House of Commons

Environmental Audit Committee

Pollinators and Pesticides

Seventh Report of Session 2012–13

Volume I

HC 668

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Volume I

Volume I: Report, together with formal minutes, oral and written evidence

Additional written evidence is contained in Volume II, available on the Committee website at www.parliament.uk/eacom

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Environmental Audit Committee

The Environmental Audit Committee is appointed by the House of Commons to consider to what extent the policies and programmes of government departments and non-departmental public bodies contribute to environmental protection and sustainable development; to audit their performance against such targets as may be set for them by Her Majesty's Ministers; and to report thereon to the House.

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The Reports of the Committee, the formal minutes relating to that report, oral evidence taken and some or all written evidence are available in a printed volume.

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The current staff of the Committee are Simon Fiander (Clerk), Nicholas Beech (Second Clerk), Lee Nicholson (Committee Specialist), Andrew Wallace (Senior Committee Assistant), Anna Browning (Committee Assistant), Yago Zayed (Committee Support Assistant) and Nicholas Davies (Media Officer).

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Summary

Insects are exposed to many environmental factors, but recent research suggests that one group of insecticides—neonicotinoids—is having an especially deleterious impact on insect pollinators. The body of peer-reviewed science on that point has developed appreciably in the course of our inquiry, but certainty is—as yet, if ever—unachievable. Our inquiry therefore focused on how Defra and the European Commission addressed monitoring, risk assessment, regulation, risk management, precaution and mitigation in response to the emerging science.

The system for approving pesticides is opaque. The Government should seek reforms whereby the European Food Safety Authority clearly identifies action points in its assessments that the European Commission must explicitly address before approving pesticides for use in the EU, and Member States should not undertake the initial assessment of products developed in their own countries in order to avoid conflicts of interest.

Defra should strategically support insect pollinators in the UK to preserve biodiversity, protect the environment and sustain a key ecosystem service. We were not encouraged by the Government's UK National Action Plan for the Sustainable Use of Pesticides, which was a missed opportunity. The plan should be revised to make integrated pest management its clear central principle, with targets to reduce reliance on pesticides as far as possible. The promotion of integrated pest management is a key feature of the EU Directive on the Sustainable Use of Pesticides, and Member States are required to implement the provisions on integrated pest management by 1 January 2014.

Defra's application of the precautionary principle involves economic factors becoming entangled with environmental decision making, which not only contradicts Defra's stated commitment to the precautionary principle, but risks overlooking the significant economic value of insect pollinators to UK agriculture. Defra should prepare to introduce a moratorium in the UK on the use of imidacloprid, clothianidin and thiamethoxam by 1 January 2014, and support such a proposal in the EU.

In the main body of this report, **conclusions are printed in bold** and ***recommendations are printed in bold italics.***

1 Introduction

Our inquiry

1. In recent years, approximately two thirds of species of wild insect pollinators have experienced population decline in the UK, while managed honeybees have experienced unusually high mortality rates, an impaired ability to pollinate crops, decreased fecundity, increased susceptibility to disease and the loss of hives.[1] Emerging scientific evidence on the possible influence on those trends, which have been replicated across Europe, of neonicotinoid pesticides has driven a discussion about the appropriate response by Governments and regulators.[2] That discussion has resulted in a range of regulatory actions across Europe, where French, German, Italian and Slovenian authorities have variously suspended the use of certain neonicotinoid insecticides on particular crops.[3]

2. Several research studies were published in 2012 on the impact of neonicotinoids on bees, notably Henry et al *(A common pesticide decreases foraging success and survival in honeybees*), Whitehorn et al *(Neonicotinoid pesticide reduces bumblebee colony growth and queen production*) and Gill et al *(Combined pesticide exposure severely affects individual and colony-level traits in bees)*. In September 2012, Defra published *Neonicotinoid insecticides and bees: The state of the science and the regulatory response*, which included its review of the Henry and Whitehorn research. It concluded that those studies did not justify changing the regulations and announced that it would undertake further research itself.

3. In May 2012, the European Food Safety Authority (EFSA) published a Scientific Opinion on the risk assessment of pesticides in relation to bees, which identified a need for a more comprehensive risk assessment for bees and recommended the introduction of a higher level of scrutiny in interpreting field studies on the impact of pesticides. Those higher standards of environmental protection and of scrutiny of field studies are yet to be agreed by EU Member States and are currently out for consultation.[4] The European Commission also tasked EFSA to produce a new risk assessment for neonicotinoids, which was published in January 2013 in the course of our inquiry.

4. Against that background of continuing scientific research on the possible effects of neonicotinoids on pollinators and discussion about the appropriate regulatory response, we decided to undertake an inquiry on what the approach in the UK should be and on how the Government should seek to shape policy making and regulation in the EU. The timing of this inquiry reflects not only the current debate in the UK and Europe—EU Member States voted on a proposal to implement a temporary moratorium on the use of certain neonicotinoids in particular circumstances on 15 March 2013—but seeks to contribute to the ongoing discussion about the relationship between science and politics and the application of the precautionary principle.

1 Q 3; *Insect Pollination*, POSTnote 348, Parliamentary Office of Science and Technology, January 2010; Ev w30, w38

2 Q 3

3 Ev 197

4 EFSA, "Guidance Document on the Risk Assessment of Plant Protection Products on Bees", *EFSA Journal*, Draft

5. The relationship between insects and insecticides also relates to a wider recent debate about sustainable food. In our May 2012 Report, Sustainable Food, we highlighted the links between food production research, food production and consumers' options and behaviours, and examined in particular the environmental impacts of producing food, the appropriate role of developing new food production techniques and the role of biotechnology.[5]

6. We took oral evidence from NGOs, scientists, the Advisory Committee on Pesticides (ACP), pesticide manufacturers Bayer CropScience and Syngenta, Defra officials, the Defra Minister Lord de Mauley, EFSA and agronomists. We also took written evidence from a range of people who are concerned about the plight of bees and other pollinators, and about the potential environmental impacts of pesticides on the environment more generally. We are grateful to them all.

7. In our inquiry, we focused primarily on neonicotinoids, rather than other pesticides, and their effects on pollinators rather than other potential environmental impacts. Accordingly, although we took evidence on potential impacts on human health (Annex), these were not a feature of our inquiry. We examined the pesticides approval system (Part 2), risk assessment, risk management and the precautionary principle (Part 3), and what more needs to be done to support pollinators in the UK (Part 4).

Insect pollinator populations

8. Thousands of insect species contribute to pollination in the UK, including bees, hoverflies, butterflies, carrion flies, beetles, midges and moths. The relative contribution of different insect species in providing pollination services has not been systematically assessed in the UK. Several characteristics of bees, such as their size, hairiness and foraging behaviour, suggest that they pollinate flowers more efficiently than other insects. UK bees include the honeybee, about 20 bumblebee species and more than 200 solitary bee species. Honeybees are intensively managed, whereas bumblebees and solitary bees are wild and unmanaged.

9. Honeybees are often cited as the most important crop pollinators, but the role of wild bees is becoming increasingly apparent to researchers. Honeybees are a practical solution to pollinating intensively farmed crops, because they can be reliably managed to be available when crops are in bloom, but wild bees may be more effective on particular crops. In apple orchards, for example, research indicates that 600 solitary bees can pollinate as well as two hives containing 30,000 honeybees.[6] A study of British oilseed rape fields found that bumblebees were twice as abundant as honeybees, and wild bees may also act synergistically with managed bees to increase pollination and crop yield.[7] It is difficult

5 Environmental Audit Committee, Eleventh Report of Session 2010–12, *Sustainable Food*, , HC 879

6 K. S. Delaplane and D. F. Mayer, *Crop Pollination by Bees* (Cambridge, 2000)

7 P. Kumar (Ed.), *The Economics of Ecosystems and Biodiversity* (London, 2010), Ch. 2

meaningfully to measure the UK's honeybee population, because it is largely a function of the number of hives maintained by beekeepers.[8]

10. Attention has recently been drawn to pollinator health by the unusually high mortality rates of managed honeybees in the USA and Europe.[9] Similar trends in other countries have contributed to claims of a global pollination crisis, although the data are limited for species other than honeybees. The decline in the well-being of honeybees has been linked to a range of factors including pests and diseases such as the Varroa mite, poor nutrition, urbanisation, agricultural intensification, habitat degradation, poor husbandry by beekeepers and climate change, as well as to pesticides and the misapplication of pesticides.[10]

11. In the UK, the overall abundance of wild pollinators has decreased in the countryside since the 1970s, and certain species have declined dramatically.[11] Buglife told us:

> As a rule of thumb, two-thirds of the species of pollinator are declining. Where we have the data, that is the situation—two-thirds are declining. So, 66% of larger moth species in the countryside, including things like the Hedge Rustic, are declining. Most of the bumblebees are declining and six species have declined by at least 80% in recent years. Where change is detectable in the data, 66% of hoverflies are declining, 71% of butterfly species are declining.[12]

Similarly, Dr Lynn Dicks of Cambridge University pointed out:

> It looks like about two thirds to three quarters of species are declining, and a good proportion of those species are declining by more than 30% every 10 years. So, for moths, two thirds of species are declining and 21% have declined by more than 30% in 10 years and that is of the widespread common species. For butterflies, it is a similar picture: 72% of the species are declining and more than half of them have declined in their distribution.[13]

12. Wild pollinator species conduct 90% of pollination in the UK.[14] Buglife told us that "70 Government scientists are researching the health and populations of honeybees and part of one person is looking at the health of wild bees."[15] Dr Dicks made the same point:

> Defra does have a bee unit that has quite a lot of staff, so they are spending quite a bit of money on monitoring bees. It is a very good monitoring scheme; there is quite a lot of scientific investigation into honeybees, and it is only for honeybees almost

8 There are currently around 28,000 beekeepers in England and Wales who manage around 138,000 colonies. Some 300 bee farmers own and manage approximately 40% of those colonies (Defra, *Improving honeybee health,* January 2013, para 23)

9 *Insect Pollination*, POSTnote 348, Parliamentary Office of Science and Technology, January 2010

10 *Ibid*; The Varroa mite only affects honeybees and therefore cannot be responsible for overall pollinator decline.

11 *Ibid.*

12 Q 3

13 Q 91

14 Q 3

15 Q 6

> entirely. So there is money; it is just somebody has decided and continues to decide that we are only interested in looking at honeybees.[16]

Professor Dave Goulson of Stirling University highlighted the limited data that are available to policy makers and regulators on wild bees and other pollinators:

> For bumblebees, we don't have numbers, so we can't tell you what the population is or how it's changed in the last 10 years or 100 years. Sadly, all we can do is look at range declines. What we can say is of the 25 UK bumblebee species, two or three—it's a moot point as to whether it's two or three—have gone extinct and probably 10 species have undergone very large range decline.[17]

13. **The available evidence indicates that wild insect pollinators, such as hoverflies, moths, midges, butterflies and wild bees, are experiencing serious population declines, but there is insufficient data to be precise about the extent of such declines due to inadequate monitoring.** ***Defra must introduce a national monitoring programme to generate and monitor population data on a broad range of wild insect pollinator species to inform policy making.***

Neonicotinoids and UK agriculture

14. The Food and Environment Research Agency (FERA) Pesticide Usage Survey found that the total amount of agricultural land treated with pesticides in 2011 (5,974,000 hectares) was similar to the area treated in 1991 (5,991,000 hectares). Over that period, the total weight of pesticides applied more than halved, falling from 1,024,000 kg to 437,000 kg, due to improvements in the effectiveness of active ingredients and in application technology. [18] That decrease encompassed a significant drop in the use of pesticide sprays (from 965,000 kg in 1991 to 356,000 kg in 2011) and a smaller increase in use of systemic seed treatments (from 58,000 kg to 81,000 kg).[19]

15. The range of active ingredients available to farmers in the EU has decreased significantly in the past 20 years. This decrease was driven by the introduction in 1993 of EU Directive 91/414, which developed the regulatory framework for pesticide registration. The number of active ingredients available for use in the EU fell from some 900 in 2001 to approximately 230 in 2009.[20]

16. Five neonicotinoids are currently approved for professional use in the UK, namely acetamiprid, clothianidin, imidacloprid, thiacloprid and thiamethoxam (TMX). Dr James Cresswell of Exeter University told us how those substances fall into two groups:

> These five chemicals fall into two groups based on their chemical structure. You have thiamethoxam, imidacloprid and clothianidin in one group. You have acetamiprid and thiacloprid in the other group. That second group are probably one to two

16 Q 95

17 Q 92

18 The active ingredient is the chemical in a pesticide product that kills, controls or repels pests.

19 Ev 137

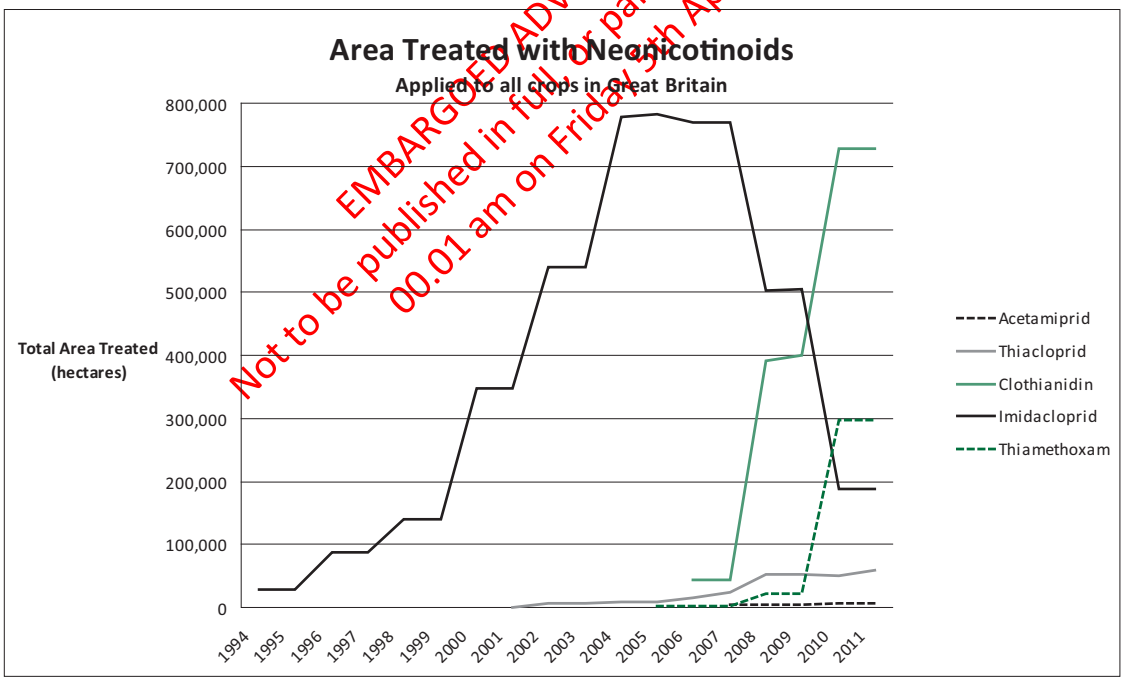
20 Ev 138

orders of magnitude less toxic than the other three, so immediately you cannot put all neonicotinoids under one label on how they will behave. In our lab, even among the three—imidacloprid, thiamethoxam, clothianidin—we are finding small but biologically interesting qualitative differences in how bees respond to those different chemicals. So some generalisation is possible, but in the details not so.[21]

17. Neonicotinoids are widely used in the UK on oilseed rape, cereals, maize, sugar beet and crops grown in glasshouses.[22] Neonicotinoids are often applied as seed treatments, which involves coating seed with a neonicotinoid insecticide in a warehouse. They are systemic, so following seed treatment, the neonicotinoid is absorbed and transported throughout the plant, which improves pest control efficiency and limits the requirement to apply subsequent foliar sprays.

18. FERA records the extent of the use of all pesticides in the UK (Figure 1).[23] The FERA data show the relatively smaller scale of thiacloprid and acetamiprid use compared with imidacloprid, clothianidin and TMX. The ACP told us that "the use of imidacloprid in the UK is declining very rapidly indeed. It is being replaced by another neonic, clothianidin."[24] Bayer CropScience also stated that the application of imidacloprid is declining "very rapidly indeed".[25] The FERA data partially confirm those observations, although imidacloprid was still applied to some 190,000 hectares of crops in 2011.

Figure 1



21 Q 149

22 Ev 138

23 FERA, Pesticide Usage Survey

24 Q 317

25 Q 458

2 Pesticide approvals

EU approvals

19. The European Commission approves active substances for use in plant protection products in EU Member States. Defra described the European approvals procedure for active substances:

> It is the job of the company which wishes to gain approval to put together the necessary scientific data to support its application … The applicant submits all of the information including study methodology and data generated, together with their own conclusions, in the form of a Dossier … The Dossier is scrutinised and assessed by a regulatory authority's experts in all of the various scientific disciplines involved. The regulatory authority's opinion—which may or may not coincide with that of the company—is set out in a Draft Assessment Report (DAR). The DAR produced by the regulatory authority of a Member State is then submitted to the European Food Safety Authority (EFSA), which organises a further scrutiny (known as peer review) by experts from all of the EU Member States. Following this peer review, EFSA sends its conclusions to the Commission. This is used as the basis for a proposal from the Commission for approval or not of the substance and any associated conditions. This proposal is adopted (or not) by qualified majority vote of Member States.[26]

20. The European Food Safety Authority (EFSA) was formed in 2002 as an independent source of scientific advice and communication on risks associated with the food chain. For pesticides work, EFSA conducts risk assessment and the European Commission is responsible for risk management. EFSA co-ordinates the peer review of active substances used in pesticides, provides scientific advice on broader issues that cannot be resolved within the peer review process and delivers scientific guidance on generic issues, commonly in the fields of toxicology, eco-toxicology and the fate and behaviour of pesticides. EU rules on the authorisation of pesticides allow the European Commission to seek EFSA's views on new evidence on the safety of a pesticide or active substance.

UK approvals

21. When an active substance has been approved by the European Commission, companies can apply to the regulatory authority in individual Member States—in the case of the UK, the Chemicals Regulation Directorate (CRD) of the Health and Safety Executive—for permission to place their product on the market. Most products include a range of substances in addition to the active substance—for example, the bait that attracts slugs to eat slug pellets. When a company seeks authorisation to market a product in the UK, the CRD prepares a scientific evaluation of factors such as the product's chemical properties, its potential toxicity to humans, dietary intake, exposure to operators and other workers, environmental fate and behaviour, efficacy and risk to crops. This draft evaluation is then considered by the Advisory Committee on Pesticides (ACP), which advises

Ministers that an authorisation can be granted only if it is content that there are no "unacceptable risks".[27]

22. The ACP is a statutory independent advisory committee constituted under section 16(7) of the Food and Environment Protection Act 1985. It advises Ministers on matters relating to the control of pests and on the approval of pesticides in the UK. Appointments to the ACP are made by open competition and follow the requirements of the Office of the Commissioner for Public Appointments. All ACP Members are required to declare any interests they might have in the pesticides industry both on an annual basis and before the discussion of particular issues. The ACP has a current membership of 20, including two lay members, mostly drawn from academia. Defra has stated that "No [ACP] member has declared that they are in the employ of companies selling neonicotinoid pesticides."[28]

Transparency

23. We heard that the data submitted by pesticide companies for regulatory purposes is not in the public domain, which makes it impossible for concerned stakeholders to examine the methods, assumptions and results underpinning risk assessment and risk management.[29] Professor Goulson commented:

> I am very confused as to why they insist this information is confidential. We are talking about safety tests, so you have a new chemical that you want to bring to the market; you have to have it tested on a range of organisms to see at what level it kills them, what concentrations kill them or whatever. There would be tests on honeybees and worms and a range of other things. It is not clear to me why that information should not be made freely available to everybody or what commercial advantage a competitor would gain by finding out how many honeybees product X would kill at a certain concentration.[30]

24. Dr Cresswell described his experience of accessing studies submitted by pesticides companies to support applications to approve products:

> I have just seen some of the studies and the way that I had to do it was I had to apply to the CRD, I had to go to York and then I had to sit in a room with a person looking to check—I don't know what he thought I might do. So I was allowed to look at the documents, make notes, but I could not have copies of them. So I did a pretty good transcription of all the data that I wanted and was able to take it away, but I am not sure that counts as transparent.[31]

Professor Goulson highlighted "the obvious inequity in that academic research that has shown evidence for harm of neonicotinoids on bees is picked apart and examined in minute detail by the agrochemical industry and yet in reverse we can't examine the

27 Ev 223

28 HC Deb, 4 March 2013, col 806W

29 Ev 125

30 Q 109

31 Q 100

evidence that they are safe."[32] Dr Dicks added that "it is the regulatory system itself, with its closed studies that you can't access, that is at fault".[33]

25. Defra appeared to be less concerned:

> The studies commissioned in support of an approval application are sometimes described as secret, but that is not an accurate portrayal. These studies carry data protection rights under EU legislation, which means that they cannot be used by other companies to gain authorisation. However the data is accessible through access to information arrangements such as those under the Freedom of Information Act and Environmental Information Regulations. These access rights to the regulatory studies have been used in respect of neonicotinoids. The Government recognises the value of having the data more readily available for wider review and has suggested to the pesticide manufacturers that it would be a good idea to publish their studies.[34]

26. **We agree with Defra that it would be "a good idea" if pesticide manufacturers were to publish the studies underpinning applications for pesticide approvals. The agrochemical industry has produced many studies on the environmental effect of neonicotinoids and other pesticides, but the data are allegedly confidential for commercial reasons. The lack of transparency in relation to trials and studies conducted by pesticide manufacturers has resulted in inequality between the pesticide industry on one side and academics and the public on the other. *The agrochemical industry should place the results of its risk assessment trials in the public domain to inform academic research and increase transparency for the public. Defra should work with industry and academics to establish which, if any, genuinely commercially sensitive details should be redacted to make that possible.***

Testing

27. On the tests that pesticide companies are obliged to conduct to support the approval of their products, the ACP told us that "the standard requirements do not include some of the specific sub-lethal effects suggested by recent academic studies."[35] The Pesticide Action Network highlighted that "the tests focus on short-term, acute toxicity to adult worker bees and mainly ignore chronic toxicity and sub-lethal effects on bee behaviour, on larvae and on hive overwintering."[36] In May 2012, EFSA published an Opinion on the risk assessment of plant protection products which addressed that point by proposing enhanced risk assessments including sub-lethal effects. Member States are currently consulting on that Opinion, which underpinned EFSA's recent revised risk assessments of neonicotinoids (paragraph 53).

32 Q 101

33 Q 103

34 Ev 196

35 Ev 216

36 Ev 125

28. The recent Gill laboratory study (paragraph 41) pointed to a need for the assessment regime to address the combined effect of multiple pesticides. Professor Goulson raised some of the practical problems:

> It becomes very complicated very quickly because there are lots of chemicals that bees would be exposed to—fungicides as well as insecticides and herbicides and so on. If you were to demand that every new product had to be tested and all possible interactions had to be tested, in an ideal world that would be wonderful, but I think the costs would quickly become extraordinary.[37]

Dr Cresswell added:

> There are two options: either you use your fundamental knowledge to predict what might happen, or you prescribe, in a regulatory framework, if those two things are going to be used together then we have to test those. I think there are ways forward but you have to be smart in what you test.[38]

29. The EU approvals process for active substances explicitly addresses only the risks to honeybees.[39] It does not explicitly refer to wild bees or other species of insect pollinator, although there is a general duty to ensure that plant protection products do not have "unacceptable effects on the environment".[40] The honeybee serves as a sentinel species for all insect pollinators in European risk assessment, but we heard that evidence derived from monitoring and testing honeybees cannot be used to draw reliable conclusions about outcomes for wild bees, let alone for other wild pollinator species. Dr Cresswell commented that "some kinds of bee are more sensitive than others. In fact, honeybees, in my view, are rather tough compared with, for example, bumblebees."[41] Dr Dicks pointed out why conclusions derived from monitoring honeybees do not apply to one important pollinator species:

> In some parts of the country, hoverflies form a very substantial proportion of the flower-feeding insect community, providing an unknown amount of the pollination service. They have very different life cycles to bees. They feed on flowers exclusively as adults. Many species have different larval habits. Some of them are laying their eggs in a crop and the larvae are feeding in the crop, so their exposure routes are very, very different from bees in many ways.[42]

30. **We recognise that it is impractical to conduct individual risk assessments for the thousands of species of bees, hoverflies, butterflies, carrion flies, beetles, midges, moths and other invertebrates that contribute to insect pollination, but we are not convinced that honeybees are an appropriate proxy for all such species.** ***We urge Defra to introduce a representative range of sentinel pollinator species in UK pesticides risk assessments and work to agree a similar arrangement across the EU.***

37 Q 130

38 *Ibid.*

39 Ev 199

40 Council Regulation (EC) No. 1107/2009, Article 4

41 Q 98

42 Q 99

Case study: imidacloprid

31. We examined the neonicotinoid imidacloprid as a case study of how the trials, risk assessment and risk management of pesticides work in practice. Imidacloprid was first approved for use as an active substance in the EU in 1991, and individual products containing imidacloprid have been registered for use in the UK since 1993. Under Article 8(2) of Council Directive 91/414/EEC, which set out a rolling programme of reassessment for active substances, imidacloprid's status as an approved substance was subject to re-evaluation in 2006. Germany was the Rapporteur Member State, and therefore the German regulatory authority produced the Draft Assessment Report (DAR) for imidacloprid in 2006. Bayer CropScience, based in Germany, developed imidacloprid, and it markets several plant protection products in which imidacloprid is the active substance.

32. We heard concerns that neonicotinoids such as imidacloprid might accumulate in the environment to the detriment of insect pollinators.[43] Many invertebrates, such as some wild bees, nest in topsoil, which makes the extent to which a toxic active substance accumulates in soil an important environmental consideration (more widely, there is the further question whether such accumulations might make their way into groundwater). We therefore examined how the issue of environmental accumulation was addressed in the 2006 re-approval process.

33. The DAR described how imidacloprid's propensity to accumulate in soil was tested by two trials conducted in two separate locations (to minimise the possibility of an anomalous result) in the UK in the 1990s:

> In order to demonstrate that imidacloprid does not persist in soil and that its use does not entail an accumulation in soil, long term dissipation studies with repetitive application of imidacloprid were conducted ... In a ... study performed in Great Britain, the long-term soil dissipation of imidacloprid following its use as seed dressing in winter barley was investigated in the course of six years. It was established that maximum concentrations in soil reach a plateau at rather low residue levels after four to six years.[44]

The DAR included the data on which that conclusion was based and expressed the results of the 1990s British soil accumulation trials in the form of two graphs (Figure 2).[45] The graphs shown in Figure 2 sit on top of the watermark, because they were added to the DAR at some point after 2006 to replace earlier graphs. The original graphs had erroneously added together the readings for different soil depths rather than averaging them. This basic arithmetic error was only partially corrected in the final version of the DAR, which still included incorrect figures which did not match the revised graphs. There was no acknowledgement in the DAR that this amendment had been made (accurate figures for the British trials appeared in an addendum in 2008).[46] Based on incorrectly calculated data, which would have exacerbated the apparent problem, the 2006 DAR concluded:

43 Ev 141, w2

44 Draft Assessment Report, "Imidacloprid", 2006, vol 1, p 42

45 *Ibid*, Annex B.8, p 640

46 Draft Assessment Report, "Imidacloprid", 2008, Final Addendum, p 8

> Long-term field dissipation trials of imidacloprid in soil with its repeated use as a seed treatment over six consecutive years have confirmed that the compound has no potential for accumulation in soil. Though the concentrations measured in the samples from the two test sites increase in the first three years the increase levels off and reaches a plateau.[47]

The conclusion in the DAR that "the compound has no potential for accumulation in soil" did not reflect the results of the trials. In reality, the trials did not show a plateau in accumulation in soil (see Figure 2, which graphs the correct data).

Figure 2

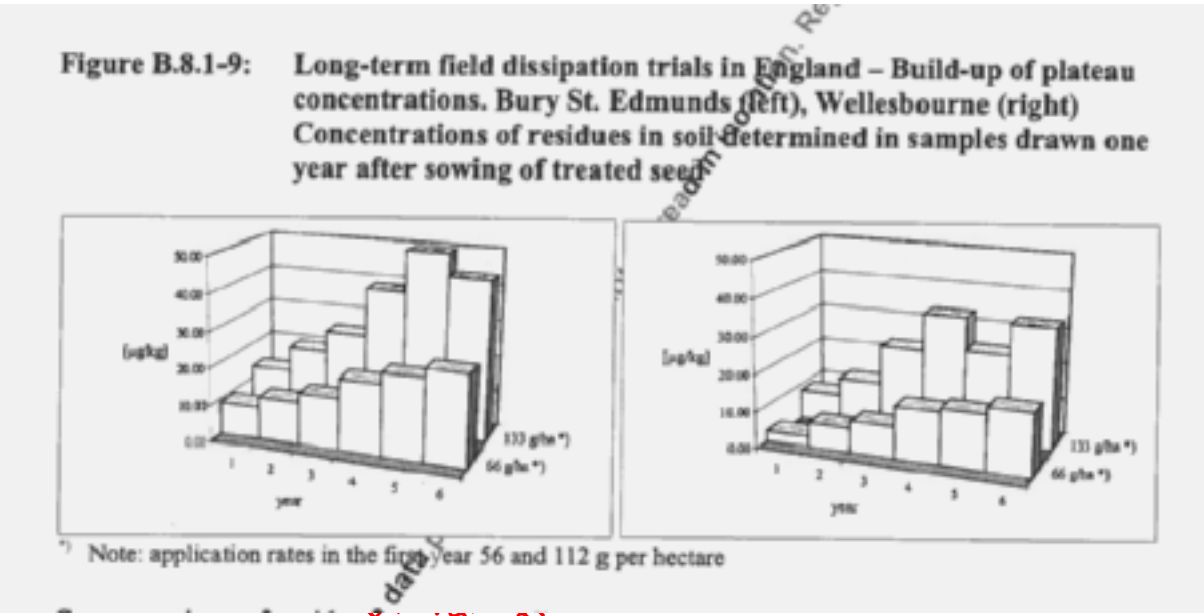


Figure B.8.1-9: Long-term field dissipation trials in England – Build-up of plateau concentrations. Bury St. Edmunds (left), Wellesbourne (right) Concentrations of residues in soil determined in samples drawn one year after sowing of treated see

*) Note: application rates in the fir year 56 and 112 g per hectare

34. The 2006 DAR was subject to peer review by EFSA, which provided a risk assessment to the European Commission. EFSA identified imidacloprid's apparent tendency to accumulate in soil in its risk assessment:

> At the two UK study sites accumulation occurred over the full 6 year duration of the studies and the experts considered that a plateau was not reached.[48]

> Plateau not reached at the end of study, data gap identified.[49]

> The risk assessment to soil dwelling organisms cannot be finalised because the assessment of soil accumulation is not finalised.[50]

47 Draft Assessment Report, "Imidacloprid", 2006, Annex B.8, p 640

48 EFSA Scientific Report, "Conclusion on the peer review of imidacloprid", vol 148 (2008), p 26

49 *Ibid*, p 79

50 *ibid*, p 58

EFSA's comments on soil accumulation were simply included in the text of its risk assessment and were not highlighted as an action point or cause for concern. EFSA also extrapolated the half-life of imidacloprid in soil, which is a measure of persistence in the environment, from the results of the UK trials: it calculated a half-life of 1,333 days at one site and of 1,268 days at the other.[51] EFSA described its calculations as "conservative estimates."[52]

35. We asked Bayer CropScience, which developed imidacloprid, about soil accumulation. Bayer's spokesman, Dr Julian Little, told us:

> It will depend on a huge number of different things, including soil type, climate, temperature, what has been grown in there, how many worms there are—everything will affect that figure. But if you are looking at something like imidacloprid or clothianidin you can be talking a half-life of anywhere between 16 and, say, 200 days.[53]

He later amended his estimate of the maximum half-life of imidacloprid: "in 'worse-case scenarios', the half-life of imidacloprid in normal soils would be variable but around 288 days, and would be expected to plateau upon repeated doses after three years."[54] That estimate is borne out by neither the 1990s UK field trials on which the re-approval of imidacloprid was based nor EFSA's 2008 risk assessment of those trials.

36. EFSA concluded its peer-reviewed risk assessment of imidacloprid in May 2008 and forwarded it to the European Commission. The EC Standing Committee on the Food Chain and Animal Health, which consists of representatives of EU Governments and public authorities and which manages risk in relation to pesticides on behalf of the European Commission, considered EFSA's risk assessment in September 2008: "The overall conclusion from the evaluation is that it may be expected that plant protection products containing imidacloprid will fulfil the safety requirements laid down in ... Directive 91/414/EEC … The review has also concluded that under the proposed and supported conditions of use, there are no unacceptable affects on the environment".[55] The Standing Committee's recommendation to approve imidacloprid did not mention the accumulation of imidacloprid in soil, and imidacloprid was re-approved in December 2008.[56]

37. We asked Defra and Bayer CropScience to comment on how soil accumulation was addressed in the re-approval process. Defra did not see the trials of imidacloprid as representative:

> The UK field accumulation study considered by EFSA was a specific data requirement from the ACP and was designed to provide a worst case assessment, hence the incorporation of the entire straw rather than stubble only … EFSA noted

51 *ibid*, p 25

52 *ibid*, p 26

53 Q 187

54 Ev 236

55 European Commission, *Review report for the active substance imidacloprid*, SANCO 108/08, September 2008

56 Commission Directive 2008/116/EC

> that the incorporation of treated plant material was the one major difference between the experimental design of the UK and German studies and might be an explanation why very long half-life of 1,333 and 1,268 days were estimated at the two UK experimental sites and a plateau in soil residues had not occurred after 6 years of experimentation.[57]

Bayer CropScience told us that the UK trials were "a very specific study that is not designed to derive half-lives."[58] It also highlighted the effect of reincorporating straw: "Normally when we do these studies they are designed to reflect common agricultural practice. In this particular study, the barley was sown and we took the harvest of the grain, but then the straw remained on the soil and the straw was chopped and shallow-incorporated back into the soil bed."[59]

38. On the reincorporation of straw into the ground, UK Agriculture and Horticulture Development Board research indicates that 50% of stem and leaf material produced by oilseed rape, a crop commonly grown from neonicotinoid-coated seed, can be collected and baled, which suggests that the remaining 50% is reincorporated.[60] Similarly, some 60% of wheat and barley can be collected and baled, which means that the other 40% remains in the environment.[61] The extent to which it is possible to collect stem and leaf material might explain why the ACP specified that straw should be reincorporated when it designed the UK trials of imidacloprid in the early 1990s.

39. When imidacloprid was re-approved for use as an active substance in 2008, Directive 91/414/EEC did not set a limit on the half-life of a substance in soil, but stipulated that an approved substance should have "no unacceptable influence on the environment … having particular regard to its fate and distribution".[62] EU Regulation 1107/2009, introduced in 2009, set criteria for 'persistence', one of which is a half-life in soil of more than 120 days (and 'very persistent' where the half-life in soil is higher than 180 days).[63] Defra told us that "active substances which are deemed to be persistent are not excluded from approval unless they are also bioaccumulative and toxic (so-called PBT substances). Imidacloprid does not meet the bioaccumulative criteria and so is not a PBT substance".[64] [65] However, Regulation 1107/2009 includes a catch-all stipulation that an active substance "shall have no unacceptable effects on the environment, having particular regard to ... its fate and distribution in the environment, particularly contamination of surface waters, including estuarine and coastal waters, groundwater, air and soil".[66] In short, Defra acknowledged

57 BEE 38, Defra, para 8

58 Q 434

59 *Ibid.*

60 Harley Stoddart and Jack Watts, "Biomass feedstock, residues and by-products", Agriculture and Horticulture Development Board, 2012

61 *Ibid.*

62 Council Directive 91/414/EEC, Article 4(1)(v)

63 Council Regulation (EC) No. 1107/2009, Annex II.

64 Ev 237

65 Bioaccumulation refers to the accumulation of substances, such as pesticides, or other organic chemicals in an organism. Bioaccumulation occurs when an organism absorbs a toxic substance at a rate greater than that at which the substance is lost.

66 Council Regulation (EC) No. 1107/2009, Article 3(e)

that imidacloprid is persistent (Regulation 1107/2009 indicates that it is "very persistent") and toxic, but justified its approval on the grounds that it is not bioaccumulative. Defra did not engage with the question whether imidacloprid's apparent half-life in soil might constitute an "unacceptable influence on the environment".[67]

40. **For Governments, scientists and the public to have confidence in the EU-wide pesticide approvals regime, data and analysis should be rigorously scrutinised and quality checked to form a credible evidence base. The 2006 re-approval of imidacloprid for use in the EU shows two flaws in the system. First, EFSA identified the issue of soil accumulation in its peer review, but the European Commission proceeded to sign off imidacloprid as an approved active substance for use in Member States without explicitly addressing that risk. There seems little point in EFSA's assessing risk if the Commission ignores environmental threats identified in that process.** ***We recommend that the Government exercises its influence in Europe to empower EFSA to include action points in future peer reviews which the European Commission must explicitly address before approving active substances.*** **Secondly, the choice of Germany as the Rapporteur Member State in the case of a substance developed and manufactured in Germany raised a potential conflict of interest.** ***The Government should seek a common understanding in Europe that active substances should be assessed by the regulatory authority of a Member State other than the one in which the applicant company is based.***

67 Council Directive 91/414/EEC, Article 4(1)(v)

3 Risk and precaution

Henry, Whitehorn and Gill

41. A growing body of published, peer-reviewed research studies points to an association between neonicotinoids and the health of pollinators. Buglife summarised research on the effect of neonicotinoids on bees and other pollinators published since 2009:

> There are 41 studies but eight of them we think are suspect, because of the dose rates being wrong or various experimental errors or foibles. If you take those out of the equation, 94% of the studies are showing impacts on bees, other insects and on the environment. This includes fatalities from dust, for instance. This includes increased disease susceptibility and death. This includes reduced foraging and activity within bees and reduced reproduction, particularly in bumblebees.[68]

Taken together, those scientific studies suggest that low doses of neonicotinoid insecticides can have sub-lethal effects that might cause sufficient disruption to the normal functioning of bees to be a threat at the colony or population level.

42. Three important studies on the effect of neonicotinoids on bees were published in 2012, either immediately before or during our inquiry:

- The French Henry study found that the non-lethal exposure of honeybees to TMX causes high mortality due to homing failure at levels that could put a colony at risk of collapse. Simulated exposure events on free-ranging, foraging honeybees labelled with a radio-frequency identification tag suggested that homing is impaired by TMX intoxication.[69] This study led the French Government to withdraw the approval for use in France of Syngenta's neonicotinoid pesticide Cruiser on oilseed rape.[70]

- The Whitehorn study entailed exposing colonies of bumblebees in the laboratory to the neonicotinoid imidacloprid, which were then allowed to develop naturally under field conditions. Treated colonies had a significantly reduced growth rate and suffered an 85% reduction in production of new queens compared with control colonies.[71]

- The Gill study investigated whether exposure to two of the most commonly used pesticides on flowering crops in the UK, the neonicotinoid imidacloprid and the pyrethroid lambda-cyhalothrin, detrimentally affects bumblebee behaviour with knock-on consequences for colony survival.[72]

43. On the significance of the emerging research, Dr Dicks commented:

68 Q 26

69 Mickaël Henry et al, "A Common Pesticide Decreases Foraging Success and Survival in Honey Bees", *Science*, vol 336 (2012), pp 347–-350

70 Ev 154

71 Penelope R. Whitehorn, Stephanie O'Connor, Felix L. Wackers, Dave Goulson, "Neonicotinoid Pesticide Reduces Bumble Bee Colony Growth and Queen Production", *Science,* vol 336 (2012), pp 351–352

72 R. J. Gill, O. Ramos-Rodriguez and N. E. Raine, "Combined pesticide exposure severely affects individual and colony-level traits in bees", *Nature,* vol 491 (2012)

> The existing published evidence about the sub-lethal effects of neonicotinoids on bumblebees (particularly Gill et al 2012; Whitehorn et al 2012) show that serious implications for bumblebee colonies are possible, if they are being exposed in the wider environment at the levels tested. Effects have been measured on reproductive fitness (85% reduction in new queen production) and colony foraging (69% of workers lost over four weeks when exposed to neonicotinoid and pyrethroid combined). Such effects would be unacceptable.[73]

44. Analysis of the Henry, Whitehorn and Gill studies focused on the question of what might be a field-realistic exposure level to neonicotinoids for bees. Dr Cresswell told us:

> There is insufficient evidence to establish with high certainty that the residues of neonicotinoid pesticides in nectar and pollen threaten the sustainability of bee populations and the pollination services that they provide to crops and wild plants. But there is sufficient evidence to raise concern about bumblebees. No experiment has demonstrated that neonicotinoids threaten the viability of honeybee colonies when delivered at realistic dietary levels. Experiments that have demonstrated impacts on colonies used unrealistically high dosages.[74]

Syngenta also questioned the dosage of neonicotinoids used in those studies:

> All those studies, in common with a number of other studies in the literature implicating pesticides as a particular problem in bee decline, are purporting to be field-realistic when in reality they are laboratory studies, usually using doses that are very unrealistic so that you are actually getting toxic effects on insects from insecticides.[75]

Syngenta's Chairman, Martin Taylor, put it more colourfully in a recent radio interview:

> The famous Henry study in France last year, which began all this fuss really, gave the bees something like 10 to 30 times the dose they get in nature and found that they had difficulty navigating home. I think I would have difficulty navigating home if I drank 20 bottles of wine.[76]

45. Bayer CropScience criticised the nature of the Whitehorn study:

> When you first looked at the headline that came out of there it suggested that this was a field study. In reality it wasn't, it was a laboratory study in which essentially insects were force-fed high levels of neonicotinoids and then given some chance to be outside. It is very different from how a bumblebee would normally be and therefore it is very difficult to see how you come to a conclusion that as a result of this study there is clearly a problem.[77]

On the other hand, Professor Goulson, who participated in the Whitehorn study, told us:

73 Ev 160

74 Ev 149

75 Q 156

76 Radio 4, "Today", 8 February 2013

77 Q 156

> The concentrations we used were taken from a published scientific study—one of the few that is in the public domain—that had measured levels of imidacloprid in oilseed rape nectar and pollen, and we precisely copied the published levels and fed that to the bees. So the concentrations were perfectly realistic from what we know of what is found in oilseed rape. There is a valid criticism of our study, which is that the bees did not have any choice but to feed on the treated food. So we exposed them for two weeks in their nests to treated pollen and nectar or untreated pollen and sugar water. During that period they did not have the option to feed on something else, whereas obviously in the real world if a nest is close to an oilseed rape field the bees could choose, some of them or all of them, not to feed on the rape. My guess is that that is not the case because they seem to love it. To try and balance that off, we exposed them for two weeks. In actual fact, a nest near a rape field would be exposed for four or five weeks because that is how long it flowers for. So on the one hand we may have exaggerated the effect by not allowing the bees the choice of feeding on something else, but on the other hand, we only exposed them for two weeks as opposed to four or five. How those two things balance up is anyone's guess, but it was the best experiment we could come up with in a world where there are not control sites. The reason we didn't do it outside is because there was nowhere where we could put nests where they would not be exposed to neonicotinoids if they were free flying.[78]

Defra's response to the emerging evidence

46. Defra stated in September 2012 that "none of the studies give unequivocal evidence that sub-lethal effects with serious implications for colonies are likely to arise from current uses of neonicotinoids."[79] Nevertheless, it was sufficiently concerned to commission FERA to conduct field studies to test the laboratory research:

> Further research will be carried out to fill identified evidence gaps, including the questions raised about the relevance of the recent studies to field conditions. The Government has already put new research in place to explore further the impacts of neonicotinoids on bumblebees in field conditions and to understand what levels of pesticide residues and disease in bees are normal.[80]

47. In December, Defra's chief scientific adviser, Professor Ian Boyd, told us, "We have commissioned a number of studies to try to get to the bottom of the problem."[81] "The key piece of research is the bumblebee study in as realistic field conditions as possible".[82] That approach was endorsed by the ACP, which told us that the FERA research would provide "conclusive evidence one way or the other."[83] FERA's field studies underpinned recent Defra policy on neonicotinoids in the UK and Europe. For example, Defra Secretary of State Owen Paterson MP told the NFU Annual Conference in February 2013 that he had

78 Q 126

79 Defra, *Neonicotinoid insecticides and bees: The state of the science and the regulatory response*, September 2012, para 2

80 Ev 199

81 Q 343

82 Q 345

83 Q 258

"asked the [European] Commission to consider all the evidence and to wait for the results of our field trials, rather than rushing to a decision based on lab tests alone."[84]

48. In January 2013, the ACP considered the results of FERA's bumblebee study. The minutes of that meeting stated:

> This study was presented to the committee and the findings discussed with the invited experts. It was concluded that the study was very difficult to interpret as there was exposure of bumblebees to neonicotinoid insecticides recorded at all three sites including the control where the oilseed rape crop had been grown from untreated seed.[85]

When we subsequently discussed the inconclusive results of the FERA research with Professor Boyd, he pointed out that "this is the nature of field studies, unfortunately. You cannot control for everything."[86]

49. Defra supplied us with a note on the FERA bumblebee field study which revealed a number of apparently fundamental flaws in execution.[87] First, the bumblebees that were exposed to the neonicotinoid imidacloprid were placed outside two weeks after the control group and the unexposed bees, which introduced seasonal variables into the experiment. Secondly, the bees that were exposed to imidacloprid had a lower starting mass than the other two groups, which might have skewed the final result given that the mass of bee colonies increases exponentially. Finally, the neonicotinoid TMX, which was not part of the experiment, was the most abundant residue in pollen and nectar in the unexposed hives.[88] In other words, the unexposed hives contained higher levels of a neonicotinoid that was not part of the experiment than the hives that were deliberately exposed to imidacloprid; an example of the extent to which neonicotinoid insecticides permeate the UK agricultural environment.

50. In November 2012—three months before the results were available for analysis—Dr Dicks presciently pointed out why the FERA bumblebee field study was unlikely to be conclusive:

> It is described as an edge-of-field study and it seems very likely to me to have one-hectare treatment plots with bumblebee colonies on the side of those treatment plots. One hectare is 100 metres by 100 metres, and I said in my written evidence we have some experimental research showing that bumblebees actually prefer to forage further than 100 metres away from their colony, so they are not likely to feed on that rape that is treated that they are on the edge of; they are much more likely to fly over it. The foraging range of the species they are likely to use, which is Bombus terrestris, the buff tailed bumblebee, is probably between one and a half and three kilometres

84 "Owen Paterson speech at the National Farmers Union Annual Conference", *Defra online*, February 2013, www.defra.gov.uk

85 Advisory Committee on Pesticides, "Minutes of the 359th meeting", January 2013

86 Q 621

87 Ev 250

88 *Ibid.*

> by evidence from recent studies. So they are not going to be feeding on the treated rape in the study.[89]

Dr Dicks also told us that the degree of scientific certainty required by Defra as a basis for action would require a 10-year research project costing around £20 million.[90]

51. **The Henry, Whitehorn and Gill laboratory studies raised serious concerns about the potential effect of neonicotinoid insecticides on bees. While laboratory studies should as far as possible replicate field conditions, they cannot by their nature do so precisely. One of their virtues, however, is that they take place in controlled conditions. The FERA bumblebee study, which Defra commissioned to test the conclusions of the laboratory studies in the field, was, we conclude, fundamentally flawed because the bees were placed outside on different dates, some colonies had a lower starting mass than others and a different neonicotinoid from the one used in the study was present in the 'unexposed' hives. The FERA bumblebee study is not therefore a compelling basis for inaction.**

52. The ACP, which provides Ministers with expert advice on pesticides, shifted its position on the effect of neonicotinoids on bees in the course of our inquiry. In November 2012, the ACP told us that laboratory studies "have not established convincingly that the exposures employed experimentally are likely to occur in nature."[91] In February 2013, however, following EFSA's revised risk assessments which we discuss below, it concluded:

> Whilst there is no single piece of evidence clearly identifying a significant adverse effect of neonicotinoid insecticides on bee species in the UK, the accumulation of information does not rule out the possibility that there might be effects occurring to bees in the field in the UK and much of this new information points in the direction of potential adverse effects.[92]

EFSA revised risk assessments

53. In April 2012, the European Commission asked EFSA to reassess the risks associated with the use of the neonicotinoid insecticides clothianidin, imidacloprid and TMX with particular regard to their acute and chronic effects on bee colony survival and development, their effects on bee larvae and bee behaviour, and the risks posed by sub-lethal doses of the three substances. EFSA published its revised risk assessments in January 2013. The risk assessments focused on three main routes by which bees are exposed to neonicotinoids: exposure from residues in nectar and pollen in the flowers of treated plants; exposure from dust produced during the sowing of treated seeds or application of granules; and exposure from residues in guttation fluid produced by treated plants.[93] EFSA produced its risk assessments by evaluating the studies submitted for the approval of the

89 Q 123

90 Qq 258–259

91 Ev 223

92 Ev 252

93 Guttation is the process by which some plants exude sap in droplets that resemble dew.

active substances at EU level, the authorisations of plant protection products at Member State level, relevant scientific literature and monitoring data recorded at national level.

54. EFSA conducted its assessments in line with its *Scientific Opinion on the risk assessment of plant protection products in relation to bees*, which it had published in May 2012. This Opinion proposed a more comprehensive risk assessment for bees, including sub-lethal effects, and a higher level of scrutiny for the interpretation of pesticide field studies. Member States are yet to agree this Opinion.[94] In its revised risk assessments, EFSA judged the available evidence against a higher standard of environmental protection for honeybees than had previously been applied, derived from its Opinion. Bayer CropScience commented: "In the case of EFSA's proposed guidance for insecticides … the [knowledge] gaps are very big … We have estimated that 96% of all pesticides, whether it is an insecticide or otherwise, would fail on that knowledge gap."[95]

55. Although the European Commission tasked EFSA with assessing the effect of all neonicotinoids on pollinators, EFSA conducted risk assessments on imidacloprid, clothianidin and TMX rather than on all five substances. When we asked Herman Fontier, Head of Pesticides at EFSA, why EFSA had not risk assessed thiacloprid and acetamiprid, he replied:

> In the first instance, we had been mandated by the Commission to look into these as well, but then, because the task was just too much for us, the Commission said, "Forget for the time being about acetamiprid and thiacloprid." Why? Because they are much less toxic to bees. It is a factor of 1,000. It is a huge difference.[96]

56. EFSA drew the following conclusions on the three neonicotinoids (imidacloprid, clothianidin and TMX) which it risk assessed:

> Exposure from pollen and nectar. Only uses on crops not attractive to honeybees were considered acceptable.
>
> Exposure from dust. A risk to honeybees was indicated or could not be excluded, with some exceptions, such as use on sugar beet and crops planted in glasshouses, and for the use of some granules.
>
> Exposure from guttation. The only risk assessment that could be completed was for maize treated with thiamethoxam. In this case, field studies show an acute effect on honeybees exposed to the substance through guttation fluid.[97]

EFSA categorises asparagus, cotton, maize (corn), oilseed rape, sunflower, pumpkin and linseed (flax) as crops that are attractive to bees.[98] This assessment therefore excludes wheat, barley, sugar beet and oats, along with many other crops.

94 EFSA, "Guidance Document on the Risk Assessment of Plant Protection Products on Bees", Draft

95 Q 384

96 Q 519

97 "EFSA identifies risk to bees from neonicotinoids", EFSA press release, 16 January 2013

98 EFSA, "Conclusion on the peer review of the pesticide risk assessment for bees for the active substance imidacloprid", *EFSA Journal*, 2013, p 17

57. EFSA does not make recommendations; it conducts risk assessments.[99] The European Commission judges how to manage any risks identified by EFSA. In that light, Defra Minister Lord de Mauley queried the use of the word "acceptable" in the EFSA press release summing up the revised risk assessments.[100] In fact, in its pesticide peer reviews—the primary source—EFSA identified the following "concerns" in relation to imidacloprid, clothianidin and TMX. On imidacloprid, EFSA concluded:

> Several issues that could not be finalised were identified in relation to the exposure of honeybees via dust, from consumption of contaminated nectar and pollen, and from exposure via guttation fluid. In addition, the risk to pollinators other than honeybees, the risk from residues in insect honey dew, and the risk from exposure to residues in succeeding crops could not be finalised … A high acute risk to honeybees was identified from exposure via dust drift for the authorised uses in cereals, cotton, maize and oilseed rape. A high acute risk was also identified for exposure via residues in nectar and/or pollen for the authorised uses in cotton, oilseed rape and sunflowers.[101]

On clothianidin, EFSA concluded:

> Several issues that could not be finalised were identified in relation to the exposure of honeybees via dust, from consumption of contaminated nectar and pollen, and from residues in exposure via guttation fluid. In addition, the risk to pollinators other than honeybees, the risk from insect honey dew, and the risk from exposure to residues in succeeding crops could not be finalised … A high acute risk to honeybees was identified from exposure via dust drift for the seed treatment uses in maize, oilseed rape and cereals. A high acute risk was also identified from exposure via residues in nectar and/or pollen for the uses in oilseed rape.[102]

On TMX, EFSA concluded:

> Several issues that could not be finalised were identified in relation to the exposure of honeybees via dust, from consumption of contaminated nectar and pollen, and from exposure via guttation fluid. In addition, the risk to pollinators other than honeybees, the risk from residues in insect honey dew, and the risk from exposure to residues in succeeding crops could not be finalised … A high acute risk to honeybees was identified from exposure via dust drift for the authorised uses in cereals, cotton, oilseed rape (except for uses with the lowest application rate authorised in the EU) and maize. A high acute risk was also identified for exposure via guttation fluid for the authorised uses in maize.[103]

99 Q 513

100 Q 596

101 EFSA, "Conclusion on the peer review of the pesticide risk assessment for bees for the active substance imidacloprid", *EFSA Journal*, 2013, p 34

102 EFSA, "Conclusion on the peer review of the pesticide risk assessment for bees for the active substance clothianidin", *EFSA Journal*, 2013, p 37

103 EFSA, "Conclusion on the peer review of the pesticide risk assessment for bees for the active substance thiamethoxam", *EFSA Journal*, 2013, p 45

58. EFSA's risk assessments were not comprehensive. In some cases, EFSA was "unable to finalise the assessments due to shortcomings in the available data."[104] Those shortcomings were largely due to the new, higher standard of environmental protection for bees applied in these risk assessments, which has rendered inadequate the data generated by many of the original field trials on which approvals were based.[105] Under the current EU pesticides approval regime, the European Commission is responsible for managing the risk where EFSA is unable to finalise its assessments due to insufficient data.

59. EFSA found that dust drift posed "a high acute risk" to honeybees in the cases of all three neonicotinoids that it risk assessed. We heard that this observation might not apply to the UK. In Italy, the suspension of imidacloprid, TMX and clothianidin as maize treatments was driven by the discovery that dead bees had been in direct contact with airborne contaminated dust generated during the drilling of treated seed. Dust from abraded seed coatings was found to contain 20% neonicotinoid content, which was more than 2,000 times the dosage in spray treatments.[106] Improving the seed treatment process and modifying the drilling equipment were proposed as ways to reduce that exposure route.[107]

60. The NFU told us that "the standards of agricultural practice in the use of pesticides in the UK are among the highest in Europe".[108] It also pointed out that "careful stewardship of all pesticide-treated seed is undertaken by the industry. This includes improving seed applications to reduce risks of pesticide dusts, and by encouraging operator care to avoid seed spills and ensure seeds are properly buried when drilled."[109] Defra set out how it believed that the risks associated with contaminated dust do not apply in the UK:

> The suspensions in Germany, Italy and Slovenia followed particular incidents in which poor practice in treating and sowing seed led to bee kills due to the creation of excessive dust contaminated with neonicotinoids. Our assessment is that the risk of similar incidents in the UK is negligible. There are several reasons for that conclusion. First, the dose rates used in the seed treatment in Germany were almost double those which would be used in the UK. Second, the problems related to maize and drilling was taking place at an unusual time of year when adjacent crops were in flower. Third, seed treatments in the UK are carried out by professional contractors, which minimises the risk of a sticker not being applied (stickers help the pesticide adhere to the treated surface). Fourth, drilling equipment in the UK is either built differently or has been adapted so that it directs dust towards the ground, thus minimising the risk of drift.[110]

104 "EFSA identifies risk to bees from neonicotinoids", EFSA press release, 16 January 2013

105 EFSA, "Conclusion on the peer review of the pesticide risk assessment for bees for the active substance thiamethoxam", *EFSA Journal*, 2013, p 2

106 Marzaro et al, "Lethal aerial powdering of honey bees with neonicotinoids from fragments of maize seed coat", *Bulletin of Insectology,* vol 64 (2011), pp 119–126

107 Tapparo et al, "Assessment of the environmental exposure of honeybees to particulate matter containing neonicotinoid insecticides coming from corn coated seeds", *Environmental Science and Technology,* vol 46 (2012), pp 2592–2599

108 Ev 137

109 *Ibid.*

110 Ev 197

Similarly, Bayer CropScience and Syngenta highlighted the safeguards in UK agricultural equipment and the application of 'stickers'.[111]

Precautionary principle

61. The 1992 United Nations Rio Declaration stated:

> In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.[112]

This statement was adopted by the European Commission in the Lisbon Treaty:

> Union policy on the environment shall aim at a high level of protection taking into account the diversity of situations in the various regions of the Union. It shall be based on the precautionary principle and on the principles that preventive action should be taken, that environmental damage should as a priority be rectified at source and that the polluter should pay.[113]

Although the EU has never adopted a comprehensive definition of the precautionary principle, it nevertheless informs not only EU environmental policy, but EU laws on food, consumer protection, trade, research, and technological development.

62. Several witnesses told us that Defra "is not taking a sufficiently precautionary approach."[114] Defra's September 2012 document, *Neonicotinoid insecticides and bees: The state of the science and the regulatory response*, did not include the words "precaution" or "precautionary principle". Instead, it justified its policy on the basis that none of the recent studies (paragraph 41) provided "unequivocal" evidence of serious implications for bee colonies, which might be taken as the opposite of the precautionary principle.[115] When we put this to Lord de Mauley, he told us:

> Let me be very clear that Defra fully accepts that the precautionary principle applies to decisions on the regulation of pesticides.[116]

> I fully accept that the use of the word "unequivocal" was inappropriate. We are not seeking unequivocal evidence, and recognise that scientific studies can never meet such a test. The reality is that we do consider the weight of evidence and, at present, the evidence suggests that the effects do not occur in the field.[117]

111 Q 170

112 United Nations, *Rio Declaration*, Principle 15

113 European Union, *Lisbon Treaty*, Article 191

114 Ev 125, 145–146

115 Defra, *Neonicotinoid insecticides and bees: The state of the science and the regulatory response*, September 2012, para 2

116 Q 343

117 Q 344

63. Defra's position on applying the precautionary principle contrasts with that in other European countries. The Pesticide Action Network told us:

> Whilst Defra have clearly decided that no action needs to be taken in the short term, the French regulatory authorities have taken a different view and have, for some years, instituted further controls and restrictions on some neonicotinoids. Following the publication of the Henry et al and Whitehorn et al studies, in March this year, the French suspended the approval for the use of thiamethoxam for oilseed rape seed treatments in June 2012. We do not understand why Defra came to a different conclusion, particularly as the cropping systems for OSR [oilseed rape] are similar in both countries. The Italian authorities, and to some extent, the German authorities have also adopted different approaches to the UK in regard to suspensions.[118]

64. EU Regulation on plant protection products states that "the objective of protecting human and animal health and the environment should take priority over the objective of improving plant production."[119] However, Defra linked economic factors to the application of the precautionary principle. Lord de Mauley told us, "We have put the case for a proportionate and evidence-based approach to this whole issue. On the one hand, there are important issues about the protection of pollinators and, on the other, there are real economic concerns."[120]

65. In 2012, nearly all oilseed rape sown in the UK was seed treated with a neonicotinoid insecticide.[121] Oilseed rape has recently become an important crop for UK arable farmers, driven in part by the increase in commodity prices in recent years. Previously grown as a break crop to help control pests and diseases in cereals, it now provides a similar output to wheat. Oilseed rape suffers from pests and diseases, such as the peach-potato aphid and the flea beetle. An agronomist, Peter Riley of Prime Agriculture, told us:

> As advisers I guess we have been led, in the past, towards seed treatments on account of the much lower levels of active ingredient used. In the case of neonicotinoids, it has made a huge difference, particularly in something like oilseed rape, which means that we get a much more consistent establishment of crop. Generally, the industry now uses something like probably a third of the seed that we were using 10 years ago.[122]

66. We asked our agronomist witnesses whether a hypothetical moratorium on the use of neonicotinoid insecticides would render it impossible to farm certain crops in the UK. Peter Riley told us:

> I am not necessarily suggesting that it would become uneconomical, but it would have a profound effect on the average margin that a farmer would have. I simply

118 Ev 126

119 Council Regulation (EC) No. 1107/2009, Recital 24

120 Q 585

121 Ev 138

122 Q 569

> don't know exactly what the full ramifications were, but I could imagine it could be quite difficult for farmers certainly.[123]

Chris Bean of Agrii added:

> It is the sort of question that you can't give an exact answer to because things will differ from year to year … It is not necessarily every field on the farm, but some fields would be badly affected. For those that were badly affected prior to the development of the seed treatments it was a case of re-drilling or giving up on the oilseed rape and putting some winter wheat in or something instead. That is a significant drain on a farmer's resources … Certainly, trials that we have done, trials that the manufacturers of the seed treatments have done have suggested anything from a 10% to 25% yield loss as a result of virus damage to the crop … In sugar beet, I would imagine it is far more damaging than that.[124]

67. On the other hand, the Pesticide Action Network pointed out:

> If you look at the example of Italy, where they have banned certain seed dressings on maize crops, not using them has not led to any increase in pest or disease problems. It has also not resulted in any kind of loss of yield or profitability to the people growing the maize.[125]

The Soil Association also referred to the Italian example:

> After the restrictions on neonicotinoids came in, they did some detailed studies on the yield and found that overall there was no negative effect. Even in terms of the affected maize plants, they found that only 10% were affected by any of the major soil dwelling pests. There was no overall impact on production levels and less than 3% of sample fields were affected.[126]

68. The Humboldt Forum for Food and Agriculture estimated the economic worth of neonicotinoid seed treatments in the European Union.[127] It concluded that "over a five-year period, the EU could lose €17 billion and more; 50,000 jobs could get lost economy-wide; and more than a million people engaged in arable production and their livelihoods would certainly suffer".[128] That analysis was predicated on a total ban on all neonicotinoid pesticides on all crops and is not congruent with either the evidence we heard from agronomists or the Italian experience of farming maize without neonicotinoids. In addition, the Humboldt Forum analysis did not take into account the agricultural and economic value of pollinators, which we explore in Part 4. **Neonicotinoid pesticides are not fundamental to the general economic or agricultural viability of UK farming, although there may be specific issues in relation to oilseed rape that might require careful management if neonicotinoids were not available to growers.**

123 Q 572

124 *Ibid*

125 Q 48

126 Q 80

127 Humboldt Forum for Food and Agriculture, *The value of neonicotinoid seed treatment in the European Union,* 2013

128 *Ibid,* p 34

69. **Defra policy on pesticides must be evidence-based. Where the available scientific evidence is either incomplete or contradictory, Defra must apply the precautionary principle rather than maintaining the status quo while waiting for further evidence. Defra policy in relation to neonicotinoids is not currently founded on the precautionary principle as set out in the 1992 United Nations Rio Declaration and the Lisbon Treaty, in that Defra will not countenance imposing a moratorium if it would not be "proportionate". Ministers currently consider that a decision on a moratorium should be informed by potential economic impacts as well as by clearer proof about harm to bees than is currently available or is likely to be produced in the near future. We recognise the agricultural value of neonicotinoid insecticides, but economic factors should not blur environmental risk assessment and risk management, where the protection of people and the environment must be paramount. *Defra must review how it exercises the precautionary principle. Economic considerations should not form part of environmental risk management decision making, but rather should be a function of a distinct and transparent subsequent political process.***

European Commission

70. Following EFSA's revised risk assessments, the European Commission exercised its risk management function by introducing an Amending Regulation to alter the conditions of approval for use of imidacloprid, clothianidin and TMX in the European Union.[129] This proposal would have introduced a two-year moratorium on the use of the three neonicotinoids on crops that are attractive to bees, with exceptions in the cases of winter cereals (because dust exposure during autumn is not considered a major issue) and of bee-attractive crops grown in greenhouses, and prohibited the sale and use of neonicotinoids to non-professional users (paragraph 82).

71. This proposal was subject to a qualified majority vote of Member States on 15 March 2013, when no qualified majority was reached either in favour or against the proposal. Although the European Commission does not publicise how Member States voted, Defra set out why the UK abstained:

> Bee health is extremely important but decisions must be based on sound scientific evidence and rushing this through could have serious unintended consequences both for bees and for food production. We are not opposing the EU's proposals. We have been clear all along that we want any decision on neonicotinoids to be based on science. We are currently finalising studies that will give us the evidence on which to base a proper decision. But as we do not have the evidence yet it is impossible for us to vote either way. There are seven other member states we expect to abstain along with us and we expect nine countries to oppose the Commission's proposals as they currently stand.[130]

72. Defra cited the need to analyse the FERA research studies as a factor in its decision to abstain (paragraph 46). The inconclusive outcome of the 15 March vote allows the

129 Commission Amending Regulation, SANCO/10262/2013

130 "What is the value of bees?", *The Guardian,* 15 March 2013

European Commission the option of appealing the decision, which would lead to a further vote of Member States, or revising and reintroducing the proposal.

UK National Action Plan for the Sustainable Use of Pesticides

73. Under the EU Directive on the Sustainable Use of Pesticides, which was transposed into UK law by the Plant Protection Products (Sustainable Use) Regulations 2012, the UK was obliged to establish an action plan to promote the sustainable use of pesticides.[131] Member States were required to develop and submit national action plans to the European Commission "by 14 December 2012".[132] Defra published the UK National Action Plan for the Sustainable Use of Pesticides on 26 February 2013. When we asked Defra Minister Lord de Mauley why the publication of the UK plan was delayed, he stated that "It is purely the process of giving due consideration to the responses to the consultation."[133] However, Lord de Mauley's officials were unable to point to a substantive difference between the draft consultative action plan and the published final action plan. Dave Bench, Director of Science, Engineering, Analysis and Chemicals Regulation at the Health and Safety Executive, explained: "In terms of substantive content, is there anything radically different in this draft to what we would have had in draft prior to the Christmas period? No, there is not anything radically different."[134] Dave Bench was, however, unwilling to accept the contention that the consultation might not have been "effective".[135]

74. On the content of the UK plan, the pesticides directive stipulated that "Member States shall adopt National Action Plans to set up their quantitative objectives, targets, measures and timetables to reduce risks and impacts of pesticide use on human health and the environment."[136] Dave Bench told us: "Our position has been for some time that we are not in favour of quantitative reduction targets of that kind of nature because they are generally fairly meaningless."[137] We asked whether the UK plan therefore complied with the directive. Dave Bench replied, "Now we believe, and have checked with our lawyers, that what we have put into the National Action Plan—which of course is intended to be an ongoing, developing document, not static—is compliant with the requirements of the directive."[138] **That it was necessary to take legal advice whether the UK National Action Plan for the Sustainable Use of Pesticides complied with the minimum requirements of the EU directive suggests that the UK failed to take this opportunity to address pesticide use to benefit human health and the environment. It is difficult to see how pesticide use will change without the implementation of the objectives, timetables, measures and targets that officials dismissed as "meaningless".**

131 Council Directive 2009/128/EC

132 *ibid*, Article 4(2)

133 Q 351

134 Q 628

135 Q 629

136 Council Directive 2009/128/EC, Article 4(1)

137 Q 630

138 Q 636

75. The pesticides directive also stated that action plans should "encourage the development and introduction of integrated pest management."[139] The published UK plan stated that "this part of the UK National Action Plan will be developed over the coming months … We will consider what more might be done to help and encourage users in this area."[140] Professor Potts underlined the merit of the objective set out in the directive:

> What we need, in my opinion, is a longer-term phased reduction in all pesticides, not just neonicotinoids, and increasing uptake of more IPM [integrated pest management] strategies, things like biocontrol, better crop management and so on. A lot of those tools are out there and if we are going to get co-benefits of good production, food security and good environmental quality, then we need to be a lot smarter about the way we intensively farm.[141]

76. Integrated pest management (IPM) is a broad approach to plant protection that discourages the development of populations of harmful organisms, keeps the use of pesticides and other forms of intervention to levels that are economically and ecologically justified and reduces or minimises risks to human health and the environment. IPM emphasises the growth of a healthy crop with the least possible disruption to ecosystems and encourages natural pest control mechanisms. Many UK farmers already utilise practices which are in line with IPM principles, particularly due to the requirements of farm assurance schemes, retailer requirements or other national or international production standards.

77. Seed treatments entail the application of pesticides before the onset and extent of any pest population can be known. Some have argued that such prophylactic seed treatment is often unnecessary and therefore inconsistent with the principles of IPM. The Pesticide Action Network pointed out:

> It is impossible for a farmer to buy non-seed-treated oilseed rape seed, so 100% of the oilseed rape in this country is grown with a systemic pesticide in it. There is no indication whether any of that is dealing with any kind of real-life pest threat whatsoever. It is simply an insurance policy.[142]

The Soil Association told us:

> There is a wide range of pest-control alternatives to the use of pesticides for insect control. Many crop pest species have natural predators (e.g. ladybirds for aphids) or parasites (e.g. nematodes for slugs and snails). These can be deliberately introduced to a crop or encouraged by providing suitable habitat (e.g. rough, unfarmed areas around fields). Often natural predators get removed from the system by pesticides, either directly or through dramatic reduction in prey, resulting in die-off of the predators and subsequently disrupting ecosystems by adversely affecting food webs.

139 Council Directive 2009/128/EC, Article 4(1)

140 Defra, *UK National Action Plan for the Sustainable Use of Pesticides*, March 2013, para 16.2

141 Q 244

142 Q 48

> Therefore reducing pesticide usage and encouraging natural predators can help control pest species as well as improving the health of the whole ecosystem.[143]

78. We asked Lord de Mauley to explain his view on IPM:

> We are pursuing integrated pest management with great keenness. In fact, pesticide users are going to be required to use it from 1 January 2014, and all pesticide users soon will be required to be trained in it, it includes integrated approaches. Of course, many farmers and growers already are familiar with IPM and adopt practices in line with it, but it is certainly something that we are extremely focused on.[144]

Professor Boyd added, "Integrated pest management is the future. We have to move in that direction and we have to move as quickly as possible."[145] The promotion of IPM principles is a key feature of the EU Directive on the Sustainable Use of Pesticides, and Member States are required to implement the provisions on IPM by 1 January 2014.[146]

79. The NFU raised the possibility that the alternatives to neonicotinoids might be more environmentally harmful than neonicotinoids themselves.[147] Similarly, Bayer CropScience argued, "What is the consequence of a loss of neonicotinoids? Farmers will have to go back to the old way of doing things."[148] If the IPM component of the EU Directive on the Sustainable Use of Pesticides is implemented effectively in the UK, farmers will be informed and incentivised to make choices other than "the old way of doing things".

80. **In the interests of the environment, food security, minimising resistance among pests and maximising agricultural incomes, it is desirable that the minimal possible amount of chemical pesticides is used in agricultural production. This means moving away from any excessive use of chemical pesticides and utilising integrated pest management. Such an approach would prevent any ban on neonicotinoids necessarily causing the increased use of potentially more harmful substances.** ***Defra must develop the UK National Action Plan for the Sustainable Use of Pesticides in line with both the spirit and the requirements of the European Directive on the Sustainable Use of Pesticides. To that end, Defra should prioritise the development of the action plan in its business plan and accordingly provide an appropriate level of resource. The UK plan should include quantitative objectives, targets, measures, timetables and indicators, as stipulated by the directive. The promotion of integrated pest management principles is a key feature of the EU Directive on the Sustainable Use of Pesticides, and Member States are required to implement the provisions on IPM by 1 January 2014. Defra should introduce clear incentives for farmers to drive take up of IPM.***

81. ***Defra should prepare to introduce a moratorium in the UK on the use of imidacloprid, clothianidin and thiamethoxam on crops that are attractive to bees by 1 January 2014, and support such a proposal in the EU.***

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143 Ev 118

144 Q 667

145 *Ibid.*

146 Ev 205

147 Q 65

148 Q 391

Private gardens and amenities

82. Many of the UK's largest home improvement retailers and garden centres, including Notcutts, Hillier, Squires, Blue Diamond, SCATS Countrystores, B&Q, Wickes and Homebase, have implemented the precautionary principle by voluntarily withdrawing plant protection products for non-professional use that contain neonicotinoids from their stores.[149] Trained and licensed contractors apply neonicotinoids in the agricultural industry, which is important because neonicotinoids are lethal to pollinators if they are incorrectly applied when plants are blooming. Lord de Mauley was confident that the current regulations for amateur use provided sufficient safeguards for insect pollinators: "The products for use in gardens have very clear instructions for use."[150]

83. Throughout our inquiry, Defra repeatedly stressed the need to apply the precautionary principle in a "proportionate" fashion given the economic and agricultural value of neonicotinoids.[151] This argument does not appear to apply to private gardens and amenities such as golf courses. Furthermore, the suspension of neonicotinoids for public use could create an urban safe haven for pollinators, which might facilitate future field studies without the problems of neonicotinoid contamination experienced in the FERA field study of bumblebees (paragraph 46). In addition, Professor Graham Stone of Edinburgh University told us that "the potential exists for cities to become net exporters of pollinators. They can't do that if they [pollinators]are being killed in gardens".[152]

84. **There is no compelling economic or agricultural case for neonicotinoid use in private gardens and on amenities such as golf courses, which provides Defra with an opportunity to exercise its stated commitment to the precautionary principle.** ***Defra must immediately withdraw the approvals for use in the UK of neonicotinoid pesticides marketed for amateur application in private gardens and on amenities in order to create neonicotinoid-free zones for pollinators in non-agricultural areas.***

149 "Garden centres weed out insecticides to help save bees", *The Guardian*, 20 February 2013

150 Q 359

151 Q 649

152 Q 127

4 Supporting pollinators

85. The requirement for pollinators for agriculture cannot be deliberately reduced by growing fewer insect-pollinated crops, because this would increase reliance on imports, affect food security and consumer choice and damage UK agriculture. Pollination services to agriculture cannot be maintained through managed honeybees, because huge numbers of colonies would be required and managed pollinators are prone to diseases—large-scale honeybee losses have occurred more than 30 times in the past 200 years.[153] Moreover, the pollination needs of most wild plants and future potential crops are not known, and they may depend on wild pollinators. Therefore, to provide stable pollination services, policies to maintain both wild and managed pollinators are needed.

86. Providing new habitat with forage and nesting sites may help to safeguard pollinators. This has other benefits, including providing a refuge from agrochemicals and helping pollinators to migrate in response to climate change. Sowing wildflower seed mixes in field margins and corners might be a quick and relatively cheap way of benefiting pollinators.[154] The amount of pollinator habitat needed in the landscape is not known, but expert opinions range from 1.25% to 2.5%. Field trials run by the Centre for Ecology and Hydrology found that bumblebee abundance was 14 times higher in wildflower margins than in the conventionally managed cereal crop.[155]

CAP reform

87. The EU Common Agriculture Policy (CAP) has increasingly provided programmes that can support pollinators. The Entry Level Stewardship scheme provides payments to farmers for establishing nectar flowers in blocks or strips, as well as other environmental activities. Defra told us that "the design is intended to provide a large quantity of nectar from a small area, to mimic some of the nectar-bearing crops that were once a feature of more traditional agricultural systems and to limit the genetic impact on native wild flower species of the widespread sowing of commercial seed".[156] Within Higher Level Stewardship, a wider range of options is available, including "floristically enhanced grass margins and conservation headlands".[157]

88. However, Defra told us that that the uptake of such nectar flower planting has been "lower than expected" and that Natural England and the industry-led Campaign for the Farmed Environment have been "specifically promoting the selection of options of benefit for pollinating insects".[158] More generally, the voluntary approach of the Campaign for the Farmed Environment to leave a proportion of land on farms un-cropped might provide a

153 *Insect Pollination*, POSTnote 348, Parliamentary Office of Science and Technology, January 2010

154 Ev 157

155 *Insect Pollination*, POSTnote 348, Parliamentary Office of Science and Technology, January 2010

156 Ev 213–215

157 *Ibid.*

158 *Ibid.*

degree of further pollinator support before any new 'greened' CAP programme is agreed.[159] In the meantime, Defra is planning to publish by March 2013 "a streamlined framework of advice, incentives and voluntary initiatives to enable farmers and land managers to be more competitive and yield better environmental results".[160] ***In its forthcoming review of advice, incentives and voluntary initiatives for farmers, Defra should give prominence to measures which would support bees and other pollinators, including leaving land un-cropped.***

89. The current negotiations on CAP reform offer an opportunity to introduce more significant pollinator-friendly programmes. Pillar 1 of the CAP, which is funded entirely from the EU budget, provides direct income support to farmers, including Entry and Higher Level Stewardship schemes. Pillar 2 of the CAP is co-financed between the EU budget and Member States over a seven-year planning cycle, providing payments to farmers for undertaking specific additional activities or investments, including for environmental protection.[161] The Commission has proposed that the next seven-year CAP programme replaces the existing direct payments under Pillar 1 with a basic payment topped up by an additional payment conditional on farmers respecting certain "agricultural practices beneficial for the climate and the environment" financed from 30% of the national Pillar 1 envelope.[162] Such 'greening' activities could include crop diversification and 'Ecological Focus Areas', which could include buffer strips between crops.[163] The Environment, Food and Rural Affairs Committee inquiry on *Greening the CAP* heard that sowing pollen and nectar mixes could underpin Ecological Focus Areas and that a range of different habitats would help to support pollinators.[164]

90. Member States agreed the seven-year EU budget for 2014–2020 on 8 February 2013, including annual sums for 'natural resources' payments which subsumes common agricultural and fisheries policies payments. That financial settlement has yet to be agreed in the European Parliament, and there is an unfinished debate in the European Commission and between Member States about the details of the new CAP package, including the degree of flexibility that states will have in interpreting what would constitute qualifying 'greening' activities and the flexibility that will be possible for transfers between a country's Pillar 1 and Pillar 2 budgets.[165] In our inquiry, our agronomist witnesses favoured CAP reform which provided more support for pollinators:

> If the Commission came up with a system for paying farmers to produce margins around the edges of their crops that provided a habitat for pollinators, that would be music to our ears, because we have been talking to Defra and their predecessors for 25 years, I should think, asking them what the value of great swathes of grass from

159 *Ibid.*

160 *Ibid.*

161 See Environment, Food and Rural Affairs Committee, Fifth Report of Session 2010-12, *The Common Agricultural Policy after 2013*, HC 671-I and *Greening the CAP,* First Report of 2012–13, HC 170, for fuller descriptions of the structure of the CAP.

162 Environment, Food and Rural Affairs Committee, *Greening the CAP,* para 1

163 *ibid,* para 3

164 *ibid,* para 67

165 European Commission, *Multiannual Financial Framework: Conclusions*, February 2013, paras 61–75

one end of the country to the other is when, for a little bit more attention to detail and a little bit more cash incentive, farmers could be putting something in that is far more beneficial in terms of not only honeybees but bumblebees and a whole range of other pollinating species. I would be wholly in favour if that is the route they are going to go down.[166]

91. **While much detail remains to be negotiated in the European Commission and between Member States, the prospective CAP package for the next seven years offers opportunities for significant additional 'greening' measures, including programmes which could support greater use of 'buffer strips' and other pollinator habitats.** ***The Government's stance in negotiations in Europe on the new CAP package should be to push measures which offer meaningful pollinator support within the environmental schemes qualifying for payment. And from that baseline, the Government should then follow a similar outlook in designing qualifying initiatives in England (the devolved Administrations would manage their own schemes).***

Insect pollination as an ecosystem service

92. Natural ecosystem services provide a wide range of goods and services to society. Pollination is a critical link in the functioning of ecosystems and is essential for a wide range of crops. Without this service, many interconnected processes in the ecosystem would collapse. Although cereal crops are wind-pollinated, it has been estimated that a total pollinator loss, affecting other types of crops, would reduce world agricultural production by approximately 5%.[167] It would also markedly reduce food diversity. Globally, cultivation of insect-pollinated crops has increased at a greater rate than the number of honeybee hives. That has created a growing imbalance between pollination supply and demand which, without sufficient wild pollinators, could limit yields in future.

93. About 80% of British plant species, including many crops, rely on insects to transfer pollen between flowers to produce seeds and fruits.[168] Without pollinating insects, those plants would reproduce less well, or not at all. This effect could resonate through ecosystems by, for example, affecting the food available for seed-eating birds, which depend on insect-pollinated plants for food. Pollination helps to maintain biodiversity and support other vital ecosystem functions, including soil protection, flood control and carbon sequestration. Insect-pollinated crops form an increasingly important proportion of UK agriculture and, as of 2007, accounted for 20% of the value of UK crops, and future land use and crop production patterns may further increase the role of pollination services to UK agriculture.[169]

94. The available evidence suggests that wild insect pollinators are declining in abundance (paragraph 11). One reason why pollinators might lack sufficient protection against threats is a lack of understanding of their true worth. We were given various estimates of the economic value of pollinators to the UK. For example, Buglife stated that pollinators have

166 Q 577

167 M. Aizen and L. Harder, *New Scientist*, vol 2731 (2009), pp 26–27

168 *Insect Pollination*, POSTnote 348, Parliamentary Office of Science and Technology, January 2010

169 Ev 116

an economic worth of £510 million a year to UK agriculture[170]; the Soil Association cited a figure derived from research by the Natural Environment Research Council of £430 million a year;[171] and Professor Simon Potts of Reading University, who was one of the authors of Defra's *UK National Ecosystem Assessment*, calculated a value of £603 million in 2010.[172] Such estimates only measure the direct 'use' of pollinators to agricultural producers, however, rather than pollinators' total value, which includes pollinators' indirect contribution to maintaining agricultural production and natural ecosystems. Furthermore, measures of the value of pollinators to the agricultural economy exclude the replacement cost of pollinating by other means. For example, if bees did not pollinate apples and producers had to rely on hand pollination, the price of dessert apples would rise by about 120% if production were maintained at existing levels.[173] Taking such replacement costs into account (but excluding ecosystem services such as carbon sequestration, biodiversity and soil and water quality), Professor Potts calculated the overall worth of pollinators to UK agriculture at approximately £1.9 billion a year.[174] In Professor Potts's view, however, much remains to be done before economics can capture the full impact of pesticides on pollinators:

> The problem is we have not quantified three steps. Exactly how much do pesticides impact on pollinators? How much do pollinators then deliver or reduce the amount of pollination they do? Then how much does that pollination impact on the economics? We are quite fuzzy on the last two, and we are only just starting to make headway on the first. It is a great idea in theory, but I think we are quite a long way off being able to do that, except for having a very simple tax or something equivalent to a tax on pesticides where it would go into a communal pot, but that is also probably not a good fiscal instrument. I cannot imagine many people buying into that.[175]

95. **The conservation of pollinators is crucial to maintaining biodiversity in the UK. In addition, pollinators have a significant economic value as an ecosystem service to UK agriculture. Farmers and environmentalists therefore have a shared interest in conserving pollinators. The data on the value and health of pollinator populations is currently insufficiently precise to inform a marketised approach that could capture the benefits and costs of pesticide use.** ***Defra should prioritise its work on valuing ecosystem services and at an early stage in that work address the particular case study of pollinators to ensure that policy making on insecticides fully reflects not only direct financial costs but wider environmental costs.***

170 Ev 139

171 Ev 116

172 Ev 233

173 *Insect Pollination*, POSTnote 348, Parliamentary Office of Science and Technology, January 2010

174 Ev 233

175 Q 248

Conclusions

1. The available evidence indicates that wild insect pollinators, such as hoverflies, moths, midges, butterflies and wild bees, are experiencing serious population declines, but there is insufficient data to be precise about the extent of such declines due to inadequate monitoring. (Paragraph 13)

2. We agree with Defra that it would be "a good idea" if pesticide manufacturers were to publish the studies underpinning applications for pesticide approvals. The agrochemical industry has produced many studies on the environmental effect of neonicotinoids and other pesticides, but the data are allegedly confidential for commercial reasons. The lack of transparency in relation to trials and studies conducted by pesticide manufacturers has resulted in inequality between the pesticide industry on one side and academics and the public on the other. (Paragraph 26)

3. We recognise that it is impractical to conduct individual risk assessments for the thousands of species of bees, hoverflies, butterflies, carrion flies, beetles, midges, moths and other invertebrates that contribute to insect pollination, but we are not convinced that honeybees are an appropriate proxy for all such species. (Paragraph 30)

4. For Governments, scientists and the public to have confidence in the EU-wide pesticide approvals regime, data and analysis should be rigorously scrutinised and quality checked to form a credible evidence base. The 2006 re-approval of imidacloprid for use in the EU shows two flaws in the system. First, EFSA identified the issue of soil accumulation in its peer review, but the European Commission proceeded to sign off imidacloprid as an approved active substance for use in Member States without explicitly addressing that risk. There seems little point in EFSA's assessing risk if the Commission ignores environmental threats identified in that process. Secondly, the choice of Germany as the Rapporteur Member State in the case of a substance developed and manufactured in Germany raised a potential conflict of interest. (Paragraph 39)

5. The Henry, Whitehorn and Gill laboratory studies raised serious concerns about the potential effect of neonicotinoid insecticides on bees. While laboratory studies should as far as possible replicate field conditions, they cannot by their nature do so precisely. One of their virtues, however, is that they take place in controlled conditions. The FERA bumblebee study, which Defra commissioned to test the conclusions of the laboratory studies in the field, was, we conclude, fundamentally flawed because the bees were placed outside on different dates, some colonies had a lower starting mass than others and a different neonicotinoid from the one used in the study was present in the 'unexposed' hives. The FERA bumblebee study is not therefore a compelling basis for inaction. (Paragraph 51)

6. Neonicotinoid pesticides are not fundamental to the general economic or agricultural viability of UK farming, although there may be specific issues in relation

to oilseed rape that might require careful management if neonicotinoids were not available to growers. (Paragraph 68)

7. Defra policy on pesticides must be evidence-based. Where the available scientific evidence is either incomplete or contradictory, Defra must apply the precautionary principle rather than maintaining the status quo while waiting for further evidence. Defra policy in relation to neonicotinoids is not currently founded on the precautionary principle as set out in the 1992 United Nations Rio Declaration and the Lisbon Treaty, in that Defra will not countenance imposing a moratorium if it would not be "proportionate". Ministers currently consider that a decision on a moratorium should be informed by potential economic impacts as well as by clearer proof about harm to bees than is currently available or is likely to be produced in the near future. We recognise the agricultural value of neonicotinoid insecticides, but economic factors should not blur environmental risk assessment and risk management, where the protection of people and the environment must be paramount. (Paragraph 69)

8. That it was necessary to take legal advice whether the UK National Action Plan for the Sustainable Use of Pesticides complied with the minimum requirements of the EU directive suggests that the UK failed to take this opportunity to address pesticide use to benefit human health and the environment. It is difficult to see how pesticide use will change without the implementation of the objectives, timetables, measures and targets that officials dismissed as "meaningless". (Paragraph 74)

9. In the interests of the environment, food security, minimising resistance among pests and maximising agricultural incomes, it is desirable that the minimal possible amount of chemical pesticides is used in agricultural production. This means moving away from any excessive use of chemical pesticides and utilising integrated pest management. Such an approach would prevent any ban on neonicotinoids necessarily causing the increased use of potentially more harmful substances. (Paragraph 80)

10. There is no compelling economic or agricultural case for neonicotinoid use in private gardens and on amenities such as golf courses, which provides Defra with an opportunity to exercise its stated commitment to the precautionary principle. (Paragraph 84)

11. While much detail remains to be negotiated in the European Commission and between Member States, the prospective CAP package for the next seven years offers opportunities for significant additional 'greening' measures, including programmes which could support greater use of 'buffer strips' and other pollinator habitats. (Paragraph 91)

12. The conservation of pollinators is crucial to maintaining biodiversity in the UK. In addition, pollinators have a significant economic value as an ecosystem service to UK agriculture. Farmers and environmentalists therefore have a shared interest in conserving pollinators. The data on the value and health of pollinator populations is currently insufficiently precise to inform a marketised approach that could capture the benefits and costs of pesticide use. (Paragraph 95)

Recommendations

13. Defra must introduce a national monitoring programme to generate and monitor population data on a broad range of wild insect pollinator species to inform policy making. (Paragraph 13)

14. The agrochemical industry should place the results of its risk assessment trials in the public domain to inform academic research and increase transparency for the public. Defra should work with industry and academics to establish which, if any, genuinely commercially sensitive details should be redacted to make that possible. (Paragraph 26)

15. We urge Defra to introduce a representative range of sentinel pollinator species in UK pesticides risk assessments and work to agree a similar arrangement across the EU. (Paragraph 30)

16. We recommend that the Government exercises its influence in Europe to empower EFSA to include action points in future [pesticides approval] peer reviews which the European Commission must explicitly address before approving active substances. The Government should seek a common understanding in Europe that active substances should be assessed by the regulatory authority of a Member State other than the one in which the applicant company is based. (Paragraph 40)

17. Defra must review how it exercises the precautionary principle. Economic considerations should not form part of environmental risk management decision making, but rather should be a function of a distinct and transparent subsequent political process. (Paragraph 69)

18. Defra must develop the UK National Action Plan for the Sustainable Use of Pesticides in line with both the spirit and the requirements of the European Directive on the Sustainable Use of Pesticides. To that end, Defra should prioritise the development of the action plan in its business plan and accordingly provide an appropriate level of resource. The UK plan should include quantitative objectives, targets, measures, timetables and indicators, as stipulated by the directive. The promotion of integrated pest management principles is a key feature of the EU Directive on the Sustainable Use of Pesticides, and Member States are required to implement the provisions on IPM by 1 January 2014. Defra should introduce clear incentives for farmers to drive take up of IPM. (Paragraph 80)

19. Defra should prepare to introduce a moratorium in the UK on the use of imidacloprid, clothianidin and thiamethoxam on crops that are attractive to bees by 1 January 2014, and support such a proposal in the EU. (Paragraph 81)

20. Defra must immediately withdraw the approvals for use in the UK of neonicotinoid pesticides marketed for amateur application in private gardens and on amenities in order to create neonicotinoid-free zones for pollinators in non-agricultural areas. (Paragraph 84)

21. In its forthcoming review of advice, incentives and voluntary initiatives for farmers, Defra should give prominence to measures which would support bees and other pollinators, including leaving land un-cropped. (Paragraph 88)

22. The Government's stance in negotiations in Europe on the new CAP package should be to push measures which offer meaningful pollinator support within the environmental schemes qualifying for payment. And from that baseline, the Government should then follow a similar outlook in designing qualifying initiatives in England (the devolved Administrations would manage their own schemes). (Paragraph 91)

23. Defra should prioritise its work on valuing ecosystem services and at an early stage in that work address the particular case study of pollinators to ensure that policy making on insecticides fully reflects not only direct financial costs but wider environmental costs. (Paragraph 95)

Annex

Neonicotinoids and human health

The approval process for neonicotinoids, as with other pesticides, includes consideration of the potential effects on human health, both through food crop consumption and through direct exposure by agricultural workers and bystanders. Exposure limits are generally set at one-hundredth of the level at which no acute effects are detected in experimental animals.[176] A 2005 report by the then Royal Commission on Environmental Pollution examined the human health risks of pesticides, which identified an association but not a firm causal link:

> We have tried to review the evidence afresh and to reconsider the hypothesis that [individuals'] reported ill health may be linked to pesticide exposure. We are not persuaded that the evidence from individual cases is so weak as to rule out this possibility.177

> There is no dispute that some people who have been exposed to pesticides have become ill. The dispute has concerned the causality and underlying basis for these illnesses. On the evidence that we have received we cannot draw firm conclusions on causality. But we are persuaded that it is possible that some cases of ill health could, on further investigation, be shown to be due to complex effects following exposure to pesticides.[178]

The Advisory Committee on Pesticides concluded that that assessment overstated the risks.[179] Georgina Downs described evidence amassed by the UK Pesticides Campaign and in the academic literature, including research since the 2005 Royal Commission report, on the effects of pesticides on people. The Campaign identified in particular what it sees as strong associations between pesticide use and a wide range of long-term chronic human illnesses.[180]

On neonicotinoids in particular, Georgina Downs told us that that particular type of pesticide was not the focus of the UK Pesticides Campaign.[181] Our agronomist witnesses had seen no link between human health and neonicotinoids:

> I have been in the business now since 1976 and have dealt with a lot of farmers across a wide area. I am not aware of any direct or indirect link of the illness on a farm that has arisen as a result of farming operations, other than perhaps being run over by a tractor or something like that.[182]

176 Ev 204

177 Royal Commission on Environmental Pollution, *Crop Spraying and the Health of Residents and Bystanders*, September 2005, para 6.4

178 Royal Commission on Environmental Pollution, *Crop Spraying and the Health of Residents and Bystanders*, September 2005, para 2.105

179 Advisory Committee on Pesticides, "A commentary on the report published by the Royal Commission on Environmental Pollution in September 2005", December 2005, paras 3.39–3.45

180 Ev 166–191, 241–250

181 Q 543

182 Q 565

Professor Vyvyan Howard of Ulster University told us that he had not identified any cases of human health effects specifically from the use of neonicotinoids.[183] Defra explained why such a link was unlikely:

> The impacts of neonicotinoids on insects are largely the result of strong binding of the compounds to nicotinic receptors. The available data strongly suggests that the binding of neonicotinoids to mammalian nicotinic receptors is much weaker than to insect receptors. In addition, scientific studies show that neonicotinoids are not as potent in vertebrates (including humans) as they are in insects. Although this does not mean there are no effects in mammals, there is a higher margin between doses required to kill insects and doses of potential concern for people than is the case for some of the older insecticide active substances such as organophosphate compounds.[184]

The ACP added:

> There is currently no evidence of harm to human health in either UK surveillance or the published literature following use of neonicotinoid insecticides in accordance with UK approvals. Given the very large margins of safety required in human risk assessment before an authorisation can be recommended, it is unlikely that use in accordance with the UK conditions of authorisation will result in any impacts on human health. However, as no experimental data are available on humans, in addition to the detailed risk assessment, the ACP also considers reports of suspected ill-health associated with pesticide exposure in the UK, and screens the published literature for reports of adverse health impacts that might be of relevance to UK pesticide use. ... None relate to approved use in the UK. Most seem to be reports of attempted suicide, mostly in developing nations. It is notable that the recovery from these events was generally within a matter of days with a relatively low level of mortality being reported. This contrasts to literature reports for some other insecticide classes which might be considered alternatives to neonicotinoids.[185]

The evidence and analysis provided by the ACP related mainly to potential acute effects rather than chronic effects. They told us that while monitoring had not identified reports of ill health in the UK associated with use of the neonicotinoid insecticides in accordance with their authorisations, those surveillance schemes focused on acute ill-health and were not designed to identify long term consequences of pesticide exposure.[186] ACP working groups are examining these issues, namely the Pesticides Adverse Health Effect Surveillance Scheme Working Group and the Bystander Risk Assessment Working Group.[187] This scrutiny is important, because there is some anxiety and concern which needs to be addressed in a timely fashion.

183 Q 475

184 Ev 204

185 Ev 220

186 *Ibid.*

187 Ev 182–183

Formal Minutes

Monday 25 March 2013

Members present:

Joan Walley, in the Chair

Peter Aldous	Caroline Lucas
Neil Carmichael	Dr Matthew Offord
Martin Caton	Mr Mark Spencer
Zac Goldsmith	Dr Alan Whitehead
Mark Lazarowicz	Simon Wright

The following declarations of interest relating to the inquiry were made:

27 July 2010

Peter Aldous declared an interest as a partner in a family farm near Halesworth, Suffolk, and having a beneficial interest in a farm near Ipswich, Suffolk.

Neil Carmichael declared an interest in receiving rental income from two farms in Northumberland.

Mr Mark Spencer declared an interest as a partner in CH Spencer and Son (farmers, Mapperley Plains, Notts), receiving rental income from Spring Lane Farm, Sherwood, and Floralands Garden Centre, Sherwood, and as a shareholder in Floralands Ltd (garden centre).

Draft Report (*Pollinators and pesticides*), proposed by the Chair, brought up and read.

Ordered, That the Draft Report be read a second time, paragraph by paragraph.

Paragraphs 1 to 95 read and agreed to.

Summary and Annex agreed to.

Resolved, That the Report be the Seventh Report of the Committee to the House.

Ordered, That the Chair make the Report to the House.

Ordered, That embargoed copies of the Report be made available, in accordance with the provisions of Standing Order No. 134.

Written evidence was ordered to be reported to the House for printing with the Report, in addition to that ordered to be reported for publishing on 24 and 31 October, 13, 21 and 28 November, 4 and 12 December 2012, 9 and 16 January, and 6, 13 and 27 February 2013.

[Adjourned till Wednesday 17 April 2013 at 2 pm

Witnesses

Wednesday 21 November 2012 (a.m.)

Page

Nick Mole, Policy Officer, Pesticide Action Network UK, and **Matt Shardlow**, Chief Executive, Buglife. Ev 1

Chris Hartfield, National Farmers Union, **Peter Melchett**, Soil Association, and **Emma Hockridge**, Soil Association. Ev 10

Wednesday 21 November 2012 (p.m.)

Professor Dave Goulson, Stirling University, **Professor Graham Stone**, Edinburgh University, **Dr James Cresswell**, Exeter University, and **Dr Lynn Dicks**, Cambridge University. Ev 18

Wednesday 28 November 2012

Dr Mike Bushell, Principal Scientific Adviser, Syngenta, **Dr Fraser Lewis**, Division Head, Environmental Safety, Syngenta, and **Dr Julian Little**, Government Affairs, Bayer CropScience. Ev 32

Dr Nigel Raine, Royal Holloway University of London, **Dr Chris Connolly**, University of Dundee, and **Professor Simon Potts**, University of Reading. Ev 41

Georgina Downs, UK Pesticides Campaign. Ev 47

Wednesday 12 December 2012

Professor Colin Brown, Member, Advisory Committee on Pesticides, **Professor Peter Matthiessen**, Member, Advisory Committee on Pesticides, **Professor Richard Shore**, Member, Advisory Committee on Pesticides, and **Dr Bill Parker**, Member, Advisory Committee on Pesticides. Ev 50

Lord de Mauley, Parliamentary Under-Secretary of State, Defra, **Professor Ian Boyd**, Chief Scientific Adviser, Defra, and **Dave Bench**, Director with responsibility for the Chemical Regulation Directorate and Chief Scientist, Health and Safety Executive. Ev 59

Wednesday 30 January 2013

Dr Julian Little, Government Affairs, BayerCropScience, and **Dr Christina Garside**, BayerCropScience. Ev 68

Professor Vyvyan Howard, University of Ulster. Ev 79

Wednesday 6 February 2013

Herman Fontier, Head of Pesticides, European Food Safety Authority. Ev 83

Georgina Downs, UK Pesticides Campaign. Ev 92

Chris Bean, Agronomist, Agrii, and **Peter Riley**, Agronomist, Prime Agriculture. Ev 97

Wednesday 27 February 2013

Lord de Mauley, Parliamentary Under-Secretary of State, Defra, **Professor Ian Boyd**, Chief Scientific Adviser, Defra, and **Dave Bench**, Director of Science, Engineering, Analysis and Chemicals Regulation, Health and Safety Executive. Ev 103

List of printed written evidence

1	Prof Dave Goulson, University of Stirling	Ev 115
2	Soil Association	Ev 115
3	Dr Christopher Connolly, University of Dundee	Ev 121
4	Bayer CropScience Ltd	Ev 123, Ev 236
5	Pesticide Action Network UK	Ev 125
6	Dr Nigel Raine	Ev 133
7	National Farmers Union	Ev 135
8	Buglife	Ev 139
9	Dr James Cresswell, University of Exeter	Ev 149, Ev 241
10	Syngenta	Ev 153
11	Dr Lynn Dicks, University of Cambridge	Ev 159
12	Royal Society for the Protection of Birds	Ev 163
13	Georgina Downs, UK Pesticides Campaign	Ev 166, Ev 241
14	Professor Graham Stone, University of Edinburgh	Ev 192
15	Department for Environment, Food and Rural Affairs	Ev 194
16	Advisory Committee on Pesticides	Ev 216
17	Professor Simon Potts	Ev 233
18	Department for Environment, Food and Rural Affairs (supplementary)	Ev 237, Ev 250, Ev 251

List of additional written evidence

(published in Volume II on the Committee's website www.parliament.uk/eacom)

1	Brighton and Lewes Beekeepers	Ev w1
2	William Summers	Ev w1
3	Rosemary Mason and Palle Uhd Jepsen	Ev w2
4	Bee the Change	Ev w23
5	Dr Robert Paxton	Ev w25
6	Friends of the Earth	Ev w27
7	The Co-operative	Ev w30
8	Sussex Beekeepers Association	Ev w33
9	Scottish Wildlife Trust	Ev w34
10	Bedfordshire Beekeepers Association	Ev w38
11	John Hoar	Ev w40, Ev w66
12	The Wildlife Trusts	Ev w42
13	Crop Protection Association	Ev w47
14	Research Councils UK	Ev w49
15	Amanda Williams	Ev w53
16	Paul Matthews	Ev w60
17	Nomenclature Committee of the International Union of Pharmacologists	Ev w66
18	Orchid Apiaries	Ev w67
19	Graham White, Friends of the Bees	Ev w68, Ev w74
20	Dr Pierre Mineau, Emeritus senior scientist in pesticide ecotoxology, Environment Canada	Ev w70
21	National Institute of Agricultural Botany	Ev w71
22	CCC Independent Agronomy Services	Ev w73

List of Reports from the Committee during the current Parliament

The reference number of the Government's response to each Report is printed in brackets after the HC printing number.

Session 2012–13

First Report	The St Martin-in-the-Fields seminar on the Rio+20 agenda	HC 75
Second Report	Protecting the Arctic	HC 171 (HC 913)
Third Report	Wildlife Crime	HC 140 (HC 1061)
Fourth Report	Autumn Statement 2012: environmental issues	HC 328
Fifth Report	Measuring well-being and sustainable development: Sustainable Development Indicators	HC 667
Sixth Report	Energy Intensive Industries Compensation Scheme	HC 669

Session 2010–12

First Report	Embedding sustainable development across Government, after the Secretary of State's announcement on the future of the Sustainable Development Commission	HC 504 (HC 877)
Second Report	The Green Investment Bank	HC 505 (HC 1437)
Third Report	Sustainable Development in the Localism Bill	HC 799 (HC 1481)
Fourth Report	Embedding sustainable development: the Government's response	HC 877
Fifth Report	The impact of UK overseas aid on environmental protection and climate change adaptation and mitigation	HC 710 (HC 1500)
Sixth Report	Budget 2011 and environmental taxes	HC 878 (HC 1527)
Seventh Report	Carbon Budgets	HC 1080 (HC 1720)
Eighth Report	Preparations for the Rio +20 Summit	HC 1026 (HC 1737)
Ninth Report	Air Quality a follow up Report	HC 1024 (HC 1820)
Tenth Report	Solar Power Feed-in Tariffs (Joint with the Energy and Climate Change Committee)	HC 1605 (HC 1858)
Eleventh Report	Sustainable Food	HC 879 (HC 567)
Twelfth Report	A Green Economy	HC 1025 (HC 568)

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Oral evidence

Taken before the Environmental Audit Committee

on Wednesday 21 November 2012

Members present:

Joan Walley (Chair)

Martin Caton	Mr Mark Spencer
Zac Goldsmith	Dr Alan Whitehead
Caroline Lucas	Simon Wright

Examination of Witnesses

Witnesses: **Nick Mole**, Policy Officer, Pesticide Action Network UK, and **Matt Shardlow**, Chief Executive, Buglife, gave evidence.

Q1 Chair: A very warm welcome to our first two witnesses, for what is the first session in our inquiry into insects and insecticides. Thank you both for coming along. We feel that this is an important inquiry that the Environmental Audit Select Committee is carrying out. We are particularly mindful that we are doing this 50 years after the publication of Rachel Carson's seminal work *Silent Spring*, which I know has influenced a lot of thinking on this whole agenda. It might be helpful for me to say to you that we are looking to close this session around 10.30am. We have quite a few detailed questions, but I think it might be helpful if you would both introduce yourselves very briefly to the Committee in the first instance.

Matt Shardlow: Hi. I am Matt Shardlow. I am the Chief Executive of Buglife—The Invertebrate Conservation Trust. We are the charity that is there to represent the needs of all the little things out there that make the world go round, including the bees, including the pollinators. We have been very much involved with the question of neonicotinoids and their potential impact on the environment since 2009, when we produced a seminal report that reviewed all the existing science at that time. We had no prior involvement in the issue. We have no general position with regard to pesticides. We treat it on an evidence-based case-by- case basis, but there had been concern about neonicotinoids and we looked into that. We found that those concerns were substantiated with science and we made recommendations that, in the light of the absence of evidence that they were safe, the chemicals should be suspended. Since then we have maintained a watching brief on this issue and we are still involved, and no doubt we will come on to some of the other things we are doing in due course.

Q2 Chair: Thank you. Mr Mole?

Nick Mole: I am Nick Mole from the Pesticide Action Network. I am a policy officer there. Pesticide Action Network has been operating for 25 years. We are the only UK charity that works on all issues of global pesticide-related concerns. We have been concerned about neonicotinoids for over 10 years, and the effects that they have on bees, other pollinators and other insects. Of course, since we have had all these studies showing all the un-thought about effects that we are seeing on bees, we have launched into it. Our main concern is that in this case—as in many other pesticide-related issues—Defra is acting complacently and is not taking the weight of independent evidence of harmful effects into account and, therefore, is not taking an adequately precautionary approach to what is a very serious issue.

Q3 Chair: That is very helpful to start our inquiry. Much of the concern there has been in the press—possibly because of the campaigning that there has been—has been about the decline of honeybees, but what we are also interested in as well, from the point of view of the Committee, is whether or not we should be just as concerned about other insect pollinators, and whether or not the UK is facing a general insect-pollination crisis or whether it is specifically an issue to do with honeybees.

Matt Shardlow: I will pick up that point. We should certainly be very concerned about what happens with our wild pollinator populations, because they do 90% of the pollination service. The apples that we eat, the flowers in the countryside, are pollinated largely by wild pollinators. That is bumblebees, solitary bees, hoverflies, moths and beetles. There are various other things as well, but those are the main groups of pollinators out there.

How well are they doing in the countryside? As a rule of thumb, two-thirds of the species of pollinator are declining. Where we have the data, that is the situation: two thirds declining. So, 66% of larger moth species in the countryside, including things like the Hedge Rustic, are declining. Most of the bumblebees are declining and six species have declined by at least 80% in recent years. Where change is detectable in the data, 66% of hoverflies are declining, 71% of butterfly species are declining. In addition to pollinators, aquatic ecosystems are also in trouble with 66% decline in the abundance of mayflies, for instance, in recent years.

Across Europe there is a similar picture. The moth data in Europe is very similar to the moth data here: 67% of Dutch species declining. Also grassland butterflies—one of the most shocking statistics—a 70% decline in abundance in grassland butterflies since 1990, so that is a very recent and massive decline in grassland butterflies, an important pollinator group. A study called ALARM looked at

bees and hoverflies across Europe and found 38% of the species were declining and 12% of the species were increasing. What does this lead to? You start to get into the area where the evidence is very sketchy but that ALARM study showed that 62% of wild flowers in Europe were pollen-transmission limited. That means that if they were getting more pollination there would be more seeds and there would be more flowers. It seems that there is already an impact in terms of the reduction in pollination services causing a reduction in the abundance of wildlife.

Q4 Chair: Do you wish to add to that?
Nick Mole: I think that is fairly comprehensive.

Q5 Chair: You have just mentioned different statistics. We were wondering about the extent of the research that there is and whether or not, in your view, Defra particularly has undertaken sufficient research in relation to wild insect pollinators generally.
Matt Shardlow: The answer that question is, no. We think that at a basic level there should be monitoring, not just of the populations of the pollinators but also of pollination rates, so that we can start to get a better grip on the relationship between the insect pollinators and crops and wild flowers. There is no national monitoring programme around that. In terms of individual bits of science, in 2009 we flagged up the potential impact on the environment, on these wild pollinators. There has been very little government-funded research looking at those issues since then. There is a bit on bumblebees now but there is very little going on. Certainly it is taking a long time for them to step outside the honeybee mentality to look at the wild bees, the solitary bees, and the moths as well.

Q6 Chair: Can I follow that up? We have seen what has happened with ash, and we have seen other catastrophes. What channels of communication do you have with Defra, and what do you think needs to happen to make the case for further research from Defra, and what is your understanding of how Defra go about the process of determining where further research is needed.
Matt Shardlow: There was a recent answer to a parliamentary question that stated that there are 70 Government scientists researching the health and populations of honeybees, which is a domestic species, and there is part of one person looking at the health of wild bees.

Q7 Chair: Part of one person?
Matt Shardlow: Part of one person looking at the health of wild bee populations. That gives you some idea of the level of priority that Government has put on this issue. Frankly we found it very difficult to engage with Government on this issue. We had a meeting with Richard Benyon, a year or two ago, about this and other pollinator-related issues, but they certainly have not come proactively to talk to us. Indeed, one thing we are concerned about is how this whole area of decision-making relates to the Aarhus Convention. The Aarhus Convention sets out that, around environmental decisions—which this clearly must be, because this is all on an environmental basis—there must be openness, there must be access to information and there must be clear decision-making and consultation, and we have not been consulted.

Q8 Chair: You mentioned the meetings that you had with the Defra Minister. Did you make any specific requests at that meeting that you would have expected to be followed up?
Matt Shardlow: As I mentioned earlier, we did ask for a national programme of monitoring to be put in place, so that we could understand what was happening with our pollinator populations much better and relate that to what is happening in terms of crop, economic and wildlife impacts.

Q9 Caroline Lucas: I want to follow up on looking at the issue of food production in particular. Given that the research is not going into the wild bee population, which seems to be so critical when it comes to pollinating our crops, do you think there is a potential catastrophe in the making when it comes to food production and, if so, is that an area where you think Defra should be doing more work?
Matt Shardlow: Absolutely. The difficulty here is that pollination is a common good, isn't it? It operates on a broader scale than a field scale; it operates on a landscape scale with populations pollinating lots of people's crops and wild resources as well. It is very difficult to look at a single field and try to make a determination about the contribution of that pollinator population to that field. There is a risk that, by focusing as we are at the moment on plant-protection products to increase output, we are not focusing enough on the ecosystem services and their contribution. We do know that, in the UK alone, they are worth £510 million a year.
For instance, if you compare that with what Syngenta claim is the benefit across Europe of the use of clothianidin, of Cruiser OSR, they claim that that is worth £800 million across Europe. Well, pollination services are worth £17 billion across Europe. If that chemical is reducing pollination services by just 4% or 5%, then the impact of using that chemical on farmers who are not using that chemical is economically negative. We do not believe that this economic issue has been properly assessed or looked at by Government as part of the process of determining this. It is a critical point, because it is part of the European legislation that they must first show that the plant-protection products have an economic benefit. If they are not accounting for the environmental impacts and the economic impacts of the environmental impacts, they should not be licensing these products for use.

Q10 Chair: On that point, is there a modelling that currently exists that could show how the economic benefits of that could be taken into account in policy formulation?
Matt Shardlow: I do not think we are at the point where we have enough science about the impacts in the field to make that determination. We will no doubt come back to this point that if you want perfect science, that may take 20 or 30 years, by which point

these chemicals will be gone, because the industry will have found the next generation so the research will be redundant. We will come back to this and Nick may add to this, but this is why we have a precautionary principle. It is a wise thing to have, because if you do not have a precautionary principle then you never get those sorts of absolute levels of proof.

Q11 Chair: You mentioned the Aarhus Convention. In view of what you said relating to that, do you think there is a case for extending the EU legislation or, if not extending it, re-assessing how adequately it is operating and how fit-for-purpose it is, so as to include risk assessments covering all wild insect pollinators?
Nick Mole: I think there is a case for that. It is covered within the text of it. Pesticides being the emissions of the environment are covered by the Aarhus Convention. We should have access to all the industry risk assessments.

Q12 Chair: Are you saying it is there already?
Nick Mole: Within the Aarhus Convention there is the provision that information should be supplied, because this is an emission to the environment. Pesticides are an emission to the environment, the same as from chimneys and that sort of thing. In theory, we should be able to access the information about risk assessments that have been done by industry.

Q13 Chair: So that I am absolutely clear, are you saying that the Aarhus Convention as it exists gives provision for this?
Nick Mole: In theory. However, they are covered by commercial confidentiality, which seems to trump that, certainly in the UK. There is no independent access to be able to peer-review or look at the industry studies that they use for their approvals of pesticides.

Q14 Chair: Are you talking about the UK now or are you talking about the application of the—
Nick Mole: The UK, but also more widely in the EU as well. It is all covered by commercial confidentiality, so independent access is at best extremely limited.

Q15 Martin Caton: Can I just clarify? I think the Chair's question was: should the EU be undertaking risk assessments or, at least, requiring the manufacturers to undertake risk assessments on wild pollinators? You seemed to say that they probably are doing that but they are keeping it secret. I think we need to clarify that.
Matt Shardlow: That may be the case. We have two bit of legislation: the Aarhus Convention, which is about access to environmental information, and the Plant Protection Products Directive, which is about that regulation happens. That regulation on plant protection products is very clear that it is about protecting the environment. In fact, it says that protecting human health and protecting the environment are higher priorities in that legislation than supporting plant protection products. We have to put those things in context. We have to look after people and the environment first—that is all there—including impacts on non-pollinators, so if there are significant, unacceptable impacts on those wild pollinators that is not acceptable. How that is implemented is then how those tests are carried out and what is required of the pesticide manufacturers, what tests do the products need to go through before licensing for use.
The European Food Standards Authority has recently produced a report saying that it is insufficient at the moment and it should at least be extended to include solitary bees and bumblebees, as a standard for the industry. We would go further. We think we need to include things like moths but also the predators that live in these fields as well. Those predators are contributing to a sustainable agricultural system and they should be part of that study as well. The answer is, yes, the legislation is all okay, but the way it is being implemented is restricted at the moment and they need to broaden the approach to include in the assessment process and a wider range of invertebrate groups.
Chair: Thank you for clearing the record about the relationship between the Aarhus Convention and the different legislation that exists in relation to regulation.

Q16 Caroline Lucas: I want to drill down on the issue of transparency. Can you just say how damaging is it—or is it damaging—that more of this research is not properly in the public domain? I want to clarify that bit, if that is what you are saying. Perhaps I misunderstood you.
Matt Shardlow: It is very damaging because it is secret. No one knows what the data is saying unless it is published. In some ways, when you get to the point we have now, where there is so much research that it is starting to look conclusive, it starts to count against the pesticide manufacturers, that they are keeping information that they think might support their case secret. Up until this point the information has been very difficult to access. I have had Bob Watson, chief scientist of Defra, telling me that, unless the pesticide industry starts to reveal their data to him, he is going to have to take action with regard to the pesticides. If the Government's own chief scientist is struggling to get hold of this information, how is the public going to have access to this important information about how these chemicals might be impacting their environment? It is just impossible.
Nick Mole: Also, the point of that is that the decisions on whether to approve a pesticide are based on these, basically, secret documents that we do not have access to.
Chair: We will be returning to this issue on transparency in just a short while.

Q17 Zac Goldsmith: Can I just clarify that there is approval at the EU level?
Nick Mole: It is approval at EU level, but for products in the UK manufacturers have to produce a risk assessment for their product that contains an EU-approved active.

Q18 Zac Goldsmith: Can I follow up on that point? Is it not also the case that the composition of the delegated committees, whose job is to assess these chemicals and approve them, is also confidential? I know that ClientEarth is running a campaign to reveal the names. It is perfectly possible that on these committees you have companies, effectively, policing, regulating and judging chemicals produced by another division of the same firm. Is that the case?
Nick Mole: I believe that is the case, yes. It certainly can be the case.

Q19 Zac Goldsmith: The information is confidential, the manner in which they are decided is confidential, and the identity of the people who are making the decisions is also confidential or secret?
Nick Mole: Ultimately, yes. There is a massive lack of transparency and no redress for it, unless you want to pursue a lengthy court case.

Q20 Zac Goldsmith: Is this an area where the British Government has made any representation? It is hard to defend, the status quo, but has Defra made any public representations on this issue of transparency?
Nick Mole: Not to my knowledge. All I have ever had is, "No. It is covered by commercial confidentiality". I have never heard them say, "Well, yes, this would be better if it was in the public domain".

Q21 Zac Goldsmith: I am going to go on to neonicotinoids in a second, but I think this issue of confidentiality is a really crucial area. It is very hard to argue against a precautionary principle, when we are not allowed access to the information that would enable us to make an informed decision. It is an extraordinary situation. I am assuming there is total unanimity, among all the NGOs with an interest in this area, on this issue of transparency. There are no arguments against it as far as I can see.
Nick Mole: No.

Q22 Zac Goldsmith: Before I go on to neonicotinoids, can I ask you: does Defra accept the data that you provided us with earlier on the decline of insects?
Matt Shardlow: As far as I am aware, yes.

Q23 Zac Goldsmith: There is no argument there?
Matt Shardlow: No. The Rothamsted work on moths is Government funded, as is the butterfly work. This is all fairly standard data.

Q24 Zac Goldsmith: The 70 people and the half-person in these jobs, are they there to monitor or are they also engaging in research to understand what is causing the decline? Is there a distinction in terms of the tasks they have been set?
Matt Shardlow: As I understand it—and I am reading slightly between the lines—70 people work at Fera, and they are interested in the health of domestic honeybees and the full range of the things that are affecting them. One person, who I believe is at Natural England, is overseeing the conservation of the remaining 500 species of bees and wasps across the whole of England.

Q25 Zac Goldsmith: That means looking for cause as well monitoring the decline?
Matt Shardlow: Potentially, yes.

Q26 Zac Goldsmith: You have already stated that you think neonicotinoids are a factor. Can you explain why? You mentioned there was a lot of science. You have made that point a couple of times. Can you explain why you think it is a key factor in the decline, not just in bees but in pollinators in general?
Matt Shardlow: Okay. I will refer to a bit of research that I did on the train on the way down.
Zac Goldsmith: Very Peter Schofield, isn't it? Three minutes on the internet.
Matt Shardlow: We have been keeping abreast of the scientific research since we produced our report. We have a list. The list is one that is not just things we have become aware of, this is a list that we circulated around a lot of independent scientists and asked them to put forward studies on things off the list. We sent it to Bayer and they suggested studies that we do not have on the list, which we have added to the list. We talked to CRD about what studies they are relying on, and we have added those to the list. I am not saying it is absolutely comprehensive, but this is as good a list as we can get of all the science that has happened since our report was produced in 2009.
In this science, basically 31 of the studies show a much bigger or more concerning impact of neonicotinoids on insects, and on other environmental issues, than was previously known to be the case. If you look at it overall, there are 41 studies but eight of them we think are suspect, because of the dose rates being wrong or various experimental errors or foibles. If you take those out of the equation that means that, since we produced our report, 94% of the studies are showing impacts on bees, other insects and on the environment. This includes fatalities from dust, for instance. This includes increased disease susceptibility and death. This includes reduced foraging and activity within bees and reduced reproduction, particularly in bumblebees.

Q27 Zac Goldsmith: Are you talking about neonicotinoids as a single entity or are you distinguishing between the five different products that are available?
Matt Shardlow: I am talking about all the neonicotinoid research, and it is an important point. The older chemicals—clothianidin and imidacloprid—are the ones where research has now come to fruition and we have evidence about. There is a lot less research on the newer ones.
Chair: It would be very helpful for the Committee to have that list that you have just referred to.

Q28 Mr Spencer: Could you clarify what sort of concentration levels are those tests conducted at? Are they at field-scale concentrations?
Matt Shardlow: Yes. As I said, there is one study where the levels were clearly too high. I have taken that out. There are a couple of studies where they only applied them for a single day. That is completely unrealistic. There is one field study where they only treated 0.05% of the area that was being foraged on

in some of the tests. So I have taken out the ones that I think are completely unrealistic. That has reduced it down to 31 studies that show bigger impacts and two studies that show either no effect or less worrying trends. We all know science is imperfect, and some science is always going to find no effect in a complex ecosystem analysis, so I think it is really worrying that 94% of the studies—which is almost at the level of statistical viability—are showing bigger impacts than we feared.

Q29 Mr Spencer: I am sorry to come back again, but I think this is an important point. Are the insects that are being tested being exposed to the type and levels of the chemical that they would naturally be exposed to in the commercial world or are those concentration levels greater than they would be exposed to in the commercial world?
Matt Shardlow: It would be wrong of me to say that they are exactly the same, because we do not know what "exactly" is and it is going to vary from one place to another. So there is no absolute, "This is what it is like everywhere". There is going to be variation in the environment. There is variation in the studies as well but they are all in the right ballpark.

Q30 Zac Goldsmith: Finally on that point, given the research that you have identified, and given the 94% alarm that that reveals, why do you think Defra has not taken that evidence to justify adoption of the precautionary principle, at the very least? To your mind, what is their argument? Why are they resisting that?
Matt Shardlow: I will probably leave this to Nick to some degree, but I will point out that in their report, which they produced in September, they talk about there being unequivocal evidence. The reason that they are not taking action at a simple level is because they are not finding absolute proof, unequivocal evidence.

Q31 Zac Goldsmith: Is it even possible to find the kind of evidence they are looking for?
Matt Shardlow: Possibly not.
Nick Mole: Defra's position on this, pointing out they like unequivocal scientific evidence: they base their decisions largely on the industry's research—which we have already covered—so we do not know what they are saying, but obviously the tests that the industry run show that they are acceptable, within a flawed risk-assessment process.
It is also worth pointing out that CRD, who ultimately make the decisions, is 60% funded by the work it does on approving pesticides. I am not in any way suggesting there is any kind of corruption going on, but to our mind there is a clear conflict of interest. Their closeness and their relationship with the work they do for the agrochemical industry is very, very clear. That the same people that approve pesticides also regulate and enforce pesticide rules—there is no separation—we think that is one reason why precautionary decisions are not made. They are too closely embedded together.

Q32 Zac Goldsmith: You are saying that Defra's reluctance to act on this issue is not in any way based on the science. It is based on the closeness of the regulators to the industry?
Nick Mole: In part. I cannot believe, given the body of evidence that we have from all these studies that Matt has just shown, that Defra could interpret it any other way than going down the precautionary route, so there must be some other reason for it. They rely in their positions on industry-generated data and studies.

Q33 Zac Goldsmith: Because of that closeness do you think the regulatory system, when it comes to chemicals in this country, therefore is not fit-for-purpose? It is not a system in which people can justify having any faith at all?
Nick Mole: I would agree with that completely. I do not think it is fit-for-purpose, either in this instance or when it comes to human health or other areas of the environment.

Q34 Dr Whitehead: Could we widen this slightly, in terms of looking at the context of this discussion? We have heard that there is no dispute about the figures on decline, but what other factors might be driving those declines, if we exclude the issue of pesticides for a moment? Are there a number of other factors that can be identified, which should be added to the list as far as decline is concerned?
Matt Shardlow: We are talking about thousands of species. Each species is unique, each species is different and each species is responding to different factors. There are going to be lots of factors involved here. One of the big factors—at least historically—has been the loss of wild flowers. Since the Second World War we have lost vast areas, huge percentages of our wild flowers from the countryside, due to agricultural intensification. Ploughing, use of herbicides, use of fertilisers, has reduced the area that is available to pollinators in the countryside and, no doubt, has had a massive impact on pollinator populations.
Whether, since 1995 until now—where I think hopefully we have slowed at least, if not halted, the loss of wild flowers in the countryside, the destruction of meadows and SSSIs—the loss of wild flowers is the big factor, or the use of these chemicals and other pesticides, I could not tell you. The science is not there to give absolute conclusive evidence as to what is the biggest factor across all these issues, but certainly it fits the pattern. A lot of the species we are seeing declining are wider-countryside species, that are potentially going to be in areas that are affected by the neonicotinoids chemicals.

Q35 Dr Whitehead: The mentions of mites and other chemical factors, are those significant in your view?
Matt Shardlow: It is probably worth making a point about honeybees and other pollinators. Most of the research is on honeybees. All of the evidence that suggests there are other issues, like Varroa mites, and field studies that indicate there may not be an effect, are about honeybees. The legislation is about wild pollination. It is about the environment. In that context there is no evidence that they are safe. When it comes

to things like the Varroa mite—which is often claimed to be the problem—that can only apply to the honeybee, which is only about 10% of pollination. So, 90% of pollination, all those declines I listed earlier, must be down to something other than the Varroa mite.

Q36 Dr Whitehead: Is that your view?
Nick Mole: Yes. When you look at honeybees, there are a whole range of problems affecting them. Neonicotinoids are just one. The increase in things such as Varroa mite could be attributable in part to the effects that pesticides are having on honeybees, so making them more vulnerable to other pests and diseases that were already in existence. The point is that we know—it is a fact—that these pesticides are toxic to bees. That is not in dispute at all. We cannot legislate against Varroa mites or other pests and diseases but we can, at the very least, take out something that we know is toxic to bees while we look at the other problems. I think that would be the sensible approach; take one part of the puzzle away and look at the other things. But it is not the entire reason that honeybees are facing difficulties.

Q37 Dr Whitehead: Regarding these other factors, the question in my mind—and you have mentioned this—is the extent to which you might say that the use of pesticides advances and exacerbates those other factors, or whether they ought to be considered discretely, and what evidence there may be of combination factors at work in terms of decline.
Nick Mole: There are two parts to that. Some studies have looked at how pesticides weaken bees' immune systems and make them more vulnerable to pests and diseases. The thing that is not looked at and certainly is not covered in any risk assessment at the moment, is the combinatory effect of different pesticides. One study has shown that the effect of a neonicotinoid with a pyrethroid, which is a different class, working together, greatly increases the effect. That is not covered in any kind of risk assessment whatsoever. In the real world, bees, and all the other pollinator species, are coming into contact with cocktails of pesticides every day, and there is simply nothing done on how these interact with each other and make things potentially worse. That is a hole in the research that needs addressing as a matter of priority.
Matt Shardlow: On bumblebees specifically—which is a good illustrative case—there have been two recent studies, both at field-level application rates and both showing big declines in reproduction: one of 33% reproduction-rate decline and one of an 85% reduction in the queens produced. If those sorts of impacts are happening on bumblebees and other pollinators in the countryside, it is very difficult indeed to see how that will not impact very significantly at a population level.

Q38 Dr Whitehead: In terms of location-specific studies, to your knowledge, what has been done about areas, such as islands, where a number of these factors are not present? For example, across the UK there are a number of islands where pesticides and combinations of pesticides are generally not used, and there appears to be anecdotal evidence that populations have a very different trajectory.
Nick Mole: I am afraid I am not aware of that.
Matt Shardlow: "Anecdotal", I think, is the word. There is also anecdotal evidence, for instance in Italy, where they have restricted the use of these chemicals, that the decline in the bees there has reversed, but it is all anecdotal. We do not have the monitoring in place, of what is happening at a national level or at a local level, so we are not getting the answers to those questions.
Nick Mole: Sorry, Matt. I will just pick you up on that. The evidence in Italy is not anecdotal. It has been shown, by Government monitoring in Italy, that stopping the use of neonicotinoid seed-treated maize has resulted in far, far fewer bee die-offs.
Matt Shardlow: For honeybees?
Nick Mole: For honeybees, yes. Not for other—
Matt Shardlow: Anecdotal for wild pollinators.
Nick Mole: Yes.

Q39 Mr Spencer: Two questions, if that is all right. I think this issue of concentration on these tests is absolutely crucial, and I hope you both accept that field-scale tests are really the best source of information, because obviously salt and alcohol at high concentrations are toxic to bees and you would not suggest that they should be banned.
Just go back to habitat. Can you give us an idea of the percentage of drop in that habitat that you were talking about, about wildflower meadows since the Second World War? Is that comparative to the decline in honeybees, or have we lost more habitat than we have lost bees, or have we lost more bees than habitat?
Matt Shardlow: I have to come back on the first point, because I not sure I agree with that. It is misrepresenting the science to suggest that they are giving these chemicals to the invertebrates at levels higher than they would be likely to be encountering in the field. It is not that the laboratory studies are heavily dosing things and then looking for an impact, because of course they are going to get one. That is not what is happening. Nor is it the case that some categories of science are inherently more important and trustworthy than other categories. There are field studies that are full of errors. One of the biggest ones that is relied on, for instance, when the Canadian Government looked at it they found that the treated and the untreated colonies were both contaminated with the pesticides. The study showed no effect. The no-effect was there because both were contaminated. One has to look at the science and each bit of scientific study on its own merits, and not say, "This is in a field study so therefore it is better than this other bit of science".
In terms of the loss of wild flowers, yes, enormous loss, 97% loss of wildflower meadows, for instance, in the countryside. As I said earlier, that loss has slowed in recent years so I think we are looking in recent years for other causes for the declines in the populations of wild insects.

Q40 Caroline Lucas: I want to come back to the precautionary principle just for one moment. I note that there was a Defra statement in September on the

state of the science, and it did not even mention the words "precautionary principle" anywhere in that paper. To the contrary, it went on and said it justified its position of not taking any action because none of the recent studies provided what it called unequivocal evidence. Do you think that Defra has a robust understanding of the precautionary principle?
Nick Mole: Defra and other organisations have publicly stated that when it comes to plant protection products, pesticides, they do not follow the precautionary approach.

Q41 Caroline Lucas: Where have they said that?
Nick Mole: To me in a meeting in this building a few years ago and, Matt, I believe you—

Q42 Chair: Do you have precise details of this meeting?
Nick Mole: I can get you the precise details, the dates and so on, but it was about the effects of pesticides on bees, and the Crop Protection Association were there.

Q43 Caroline Lucas: It will be on the record somewhere?
Nick Mole: It will be on the record somewhere, yes.
Matt Shardlow: I think the NFU's evidence to this Committee says, quite clearly, that they do not think a precautionary principle should be applied to this area of regulation.

Q44 Caroline Lucas: The NFU says it does not believe that or NFU says Defra does not say it? There is quite a big difference.
Matt Shardlow: Certainly, in the past NFU have said that Defra is in the same position as the NFU. That may just be NFU's view, from my experience. I do not know.

Q45 Caroline Lucas: There is quite a big difference between Defra saying it and the NFU.
Matt Shardlow: There is.

Q46 Caroline Lucas: Anyway, four studies recently—two from the US, one from France and one a British study—all of which look as if they should be raising concerns, and yet the Chief Scientist at Defra, as advised by the advisory Committee on Pesticides and the Chemicals Regulation Directorate, has not acted. Can you give a sense of why that might be?
Nick Mole: We met the Chief Scientist, Professor Ian Boyd, to outline our concerns about the Defra response to it. We left him with a detailed critique, which is in part what our written submission here was. We have left it with him and are waiting to hear back from him. He seemed concerned at the issues we raised and he was going to ask Defra for some answers about their position. I have not had any follow-up from that meeting.
Matt Shardlow: It is very clear indeed, in the plant protection products regulations, that the precautionary principle applies in this situation, "underpinned by the precautionary principle in order to ensure that active substances or products placed on the market do not adversely affect human or animal health or the environment". It is also very clear that the member states must be satisfied that the active substances used in the product have been approved "in the light of current scientific knowledge". When new knowledge becomes available, it is quite appropriate—and they have every right and every right in law—to review that product in the light of the new science. This is what they have done but we believe they have applied the wrong test. They have applied a test of looking for unequivocal proof. We believe there should be a precautionary principle. So we are concerned that this is wrong in law and we are looking at whether we should be judicially reviewing their decision, in the light of not just the precautionary principle but also the range of factors that we are concerned they may not have considered.
For instance, they have a duty to conserve biodiversity under the NERC Act. We have seen no evidence of them considering the impacts of this on various aspects of biodiversity. We have not seen any assessment on the impacts on the Water Framework Directive; the impacts on protected sites, SSSIs and SACs. Also, we think they have not considered the full range of environmental issues that they should be considering in making such an important environmental decision. We also believe they have not carried out a proper open process with proper consultation, so we think this decision is probably wrong in law.

Q47 Caroline Lucas: Just to have it clearly on the record—I think you have said this already—if Defra were to be guided by the precautionary principle, is it overwhelmingly clear to you that they should be banning neonicotinoids, even if they are waiting now for unequivocal evidence?
Matt Shardlow: No question about it.
Nick Mole: No question or, at the very least, instituting a moratorium on their use.

Q48 Caroline Lucas: Can I just put one argument to you that has been raised in some of the evidence we have looked at, which has suggested that a ban might do more harm than good to insect pollinators because it is argued that it would lead the agricultural industry to spray larger quantities of potentially more harmful pesticides more frequently?
Nick Mole: This is a typical and regular line used by the agrochemical industry when there is any hint that one of their profitable pesticides might be looking at a suspension or a withdrawal. There is no evidence to suggest that if neonicotinoids were not used they would be replaced by potentially worse older chemistries, or there would be any need to spray in greater quantities. Oilseed rape is an example of one thing that is not looked at. It is impossible for a farmer to buy non-seed-treated oilseed rape seed, so 100% of the oilseed rape in this country is grown with a systemic pesticide in it. There is no indication whether any of that is dealing with any kind of real-life pest threat whatsoever. It is simply an insurance policy, and there is a real need to look at whether we need this amount of seed dressing—is it really dealing with a problem—because if it is purely for insurance, it completely undermines basic principles of integrated

pest management and it is leading to overuse of pesticides. So, number one, are they really necessary? We do not believe that they are, so there would be no increase in spraying.

If you look at the example of Italy, where they have banned certain seed dressings on maize crops, not using them has not led to any increase in pest or disease problems. It has also not resulted in any kind of loss of yield or profitability to the people growing the maize. I am sure you will hear more in the second session about what can be used. We think it is a fallacious statement and it is alarmist scaremongering from the people who are profiting from selling treated seeds.

Matt Shardlow: Can I just say that it is very attractive to think that new things are better than old things and it is not always the case. While the older chemicals tended to be used in larger volumes, they were a lot less toxic. In addition, the old chemicals would—as Nick said—be used to treat a problem on an occasional basis, whereas the new chemicals are used prophylactically. They are used whether there is a problem or not. You get this highly toxic chemical applied to the seed, put in the soil. It then stays in the soil and in the plant and potentially washes out into aquatic systems. The aquatic ecosystem as well as pollinators, is something you should bear in mind. I know this is about pollinators but in 89% of Californian water bodies they found neonicotinoid pollution, so there is a potential issue here with the chemicals getting washed out of the soil as well. There is no evidence that what went before was worse for pollinators than what is happening now. Even if that was the case, surely the answer is then that those chemicals as well should not be being used, if they are destroying the environment as well.

Q49 Mr Spencer: This is really important as well. Are you suggesting, then, that the whole of the UK agricultural industry has been mis-sold a product that has no commercial benefit whatsoever, and the agricultural industry is spending millions and millions of pounds on a product that is completely a waste of investment?

Nick Mole: That is not what I am saying at all. These products obviously work when there is a pest present—they do—otherwise they would not be approved, so they are efficacious. My point is: do we need 100% of oilseed rape, in this case, treated with these pesticides? From what I have seen my conclusion is, no, we do not. It is not targeting specific pest problems. It is an insurance policy just in case. There is no evidence to point that these things would be damaged by pests if they had not had the seed treatment on them.

Q50 Mr Spencer: Given that viral diseases in plants are spread by aphids who go between plants, surely you would recognise that a seed treatment that prevents that from happening, and is applied when there are no pollinators in and around that crop, that applying a chemical to a crop when it is in flower is much more likely to come in contact with pollinators as they are going in and around that crop?

Nick Mole: Again, that would be basing it on the chemical-first approach when there are other non-chemical approaches that could deal far more effectively, or as effectively, with pest and disease problems. I would again draw your attention to the Italian study, which did not just look at insect problems but at the whole range of pests and diseases related to that and saw no increase, whatsoever, by not using seed treatments.

Matt Shardlow: I think the evidence should be gathered and there should be more work looking at the economic benefits. That should be part of the regulation process and part of what the UK Government looks at. We do not have all the answers. I would draw attention to one product called Biscaya, which is marketed against pollen beetles that are a pollinator. With pollen beetles, all the evidence I have seen shows that the damage caused by these beetles is replaced by the plant. Pollen beetles do not cause a reduction in production, yet there is a chemical being marketed with the purpose of destroying that pollinator, so there are some questions to be answered here as to how efficacious and how useful some of these products really are.

Q51 Martin Caton: I come back to the point you made about the Californian research about water pollution by neonicotinoids. Has there been any research done in the UK about pollution to our waters?

Matt Shardlow: I am not aware of any. We have asked Defra in our pre-action letter that we sent to them—and which we submitted as evidence—to provide us with details about how many sites are being monitored, what chemicals are being monitored and what the results are, but we are not aware of any research in the UK looking at how these pesticides are impacting on water bodies. As we have to get water bodies in good ecological condition by 2015, I think that is a really pertinent question for us to try to answer.

Martin Caton: Thank you.

Q52 Caroline Lucas: Just the last bit, you talked a moment ago about issues around a weight of pesticides and again, in some of the evidence we have seen, they talk about the fact that the weight of pesticides is now reduced and so we live in a happy, much less toxic world. Would you comment on the importance of concentrating on the weight of pesticides versus the concentration? Is not concentration a rather more useful measure of level of toxicity rather than weight?

Nick Mole: Yes, it is. Monitoring the improvements or reductions in pesticide used by the amount of kilograms applied is completely spurious and does not take into account the greater toxicity of neurochemistries. A more appropriate approach would be to look at treatment frequency: how much area is being treated; how regularly they are being treated, which is what several other European member states do.

Chair: We turn now to regulation.

Q53 Mr Spencer: Clearly there has been a different response in different member states of the EU. I wonder if you want to comment on why you think different states have responded in a different way, and whether that is indicative that the EU regulation of those chemicals is failing somehow.

Matt Shardlow: I think it looks very haphazard, doesn't it? Some of the haphazardness of this comes about through the setups in each individual country and the opportunities that arise. If you look at each one, each one of those instances has a different cause and a different route in. In Germany it was a mass movement of beekeepers that created political change. In France it was a Government funded bit of research; it was their research so they reacted on that research. In Italy their legal system has enabled people, in a way that we cannot do, to stand up for their environment and to protect their rights as beekeepers. In each different case you find there have been chinks in the armour around these plant protection products. In the UK we have yet to find that chink, which enables the science to be properly considered in a way that could result in the Directive—and the perfectly logical and legitimate principles and morality around that of protecting the environment and protecting people—being applied in the UK.

Nick Mole: I also think it is a result of different approaches to scientific uncertainties, so France, Italy and Germany have taken a more precautionary approach than we have in the UK. They are basing it essentially on the same evidence but it is how they interpret that evidence. There is no killer document in France that they have acted on. It is just their interpretation of that and their response to the scientific uncertainties.

Q54 Mr Spencer: How damaging do you see it? Potentially, if you were in charge of the research and development budget of one of these chemical companies, and you see the different interpretation across member states, there is no real incentive for you to go out there and find a new product? You would not have the confidence to invest in a new product, in that you are not sure if you are going to be able to apply that product in all member states. We are almost making the problem worse, in that we are pulling out the confidence of those companies to go and find products that are less damaging to the environment.

Nick Mole: I am not really sure what the question was, but I do not think it is going to stop people developing new pesticides. Approval is given at the EU level for particular actives. It is then up to individual member states to approve the products that contain those, although it is done on a slightly different basis. We now have a zonal authorisation, so one member state can accept a product and it would be used throughout that zone, which we do not think is correct. If it is restrictive, then I have to say I am all for that. That is just the way it is. What we would rather see is, instead of the millions and millions of pounds that have been put into developing new chemicals, that money would be better spent on researching non-chemical approaches to dealing with pests and diseases.

Mr Spencer: I think we covered the regulatory regime fairly well with Zac earlier on.

Chair: All right.

Matt Shardlow: Mark, can I just add to that? I come back to the point that there cannot be no risk in this for the chemical manufacturers. They are producing products. Some of those products are going to work, some of them may have unexpected impacts. Those should be discovered as early as possible and action taken as quickly as possible. We cannot take risk out of there if we are going to deliver on what the directive says, which is, "The objective of protecting human and animal health and the environment should take priority over the objective of improving plant protection".

Q55 Mr Spencer: The point I am making is that clearly it costs a lot of money to develop these products. If we do not have a regime across the whole of Europe, which those companies understand, and a framework that they can work to, then they are not going to put that money into research and development, and they will concentrate their activities in other parts of the globe and that will commercially disadvantage—

Matt Shardlow: That is a fair point. There has to be clarity about what is expected of those products, what tests they have to get through and, hence, how safe they have to be. I think that is something we all have to strive to achieve.

Q56 Martin Caton: I have a question, but I would like to join this debate, if I may, because I think the thing we have to balance against what the chemical companies have to put into their research is the profits that they get out of very successful products. Off the top of your heads—and I know it is a big call—do you have an idea of how much, say, Bayer or Syngenta actually make from the profits every year from what they sell in this country?

Matt Shardlow: No, but I had a figure—

Martin Caton: If you could provide it in writing.

Nick Mole: We can do that. Yes, we can provide that in writing.

Martin Caton: I think that would balance it.

Nick Mole: In the UK, EU and globally, imidacloprid is their best selling product and we are talking hundreds of millions.

Q57 Chair: Just before we move on from this—I am particularly asking Mr Shardlow to respond to this—in your evidence you refer to the proposed judicial review. I am very mindful that there are certain rules that relate to Select Committees about discussing anything to do with judicial review so, having regard to that, can I just ask you if you are in a position to say what the likely implications of the Prime Minister's speech to the CBI are in relation to, I understand, a policy change to look at removing red tape and to removing judicial review, in respect of environmental decisions? What impact might that have, and how might that relate to the discussion we are having here, in relation to regulation and Defra's decision not to change the regulations earlier in the year?

Matt Shardlow: My understanding is that statement was concerned primarily with judicial reviews in the context of the planning system. However, I cannot understand how one could introduce a filter for judicial reviews that would only apply to one set of decisions and not another. If there was an attempt to introduce that, I would think that would potentially fall foul, again, of the Aarhus Convention, because the Aarhus Convention is pushing things towards more access for the people to make sure that the environment and their needs are represented in the courts and represented through the legal system. As has been pointed out in relation to the system, there are very few judicial reviews taken on behalf of the environment and most of them with very good cause. It is certainly not a vexatious issue, with lots and lots of cases coming forward on environmental grounds but really for other reasons. People are genuinely concerned about looking after their environment and should have access to justice to enable them to do that.

Q58 Martin Caton: Do you have any information about what mitigation strategies work to support, particularly, wild insect pollinators, and is there evidence of where they have been shown? I am thinking of things, such as sowing wild flowers around the edges of crop fields and that sort of thing.

Matt Shardlow: Yes. Certainly one can give a boost to pollinator populations by putting in wild flower mixes around the edges of fields. It is not a perfect solution for a number of reasons. One reason is that it does not provide very good nesting habitat for the bees. It provides foraging habitat but, because the ground is still ploughed and turned over, it does not provide very good nesting habitat. You need to find that elsewhere.

The other point is that, as these chemicals are used more and they persist in the soil for a number of years, there is an increasing chance that in fact those verges and margins will produce wild plants that also contain neonicotinoids, and that impact has not been looked at yet either. We know from one study where dandelions grew on an area that had been treated with neonicotinoids, those dandelions had high levels. We also know, from work that has been done on rhododendrons in gardens by Bayer that, three or four years after the use of neonicotinoids in a garden environment, the levels in the nectar and pollen in the rhododendrons are at potentially fatal levels, so there are issues with that.

In terms of what does work, we believe that one has to look at reverting areas of whole fields back into a lower input, less pesticides, less nitrates production system, to try to get back that network of wild flower habitats in the countryside. We have a project called B-Lines, which is attempting to do that at the moment, and working with Yorkshire councils and others to put in place the lines where farmers can work to reintroduce wild flower networks into the countryside. That provides both forage and nesting habitats, which would help our beleaguered wild pollinator populations.

Q59 Martin Caton: Basically, there is no mitigation that would work properly if the continued use of these particular pesticides carries on?

Matt Shardlow: At the moment all agri-environment schemes, put together in the last 20 years, have created just 6,500 hectares of pollinator habitat, which might sound like a bit but when that is spread over the whole of the UK that is not much at all.

Chair: Thank you both very much indeed for the written evidence and also for coming today to share your expertise on this. Thank you very much indeed.

Examination of Witnesses

Witnesses: **Dr Chris Hartfield**, National Farmers Union, **Peter Melchett**, Soil Association, and **Emma Hockridge**, Soil Association, gave evidence.

Q60 Chair: I would like to give a very warm welcome to each of you. I think you sat in on the previous session, so you are aware of the direction of our concerns. Would you briefly introduce yourselves to the Committee and then we can go straight into the questioning?

Peter Melchett: I am Peter Melchett. I am the Policy Director at the Soil Association, which is 60-plus years old. Organic farmers farm some 720,000 hectares just about. It is an interesting contrast to the 6,000 hectares Matt just mentioned that are in stewardship schemes. The 718,000 hectares that organic farmers farm are all farmed without the use of neonicotinoids, or indeed any other field-scale pesticide treatments, pretty much. We called for a ban on neonicotinoids three years ago and, as you have heard, the science since then is 94% of the studies show that the science is even more unfavourable to those chemicals than it was.

In our evidence we have picked up a number of the points you touched on this morning, about the pesticide regulation system not being fit-for-purpose. It relies on industry studies that are secretive and may be very selective. We do not know. It does not have any mechanism for looking at the very low doses of active ingredient that a seed treatment like neonicotinoids delivers. These are doses that are well below observable effect level and not covered by pesticide regulation, but it is the repeated low doses that are a problem. There are a number of other problems in the regulations as we see it.

Q61 Chair: Thank you for that from the Soil Association. Perhaps just briefly, Dr Chris Hartfield, if you would like to do the same and then we will go straight into the questions.

Dr Chris Hartfield: I am Chris Hartfield. I am Horticulture Policy Adviser for the National Farmers' Union. I am also the National Farmers' Union lead on

bee health issues. I am representing our farmer and grower members who have an interest, of course, in the value of agricultural pollination but also in the pollination of wild habitats as well, as they are responsible for managing the majority of these habitats in the wider countryside. We also have an interest in representing commercial bee farmers as well, who are our members also.

Q62 Mr Spencer: Can I clarify from Peter, the acreage that you are farming, could you give us a ballpark figure, a breakdown as to how much of that was in cereal production, how much was in grass and how much oilseed rape you were growing organically?

Peter Melchett: The oilseed rape is easy to answer. There is no organic oilseed rape because there is no market for organic oilseeds. The breakdown between—

Emma Hockridge: I think it is around 40% grassland and the rest arable production, and obviously a small percentage within that would be in vegetable production as well.

Q63 Chair: What we want to try to get an understanding of, in the course of our inquiry, is to what extent the future of the agricultural sector of the UK—which both of you have real interests in—depends upon a healthy population of both managed and wild insect pollinators? Perhaps starting with you, Mr Hartfield?

Dr Chris Hartfield: The importance of insect pollinators varies by crop. I would make that point to start with. Indeed, there are crops that do not require insect pollination at all: your wind-pollinated crops, your cereals like wheat, and also crops like maize. Different crops have different levels of dependence upon insect pollination, and it varies from 100% for things like apples to perhaps less than 10% for something like oilseed rape. When you combine that need for insect pollination by crop, with the current area grown for that crop and then the market value for that crop, that is when you can calculate the economic value of agricultural pollination, and obviously those figures can be updated year on year. That is why you would have seen figures for a value of £200 million or now £400 million or in excess of £500 million. Interestingly, those figures all hinge on one piece of 20-year-old research, looking at the dependence of crops on insect pollination, done by Ingrid Williams over 20 years ago.

Whichever figure you use, there is no doubting the economic value of healthy populations of pollinators. It is substantial, and it is clear that a healthy pollinator population will currently be one factor that is underpinning the future success of agriculture and horticulture. The fact is we would not be able to grow many crops successfully in the UK without pollinators, which is why it simply would not be in the interests of UK agriculture or horticulture to undertake practices that are known to result in the widespread destruction of those pollinator populations.

Emma Hockridge: To add to that, there have been some calculations done on the cost if it was necessary to use alternative means of pollination. That has been estimated at £1.8 billion. Within that obviously there would be huge impracticalities, particularly for some of the major crops in the UK. You can imagine people walking through these crops damaging them and causing other problems. Of course pollinators do carry out many other vital services within the balance of ecosystems. They are not just there as pollinators but have beneficial effects, for example in terms of pest control within the broader system, so are hugely important.

Q64 Caroline Lucas: Just off the back of that, since we were talking about the precautionary principle earlier, Mr Hartfield, I want to give you the opportunity to give your view of the NFU's position on the precautionary principle. I notice that in your evidence you say there is no compelling weight of evidence showing conclusively that neonicotinoids are responsible for declines in bee population. We have already discussed whether or not the precautionary principle requires compelling weight and conclusiveness, but perhaps you would like to say whether you think the precautionary principle does come to bear on this and how you define it?

Dr Chris Hartfield: To clarify, yes, we accept the precautionary principle. It is there. It is embedded within EU law. What we are saying in our submission is that we do not think it is appropriate for the precautionary principle to be brought to bear in this particular circumstance, with respect to banning the use of neonicotinoids—as is being called for currently—for a number of factors, which all hinge around how particular organisations define the precautionary principle. We do not agree with its use in this context, because we do not see that there is a compelling weight of evidence that is demonstrating that neonicotinoids are responsible for the widespread decline in pollinator populations.

Q65 Caroline Lucas: Do you not seem to be defining the precautionary principle yourself, in a rather different way from the understood way of defining it? I have never heard it being described as "a compelling weight of evidence showing conclusively". If it is conclusive, by definition it does not need to be precautionary.

Dr Chris Hartfield: One of the problems with the precautionary principle is that the definition of it is not clear. If you look at what is written in the EU, there is massive room for interpretation. This is probably why we are having this debate. One of the key things with precautionary principle, and why you would bring it into force, is to ensure that there is a higher level of environmental protection as a result. There is a problem, you bring the precautionary principle to bear and, as a result, there is a high level of environmental protection. We believe that in this circumstance that cannot be demonstrated, because of the high risk that the alternatives to neonicotinoids—that would be used if neonicotinoids were banned—would pose to bees, to other pollinating insects and indeed to all beneficial insects.

It was referred to in the first session that there is also a cost consideration within the precautionary

principle, and I would like to bring the Committee's attention to a statement made under the Rio Declaration—

Chair: Sorry, I am having difficulty hearing. You would like to draw the Committee's attention to?

Dr Chris Hartfield: To statements made under the Rio Declaration of 1992 that said the definition of the precautionary principle based just on lack of certainty is not enough of a reason for postponing or halting measures which are cost effective, and the NFU believes that banning neonicotinoids would not be cost-effective.

Q66 Caroline Lucas: How can you know that? In your own evidence you talk about the science being inconclusive, so if you do not know what the impact is of neonicotinoids how can you then decide what the relevant trade-off is going to be, in terms of whether or not there are going to be less damaging ways of dealing with pests that do not require use of neonicotinoids?

Dr Chris Hartfield: We have looked at the trade-off for various crop scenarios. What would happen in the absence—

Q67 Caroline Lucas: If you accept that the science on neonicotinoids is inconclusive, then how can you have made that decision because you do not know? You have said in your evidence that the science is inconclusive. How can you then—

Dr Chris Hartfield: Sorry, I am not following the point you are trying to get to.

Caroline Lucas: I am trying to get to the point of: how can you say, with such certainty, that if you were not to use neonicotinoids the impact would be worse because you would be using insecticides that are more damaging? How can you say that, when you know that there is a degree of uncertainty about the toxicity of neonicotinoids, which you acknowledge yourself? How can you say whether one is going to be more damaging than the other, when you do not know how damaging one of those things is?

Dr Chris Hartfield: You have to look at the evidence that is available to you. You have to look at what the alternative scenarios would be for various crop pest situations. If neonicotinoids are removed, what would be used instead of those neonicotinoids? We know that for various crops those neonicotinoids would be replaced—you would have a single seed treatment of neonicotinoids, a very targeted low dose of an insecticide—with at least two or more multiple sprays of broad-spectrum insecticides, and this is not just saying that. This is because those are the only options available.

What is very clear is if you remove neonicotinoids from the situation, the pest problems are not going to go away. Farmers are still going to feel the need to react to pest pressures and to apply insecticides, and so they will use the next best thing. The reality is that growers and farmers use neonicotinoids because they are the most effective products available to them. It is not because they are the cheapest. They are very expensive to buy and apply so, almost by definition, if you remove those then you are relying on—

Q68 Caroline Lucas: I am deeply concerned about the kind of trade-offs that you seem to be implying here. On the one hand we have plant protection, on the other hand we have protection of bees, and somehow we are going to trade-off protection of bees because we think that being able to continue with the kind of plant protection that we have done in this country for many years is more important.

Dr Chris Hartfield: The European Food Safety Authority themselves, in a scientific opinion they published earlier this year on this whole area, looking at the assessments around bees and insecticides, said quite clearly that there is a balance that must be considered between food production and environmental protection. So, yes, there is a trade-off that needs to be considered, between food production and environmental protection. Yes, there is a trade-off to be considered.

Q69 Zac Goldsmith: Just on this point, because I think this is an important point. In order to make the judgment that you have made—that you outlined earlier, in relation to that trade-off—you must have a view, therefore, on how toxic neonicotinoids are. My question to you is what science have you been looking at that has enabled you to reach that position? You say it is not conclusive. We heard from the previous session, from both our panellists, that there are endless examples of scientific research that have testified that neonicotinoids are hugely toxic and are a big part of the problem that we are talking about today. My question to you is: in the evidence that they provided, what do you disagree with? What science do you endorse? Which reports have enabled you to reach this position that you have reached?

Dr Chris Hartfield: I do not think we disagree with any of the scientists. This is not about disputing the science. It is about—

Q70 Zac Goldsmith: Sorry, I am going to have to interrupt you. It has to be about disputing the science because, according to the evidence that we received, 94% of the papers in existence on this issue—barring the ones that were removed because they were not realistic—suggest that there is a very profound problem, so it is a question of whether or not you believe in that science and endorse it or not.

Dr Chris Hartfield: With respect, that is about interpretation of that science. That 94% figure, and the view that was given by the previous panel, is about interpretation of the science. That is not questioning the science or interrogating the science, it is about how you, as a particular organisation, interpret the science.

Q71 Zac Goldsmith: How do you interpret that science? What is it that has enabled you to reach your view that the precautionary principle would be inappropriate at this stage? Can you tell us that?

Dr Chris Hartfield: Our view is that there is no compelling weight of evidence that shows that neonicotinoids are causing the widespread decline of bees and other pollinating insects that we are seeing. The fact is one thing—

Q72 Zac Goldsmith: What are the things that you are looking for then? What is the threshold that you are looking for as an organisation that might encourage you to change your position on that? What is it that needs to be delivered, in terms of science and research? Is it a statement by agribusiness? Increasingly, NFU seems to be national agribusiness union and not National Farmers Union. It is quite extraordinary. Is there a particular thing that your organisation is looking for that might encourage you to push for the precautionary principle. Is it a statement from Defra? Is it internal industry research that you might endorse? What specifically is it?

Dr Chris Hartfield: We are looking, quite simply, for a balanced and proportionate appraisal of the situation. That is fundamentally what we are looking for.

Caroline Lucas: So why were those 94%—

Dr Chris Hartfield: We are looking for that to be done at an EU level, because we do not believe that member states should be taking unilateral approaches on this issue, that the position should be clear at an EU level. Also one of the things from this morning—

Chair: I think Caroline wanted to come back.

Caroline Lucas: Sorry, there is just so much to try and unpack. Yes, go on.

Chair: I will bring you in at the end, Peter. I just want to get Caroline in and then Martin, because this was originally a question that was directed to the NFU.

Q73 Caroline Lucas: It is going back to the fact that we have 94% of these studies suggesting that there are problems. We have Mr Hartfield saying he wants something that is balanced. We have already shifted from something that was supposed to be compelling and absolutely conclusive, to now Mr Hartfield saying he will settle for something that is balanced. If you have 94% of studies saying that there is a problem here, I fail to see why that is not balanced enough for you to be prepared to see some action.

Dr Chris Hartfield: I am afraid I did not do the research coming down in the train to come up with a 94% figure, so I would be happy to look at that and look at that research after this session.

Caroline Lucas: It would be very interesting to have your views on that.

Q74 Martin Caton: You are not assured that there is compelling and categorical evidence that says neonicotinoids are a large part of the problem. Do you believe there is compelling and convincing evidence that they are not part of the problem?

Dr Chris Hartfield: We are not denying that pesticides are one of the factors. One of the problems with this debate—and it has been very clear from the session this morning—is that we talk about declines in pollinators and that is immediately juxtaposed with this weight of evidence, concerns around pesticides and the impacts on insects. It is automatically taken that that one problem is due to that second thing.

I heard very little mention this morning that the challenges facing bees and other pollinating insects are multi-factorial. If you look at the evidence that has come out of the scientific community that is very much the consensus, with respect to the challenges facing bees and other pollinators. The consensus is that the key challenges facing honeybees are pests and disease, principally the parasitic mite Varroa. The key challenge facing wild pollinators is the loss of habitat and the problem that causes with respect to finding forage. The United Nations Environmental Programme identified around 12 different challenges facing pollinators. This is not about denying that pesticides is one of those factors but it is about keeping it in context. Otherwise you trivialise all the other factors, and you do not do justice to investigating the impact of pesticides on insects in a robust and scientifically proportionate way.

Q75 Martin Caton: Would you accept that there is a growing body of evidence that shows that the new neonicotinoids are contributing to those other factors?

Dr Chris Hartfield: There is a growing body of evidence that shows concern around neonicotinoids and insect pollinators, yes. As I say, I would not deny any of the evidence but it is about looking at that evidence in detail. It is not just about taking it on face value that another piece of evidence is equally as valid as the piece of evidence that went before it. You have to look at that in detail. As Mr Spencer was saying in the previous session, you have to look at the doses involved. You have to see whether they are realistic, in terms of what the pollinators would be exposed to under field situations. You have to look at the whole range of factors. It is not just about stacking up the pile and saying, "Well, that is enough to ban neonicotinoids".

Q76 Chair: This was a question that was originally asked of the NFU in respect of the precautionary principle. Peter Melchett, you have been very constrained. We are constrained for time, but I will give you an opportunity now to place on record a very brief response to the issue about the precautionary principle.

Peter Melchett: Could I just make two quick points before that, on the question of habitat loss and its impact compared to pesticides? The habitat loss that we know has affected all insect populations in the UK on farmland largely occurred during the 1960s, 1970s and 1980s. And—according to the NFU and the Government—has now largely stopped, and indeed has been reversed, because of the introduction of stewardship schemes and wild flower margins, so you would have expected pollinator numbers to start to recover. In fact it is in the period when we have not been losing habitat that we have started to lose pollinators and honeybees in huge numbers. The idea that there is a link with the new class of pesticides, which were introduced at that time, is entirely rational.

Secondly, this trade-off argument is really disingenuous. There is no science, no facts, on which to base a claim that if you did not use neonicotinoids things would be worse. Nobody has done any published work to show that. The only published science is from Italy, which shows that when neonicotinoid use was suspended for three years there was a 50% recovery in winter survival rates. That is

the one bit of clear evidence, and the farmers were no worse off.

On the precautionary principle, one of the most disturbing and upsetting things about this saga, which has been going on for many years, is the way I think the goalposts have been quite deliberately moved as the scientific evidence against neonicotinoids has built. You see now in the National Farmers Union's evidence phrases like, "compelling weight" and "not being conclusive". As has already been pointed out, if something has to be conclusive you would not need a precautionary principle. You would not need any principle at all. If the evidence is conclusive you act on it. The point of the precautionary principle is to accept that, particularly in an area like this, there will always be some element of uncertainty if the science is good. The level of uncertainly that is acceptable to the Government and other interests protecting neonicotinoids has simply gone up and up, so we now have Defra using—as Caroline Lucas pointed out—the phrase "unequivocal". That removes any element of uncertainty at all and is scientifically impossible. Good scientists will never say "unequivocally" something is the case. In fact what has happened is that, as the scientific evidence about neonicotinoids has increased, the bar has been raised until now, if you accept the Government's position, it is at an impossible level, which dooms pollinators to continued death and destruction.

Q77 Zac Goldsmith: Just very quickly, why? Why do you think the Government is raising the bar to an impossible level? Where does that resistance come from?

Peter Melchett: I think the key problem that systemic chemicals generally pose to pesticide regulation, is that they introduce a whole new category of risk. We saw that a few years ago with the cocktail effect. People were quite rightly concerned that the regulatory system was not looking at possible interactions, and perhaps additive or even synergistic impacts with different chemicals, and the regulatory system took some steps to address some parts of that. These chemicals give rise to a whole new class of problem because they appear to be active at doses below what is accepted as an active level of dose, so a neonicotinoid seed dressing delivers minuscule doses of the pesticide to bees but of course it does it repeatedly, hour after hour after hour. Every time a bee or another pollinator revisits pollen on a plant it gets a tiny dose of this chemical, and it is that that would be very difficult to regulate and the regulatory system simply does not cover it all, so to admit there is a problem is to admit that the whole regulatory system needs review, which it certainly does. It is not fit-for-purpose.

Q78 Chair: Worst case scenario—and everyone is concerned about food security and food supply—were pollinator numbers to decline so dramatically, is the large-scale manual pollination of crops feasible in the UK? A very quick answer.

Peter Melchett: I farm organically. We grow peas and vetch for seed and they both need pollinating by insects. I can tell you, if you have a gang of people walking across my pea crop they may pollinate them but there would not be any crop left. It is completely, economically and physically, a ridiculous impossible idea.

Emma Hockridge: As someone worked out, that calculation of the annual £1.8 billion cost equates to the average salary of 60,000 teachers so a huge economic impact.

Dr Chris Hartfield: No, is the short answer. Large-scale manual pollination would not be feasible.

Q79 Mr Spencer: To go back and explore this, let us imagine that we are going to stop using this chemical and we are going to use foliar applied chemicals. Can we establish whether you think that would be worse or better than the current situation? If we reached the stage where we removed those foliar-based insecticides, what would be the impact on food prices and crop yields?

Peter Melchett: I would say that this catastrophic decline in honeybees and wild pollinators appears to coincide with the introduction of systemic chemicals, and in particular the neonicotinoids in the seed dressings, which—as you heard in the previous session—are now ubiquitous, so they are not used on a need-to-use basis, they are used as a precautionary application on all, for example, the rape seed. Going back to more selective use of sprayed insecticides would certainly be better. If you look at the historical evidence when those chemicals were in use, bees and wild pollinators were not disappearing at the rate they are now, which is why I dispute this idea that there is some trade-off, which would make things worse. It is unsupported by any evidence, or any peer-reviewed science at all. It is simply a slogan.

Q80 Mr Spencer: That is anecdotal. There is no scientific evidence to prove that.

Peter Melchett: Nobody has done any control field trials over a period of years looking at the impact of previously used insecticides and neonicotinoids—no, that is true—but we know that we were using those sprays. They were only used when farmers needed to use them against identified pests. They were not in every crop, all the year round, the whole time the crop is growing, in all of the pollen. We know that spraying insecticides is pretty inefficient. When I last saw it demonstrated, about 90% of the spray either did not hit the crop at all or bounced off and hit the ground—it may have improved a bit since then—so it was not a terribly efficient method. Of course, very often the insecticide only stayed on the crop for a short period of time.

Emma Hockridge: There does seem to be the assumption that anything that was used in the past is automatically worse than the newer products that are made now, which is not automatically true.

Just going back to that Italian example, after the restrictions on neonicotinoids came in they did some detailed studies on the yield and found that overall there was no negative effect. Even in terms of the affected maize plants, they found that only 10% were affected by any of the major soil dwelling pests. There was no overall impact on production levels and less than 3% of sample fields were affected. With regard

to the insurance principle, a lot of the seed dressing is used as insurance, not necessarily directly if the crop is being attacked.

Peter Melchett: That is published science based on the Italian three-year experience.

Q81 Mr Spencer: If we remove the foliar-based chemicals as well, what impact do you anticipate there would be on yields and food prices?

Peter Melchett: If you remove insecticides you have to change your farming system, to use rotations to combat insect pests, as you would in agri-ecological or organic systems, so you are looking at a different system.

Emma Hockridge: I think we also have to look at the particular crops that, particularly in the UK, these are being used on, so maize and oilseed rape in the large majority, and they are not necessarily automatically going into the human food supply chain. They are used for animal feed, biofuels and so on, and so not an automatic impact.

Q82 Mr Spencer: Is that a realistic prospect of completely changing the agricultural system that you identify?

Peter Melchett: If you look in Europe as a whole the organic market is growing in double figures—and has done through the recession—of somewhere between 10% and 11% and 15%. The land area is steadily increasing in Europe as a whole and also in countries, like the US, places in Latin America, and in China and India. It is not going to happen overnight but there is definitely a global trend, even through the global recession, in that direction.

Q83 Mr Spencer: Chris, do you want to respond as well?

Dr Chris Hartfield: I would just say clearly the NFU has members that grow both organically and conventionally, and we do not see that it is a black and white, one or the other, situation. It is basically about getting the best resource you can to produce the best outcome, and pesticide inputs have a place to play within that, a place to play in ensuring safe, reliable and sufficient supply of affordable food. This has been no better emphasised than this year in the wake of a brutally harsh season—like the one we have just had—pesticides have been one input that have helped mitigate the impacts of that for what otherwise would have been a disaster. If you look at production this year within the organic sector, unfortunately that has meant many organic producers this year have suffered extremely low yields and some of their crops have been completely wiped out and unharvestable: brassica crops, for example, and potato crops.

Q84 Martin Caton: Peter, you have already answered this, but perhaps I could ask you to expand on it, giving your reasons why you think the UK safety standards and practices for applying systemic pesticides are not sufficient to protect insect pollinators. Could I also ask your opinion, Chris, of the present rules?

Peter Melchett: This would apply to European standards not just to the UK and indeed globally. Pesticide regulation was designed after the Second World War to allow pesticides to be used. The regulatory system was not set up to decide whether or not pesticides should be used as a general principle, but to ensure that, when they were used, they would be used as safely as possible. There were two keys things that needed to be incorporated in a regulatory system to make it workable. One was you had to look at it chemical by chemical. If you looked at combinations, the possible combinations that occur in the real world, on the farm, the system becomes impossibly complicated, expensive and unworkable, and the answer would be you would not authorise any pesticides for use because you would not be able to test every possible combination, and that was what led to the concerns about the cocktail effect over many decades.

The second thing that was a requirement to make the system work was you had to assume that, at some level or another, these things stopped having any impact because otherwise you would have to test down to incredibly low levels. As technology and science has improved in the last 30 or 40 years, the levels at which you can detect pesticides have become smaller and smaller and that would have meant a regulatory system looking at tinier and tinier doses, which again would have made it impossibly expensive and, therefore, you would not have authorised any pesticides at all.

What the neonicotinoids do, as a systemic chemical, in every part of the plant is deliver very small doses, but continually over a long period of time, and very often. As Matt Shardlow told you in the earlier session, what you find is you need to look at the impact over a period of weeks or even months not—as some of the research that he rejected did—over a single day. On the whole, all the safety testing of pesticides and other things in farming rely on pretty short-term testing, 90 days tends to be the very longest for feeding trials for example. This is a real problem for the regulatory system as a whole. If you accept that minuscule doses repeated regularly can have an active effect on insects, of course the next question is can they have an active effect on you and I, and we do not know that.

Q85 Martin Caton: Before Chris comes in, the recent recognition of the inadequacy of the present regime, as it applies to systemics, seems to be a step forward but do you think that is going to produce changes that will tackle the problem?

Peter Melchett: After the number of years that organisations, like Buglife, ourselves and many others now, have been complaining about neonicotinoids, I see every move, I am afraid—and perhaps too cynically—as a move simply to delay action, including calls for more research. We are convinced by the arguments. The scientific evidence is overwhelming and the evidence of the good impacts of bans, for example in Italy and other countries, is clear, and what Defra should do is ban them immediately.

Emma Hockridge: Looking back further through history there are a huge number of examples within pesticides and pesticide regulation where it has taken

many years to ban certain pesticides, and the Chair mentioned *Silent Spring* at the beginning. As a result of the anniversary we did some work looking back through each decade looking at how long it had taken for pesticides—for example, DDT, but a range of others since then—to be banned, and how long that evidence had taken to build up, and it has been between 20, 30, 40 years in some cases, and that is just really unacceptable.

Dr Chris Hartfield: The NFU believes that the current UK standards and legislation are sufficient to protect pollinators. That is not to say that there are not gaps, and those gaps have been identified and are well known. There is work coming out of Europe by EFSA that has identified those gaps, and it is totally right and proper that, as the science and the knowledge base moves on, you review the way that you assess pesticides. That is totally right and proper. If you find that there are gaps then you adjust those assessment processes accordingly.

The NFU does not sign up to the kind of conspiracy theories, which you might see in the popular press, about collusion between Government and chemical companies in the areas of pesticide legislation or regulation. One thing that I would also like to say is that it is remarkable and worth putting on the record that most organisations that are calling for precautionary bans, more restrictions on the use of neonicotinoids, are organisations that have quite public pre-existing anti-pesticide agendas. It is remarkable that none of the beekeeping organisations are calling for bans on the use of neonicotinoids.

I would like to quote you something from the September edition of *The Scottish Beekeeper,* and these figures relate to honeybee colonies run by one of the biggest commercial beekeepers in the UK, a guy called Murray McGregor. In the 2011-12 season he had 2,000 bee colonies in Tayside and Lothian. He is very proactive in controlling his pests and disease, particularly Varroa, and he does that very effectively. In the 2011–12 season all 2,000 of his beehives, of his colonies, were actively taken to flowering oilseed rape crops that, as we have heard, are more likely than not to have been seed treated with neonicotinoids. His losses in that season were just 5%. The lowest he had seen for several years. Lower than his losses with colonies that he had in areas where there was no oilseed rape, and also in other years where he had colonies placed where there was no oilseed rape. As someone at the coalface of this issue, his experienced view as a beekeeper is there is no negative association with oilseed rape and, accordingly, he actively seeks out oilseed rape—like many beekeepers I speak to—for all his bee colonies, to boost colony vigour and honey production, and the forage that that crop provides.

Beekeepers, in my experience—and I talk to a lot of beekeeping groups—are not concerned about neonicotinoids and insecticides. They are concerned about pests and disease and principally the control of Varroa.

Emma Hockridge: Can I just clarify Chris' answer. It is not true that all beekeeping associations are not calling for answers. The British Beekeepers Association has quite famously not called for a ban, and many of its local groups have in the past years been quite outraged that they have been taking money from at least one of the chemical companies. A number of their own local groups have been very much against their position. There are also a range of other beekeeping organisations, BioBees, Natural Beekeepers, associations in general who have been very keen.

Chair: Okay, we are now up against the clock. I know that Zac Goldsmith wants to come in, but I do remind colleagues that we are up against the time and schedule.

Q86 Zac Goldsmith: I was going to make that point, and say that all the chapters that I know are outraged by the behaviour of the central organisation and believe that it is linked to the money that they have been taking from industry. I think that should be on the record.

My question is to the NFU. You have taken a very strong position against the science that already exists, at least the interpretation of the science that already exists as you put it. It would be very useful—we cannot do it now—if you would agree to submit in writing your organisation's analysis of the reports that we heard identified earlier, and why you think these do not provide sufficient evidence to justify the precautionary principle. It would be useful to have that on the record in an authoritative manner, and we would hopefully be able to incorporate that into our process because a blanket dismissal is not good enough at this point.

Dr Chris Hartfield: No, as I said before, I am not dismissing the science. It is about interpretation of that science. As an organisation I could not commit to that now because you are talking about an extremely labour intensive and resource heavy process to review, paper by paper, all of the science and evidence in this area. As an organisation we do not necessarily see that that is our responsibility to do. I think the responsibility—

Q87 Zac Goldsmith: In that case I just make the point that to have taken the line that you have taken it would be reasonable to expect that your organisation had already reviewed that science, because you have put up a very robust opposition to the idea of introducing a precautionary principle. You seem now to be admitting that you have done so without having reviewed the scientific papers that were outlined earlier, which seems to me to be a very irresponsible position for an organisation like the NFU.

Dr Chris Hartfield: We are following the consensus of the scientific opinion. I have stated that today. We are also following the lead of what is coming out from the regulatory authorities at EU level, and at UK level as well.

Zac Goldsmith: Science never allows an absolute consensus but, in as much as consensus is possible in science, the evidence we have heard today suggests the consensus is calling for a precautionary approach. Again, it seems odd that the NFU has—I have made the point.

Q88 Caroline Lucas: In your own evidence you have said that the science is inconclusive.
Dr Chris Hartfield: Indeed.
Peter Melchett: But conclusive enough to do a detailed cost-benefit analysis on whether continuing to use neonicotinoids is better or worse for farming in the environment. You are knocking earlier use of insecticides, which, as I say, is not based on any rational process but is just a slogan.

Q89 Mr Spencer: It would be worth exploring whether the market could deliver a solution. If we can cost out how much certain bodies think this costs the environment, could farmers be paid to not use these chemicals and to introduce more habitats and practices that increase the amount of pollinators. Could the market deliver a solution?
Peter Melchett: Farmers are paid by the public not the market—if we are looking at the money we get from the Common Agricultural Policy—I suppose it is possible under pillar 1. To qualify for your pillar 1 payment you might be asked not to destroy pollinators—and remember the majority are wild not honeybees—on your land, because if you are expected to keep it in good environmental condition that surely means having a healthy population of pollinators. That would not involve farmers being paid. It would involve farmers who are destroying pollinators not being paid, and it is a very interesting thought that had not occurred to me, but may be one we should pursue with the Commission if we cannot get regulation at a European level to ban these dangerous chemicals more quickly.
Emma Hockridge: Of course there are mechanisms within that system already to support farming systems that are beneficial to pollinators, for example, organic farming systems. Even through the entry level scheme, as was mentioned before, there are specific ways that farmers can be supported, but there is not a very high uptake so I think there is some tweaking. We can look at that in more detail.

Q90 Mr Spencer: How would you measure that because there is no ability for farmers to access local data on the numbers of pollinators, and how you would even begin to measure it or make it work?
Peter Melchett: There are a number of publicly funded operations on farms that are based on general science, so we know that providing winter food and nesting cover is important for the survival of some of our most endangered farmland birds, like Grey Partridge or Skylarks or Corn Buntings, and there is good science to support that. There is now really very good science to show which elements of the agri-environment schemes will help those rare birds.
As Emma says, the parts of the schemes that are likely to be the most helpful are not being taken up enough yet. Defra have made some changes to encourage that, so there are mechanisms to encourage farmers, either not to do something bad or to do something good. The idea that you have to keep pollinators healthy populations by following certain practices, which might include avoiding systemic seed dressings, I think, is a really interesting one. Perhaps we can get the Agricultural Commissioner to pursue it.
Chair: I will bring our session this morning to a close. I do not think we were ever going to cover all the issues. Can I remind our witnesses this morning that if you do have any further written evidence arising out of our discussion, which you wish to submit to us, please do let us have that. Thank you very much indeed for your time.

Wednesday 21 November 2012

Members present:

Joan Walley (Chair)

Peter Aldous	Caroline Lucas
Neil Carmichael	Caroline Nokes
Martin Caton	Mr Mark Spencer
Zac Goldsmith	Dr Alan Whitehead
Mark Lazarowicz	Simon Wright

Examination of Witnesses

Witnesses: **Professor Dave Goulson**, Stirling University, **Professor Graham Stone**, Edinburgh University, **Dr James Cresswell**, Exeter University, and **Dr Lynn Dicks**, Cambridge University, gave evidence

Q91 Chair: Can I welcome all four of you? I will try and catch everybody's eye as we go through the session that we have this afternoon. This is the second hearing that we have in our current inquiry. As you can see we have a full Committee and a full panel of witnesses, so I will ask you to try and be as concise as you can be with our detailed questions, and rather than have each of you give a summary of where your individual research, etc., is at, we intend to go straight in with questioning, if that is okay. Try and catch my eye.

What we will do is we will start off with a question about the evidence that we have received about the decline of bees in the UK but rather less evidence about other insect pollinators. We are just really interested to understand how much you think that the UK faces a general insect pollination crisis, or whether or not it is just a problem with bees. I do not know who would like to catch my eye on that first of all.

Dr Dicks: I am quite happy to start. Hi, and thank you very much for the invitation to come here. There is a decline in some insect groups; we know from the evidence on numbers. We have evidence on abundance of bees that has been collected over time in a systematic way on a few pollinator groups. So if you look at wild pollinators, we are talking about moths, butterflies, beetles, wild bees, and of those groups we have numbers over periods of years for moths and for butterflies and very recently published also for ground beetles, which are not pollinators but they are an insect group, and there are also flower-visiting beetles that have different life cycles and different food sources, so it is interesting in itself.

It looks like about two thirds to three quarters of species are declining, and a good proportion of those species are declining by more than 30% every 10 years. So, for moths, two thirds of species are declining and 21% have declined by more than 30% in 10 years and that is of the widespread common species. For butterflies, it is a similar picture: 72% of the species are declining and more than half of them have declined in their distribution.

For ground beetles, again from the environmental change network—which is long-term monitoring data—on 11 grassland sites around the country, going back to 1994, we have three quarters of the species declining, and half of these have fallen by more than 30% in 10 years. These are the groups for which we have numbers, and for bees and hoverflies, we have distribution data, which comes from volunteer records collected over time but without systematic monitoring and without numbers of individuals, and there we have evidence that more than half of the grid squares that were looked at had fewer bee species now than they had some years ago.

For bumblebees, we have evidence of declining range in some species; massive declines in range since 1960. Dave could tell you more about bumblebees.

Q92 Chair: I don't know if anyone wishes to add or give a different version?

Professor Stone: Do you want to add some more on bumbles?

Chair: Do try and use the microphones because the acoustics are very difficult in this room.

Professor Goulson: For bumblebees specifically, as Lynn says, we don't have numbers, so we can't tell you what the population is or how it's changed in the last 10 years or 100 years. Sadly, all we can do is look at range declines. What we can say is of the 25 UK bumblebee species, two or three—it's a moot point as to whether it's two or three—have gone extinct and probably 10 species have undergone very large range decline. So some have basically disappeared from most of the area they used to occupy, and that is pretty much all we can say at this point.

Q93 Mr Spencer: Dr Dicks said specifically the 1960s. I wondered why you picked the 1960s, and has that decline over more recent years, since the use of various chemicals, increased or decreased or continued at the same rate of decline since the 1960s?

Dr Dicks: The 1960 date is for the bumblebee distribution data. It is data collected pre-1960 and post-1960 to 1982, and it was published quite a long time ago. So there was a decline going on for some bumblebee species before neonicotinoids were introduced for sure. But the important thing to say is that the decline is continuing, and we know very well it is continuing in butterflies and we know it is continuing in moths. It is quite alarming the rate of decline for some species, not for all species. There are quite a lot of widespread common species that are doing all right, but relative to the number of species that are not doing all right, it is not a very nice picture for insect diversity in the UK.

Professor Stone: I was just going to make a point that different species and different pollinator groups kind of operate on different spatial scales, so the impact of population changes for some kinds of pollinators are very local, and if you lose a population, it may be difficult to get it back. That applies to a lot of the wild bees, for example, which are often small in local populations. But other things that are very important biological service providers include some of the hoverflies, the geographic ranges over which annual populations ebb and flow are much larger and so for some of those—and these include some of the species that seem to be faring better under modern circumstances—we receive large population influxes from Europe every year. So part of the variation that Dr Dicks was mentioning reflects the variations in scale of which some of these populations were.

Q94 Chair: To follow on, Dr Dicks, you mentioned about volunteers doing volunteer research. Can I just ask why has there been so little academic research on wild insect pollinators, do you think?

Dr Dicks: There is quite a lot of academic research, but it is not answering the questions that we have about what the causes of decline are and what is declining as well as it could. I think the answer to your question is there just isn't the funding. It is quite difficult to get funding to do basic ecology research, and it is even more difficult to get funding to do applied ecology research. In order to get a big amount of funding, you have to demonstrate that you are answering a brand new and pure scientific question with scientifically excellent methods, and that does not always apply to, for example, monitoring or applied questions such as this.

I would say that we have a big research programme in the UK that is going on at the moment called the Insect Pollinators Initiative. That has spent £9.6 million on insect pollinator research, and some excellent new data is coming out, answering some of the questions we have at the moment about the different threats and the ecology of pollinators.

One of the projects that was proposed for that programme was about monitoring of insect pollinators and it did not win funding, so that just demonstrates that if you want to do the monitoring, which is what we need to answer this question about the effects of pesticide, science funding doesn't cut it.

Dr Goulson: That was exactly the point I was going to make. I have also tried to raise funds specifically to set up a long-term bumblebee monitoring programme, so that I could tell you whether the population had changed and was unsuccessful in getting funding, so hence we don't have the data.

Q95 Chair: Where would you expect to get the funding from?

Dr Goulson: In that instance, I applied to the Natural Environment Research Council, which is one of the Government funding bodies, and the success rate on average was rather low anyway—17% perhaps—so one would expect to be rejected on average, but nonetheless it illustrates the difficulty in getting funding for ecological research generally.

Dr Dicks: It is also worth saying, if I can just note one more point, I don't know how much money it spends, but Defra does have a bee unit that has quite a lot of staff, so they are spending quite a bit of money on monitoring bees. It is a very good monitoring scheme; there is quite a lot of scientific investigation into honeybees, and it is only for honeybees almost entirely. So there is money; it is just somebody has decided and continues to decide that we are only interested in looking at honeybees.

Q96 Chair: All right, and a very specific question: is it possible to assess the risk to wild insect pollinators by extrapolation from the risk assessment conducted on honeybees?

Professor Stone: No.

Q97 Chair: No. Is that a no?

Professor Goulson: A no from me, too.

Chair: No.

Professor Goulson: Honeybees are very atypical insects for lots of reasons.

Q98 Chair: Are you all saying no?

Dr Cresswell: Yes, and I am saying no as well, in that some kinds of bee are more sensitive than others. In fact, honeybees, in my view, are rather tough compared to, for example, bumblebees. So if you wanted to measure like for like, if you expose a honeybee to this much pesticide and you expose a bumblebee to the same amount, will they have the same response? The answer is no. But given that you know that bumblebees are more sensitive, for example, you would therefore be able to predict. So in a sense if you are trying to develop a workable sentinel species the answer is yes, you could go back to making the honeybee the white rat of lab testing for pesticides, but you would have to do a lot of fundamental research to find out about the sensitivity of the other species, so that you could extrapolate from one to the other.

At EU level, they are talking about using a times 10 safety factor, so if you don't know you just assume the other species is 10 times more sensitive than the one you are looking at. So there are logical ways forward, but they require either a risky safety factor or they require a lot of extra fundamental knowledge that we currently largely lack.

Q99 Chair: All right. Just finally from me at this stage, is there, therefore, a case for extending EU legislation to include risk assessments that also cover wild pollinators, would you say?

Dr Cresswell: That is already being done with the EU working group on pesticides and bee risk assessments. The problem is if you are going into a regulatory process, you then have to specify what kind of testing you would like done, and the show-stopper is really that we are not quite sure what to test and how. So there is a willingness to extend the regulatory procedure, for example, to solitary bees; you then have to write guidance about how member states will do it, and the answer is, "Well, we're not quite sure what guidance to provide yet."

Dr Dicks: Can I also say something about hoverflies, which are in the pollinator community and, in some parts of the country, a very substantial proportion of the flower-feeding insect community, providing an unknown amount of the pollination service. They have very different life cycles to bees. They feed on flowers exclusively as adults. Many species have different larval habits. Some of them are laying their eggs in a crop and the larvae are feeding in the crop, so their exposure routes are very, very different from bees in many ways. Other hoverfly, their larvae are living in ditches and water. I think that there is a huge case there for a different model of experiment to test the effects of pesticides.

Professor Stone: Even though the pesticide chemicals are hitting the same fundamental systems—the same neural systems or the same physiological systems—in the insects, the way those convert through into the behaviour of individuals, the way a hoverfly would respond or a worker bee would respond or even a male bee, because we don't think about the males and the courtship and the sexual interactions in honeybees very much—or even in bumblebees very much—but in solitary bees they are a big part of it. So the way those fundamental kinds of neural impacts of the chemicals are converted into behaviour and then into the dynamics of the population, whether it expands or grows, we expect to vary among particular groups. These things have been evolving separately for a long, long time so we think of hoverflies and bees—they are both insects, aren't they?—but they started in their own separate evolutionary way back before the time of the dinosaurs, so there are plenty of differences.

Chair: All right. We will move on to the subject of regulation—you have just touched on it—and I will turn to Caroline Lucas.

Q100 Caroline Lucas: Thank you very much. I wanted to ask you if you think that the UK pesticides risk assessment regime is sufficiently transparent to research scientists like yourselves?

Dr Dicks: Can I just say no?

Caroline Lucas: You might want to elaborate but—

Dr Dicks: My experience for this is fairly limited because I don't actually work in this area of pesticide regulations, but I did try and have a look at the studies that support the assessment for the neonicotinoids that are available in the UK and I did find reference to studies, reference to field studies, but I could not find the studies themselves at all. I did find one author name in a table. I maybe spent an hour and a half trying to find these things, so that doesn't say they are not there, but my point would be that they are very inaccessible and they should be not just accessible but shoved in our faces to check whether we agree with the methods.

Dr Cresswell: I have just seen some of the studies and the way that I had to do it was I had to apply to the CRD, I had to go to York and then I had to sit in a room with a person looking to check—I don't know what he thought I might do. So I was allowed to look at the documents, make notes, but I could not have copies of them. So I did a pretty good transcription of all the data that I wanted and was able to take it away, but I am not sure that counts as transparent.

Q101 Caroline Lucas: Did you ask them why? Did they give any reason? Presumably, you must have asked if you could photocopy it or take it away or something. What reason would they give?

Dr Cresswell: My understanding, and I think you would have to check with the CRD, is that many of the studies are conducted by industry, and industry view them as confidential information and so I am told anecdotally that the show-stopper is they are unwilling to share their confidential information with other industrial competitors. But I have no idea why that counts.

Professor Goulson: I just want to flag up the obvious inequity in that academic research that has shown evidence for harm of neonicotinoids on bees is picked apart and examined in minute detail by the agrochemical industry and yet in reverse we can't examine the evidence that they are safe. As James said, it would be very nice to be able to look at their studies in the detail that they look at our studies, but we are not freely able to do that.

Q102 Caroline Lucas: You explained it might be commercial sensitivity, so does the pesticides industry have an undue influence, if you like, on the regulatory process, do you think, in terms of the role of testing products?

Dr Cresswell: I am not sure.

Q103 Chair: Sorry, is that a no, or are you—

Dr Cresswell: I have no basis to judge, I don't think.

Dr Dicks: From where I am sitting, it is the regulatory system itself with its closed studies that you can't access that is at fault, and I would not know whether the pesticide industry has an undue influence or not.

Q104 Caroline Lucas: Just to put to you some evidence that we heard this morning from the Soil Association where they say, "The current UK system of pesticide regulation relies on the use of industry data that is not subject to scientific peer review and publication", which seems to be what you have just reinforced. "Second, there is no requirement for companies to publish all the research they conduct leading to the risk of only cherry-picked favourable studies being used to obtain regulatory approval." If you are nodding to both of those it seems to me that it would not be too big a leap, therefore, to conclude that the pesticide industry does indeed have an undue influence on the regulatory system.

Dr Dicks: The same is true of science though: we don't have an obligation to publish all the studies we do; we publish the ones that we think will get published, so there is a bias. The bias is across all science—private and the publicly funded—I think.

Q105 Caroline Lucas: If you got your research to do what you wanted to do through NERC, you would be expected to publish it, would you not?

Dr Goulson: Yes. Generally speaking, academics are under huge pressure to publish whenever they can, so it would be very odd to choose not to publish something.

Q106 Caroline Lucas: Trying to get to the heart of this, then, is it not the case then that these private companies are exerting—I will say it again—an undue influence either by making it easier for scientists not to then put into the public domain the research that they have conducted, or by themselves not putting their own research there?
Dr Dicks: It is impossible to say, without seeing the full body of research that they have done, whether they have hidden some of it. They may have done.

Q107 Caroline Lucas: The Advisory Committee on Pesticides, for example, is a part of the whole regulatory process; I have struggled to find out exactly who they are and what their interests are and who might or might not fund them or whatever. How much do you know about them as an example?
Dr Cresswell: I have heard of them. I know they exist and I know that it is not always easy to get hold of their minutes. There were some things that I would have been interested in looking at, and I don't know how to do that.

Q108 Caroline Lucas: But does that not strike you as deeply shocking? Maybe that is the difference between scientists and politicians, but to me that just seems outrageous that you can't get hold of who these people are who have such a significant influence on the safety regime governing pesticides.
Professor Stone: It is one of the things that makes this area less scientific than it should be.
Chair: Professor Stone, I am having difficulty hearing you; it is because we have so many witnesses—
Professor Stone: All right. I will put my lecturing voice on.
It is one of the things that makes this area less scientific than it should be because the basic tenets of science are sharing information and being clear about what you mean and being willing to discuss your results in open and frank debate. If we don't have access to those data, we cannot comment on them in an informed way; neither can we know their quality.

Q109 Zac Goldsmith: It may be you are not the right panel to ask but just on this point, is there an answer to this in your view, a mechanism for allowing for much freer access to this scientific data without compromising the commercial sensitivities that undoubtedly would from time to time exist? So companies will do some research where they would legitimately be able to say, "Look, we want to hold on to this because we don't want our competitors to see it," but is this is a mechanism that you can imagine where the vast majority of information would be freely available and the excuse of commercial sensitivity would not be able to prevent the release of documents that would make your jobs easier, for example. Is there a formula that is bandied about in the scientific community that you would endorse?
Professor Goulson: There isn't, I don't think, but I am very confused as to why they insist this information is confidential. We are talking about safety tests, so you have a new chemical that you want to bring to the market; you have to have it tested on a range of organisms to see at what level it kills them, what concentrations kill them or whatever. There would be tests on honeybees and worms and a range of other things. It is not clear to me why that information should not be made freely available to everybody or what commercial advantage a competitor would gain by finding out how many honeybees product X would kill at a certain concentration.

Q110 Zac Goldsmith: I agree with you. That is the point of the question, but would it be possible to imagine a kind of freedom of information type approach where the default position would be to release information, except where it can be demonstrated that there is commercial sensitivity? Is there nothing like that out there?
Dr Cresswell: It seems to me that essentially that was the process that I went through; I just had to physically go there and not take any copies of the folders or pictures with my mobile phone. What was surprising to me was that some of the studies were quite good and were certainly publishable, so that gave me some confidence that the people who were doing the decision making process had some good data to look at, but it didn't answer my question about why it was not publicly available other than by personal travel, which seems bizarre and archaic.

Q111 Caroline Lucas: Just to finish off on that, I suppose, to the extent that it is more difficult to get public funding to do research, then obviously that leaves more of a gap for the pesticide companies and other private companies to come in and fund that research themselves. How much of a risk do you think that is, and are you prepared to say if anybody was funding you or whether you think that has an influence on the kind of work that gets done? I am not suggesting that the work is not rigorous but just in terms of the areas that will be covered and so forth.
Dr Cresswell: I think that depends on the individual scientist. I am funded at the moment by Syngenta. One of the negotiations that we had was my freedom to publish what I found. I insisted on having that in my contract and it is in there. It is a case-by-case basis. I think it is perfectly possible to operate in a fair and impartial manner under those kinds of conditions. I don't see a problem with it.
Dr Dicks: I would agree with that. I think that private companies will go into these kinds of negotiations when looking to fund research from the position that all of your findings will be private and owned by them, but it is perfectly possible to come to an agreement that says, "All of the findings will be publicly available and I can publish them and the data will be online." If they don't accept that position then it probably would be risky to—
Dr Cresswell: I would say that that was their norm and, in fact, the person I was negotiating with and I had to have a number of conversations with their law department because they just were not used to the idea of not having confidential information be part of the contract. So it was a bespoke arrangement.

Q112 Caroline Lucas: So it is just rare then?
Dr Cresswell: Yes.

Dr Dicks: It comes down to the individual scientist like James pushing for it, standing their ground saying, "I won't do it unless," and being desirable enough to the company for them to agree to that.

Q113 Dr Whitehead: The default position is normally that if you don't agree to that then you don't get the—
Dr Dicks: You don't get the money? Maybe.

Q114 Chair: Dr Cresswell, I thought you wanted to come in?
Dr Cresswell: I was only going to say that that is not an inevitable conclusion.
Dr Dicks: Agreed.
Professor Goulson: This might seem totally irrelevant, but just to give a slightly different perspective that I think is important in understanding how the public will perceive academics being funded by industry, this is from a paper discussing things that happened 60 years ago in a rather different industry, but if I could just read it very briefly, "Scientists were the perfect foil for the tobacco industry's public relations response to allegations that cigarette smoking was injurious to health. Scientists could be counted on to call for more research giving the impression that there was controversy, in addition by supporting scientific research the industry would be seen as doing something positive."
Then, just to skip on a bit, "The tobacco industry made frequent reference from 1964 onwards to the fact that qualified scientists challenged the evidence that smoking caused disease, yet many of these so-called independent scientists were recruited and had their research programmes supported by the tobacco industry."
My point is that the tobacco industry used this, among other tactics, to keep selling cigarettes for 50 years, while pretending or refusing to acknowledge that there was a link between health and smoking, which we all know of course that there was.
I am not saying that this is happening now. I have every faith in James's integrity and I don't want you to take this as a suggestion that I don't, but the public will see it in the same way as they now view what happened in the past.

Q115 Mr Spencer: Just to clarify, Dr Cresswell said that he went to look at that evidence and he felt as though that evidence would be supportive of the argument that those companies were putting forward and could not understand why they would not publish that information.
Dr Cresswell: In that particular instance, what struck me was that the experiment was quite well designed, quite well conducted. I would have analysed it differently and I plotted some different graphs, but having done that it seemed to be a perfectly publishable piece of work, and, yes, it would have supported their position that the pesticide was safe.

Q116 Mr Spencer: So given that that evidence supported their case, what other motivation, other than commercial sensitivity could there be for not releasing that information?
Dr Cresswell: Yes, that is a question for the industry.

Q117 Martin Caton: To follow up, Dr Cresswell, I completely accept what you said about your negotiations with Syngenta, but in those negotiations was there a focus on what your research was going to cover? Were they able to push you in a direction that would benefit them? Just in terms of research, I am not suggesting—
Dr Cresswell: I think the way to précis it, they said, "Okay, here are the things we want you to look at. We foresee that this may work out in our favour, but if it doesn't you have got freedom to publish anyway." That was essentially how it worked.
Martin Caton: Okay, thank you.
Dr Dicks: I just wanted to check, will we have a chance to talk about the field trials, or can I talk about those now? I don't know whether the studies that you saw were field trials—

Q118 Chair: Yes, we will come on to that. But just going back to the point that Mr Spencer made about commercial confidentiality and so on as a reason for not maybe publishing, is that an issue as far as the funding of research is concerned?
Dr Cresswell: I am sorry?
Chair: The suggestion that maybe some of the research is not being published because of the issue of commercial confidentiality.
Dr Cresswell: Do you mean that a scientist in any university has been commissioned and then their research has been suppressed by using the contractual confidentiality.
Chair: I am not sure I would use the word "suppressed" but it is just not generally being in the public realm.
Dr Cresswell: Yes. Essentially, unless we had had the negotiation about this contract if the research that I did fell under what they define as confidential information then they could so choose not to have me publish it, so that is a possibility. Whether anyone actually does that, I do not know.
Professor Stone: I would just like to take this very briefly back to one of the first questions about why is there not more research on other wild pollinators. If there is a limited budget to invest in research from the research council, it is going to be invested primarily in the recognised social bee pollinators first off. Then, if you have a contribution to research from industry, I would say it is very unlikely to target the wild bee biodiversity-associated pollinators. It is much more likely to target, again, the social bees—meaning the honeybees and the bumblebees, primarily the honeybees—and if we want to target things like hoverflies, the other 200 or so species of solitary bees and all the other things that pollinate flowers then there is no alternative, I would say, than to get, if you like, independent Government-sourced funding for that kind of thing, unless we can really get the companies to invest in that.

Q119 Mr Spencer: If we could just turn to field trials, I just wondered, fundamentally, is it possible to recreate a field-scale trial in a laboratory?
Professor Goulson: No.

Dr Dicks: No.

Q120 Mr Spencer: You all agree that is impossible to achieve?

Dr Cresswell: Looking at the way the regulatory process works is that the field trial is the gold standard and the laboratory trials and what is called the semi-field ones—which are half laboratory, half field—tend to be dismissed because they are not field trials. I think the problem is not one in principle; it is just that people don't tend to do their laboratory trials in a way that turns out to be realistic. Fundamentally, if we knew more about what went on in the field—principally what the doses are and what the exposures are—then we could take them into the lab and test them. For example, you don't dismiss a sports scientist who has worked on the legs of their athlete in the lab and then say, "Well, that tells you nothing about how they are going to do in the race." You would want to know whether the sports scientist had tested the athlete's legs under the race-like conditions. That is the critical thing.

In my view, the regulatory system could make use a lot more of laboratory trials, but we need a lot more fundamental information about what the environment is like in order to recreate it properly in the lab, and in this context I mean what the dosage is, what the residues and exposures are. That is the fundamental gap and that is the argument principally about when Defra say the lab trials were not very realistic. What they often mean is the doses can't be justified as being realistic.

Q121 Mr Spencer: Just talk us through that dose and concentration rate. Are we talking in the laboratory of twice as much as you would expect on a field scale or ten times or what sort of concentration are these tests being conducted on?

Dr Cresswell: This goes back to this issue about publicly available data. I noticed in the Syngenta submission that they began to talk about what the range was of the concentration of residues in pollen and nectar for thiamethoxam, but the laboratory trials so far have been constrained to dredging out the one or two reported values we can get at from the scientific literature, which may or not be particularly relevant.

One of the things that struck me when I first got into this field was the complete lack of data on the residue levels. When I measured what was in pollen and nectar oilseed rape in the UK a couple of years ago, that doubled the publicly available data set on relevant residues. That is the problem and it always seemed to me that one of the things that might happen was that we would do a bunch of laboratory work and then someone would come along and go, "Aha, but the residues are over here," and you have a mismatch. That tends to be the problem and that is, I think, why at the moment field trials trump the lab work, because they claim that in the field trials the residues are more environmentally relevant. That is inarguable. Whether they are representative of the broad range of what goes on in the UK, for example, that is arguable.

Q122 Mr Spencer: So that is clearly an evidence gap, in effect?

Dr Cresswell: Yes, yes, absolutely.

Q123 Mr Spencer: What is your insight into how the Defra research programme at the moment is filling those evidence gaps that clearly exist? Is the Defra research programme assisting?

Dr Dicks: It seems that that is the major evidence gap from my perspective. As James was saying, we just do not know what the real exposure level is in the field, and the real exposure in the field for insects depends on their behaviour; it depends on their foraging range; it depends on their flight period, all kinds of things. So it is quite difficult to get to that data. It would be reasonably easy to monitor wild bee-collected products, for example, or hoverfly diet content and test them for neonicotinoids. That would be a fairly straightforward set of research, but it is not what Defra are doing in their research.

Professor Goulson: I have here a research project approval form that I sent to Defra, requesting that they fund a project to look at how the exposure levels of real bumblebee nests put out in the landscape by looking at the concentrations of pesticides in the nectar and pollen that they bring back, which is one of the major knowledge gaps. They seem to be about to fund it, so I got an e-mail two days ago saying that they were intending to "progress" it, which I think means that they are going to fund it, though I am not quite sure. If anyone from Defra is here they could perhaps let me know. But they may be then in that case taking a step to fill one of these knowledge gaps. More generally, it is hard to know what Defra are doing at any one time until it is published, so what else they are doing right now is hidden from academics largely.

Professor Stone: Yes, one thing to follow on from that, there is a very substantial document concerning Europe-level policy on risk assessments for pollinators that covers all bees. There is quite a big gap between the many questions that that raises about what we don't know and the relatively narrow list of programmes that Defra are currently targeting. I know nothing about their budget constraints. That is not a criticism, just an observation. Also, given the enormous value of pollination services the total value of those projects—when you look at the investment—just to me seems remarkably low.

Professor Goulson: I have been a little confused by EFSA's position because they are currently maintaining that neonicotinoids as currently used are safe, but at the same time they have launched this consultation into developing improved methods of testing new products that come to market to ensure that they are safe, particularly targeted at products that are systemic and that are used as seed dressings, which seems to me almost an admission that a mistake was made when neonicotinoids were introduced. They are saying they are safe, but at the same time they are putting a lot of effort into preventing it happening again. That does not quite add up to me.

Dr Dicks: Can I say something very quickly about the Defra study that is funded already, which is to look at the exposure of bumblebees in a field environment? I

can't see the actual methods of that at all, but it is described as an "edge of field" study and it seems very likely to me to have one-hectare treatment plots with bumblebee colonies on the side of those treatment plots. One hectare is 100 metres by 100 metres, and I said in my written evidence we have some experimental research showing that bumblebees actually prefer to forage further than 100 metres away from their colony, so they are not likely to feed on that rape that is treated that they are on the edge of; they are much more likely to fly over it. The foraging range of the species they are likely to use, which is Bombus terrestris, the buff tailed bumblebee, is probably between one and a half and three kilometres by evidence from recent studies. So they are not going to be feeding on the treated rape in the study, I would say.

Professor Goulson: Sorry, to return slightly to the relevance of the value of field versus lab studies in relation to what you were just saying, the gold standard of doing a field trial usually involves putting a hive immediately next to a planted stand of treated crop. The recent studies strongly suggest that the impact of neonicotinoids, which in reducing the navigational or impairing the navigational abilities of bees is only detected if the bees have to navigate over sizeable distances—the sorts of distances that they naturally navigate over. So if they have to return from a kilometre from their nest, they are more likely to get lost if they are exposed to neonicotinoids. If their nest is placed immediately next to the treated crop, so they are flying 10, 20 or 30 metres, they are not going to get lost on the way home, even an intoxicated bee can stagger back from 20 yards away, so even the gold standard is failing to detect what could be a significant impact of these pesticides on bees.

Dr Cresswell: I am not sure how much the Committee wants to hear about how the EFSA guidance document has tried to address some of these concerns, but certainly that last one that you were talking about, the idea is to do a separate test on navigation ability. Being a member of that particular group, indeed we have done what we can to try and use our ecological nouse to cover the bases.

Q124 Mr Spencer: Just to clarify, just so it is clear in my own mind, you are saying that no one has done the research to identify how much of this chemical is in the nectar and pollen. So all of the academic research that has been conducted—

Dr Dicks: There are levels in nectar and pollen, but what we don't have, for anything other than honeybees, is the level in the bee-collected nectar in the colony or the nest for that which is being fed to the young, which is different from just measuring nectar in flowers because most bees don't just forage on one type of flower; they forage on a range of things.

Dr Cresswell: For example, if you want to do a good risk assessment for the UK, you would want to see a distribution of what is in the pollen and nectar from maybe 20 different sites of oilseed rape across the country.

The problem is that we can make a pretty good guess about what the maximum range of residues is. The difficulty is that a small change in concentration across that range makes quite a big difference because what we call the dose response curve is quite steep. So if you move along the concentration gradient a little bit, you move up or down the performance gradient quite a bit, at least certainly in some of the things that I have measured. So it does make quite a lot of difference having that level of precise knowledge. Making a reasonable guesstimate does not necessarily give you what turns out to be the precise, right answer.

Professor Stone: Is there anything in the EFSA document or in planning about hoverflies?

Dr Cresswell: No.

Professor Goulson: Just an additional point, the focus here has been on the levels in oilseed rape as the route of exposure to bees. Of course bees may also be exposed through other routes, and there is concern that neonicotinoid seed dressings may drift as dust or through soil water enter plants other than simply the crops. So there may be other routes of exposure of bees to neonicotinoids and that has not really been investigated at all, so it is very hard to guesstimate what it might be.

Just one small additional point, they are also used a lot in urban areas. They are sold in garden centres for spraying on to roses and vegetables, for example, and nobody's looked to see what kind of levels are found on average in urban gardens and again could add to bee exposure.

Q125 Mr Spencer: To Professor Goulson specifically, the Defra criticism of the Whitehorn study, to which you have contributed, stated, "It may be significant that the control bees consume nectar and pollen, whereas the treatment bees were given a different diet of treated pollen and sugar water". I just wonder if you felt that was a fair criticism.

Professor Goulson: All of the bees were fed only on sugar water. In the online version of our manuscript that was published first, in one place we used the word "nectar" instead of sugar water. They are often used interchangeably. It should have said "sugar water" throughout. In the formal, printed version of the manuscript it says "sugar water" throughout. The important point is that all of the bees in all treatments were fed on exactly the same apart from some had the pesticide added. It is a nice example this of the nit-picking that has been done on the scientific research that is publicly available. It is a nonsense that criticism. In that respect the study was fine.

Q126 Mr Spencer: Can you again just give us an idea of the concentration level comparison between that test and the field test?

Professor Goulson: The concentrations we used were taken from a published scientific study—one of the few that is in the public domain—that had measured levels of imidacloprid in oilseed rape nectar and pollen, and we precisely copied the published levels and fed that to the bees. So the concentrations were perfectly realistic from what we know of what is found in oilseed rape.

There is a valid criticism of our study, which is that the bees did not have any choice but to feed on the

treated food. So we exposed them for two weeks in their nests to treated pollen and nectar or untreated pollen and nectar—sorry, sugar water, I should say, not nectar—and during that period they did not have the option to feed on something else, whereas obviously in the real world if a nest is close to an oilseed rape field the bees could choose, some of them or all of them, not to feed on the rape. My guess is that that is not the case because they seem to love it. To try and balance that off, and sorry for going into a bit of detail here, we exposed them for two weeks. In actual fact, a nest near a rape field would be exposed for four or five weeks because that is how long it flowers for. So on the one hand we may have exaggerated the effect by not allowing the bees the choice of feeding on something else, but on the other hand, we only exposed them for two weeks as opposed to four or five. How those two things balance up is anyone's guess, but it was the best experiment we could come up with in a world where there are not control sites. The reason we didn't do it outside is because there was nowhere where we could put nests where they would not be exposed to neonicotinoids if they were free flying.

Q127 Mark Lazarowicz: On the point you mentioned in the past about urban gardens, is that something that could be of any particular importance, or is it fairly marginal in the overall scheme of things? Given what you were saying about the amount of sprays or whatever used by domestic gardeners, some people could be putting in vast amounts. Is that likely to be of any major importance, or is it really not something—

Professor Goulson: It is hard to say because it is very difficult to get hold of the data as to how much is used. Defra provides pesticide usage data for farmland, but how much Dobbies or whoever sell to gardeners is unknown. It is a concern that farmers are trained in using pesticides, whereas of course gardeners might well think, "Oh, well, I'll bung on an extra whatever to make sure it works." I can find no data.

Professor Stone: There is one of the projects in the insect pollinators initiative that Lynn referred to that is targeting the question about how much pollinator richness and diversity there really is in cities, and it is worth saying that there is a lot. So the potential exists for cities to become net exporters of pollinators. They can't do that if they are being killed in gardens, but there is enormous goodwill towards pollinators and I think a lot of the killing of them is entirely down to ignorance. So if people are made aware and pollinator populations are allowed to grow then there is every reason to think that urban areas need not be deserts if pollinators can be net exporters—very helpful.

Professor Goulson: If I could just add that there is no economic argument to justify the use of these pesticides in urban areas at all. If there are a few aphids on someone's roses, it really doesn't matter. Toronto has banned all pesticides for garden use and people still have lovely gardens full of flowers. I personally think that it is ridiculous that we sell these things to untrained gardeners to chuck on their gardens willy-nilly. There is no need for it.

Dr Dicks: It is important to say as well—one last point on the urban pollinators—the important habitats in an urban area are gardens and allotments for species diversity and abundance of pollinators that are—

Professor Stone: And cemeteries.

Q128 Neil Carmichael: I just want to note, because you are following an interesting line of discussion here, that in Stroud—my constituency—we have a sort of wild bee support scheme, if you like and that is in the Stroud town. There are definitions about what is urban and what is not. But I want to ask what kind of structures and framework would you say is best for such a scheme to really produce some interesting results, because obviously you have the question of who does what and boundaries and so on?

Dr Dicks: I am not quite sure what you mean by the question.

Professor Goulson: Are you thinking of pictorial meadows and—

Neil Carmichael: I am thinking of gardeners and house-owners and things being encouraged to give homes effectively to wild bees and appropriate access to what wild bees need.

Dr Dicks: There is quite a long list of different things that you can do, some of which we know work very well to help bees, which gardeners can do. Avoiding all pesticide use is one thing.

Neil Carmichael: That is an obvious one, isn't it?

Dr Dicks: Planting the right flowers at the right time, providing a full season of forage.

Q129 Neil Carmichael: I was struck when I went to see a friend from New York and he has been making honey for years. He was describing the different challenges that he has in Westport in New York as compared to Oxfordshire here. I was quite interested in that, and I was just wondering if there were any sort of trends that are worth identifying and discussing in this Committee?

Chair: Whether that is for the "Gardeners' Question Time" panel I don't know.

Professor Stone: One thing I could say is that increasing numbers of city councils are leading by example now and planting what are called urban meadows or pictorial meadows and replacing very low diversity green strips that are good for playing football on, but you can have too many of them, and planting them with mixes of flowers that are good for pollinators.

There is a fair amount of Government-funded research now on making those mixes not just pretty but also good. So you can have a bunch of flowers that look nice but are no good for bees, and you can alter those mixes to make them look good and also be good for bees and potentially as seed sources for birds and other things. There is a certain amount of leading by example that is happening and growing, which is great.

Dr Dicks: Also a huge scope for doing it, because you are right, a lot of urban planning and landscaping doesn't provide forage at all. The Insect Pollinators Initiative research is going to make the design of mixes like that quite a lot more sophisticated than it currently is, because we're going to understand what

the different amino acid requirements of bees are across the year and also what quantity of nectar and amino acid is produced by, I think, 200 of the most common plant species and some garden species. So we are going to have a really good idea of what resources different plans provide and be able to present a set of forage that will support a bee community in an urban environment. There is a huge amount of scope to do it better.

Professor Stone: And it makes people happy.

Chair: I do think we have quite a few very specific questions still and I think this is an interesting aspect, especially what councils like Stroud and Birmingham particularly have done, but I think we must move on if I may to Peter Aldous.

Q130 Peter Aldous: A recent study has found that the combined effect of different pesticides could be more harmful to bees than exposure to single chemicals. Do you think such combined effects should thus be included in a risk assessment framework?

Professor Goulson: In an ideal world, yes, but of course it becomes very complicated very quickly because there are lots of chemicals that bees would be exposed to—fungicides as well as insecticides and herbicides and so on. If you were to demand that every new product had to be tested and all possible interactions had to be tested, in an ideal world that would be wonderful, but I think the costs would quickly become extraordinary.

Dr Dicks: There are some key combinations presumably on the basis of their different modes of action, which you could test.

Dr Cresswell: The study that you are referring to, what was striking about it was there was not a synergy, that each pesticide had its own effect and then when you put them together they were additive, and they were not instead multiplicative or something like that. I think it would be possible and perhaps already happens in risk assessments that by looking at the class of chemical, there are certain fungicides that knock out the enzymes that would otherwise detoxify a pesticide, and you can see that coming. So there are two options: either you use your fundamental knowledge to predict what might happen, or you prescribe, in a regulatory framework, if those two things are going to be used together then we have to test those. I think there are ways forward but you have to be smart in what you test.

Professor Goulson: Just one further brief comment: there is evidence that exposure to neonicotinoids potentially reduces resistance to disease in bees. That would be something that perhaps could be or should be investigated, because that is something that you wouldn't detect if you simply test a pesticide in a lab where there are no diseases, but as soon as you use them in the real world where bees are exposed to multiple stresses then it could become important.

Q131 Peter Aldous: Professor Stone, do you have anything to add?

Professor Stone: No.

Q132 Simon Wright: I wonder if you could comment on the evidence from Italy, which led to the suspension of three neonicotinoids. The evidence suggested that fine dust generated by the drilling of neonicotinoid treated seeds is lethal to the bees and, indeed, that the concentrations of neonicotinoids were very high—about 20% among the tested content. What weight should we be giving that research?

Dr Cresswell: The German BVL, which is the bee health unit, has done quite a lot of work on this and essentially it depends on what equipment you use. There are two things that are important in generating dust, one of which is how well the pesticide has stuck to the seeds and the other one of which is what happens to the exhaust from the seed sowing machine. Essentially, it is like a big vacuum cleaner because it blows the seeds in, but there is a stream of air that then comes potentially out of the back of the machine. If you have some dust and, like the paper I think you are referring to, the Monterano paper, if you have 150 litres a second or a minute of air with this dust going out either vertically or up into the air then you are going to spread that dust and kill bees.

What the Germans have found, and there are a couple of papers published this year and last year, showing that essentially there is a technical fix and it depends on what you do with the exhaust air. If you divert the exhaust air by fitting a deflector to the machine then essentially you virtually abolish the emission of dust. What the Germans have done is to legislate and publish a list of acceptable machinery.

When we discussed this at the EU level, the problem is whether or not certain member states have the machinery and whether they will force their farmers to use that because of financial and economic reason and whether that is feasible.

Q133 Simon Wright: Can you just comment on then, because I understand that there were further trials done in Italy that said that new equipment did not make much of a difference?

Professor Goulson: I have most of it here—the new ones that have come out of Italy that seem to suggest that the deflectors are not 100% effective, that you still get detectable amounts of dust in the air but it is reduced.

Dr Cresswell: The Germans claim that their list of approved machinery has to reduce emission of dust by over 90%, so that means you have a 10% maximum. Looking at their graphs, it seems to go a bit lower than that, but essentially that is the level of prevention.

Professor Stone: Is there not just an issue that if you do not get so much airborne dust it is being deflected somewhere, so it is going down to the soil surface? One of the big discussions is that if you do not get a broadcasting of dust, which is bad for some things, for lots of things that live on the soil surface and for many wild bees that nest in the top few inches of the soil or down among the vegetation right on the soil surface, they will be getting increased exposure—ground beetles, other things like that.

Professor Goulson: A general point here, which is that we do not know where most of these compounds go, so there is a study published by Bayer scientists, which I also have here, which quantifies the amount of neonicotinoids in the crop, and they estimate that it is usually between two and a maximum of 20% of the

amount that was applied to the seeds that ends up in the crop, which means that there is somewhere between 80% and 98% that is unaccounted for. Now the estimates are that maybe 1% or 2% of that is lost in dust, but that still leaves the vast bulk, which ends up somewhere, presumably mostly in the soil but not in the crop, and the evidence I can find suggests that it lasts quite a long time, potentially years, in the soil, potentially leading to a situation where it could accumulate year after year. As far as I know, there is no real evidence one way or another as to whether that is happening, but it is of potential concern because if it is happening, for one there is an obvious impact on soil invertebrates, which are vitally important for maintaining soil structure, but also the neonicotinoids could be being drawn up by field margin plants or hedgerow plants and making them toxic. So the story could go beyond bees. It could be that these compounds are affecting any herbivorous insect—say, butterfly larvae—living in field margins, which would be extremely concerning. But I can find no evidence one way or another to evaluate that hypothesis. The central point is we do not know where most of these compounds end up.

Chair: I think Mr Spencer wants to come in on that point and then I am going to move to the precautionary principle. Martin, you want to come in as well.

Q134 Mr Spencer: Just as to whether you thought that, given when that seed is being drilled, clearly flying pollinators would not be as likely to be present because the soil would be bare, and how does that compare to a foliar application of the chemical when the plant is in flower? Which one is likely to have the biggest impact on those pollinators?

Professor Goulson: These particular compounds that are used as seed dressings are never used as foliar applications as far as I understand it, so nobody would be able to tell you what the relative risks would be. I would guess if you sprayed them around in the middle of summer on to the foliage that would probably be much worse than putting them on the seed, but I am guessing.

Dr Dicks: You are not allowed to do that. You do not spray during flowering because you would damage bees.

Q135 Mr Spencer: Are you suggesting that garden centres were selling chemicals that they were spraying?

Professor Goulson: For garden use, yes, absolutely.

Dr Dicks: It probably says on the bottle, "Harmful to bees".

Professor Goulson: But it does recommend that you spray them on flowers and vegetables that flower, and it does not say you cannot use them in the summer or when bees are around.

Q136 Martin Caton: Just very quickly, Professor Goulson, on the point you just made about the Bayer research that you came across that suggests that perhaps up to 98% of neonicotinoids are not taken up by the plant, they are likely to end up in soil water, as you said, and yet, as you have just said, there does not seem to be any research going on into finding out what is happening to that and the knock-on consequences to other pollinators. That is surely a crying gap.

Professor Goulson: Yes, I think is the answer.

Chair: I am just going to bring in Zac Goldsmith, who I think has to leave. Am I correct?

Q137 Zac Goldsmith: I have to leave shortly, I am afraid. My apologies. I am going to jump the gun slightly.

Chair: You wanted to ask a question on the precautionary principle.

Zac Goldsmith: Yes, and a couple of other questions coming on the specifics of issues relating to neonicotinoids. I just wanted to ask you, based on the available evidence, the evidence that you have seen, do you believe that there is enough of it, enough concerns around neonicotinoids to justify the precautionary principle now? In other words, if you were Defra and you were employing the precautionary principle, would you at least put a moratorium on the use of neonicotinoids now, pending further research, or is there not enough evidence to justify that?

Professor Goulson: Personally, yes.

Q138 Zac Goldsmith: Yes, you would adopt the precautionary principle?

Professor Goulson: Put it another way, I think if these products came to market new, knowing what we know about them now, that they would not have been licensed, in my view.

Dr Dicks: I would say yes as well. I think the precautionary principle states that where there is uncertainty in the science the burden of proof should be on the people taking the action to show that it is harmless, and we do not have convincing evidence that these are not harming bees in a quite unacceptable way.

Professor Stone: There are an awful lot of questions we do not know the answers to, a lot of which there is submitted written evidence, and are recognised in the EFSA proposal for future risk assessments on bees at least. The question from hammering the environment is, if we were not going to use neonicotinoids, would we replace them with something that was worse because we would not be willing to not replace them at all.

Q139 Zac Goldsmith: That was my follow-up question to you. What do you say to that argument? That is an argument that was put forward today.

Professor Stone: The obvious answer is if the cost of any course of action is to significantly destroy an essential ecosystem service then that falls into the category of no-brainer. You would not destroy your pollinator service, if that is what is going to happen. If that comes at the risk of slightly lower production, which is the trade-off that is quite correctly identified, then that is a decision for society to take.

Q140 Zac Goldsmith: The point that has been made is that if you were to get—

Chair: Sorry, Zac, just before, can I just give Dr Cresswell the opportunity to answer as well please?

Dr Cresswell: I think it is interesting to explore what the precaution is against, and there is a distinction between precaution against harm and precaution against population decline. I think it is unquestionable that harm to bees happens. The question is whether or not these precipitate population declines, and then I think the answer to that is "deep uncertainty". The precautionary principle is complicated because if you just go for do no harm then of course you couldn't use anything. But if the question is do no more harm than you can justify economically, all the other sources of wellbeing that we get, once you get into the complexities of cost and benefit is much more difficult, so I restrict myself to the scientific question: is there good evidence that these things cause a population decline? On that one, I say "not yet".

Q141 Zac Goldsmith: Just on that point, we took evidence this morning from a number of people, but I think it was a representative from Pesticide Action, it may have been Buglife, who told us that having scanned all the available scientific evidence—it was not a scientific statement—94%, I think was the figure, would come down one way or another against, or would conclude broadly speaking that neonicotinoids are causing real problems in relation to pollinators, which is a very high figure, and that is not a scientific figure. But you seem to be saying there is an absence of evidence and therefore one would adopt the precautionary principle, but isn't it more than that? Is there not quite a lot of evidence that suggests that neonicotinoids are potentially major contributors to this problem—or am I putting words into your mouth?
Professor Goulson: If I could just make one point: James says that there is no evidence for a population level impact. In fact, we have no data on population change with respect to any pesticide that have ever been used in the past. We do not have any population data for bees. So to say there is no evidence for population level decline is not terribly helpful, because we have no data on that.

Q142 Zac Goldsmith: Is it because we have not been looking for that data?
Professor Goulson: No data has been collected, so of course we will not have any evidence for a population level decline. If you do not look, you will not find it.
Dr Dicks: I would object to Defra's position, which seems to be it would not take any action unless there was unequivocal evidence of harm. I was trying to think through what unequivocal evidence in this case would look like to me, and I think it would be to show that the use of neonicotinoids was causing population decline in one or more species of wild pollinators. You would need 10 kilometre squared areas of landscape as treatment with and without neonicotinoids. You would need a paired design, so you had pairs of patches that size across the country replicated maybe 10 times. You would need to monitor the wild insects for probably at least five years. Many studies like this look over three years, and that simply is not enough time to measure any population change because the variability between years is too great. So five years, 10 pairs of sites, and the idea of trying to get a 10 kilometre squared area with no neonicotinoids used at all but the same crops and the same landscape structure as another control area that has the normal neonicotinoid use is possible, but you can start to see how very expensive that would be as a study. I think as a comparative figure you could think about the farm scale evaluations that were done for genetically modified crops, which was 60 sites over three years, 10 hectare plots, so much smaller, and they cost about £6 million. So it is not an unfeasible amount of money, but it is a large study you would have to do. If that study was done and there was shown to be no difference in population trends or changes over five years, or preferably 10 years, between the control plots and the neonicotinoid plots then that would be unequivocal evidence either way. We are a very long way from that, and I do not think it is very likely to happen.

Q143 Zac Goldsmith: You began your comment by criticising Defra's approach. Is that that they are demanding a level of scientific certainty that is impossible to firstly get?
Dr Dicks: It would cost £20 million.

Q144 Zac Goldsmith: Unless they were willing to cough up millions of pounds in 10 years and presumably put a moratorium in place in the meantime, given that we do not know, you are effectively saying that they have created an impossible task. It makes it impossible for the regulators to rule against neonicotinoids in the absence of the kind of scientific rigour that only they can make available.
Dr Dicks: Yes, that would be my view of what would be unequivocal, and I do not think it is very achievable and it would take way too long. I am not sure I would stand up and say I think neonicotinoids must be banned now, because there is just so much uncertainty around what the actual effect is. There is clearly some pretty hefty effects on bumblebee colony queen production, and we should be very wary of the effects of these things. What I would like to see is a plan to reduce their use over time. They have a very good plan in place in France to reduce the use of pesticides up to 2018 by 50%. We have nothing in this country that is looking at general reduction in any kind of pesticide use.
Professor Goulson: In fact, we are increasing use. Neonicotinoid use has increased every year for the last 20 years and continues.
Dr Dicks: So has the total treated area of all pesticides. It has increased year on year.

Q145 Zac Goldsmith: Last question: practically speaking, given that we are where we are now, the use is rising and is already substantial and there are many question marks over the effect of this stuff on the pollinators, from a policy point of view if you were advising Defra now, realistically speaking what should Defra be doing?
Dr Dicks: I do not think I can answer that.
Zac Goldsmith: You already have.
Professor Goulson: They should be swiftly evaluating what the alternatives are and how effective they are. My best guess as a non-expert would be to switch back to pyrethroid insecticides, which have been used

for a long time and which are relatively benign, still kill bees but they do not hang around long in the environment. But that would seem to me to be a priority. We do not know what would happen if we stopped using neonicotinoids as far as I can tell.

Professor Stone: I would just add to that, that there are two ways we can look at this. One is to ask whether the experiments that have already been done meet the criterion of these pesticides being dangerous or not as a cause of a particular decline or not, which is what James has been looking at a lot. Or we can ask whether the right questions have even been asked, because if we do not have the outcomes of those kinds of experiments to inform us we cannot ask whether they support the question one way or the other.

Q146 Zac Goldsmith: This goes back to the transparency issue.

Professor Stone: I think we have come up with a list of important questions that we do not know the answer to and we need the answers to those questions. It is not just a case of producing more science for the sake of it. We absolutely need the answers to those questions.

Chair: I think Dr Cresswell was going to answer that same question.

Dr Cresswell: I do not think it is the case of the failure to demonstrate a decline invalidating the question. For example, if I said to you that an environmentally realistic dose of some chemical was going to cut your sperm count and all the other males in the room by 99%, we would not need to do a field trial to know that our population was going to be in danger. I think that strong laboratory knowledge can inform things that are very difficult to measure in the environment. What I am saying is, we do not have even the laboratory trump card yet. If we had that I would not worry about the fact we do not have long-term monitoring and I do not think it is impossible to get that kind of thing, but we need more fundamental understanding, and we need some environmentally realistic doses, which harks back to what I said earlier.

Q147 Zac Goldsmith: Chair, do you mind, I am going to jump in with one more very quick question? I take your point there, but the likelihood is that that kind of research, that quality of research does already exist and we just have not seen it. You have not seen it because it is all locked up and confidential. Would it not be—

Dr Cresswell: It is what I do in my lab.

Q148 Zac Goldsmith: But would it not be a sensible approach then for Defra, rather than taking the draconian measure of putting a five-year moratorium on this stuff while they conduct the tests, to demand sight of the studies that do exist, so that at least we can potentially buy ourselves a shortcut there?

Dr Cresswell: I think that to some extent your first point was probably right, which is that the overwhelming drive to produce field evidence has meant that there is a dearth of fundamental laboratory based understanding of what the mechanisms of toxicity are. We do not even know which enzyme system detoxifies imidacloprid. We only know it for a couple of these things. We just do not have a fundamental understanding of how these bees work on the inside, and I think we could learn an awful lot from that and that is one area that is not worked on hard enough to try to even figure out what size of environmental effect to expect in our field trials, but the time scale for achieving that is relatively short.

Professor Goulson: This may seem slightly tangential, but I think it may be an important point I would like to make. I had a meeting earlier this year with a company called Agrii, who are agrochemical middle men, and they employ 300 agronomists who spend all their time going round farms, advising farmers on what pesticides to use and which seeds to plant and so on. They openly admitted that 90% of their profit comes from the mark-up on the agrochemicals that they then sell to the farmers having recommended them. They say that they have 40% of the UK market, that 40% of farmers are advised by that one company alone. I was rather shocked therefore to realise that the UK farmers are primarily receiving their advice from people who have a huge financial motivation to encourage them to use more pesticides than are strictly necessary. It raises a broad question as to whether we are not overusing pesticides across the country, not just neonicotinoids, because of the system we have in place to advise farmers about their use.

Q149 Mark Lazarowicz: There are five neonicotinoid insecticides that are currently for professional use in the UK. Do individual products have different impacts on pollinators, or are there generic effects?

Dr Cresswell: So these five chemicals fall into two groups based on their chemical structure. You have thiamethoxam, imidacloprid and clothianidin in one group. You have acetamiprid and thiacloprid in the other group. That second group are probably one to two orders of magnitude less toxic than the other three, so immediately you cannot put all neonicotinoids under one label on how they will behave. In our lab, even among the three—imidacloprid, thiamethoxam, clothianidin—we are finding small but biologically interesting qualitative differences in how bees respond to those different chemicals. So some generalisation is possible, but in the details not so.

Q150 Mark Lazarowicz: Related to that, given there are concerns about neonicotinoids, is there any possibility of fine-tuning them in some way so as to make them less harmful to pollinators?

Dr Cresswell: Yes, certainly insects differ in their sensitivity. Different types of insects are all different in their sensitivity to neonicotinoids. We also see the emergence of resistance from quite small genetic changes in insect species. Essentially, the way you have to think about these neurotoxins is like a lock and key where the nerve is the lock and the insecticide is the key. It is a question of goodness of fit. So it is theoretically possible to be able to design a key that will only fit certain locks and not others, but I think that is a question for chemists and structural chemists and neurophysiologists. I know that it is talked about

in the literature, but very much a Holy Grail kind of thing, and I suspect that the pipeline for delivering such a thing, even if it were available to test, would be 10 years—so an entirely worthy thing to pursue, but I do not think it is on the horizon.

Professor Goulson: I would be slightly less optimistic simply because these compounds are used to protect crops against a broad range, a taxonomic range of different insects, beetles, flies, lepidopterans and so on. So to engineer them in a way that meant they would still kill a broad range of insects, all the ones you wanted them to kill but would not kill the ones you did not want them to kill, for me stretches the bounds of possibility. I am not saying it is impossible, but it strikes me as unlikely.

Dr Dicks: There is one other possibility that I thought of, which I do not know the answer to, but is anyone working, I wondered, on whether it is possible to stop the plants from translocating the stuff into nectar and pollen? We could ask some industry research scientists that because it might be possible, I do not know.

Dr Cresswell: There certainly are order of magnitude differences in sensitivity across quite surprisingly close insect groups, so I disagree with what you just said fundamentally.

Professor Goulson: I will put it another way: no one has ever yet produced an insecticide that does not kill bees.

Q151 Martin Caton: On mitigation, has there been any research to identify which of any possible mitigation strategies to bolster pollinator numbers are likely to prove useful?

Dr Dicks: Yes, loads, if I can answer that.

Q152 Martin Caton: Can you quickly indicate?

Dr Dicks: There are lots of studies on a whole range of different interventions to help pollinators. There is a quite recent meta-analysis. There is a narrative description of evidence that I have written myself for bees specifically. What emerges is that there are few strategies that are particularly effective at providing resources for pollinators or having pollinators on them. Those things are sown wild flower strips or naturally regenerated field margins that have wild flowers on them and also providing nest boxes for solitary bees is very effective at increasing population numbers.

So for most of the other interventions like wildflower strips, the evidence we have is largely, not entirely, just showing that when you plant wildflowers insects visit them in larger numbers than they visit just the grass strip or a patch of crop. We do not know with any certainty whether this is providing forage that allows an increase in population numbers year on year. There are some studies emerging that do look at it, which Graham seems to have, so looking at reproductive success of solitary bees and showing that there is a benefit, but we do not have very good evidence to say for sure. The question that is not answered that needs to be answered is, are these pollinator communities and populations limited by foraging resources, so planting flowers can help boost their numbers, or limited by nesting sites? We know that providing nesting sites for some species of solitary bee does boost their numbers year on year.

Professor Stone: There is some evidence, which these guys may know more about than I do, which is if you grow flowering margins around fields and build up hoverfly populations, which are pollinators as well, then their larvae eat more of the aphids that are damaging the crop and so you could, in theory, reduce the amount of pesticide that you would need to apply. So that is the kind of feedback you want to engineer. The question is whether that would take things into economically sustainable levels.

Dr Cresswell: In principle, this has to be a mitigatable problem because the relationship between concentration of dose and performance has a slope to it, so if you lower the dose, you are going to improve the performance towards a zero dose. Therefore, if you put in other kinds of flowers into the environment that the bees are going to use and dilute the pollen and nectar they are going to get off the crop then this is going to produce an improvement. Work at the Tremough Campus at Exeter is beginning to understand the way the bees move at the landscape scale, and so you should be able to predict if we put in these many square metres, hectares, of alternative flowers then the bees are going to principally go there, or at least half of them are, and that is going to drop the level of residues in the colony by X% and that is going to give you this much of a mitigation effect. We ought to be able to design landscapes to meet a specified level of protection.

Q153 Martin Caton: Dr Cresswell, I remember reading your written submission and you recognise that there is possibly a problem with bumblebees, although you do not think there is with honeybees, and you think the answer to that is, I think we call it, smart mitigation. That raises even more after the conversation we have had about other pollinators. That might deal with bumblebees, but if we have a problem with hoverflies and other sorts of pollinators, as has been indicated, with very different lifestyles and different habitats then is mitigation going to be realistic?

Dr Cresswell: I think that flowers are good for all pollinators. A drop in dose is going to help everybody, and the habitat that you put aside to grow those flowers in is going to provide the kind of habitats that other pollinator groups might well use for nesting sites. To me it seems like this is a discussion that has not been had yet and more research ought to look at the possibility of mitigation.

Dr Dicks: I agree with the strategy, but it is on the assumption that the neonicotinoids are not ending up in the flower margins, which I do not believe we know at this point.

Dr Cresswell: That is going to be an inverse square law, so you think about a drop of ink in a bathtub, it is going to spread out in all directions. It is going to be most concentrated in the field and it is going to drop off rapidly. You do not have to put your mitigating flowers next to your field. I am talking about the possibility of doing this at a landscape scale.

Professor Stone: I think there obviously has to be a way to go forward and there is a lot of basic biology

on other pollinator groups that we need, so suggestions like spraying your crops at night rather than during the day when all the bees are back at their nests and bed would work for some things, but they would not work for other kinds of pollinators that do not have a nest to go home to and hang around in the crop because they could get got at during the night. Different groups of bees have quite different daily activity patterns to honeybees and even bumblebees, so there is a lot of basic research on which pollinators are active at which times in the crops and in the areas immediately around the crops on the landscape scale that we need to have the answers to. Some of those are happening now, but they are a drop in the ocean in terms of the diversity of pollinators.

Another reason that there is so much focus on honeybees and then bumblebees is because we know enough about their basic biology to design experiments around what they generally do, but for a lot of the solitary bees, which are very different, they are way more diverse in their biology than the social bees are, and the different kinds of hoverflies and other pollinators are just difficult. They are biologically diverse, and in order to develop some remedial strategy we need to know a lot more about what they are doing in and around crops.

Chair: I think on that note we have exhausted our questions for this afternoon. It has been quite a technical subject area for us, so I thank all four of you for coming along and making your time so freely available to us this afternoon. Thank you very much.

Wednesday 28 November 2012

Members present:

Joan Walley (Chair)

Peter Aldous	Caroline Lucas
Neil Carmichael	Caroline Nokes
Martin Caton	Mr Mark Spencer
Katy Clark	Dr Alan Whitehead
Zac Goldsmith	Simon Wright

Examination of Witnesses

Witnesses: **Dr Mike Bushell,** Principal Scientific Adviser, Syngenta, **Dr Fraser Lewis**, Division Head, Environmental Safety, Syngenta, and **Dr Julian Little**, Government Affairs, Bayer CropScience, gave evidence.

Q154 Chair: I would like to welcome each of you to our session this afternoon, an inquiry that is important to this Select Committee and one that I think is of great interest to many people. For your information, we are expecting votes at 4 pm and we have three separate sessions, so we have a number of detailed questions that we wish to ask of you, if we may.
I would like to start off with a question particularly for Dr Lewis and Dr Bushell. I am referring to today's *Farmers Weekly* and the quote, "Based on previous statements, we believe this committee"—the Environmental Audit Committee—"is in danger of pinpointing the bee colony decline on a single pesticide when there are other important factors at play." On what evidence did you feel compelled to make that statement?
Dr Bushell: That statement was made by one of our Basel corporate affairs people.

Q155 Chair: Do you have the evidence for it?
Dr Bushell: That we made the statement or that you are focusing only on insecticides?
Chair: I wondered what evidence you have to cause Syngenta to make that statement.
Dr Bushell: The issue about bee health is multifactorial, as I am sure you know, and focusing only on a single one is unlikely to get a good result for bee health.
Chair: Thank you very much indeed. We must move on to detailed questions.

Q156 Martin Caton: Do you accept the findings of the recent Gill, Henry and Whitehorn studies on the sub-lethal effects on bees of neonicotinoids?
Dr Bushell: Firstly, all of those studies, in common with a number of other studies in the literature implicating pesticides as a particular problem in bee decline, are purporting to be field-realistic when in reality they are laboratory studies, usually using doses that are very unrealistic so that you are actually getting toxic effects on insects from insecticides. With the Henry study particularly, I heard him speak in Cambridge in September and he admitted himself that the rates he used were unrealistically high. Julian, perhaps you would like to address the Gill and Whitehorn data.
Dr Little: I think the Whitehorn study is interesting. When you first looked at the headline that came out of there it suggested that this was a field study. In reality it wasn't, it was a laboratory study in which essentially insects were force-fed high levels of neonicotinoids and then given some chance to be outside. It is very different from how a bumble bee would normally be and therefore it is very difficult to see how you come to a conclusion that as a result of this study there is clearly a problem. With all of these three studies the research in itself is not in question; the conclusions that can be drawn from them are very much in question. I think that is the key point that we need to point out. We are not rubbishing the research at all. What we are very concerned about is where conclusions are drawn from these sort of studies that, to be honest, were not designed to make those conclusions.

Q157 Martin Caton: Isn't this sort of Orwellian mantra of field study good, laboratory study bad just simplistic and very unscientific? We have taken evidence, and we will be taking some more evidence after you, from scientists who are saying all forms of research have their drawbacks and none more so than attempting to do field tests.
Dr Little: In the end fields are where bees and other pollinators are, so if you can do field trials or you can do field studies then clearly that is the best way of finding out whether a particular product has an impact. In the evidence that we submitted, we pointed out two very large field studies that go into a lot of detail about what is causing problems. This is using real bees and real beekeepers in real situations. In those situations they can see really key effects or key linkages between poor bee health and things like varroa destructor and very little, if any, correlation between poor bee health and insecticide use.

Q158 Martin Caton: Without getting into the "our research is better than yours" sort of argument, there are criticisms of the research that you have quoted in your submission to us. There are other scientific criticisms of them. Has either of your companies considered withdrawing your neonicotinoid products pending conclusive research to justify their continued use?
Dr Bushell: We believe that the body of evidence that supports safe use of neonicotinoids is very compelling. These products have been on the market for many years and the decline in bee population is

due to other factors. That is what our overwhelming assessment of the data shows.

Dr Little: Just to add to that, I think you need to go back and understand why neonicotinoids are used. There are some very good reasons why farmers have looked at these sort of products and recognised them as being quite simply a better way of controlling the pests and diseases that they absolutely need to control at the very early stages of germination and early growth of a crop. When you look at things like the mammalian toxicity of these products, they are incredibly safe compared to some of the older products that used to be used many years ago. Traditionally insecticides were always an issue. When it comes to neonicotinoids, there isn't that issue. If you combine the ease of use, the fact that you don't have to spray nearly as often, the fact that they are much safer to use means that there are compelling reasons why farmers want to use these products and why we would continue to supply them.

Q159 Chair: Dr Bushell, could I press you a little bit more? You said just now that the evidence is compelling and it would be really helpful to the Committee if you could name which evidence you are referring to.

Dr Bushell: Fraser, perhaps you would like to talk about the regulatory studies, which are in the possession of CRD.

Q160 Chair: Sorry, I thought you were referring to academic studies.

Dr Bushell: We have provided in our written evidence a variety of different papers that show that the major influence on bee health comes from, as Julian has already said, the varroa mite, the viruses that they bring into the colonies, the weather and, very importantly, habitat availability and food resources.

Q161 Chair: It would be really helpful if you could name one of them so that we know which ones you are directing us to.

Dr Bushell: Schneider is one of those. I think you could look also at the Cresswell paper and look at the one on scientificbeekeeping.com. It is a very balanced view of bee health from beekeepers.

Chair: Thank you. I will hand you back to Mr Caton.

Q162 Martin Caton: It is interesting, we had Professor Cresswell here a few days ago and, although he endorses your position as far as honey bees are concerned, largely, he does identify a problem with bumble bees caused by this particular systemic pesticide. So even the scientists you are quoting are not confident that there is no contribution from this particular pesticide. In your written evidence both of you have recognised that the European Food Safety Authority will introduce a new pesticide testing regime and risk assessment next year, partly in recognition that the existing system does not adequately assess systemics. That new regime, as we understand it, will just be looking at new products and will not include existing neonicotinoids. Will your companies voluntarily submit your existing TMX and IMD products to the new tests next year?

Dr Lewis: As part of the reregistration programme that exists within Europe, those products will be evaluated under the new scheme. When we made the original submission we used a scheme that was 91/414, which was the original pesticide reregistration. That has now been updated to 1107. The new bee guideline that is being worked on at the moment and is in the draft phase will come into place and we will evaluate our compounds against that bee scheme. We are also already beginning to look at bumble bees for example. We have a study with bumble bees and oilseed rape planned for next season, flowering next year. We will do that and all of that data will be submitted to the appropriate regulatory authorities.

Q163 Peter Aldous: This is a question to Dr Bushell and Dr Lewis. The French Government were very much impressed by the Henry report, to such an extent they have actually withdrawn the registration for Cruiser oilseed rape. How do you feel about that? Do you think they made the right decision or got it wrong?

Dr Lewis: We think that they have got it wrong. The French decision was against all of the evidence and the actual recommendation of their own experts within ANSES, the French pesticide safety authority. It is also interesting to note that the French continue to allow the use of Cruiser on maize, which is a bee-relevant crop as well, as well as on sugar beet, which isn't. The other interesting point as well for the Committee is that the French authorities are still allowing their seed treatment companies to continue to treat seed for export, so we do think they have got it wrong.

Q164 Peter Aldous: Why do you think they made the decision they did?

Dr Lewis: That is something that we are trying to follow up at the moment. We are in discussion with the French authorities, and I think there is likely to be legal action to challenge that decision through the courts.

Q165 Peter Aldous: Do you want to speculate as to why they made that decision?

Dr Bushell: If you would like us to speculate, I am sure it was an entirely political decision. That is my speculation. We don't know.

Q166 Peter Aldous: Other than proceeding through the courts, are you doing anything else to seek to get them to reverse the decision; negotiation, perhaps, or discussion?

Dr Lewis: We are in discussion with them. We are working very much with ANSES who are the relevant government body we work opposite. We are talking to them and we are trying to talk to the Minister who made the decision somewhat in isolation. Clearly, given the situation we are in, we have no other action than to take some form of legal action.

Q167 Peter Aldous: Just to clarify, was this a decision made by the new French Government post-May?

Dr Lewis: We are not exactly sure.

Dr Bushell: We are not entirely sure when the date was. I thought it was in April.
Dr Lewis: Yes, it was the new Government.

Q168 Peter Aldous: There was no wind of it happening before the elections there?
Dr Lewis: No.

Q169 Mr Spencer: Is there an inspection regime in place to stop a French farmer importing UK or German seed treated by a chemical and drilling it within the French borders? The question is: how can the French Government enforce that ban?
Dr Lewis: I am sorry; I don't know the answer to that.
Dr Bushell: I don't either. We can find out for you. It would be clear that with oilseed rape, if someone came and inspected the field they could look for residues of those products and then the farmer would be acting illegally. We certainly wouldn't sell banned materials to farmers. We would always abide by the regulation and laws that are in force in any territory.

Q170 Simon Wright: I would like to talk about the evidence from Italy in relation to contaminated dust. This led to the suspension of three neonicotinoids as maize treatment, and the evidence suggested that the fine dust generated by the drilling of treated seed is lethal to bees. Do you accept the results of the Marzaro study, and what do you make of the policy response to it?
Dr Little: It is a very interesting area of work. We recognised that there was an issue with dust and maybe I should explain a little bit about what we are talking about here. If you are talking about a neonicotinoid seed treatment, essentially you are taking a seed and applying a product to that seed. The idea is that the farmer would drill that seed and as that seed germinated would take up that chemical and it would protect it at the very early stages of that plant's growth. One of the areas that was observed was that when a farmer was planting that seed there was the occasion where you could get a fine dust coming out of the drill, especially if it was a maize drill. The reason for that is it is a pneumatic drill, so they push the seed into the soil, and the way that those drills had been originally designed meant that they vented to the air. This was recognised as being an issue and companies have been working with the manufacturers for new machinery but also to retrofit machinery that was already in the marketplace to make sure that that dust is vented to the ground, thus massively reducing the incidence of airborne particles. That appears to have been very successful over the last two years in absolutely minimising that sort of issue happening. That is a bit of background to that. In Italy itself they have had very clear restrictions on the use of a number of products for a few years now.
Dr Bushell: I would add one other point to this and that is looking at the formulation science to make sure that by the use of appropriate stickers and polymers you get a much better adherence of that material to the seed. All the companies work with the professional applicators. These materials are not generally applied by farmers themselves. They are applied by professional applicators using machines that are designed for the purpose. We have set very low levels of dust-off, the amount of dust that is coming out of a treated seed, and anything that fails that can't be sold without being re-treated.

Q171 Simon Wright: Are there any possible other effects relating to venting to the ground, for example on wildflowers? Is that something that is being looked at?
Dr Little: What you are looking for is a method of exposure. The way that most people saw dust as being an issue was airborne dust. The fact that it is on a flower or whatever doesn't necessarily mean to say that a pollinator is going to pick that up. In fact, the chances are it is not going to pick that up, because they are looking for something specific.
Dr Bushell: Studies in the literature seem to imply very much that this is airborne contamination of bees flying through the field as the major route of uptake and not taking this in from other areas. Of course, if you can stop the dust by minimising it, by making sure much less exits the field, then this keeps the risk very low.
Dr Lewis: I was just going to add one final point. Clearly, if you are aiming the dust from the pneumatic driller into the ground the ability of that dust to drift is significantly reduced, so it would also prevent movement. In modern fields there are very few wildflowers in the field itself.

Q172 Caroline Lucas: What research have you done on the effects of neonicotinoids on bees that has not been published or has not been submitted to the regulatory authorities?
Dr Lewis: I think it is fair to say all of our data has been submitted to the relevant regulatory authorities. In many cases we might wish to publish more of that data more freely, but the current regulatory system means that if we did that that data would be available for competitor companies to use to achieve their own registration, so as soon as we publish it we lose our data protection. Having said that, there is an intention, within Syngenta at least, to publish two of our main studies that we have relied on for registration, which have already been submitted to peer review journals and will hopefully be available at the end of this year or the beginning of next.

Q173 Caroline Lucas: We were going to ask if we could get access to those before you get it back from the assessors.
Dr Lewis: As long as it is kept confidential by the Committee such that it doesn't interfere with the scientific peer review, then yes, we can supply both of those papers to you.
Dr Bushell: But they would be in draft form and, of course, they may be changed during the peer review process.
Dr Lewis: I would like to add one point, though, that I think is important for the Committee to understand. All companies have a system where we are mandated to submit any adverse data to the regulatory authority as soon as it is generated. We have no option with that. It is currently enshrined in the EU at least in article 56 of 1107/2009, which I have brought with

me and I could quote or leave with the Committee if you wish, but it says, "In particular potentially harmful effects of that plant protection product or its residues, metabolites, etc, that have harmful effects on human or animal health or groundwater or their potentially unacceptable effects on plants or plant protection in the environment shall be notified." So it would be illegal for us to conduct any research and not submit it to the relevant regulatory authorities. That is not something that only happens in Europe. It happens elsewhere in the world as well. So we have no ability to hide any data. As soon as we generate adverse data, it needs to be immediately submitted to the authorities.

Q174 Caroline Lucas: How about more proactively sharing unpublished research in relation to risk assessments with the academic community, for example? We heard some evidence last week that suggested it can be quite difficult to get hold of some of the research.
Dr Lewis: As I said, one of the difficulties we work with at the moment within our current paradigm is we lose data protection.

Q175 Caroline Lucas: I appreciate the point that you are making, but can you envisage any way in which academics would be able to have access in a way that doesn't prejudice your competitive advantage?
Dr Lewis: In the revision of 91/414 that produced 1107 we made a submission that we should change the data protection rules such that we should make the system more transparent and allow our data to be published. That was rejected by the EU. The main way that we could do that is if the system that we currently work under was changed to give us some kind of data protection while still publishing our data. It is driven principally by freedom of information rules that cause the problem and some of these are currently antiquated in terms of the system, particularly in the electronic age we live in.

Q176 Caroline Lucas: In terms of following that up further, would you be able to send us a memo explaining what you think would need to change at EU level to enable you to do what you say you would like to be able to do?
Dr Lewis: Yes.

Q177 Caroline Lucas: That would be really helpful. I don't know if you would agree, but in a sense there is a bit of an imbalance. What we have heard from some of the academics is that they publish their material and you can challenge it, and yet sometimes it feels like it is not a very even balance, because some of the stuff that you have is not in the public domain for them to be able to challenge.
Dr Lewis: Yes, I think we can submit that. We have some ideas. Clearly it is for governments, not just this one, to look at that, but we would gladly put some thoughts together. As I said, we are publishing two of our key studies, one of our long-term four-year studies where we have continued to look at a set of hives over a number of years.

Caroline Lucas: We look forward to having that. That would be marvellous.

Q178 Zac Goldsmith: I would be interested to hear why you think the EU turned down your suggestion.
Dr Lewis: I am not sure, to be honest. I don't know the answer to that.

Q179 Zac Goldsmith: Is the view that you have put forward widely shared among industry?
Dr Little: I think there is also an element here that there are a lot of competing elements when this part of the rules was drawn up, thinking that making data more available without protection would result from these rules. Actually it is the reverse: less data comes out. There was a view that if generics were able to come into the market earlier then that would bring down the price of crop protection products, but, as I said, all it has done is driven companies to being more careful about releasing information rather than less.

Q180 Zac Goldsmith: Who would be responsible for that decision? To whom did you submit your ideas; which department was it?
Dr Lewis: Sorry, I don't know the answer to that personally, but we can let you know. As part of the thoughts that we submit to you, we can put that in.

Q181 Zac Goldsmith: As far as you know, this was not rejected as a result of lobbying by your competitors? This is not something that industry itself has tried to do?
Dr Lewis: Not as far as I am aware, no.

Q182 Caroline Lucas: In the spirit of interrogating research, I wanted to look at the German study that was cited in the Bayer submission of evidence to us. You talk about the impressive size of the study of the Genersch research—1,200 colonies—but is it not the case that only 215 of those were screened for pesticides and of those, as I understand it, around 74 tested positive for at least one neonicotinoid? That does demonstrate beyond doubt that bees are regularly exposed to significant quantities of that insecticide, and crucially no data is presented on the survival of those particular colonies. The only analysis that is done is a very crude one comparing survival in colonies with high levels of pesticides very generally, which includes lots of fungicides that are not known to harm bees, with survival in those with low levels. In other words, the research that you have put forward and are citing, which I understand was funded entirely by industry as well, for what it is worth—
Dr Little: There are a few things on that. It was funded mainly from the German Government.[1] We helped out with a couple of the techniques that they needed help with in terms of identifying individual products. You are right that not all 1,200 colonies were assessed for individual content of products. They

[1] Note from witness: Dr Little has pointed out that the German study on bee health was funded 50% by the Ministry of Agriculture and 50% by the Federal Bee Institute, which are themselves funded by the German Government, from 2010 to 2013. Before 2010, the study was 50% funded by the Federal Bee Institute and 50% funded by the industry.

took what they saw as a rational sample, a reasonable sample.

Q183 Caroline Lucas: So, 215 out of 1,200?
Dr Little: What they did do, though, is look very much at the viability of all those colonies. I am not 100% au fait with each and every detail of it—the problem of not speaking German is always an issue—but what is very clear is that, if you go through the conclusions of that report and look at the correlation between either the problem with varroa or the diseases that they spread, or issues with climate, weather and habitat, those were overwhelmingly the issue in that particular case.

Q184 Caroline Lucas: But in that case there was no analysis done on colonies with neonicotinoids versus those without, so that comparison was not there.
Dr Little: But if you looked at those situations where those products were present you saw no correlation between either a healthy or an unhealthy colony.
Dr Bushell: I think a particularly interesting example would be to look at Australia when you are talking about the real issues associated with bee decline. Australia probably has the healthiest bees anywhere in the world because they don't have the varroa mite. They go to extreme efforts to keep the varroa mite out, as you may have seen in the press this week, and they, of course, use neonicotinoids very widely.

Q185 Caroline Lucas: Just to end up on that point, the trouble with that kind of statement—as indeed the statement in the Bayer evidence where it says, for example, "It is worthy of note that France has restricted the use of neonicotinoids for over 10 years. Despite that, bee health in France remains similar to or worse than here in the UK"—is that they purport to be scientific but you can't really interrogate them scientifically at all, because there could be a million other things going on in France or in Australia. When it comes to France, as I understand it, they still use neonicotinoids quite a bit on sunflowers, for example. I think that sometimes it can sound as if the evidence is supporting the case that you want to make, whereas when you challenge it a bit more that is not necessarily the case.
Dr Bushell: That is true also of the people who argue that insecticides are the real cause of bee decline. I think a very powerful example would be our Operation Pollinator, which I am sure many members of this Committee will be familiar with. We have more than 10 years' experience of planting up field margins as areas of high biodiversity that show a huge benefit and increase in numbers of all pollinators, bumble bees, honey bees, solitary bees, for example, including in the first studies bumble bee species that were thought to be extinct in those areas. This is an example of sustainable, intensive agriculture in action. You have a good high-yielding crop in the middle of the field, and a small area of land in intensive farming areas, managed well for biodiversity, will have a hugely positive impact on beneficial insects, birds and other biodiversity.

Q186 Martin Caton: Dr Lewis, in the quote you just gave us from the document from the EU on the things that you would have to report if you came across them in your research, one of the things you mentioned was groundwater pollution. What assessment of groundwater pollution has been done with regard to neonicotinoids?
Dr Lewis: I think it is fair to say that in Europe we have probably the most stringent regulatory regime, particularly when you apply it to groundwater, with the absolute cutoff of 0.1 micrograms per litre. The assessment that we have to go through for every use, not just every compound but every single use, against that criterion is by far the most stringent in the world. Half of my department spend their time looking at just that issue. It is a very rigorous assessment. Prior to approval of that use, whether you were using conservative models that assume all groundwater is at 1 metre below the surface, there is an extensive modelling and field study and lab study set of data to look at the parameters that would affect movement of a compound in soil. Also increasingly now throughout Europe post-registration we are seeing significantly more monitoring of groundwater going on across most countries in Europe. At the moment, all of those are showing that there is no contamination of groundwater by these types of compounds, and in fact it shows very clearly that the models used for registration are very conservative and significantly over-predict what would happen with groundwater.

Q187 Caroline Lucas: Could you tell us how long the chemicals persist in soil? How long are they active in terms of being a potentially toxic chemical?
Dr Little: It is a little bit of, "How long is a piece of string?" because it will depend on a huge number of different things, including soil type, climate, temperature, what has been grown in there, how many worms there are—everything will affect that figure. But if you are looking at something like imidacloprid or clothianidin you can be talking a half-life of anywhere between 16 and, say, 200 days.
Dr Lewis: For thiamethoxam we are slightly shorter than that longer figure. We are talking in the region of 20 to 80, 90, 100 days.

Q188 Caroline Lucas: There is a factsheet on one of the products that says that trials have shown 100% control of pests up to 11 months from application, so doesn't that suggest a longer activity?
Dr Little: I have no idea which product you are talking about in which crop.

Q189 Caroline Lucas: It is called Turf Merit, a granular formulation of neonicotinoid intended for spreading on amenity grasslands. The factsheet on a Bayer website says, "Trials have shown 100% control of pests for up to 11 months from application." I will send you the link.
Dr Little: Thank you.

Q190 Dr Whitehead: I will ask you some questions about your own procedures. DEFRA said early this autumn that they would need to see unequivocal evidence of harm to bee colonies before they acted on

neonicotinoids. What sort of standard of proof do you require internally before advancing a new product for risk assessment and taking it externally?

Dr Little: Are you talking in terms of taking it to commercialisation?

Dr Whitehead: Yes. If you have developed a product, and presumably you are testing it and looking at it internally, what sort of checks and balances and degree of proof do you require before you would submit it for risk assessment subsequently? How does that work?

Dr Little: If you are talking about an insecticide, you will have a whole raft of different insects that you will want to control. In some cases it may be one particular insect that you will be interested in, so you have to be able to control that insect for a farmer to be interested in buying your product. That is a given: you have to have efficacy. In addition to that, there will also be a whole raft of indicator species that you really don't want to have a high level of control of and you won't be surprised that the honey bee is one of those. In the case of Bayer—and it will vary depending on individual companies—we will invariably test insecticides in the field, irrespective of what happens in the laboratory, because that is the most important of all the things that we have been talking about today in terms of understanding the effect of an insecticide in real conditions. So we will go through all of those processes, and if we get good efficacy and very little impact on bees and other indicator species, if these products are used properly, then we would look to advance that product, depending on other things as well. But from an environmental perspective that is how we would go through that process.

Dr Lewis: To build on that, at a very early stage in the development of a new product, while it is still in research and before you even know you have something that can be really commercialised, we look at its environmental profile. You can understand that. If we are going to invest something in the region of $250 million to $300 million in taking a product through to commercialisation, we want to be very sure that we have a good product that is safe, can be used safely and can be registered. So we conduct a lot of early tests. Coming back to the example earlier about groundwater where you have an absolute trigger, we have to be very sure that the compound can be used safely and not contaminate groundwater, because clearly that would mean that we would not be able to get a commercial licence in Europe. I think it is fair to say in all companies, and I can definitely speak for my own, we take two separate decisions. The first decision we take is we satisfy ourselves that it is safe before we satisfy ourselves we can commercialise it. To do that we do a lot of early stage testing, principally in the laboratory but also under field conditions, to take those decisions.

Q191 Dr Whitehead: If you are risk assessing a new product, particularly in terms of what might be its collateral damage over and above what it is intended to damage, what are the costs? Is that the whole cost you have just mentioned or is that a part of the costs?

Dr Lewis: If you were talking about the regulatory package, for example, depending upon how broad, how many crops, how many countries, you are talking somewhere in the region of $60 million to $100 million to do the regulatory and safety testing that is required these days. In Europe it is probably at the upper end of that because we are dealing with probably the most stringent regulatory regime in the world.

Q192 Dr Whitehead: Does that sort of cost deter you as companies from putting forward new products? Is it regarded as perhaps a brake on new and improved products?

Dr Bushell: At the industry-wide level it is a deterrent to innovation and investment. If you look at the case of herbicides, simply because I have the data on this, if we go back to when I started in the industry over 30 years ago there were the top 50 research-based companies that the Wood Mackenzie report would talk about. Now if you are looking at herbicides, there are probably three or four global companies researching for new herbicides, and this is principally because of the cost of registration.

Dr Little: In that internal process you reject so many so it becomes very difficult to find something that can do what a farmer needs in terms of the ability to grow safe, high-quality, affordable food but at the same time have minimal effect on the environment. It is very difficult to find a product that will work in those situations.

Dr Bushell: I should also add that if we have developed a product, let's say for a small number of crops, big crops like maize, wheat, maybe soya, you can't then just extrapolate from the data that we have and use it on all crops. Every application in every country at every rate will be subject to a risk assessment to convince our development committee that it is safe to release to sale.

Q193 Dr Whitehead: Would your risk assessments include or would you want them to include—let's say when you have decided that you really don't want your product to harm bees—all pollinators, or do you think all pollinators should be included as a category of harm in risk assessment, as opposed to just bees?

Dr Lewis: The current regulatory regime worldwide uses honey bees as a surrogate for all pollinators, and there are safety factors built into the risk assessment regime that account for extrapolation to other pollinators. As has been referred to already, the new work that has been done, the new research, is going to expand the number of species that we look at, but given the diversity that is out there, you could never look at every species. You just couldn't do it. Most of them would be untestable under the current science that we have, so it will still be necessary to focus on a number of them. We are just going to expand the number that we look at, and we agree with that. As I said earlier, we will begin testing on more species, particularly for products that we are inventing now that won't reach the market for another five to 10 years.

Dr Little: If you think about essentially there is one sort of honey bee, looking at bumble bees just in the UK you are talking 20, so which one would you choose? Then if you are looking at solitary bees, you

might be going up to, say, 200. If you then go into non-bee pollinators you may be talking about 2,000. I don't know what the exact number is on the bigger value, but you can understand that to be able to test on every single pollinator doesn't make sense. The trick is to find the species that really are representing the rest of that pollination group. I think one of the key things that EFSA will have to come up with is a group that represents this whole class of pollinators much better than just a single pollinator.

Q194 Dr Whitehead: Forgive me, but how do you know what is a representative species under those circumstances?
Dr Little: That is when we go back to the entomologists and start looking at how that will work. If you are talking about a bumble bee and you are talking about European legislation, you are going to have to look for a bumble bee that is in all countries in Europe, otherwise it wouldn't make sense, would it? So it will take some time to identify those really good indicator species that genuinely improve the predictability of insecticides on pollinators over and above what we already have with the honey bee. As we have already said, the honey bee is currently the species of choice, but there are a lot of worst-case scenarios built into that to try to take into account the possibility that other species might be slightly more sensitive.

Q195 Zac Goldsmith: Are either of your companies represented on the EFSA committees that take a view on new chemicals?
Dr Little: No.
Dr Lewis: EFSA has a mandate that it will not involve commercial companies in those committees.

Q196 Zac Goldsmith: Why is the composition of those committees confidential? Why do you think that is?
Dr Lewis: I am not sure. I think some of their technical committees are not confidential and they are published, so I am not exactly sure what committees you are referring to.

Q197 Zac Goldsmith: I don't know what the technical term for the committees is, but the committees that are tasked with effectively providing a green light for new products entering the market.
Caroline Lucas: What about the Advisory Committee on Pesticides, the ACP?
Dr Lewis: That is in the UK and that membership is made public.
Zac Goldsmith: I am talking about the committees delegated by EFSA to take a view on new products. I forget the technical term. I am going to have to stop that line of questioning because I can't remember the name of the committee. I wish I was able to come back to you, and I may be able come back to you after the session.

Q198 Caroline Nokes: I want to move on to the issue of funding of the Chemicals Regulation Directorate. I want to try to get to the bottom of whether it is funded directly by yourselves or whether there is some other funding arrangement.
Dr Lewis: When I started working for Syngenta 24 years ago, when we made a submission to a regulatory authority, other than a minor nominal fee, we didn't pay for the service of registering that compound. About 10 years ago it was changed by Parliament such that it was deemed that, as we wanted the registration, we should pay, so we now pay a fee with every submission to CRD in the UK to process that and either decide for or against a registration. A good analogy for this, perhaps, is your driving licence. At the moment we pay an agency to give us a driving licence. When you pay that fee, it doesn't make any decision that you will or will not get a driving licence. I think it is the same with the regulatory system. We pay regardless of whether we achieve a registration, and there are many instances in the UK where we do not achieve a registration.

Q199 Caroline Nokes: Do you have any indication of what proportion of their funding comes direct from agrochemical companies?
Dr Lewis: I do not, no, I am sorry.

Q200 Caroline Nokes: Does it give you any influence over their deliberations or, as you indicated, is it just a straightforward you pay your fee, end of negotiation/discussion?
Dr Lewis: In my personal opinion, none at all. I find that CRD are one of the most challenging regulatory authorities we deal with, similar to the French and the Germans but more challenging than many others in Europe, and if anything they are becoming more challenging as the regulatory paradigm develops throughout Europe. So, no.

Q201 Caroline Nokes: On a different theme, do your companies have any contractual or financial relationships with research that is going on in universities and, if so, how does that work?
Dr Bushell: We have thousands of individual research collaborations with university groups throughout the world. In the UK we probably have more than 100 projects underway at any time, and they would cover all aspects of plant science, physical science, chemistry for example, and bioscience.

Q202 Caroline Nokes: As part of those relationships, do you take any steps to safeguard the findings of that research, for instance to prevent publication if it is in any way unhelpful to your objectives?
Dr Bushell: If we are talking about a piece of contract research where it might be that they have a particular machine that can do something, then that would be a confidential thing, but that is a very small number. We couldn't and wouldn't ban publication of studies except to protect, for example, confidentiality during the filing of a patent. But of course we realise that if you are working with students and academics, they have a need to publish, and banning them from publishing would mean that none of them would work with us.

Q203 Caroline Nokes: So it is in no way unusual for you to come to an arrangement with a researcher that they would get the specific ability to publish a view? Quite the reverse, it would be normal for you to expect them to publish?

Dr Lewis: Absolutely normal, and that applies whether we are working with them directly or through a scientific funding agency like BBSRC.

Dr Bushell: In some cases where, for example, in a chemistry project an interesting invention has been made, perhaps in formulation technology, then the contract would have in it a clause that would say, "We may require publication to be withheld but this will normally have a period of not more than six months", which would allow the filing of a patent and then, of course, you would be free to publish it even before the patent was published, because the filing date would be set.

Q204 Mr Spencer: It is a bit of an unfair question, but could you give us an idea of the cost to the taxpayer if the taxpayer were to pick the tab up for the funding of CRD and the sort of research that goes on at universities? What sort of bill would that amount to?

Dr Bushell: I think you would be better off asking CRD what their total budget is and how much of it they get from industry, because of course we don't know what other companies are paying. They are taking several years to review dossiers. In the old days when we used to print everything out as a dossier, it resembled the *Encyclopaedia Britannica*. Now it goes in on CD, so it's a little bit easier to carry.

Q205 Mr Spencer: If the Government turned around said, "We are taking the funding of the CRD off you and the public purse is going to pick that up," how sorry would you be?

Dr Bushell: We would be really delighted.

Q206 Mr Spencer: We heard evidence from the Soil Association, which is one of the largest organic farmers in the country. They don't grow oilseed rape at all. If we withdrew these sorts of chemicals, would that wipe oilseed rape out as a viable crop in the UK, or could we continue to grow it by other means?

Dr Bushell: Julian has a very interesting study talking to farmers, and I think we should ask him to answer this.

Dr Little: I mentioned it in our submission, but essentially we asked farmers what does it mean if you lose seed treatments, and it is worth going back and saying there is a reason why they use these things. In many cases it is about establishment of their crop, getting their crop going at the very early stages. In many cases it is actually to control not the pest itself, the insects themselves, but the diseases that they will spread, so, for example, in oilseed rape it might be turnip yellow virus, in wheat it might be barley yellow dwarf virus. Those viruses can have really crippling effects on your yield. With turnip yellow virus, for example, in a worst-case scenario you are looking at a 25% reduction in yields.

We asked farmers what would be the consequences: 87% of people said that it would severely impact their ability to grow oilseed rape; 72% suggested that it would definitely have an adverse environmental impact; 79% said their oilseed rape yields would probably decrease; 90% would need to increase the number of sprays on that crop, so increase their pesticide spraying; and 84% suggested that pest control would be a lot more expensive, so they are getting less yield and it is also costing them more to grow a crop. One that really threw us, to be absolutely honest, was that 47% of farmers said they would consider not growing oilseed rape, either some of their oilseed rape or oilseed rape altogether, which was a very big surprise to us. Oilseed rape is a major crop in the UK, and certainly in many cases is the crop of choice if you are not growing wheat. So, without that crop of choice the economics of UK agriculture start to look a bit less attractive.

Dr Bushell: In France, Cruiser on oilseed rape has been deregistered, and if you ask our French national company what are we recommending to farmers for this year, you find that the tools available to farmers for insect control are very limited. This is quite dangerous, because if you are relying on essentially a single set of tools like the pyrethroids, you are going to cause resistance in major pests very quickly without having the benefit of the other mode of action coming in from these simple seed treatments.

Q207 Mr Spencer: Could you send us the data?

Dr Little: Of course.

Q208 Mr Spencer: To focus on that, could you run through the argument where some of your opposition says that if you don't use this seed treatment, which is obviously a blanket application of pesticide, then you would only treat where there is an issue, where it becomes a pest problem? In what sort of percentage of occasions is there likely to be a pest problem? Are we talking 10%, 50%, or 90%? Are those chemicals better or worse for the environment?

Dr Little: It is another one of those "How long is a piece of string?" questions, but let's give it a go. What you are suggesting is that you go towards, "If there is a problem we will deal with it." The only slight problem with that is that frequently by the time you have spotted there is a problem the damage has already been done, and that is especially true with insect-borne diseases. Once you have spotted that you have a particular virus in your crop, the chances are you have lost that crop, or lost a lot of that crop, and basically the damage has been done. So you have to be able to take out those particular vectors almost as they are happening, or even slightly before they are happening, rather than once you have seen that they are happening.

The other thing about seed treatments that is absolutely critical here is that they are a management tool for farmers. They don't have to look out the window and say, "Oh my God, I can't spray today," and then panic as to whether they are going to lose their crop or a significant yield from that crop. They already know that at that early stage—and frequently it is at the wettest times of the year when they are less likely to be able to spray—they have at least these particular problems under control. So it is a fantastic

management tool for them to really make a difference when it comes to growing their crops, producing those high-quality affordable crops that we are all used to being able to go into the supermarket and buy at a reasonable price. Without that certainty, farmers will take whatever opportunity they have to spray. In a bad year that might be four extra sprays. I am not convinced that if you are an entomologist or an environmentalist you really want farmers to go out there and spray insecticides during those times. If it is early in the season, that is exactly when bees are coming out of hibernation, and it is not a good time to be spraying, so anything that you can do to reduce the number of sprays is a good thing, and seed treatment is a fantastic way of doing that.

Dr Bushell: When you are applying a seed treatment, of course by definition it is in the soil and so you are controlling soil pests that attack the germinating seedling as well as getting protection for the developing foliage from attack from leaf-feeding insects. So that is a really good help to farmers. Of course they could come in later on and spray against foliage pests. It would be very difficult to control those soil-dwelling pests because of the very limited range of chemicals available.

Q209 Mr Spencer: I may be completely wrong, but is it possible to fine-tune these chemicals to the degree where you could block the chemical reaching the flower, so it covered the rest of the plant but didn't get to the flower? You would then deal with the insects that were attacking the plant but not the pollinators that were landing on the flower. Is that technically possible? Have you done any research to look at that?

Dr Little: In a way that is exactly what imidacloprid, clothianidin and thiamethoxam do. They are present at a high enough concentration to control those insects they need to control at the early stages of that crop and yet are present, if at all, in tiny, tiny amounts once it gets to the flowering part of the plant. Quite simply, once it has got to that level it is not controlling any pests at all, let alone having any significant impact on a pollinator. It is certainly not controlling an aphid that is far more sensitive to a neonicotinoid than a bee will ever be.

Dr Bushell: You have created a zone of protection in the early stages of growth and by the time, as Julian said, you come to flower, when pollinators and bees are being attracted into the crop, the levels are very low. Of course, that will have all been taken into account, as Fraser said, during the risk assessment process to make sure that important pollinators are not being damaged by these products.

Q210 Chair: We are just about to get to the end of this part of our hearing this afternoon, but I would like to go back to my first point about the statement that Syngenta made to *Farmers Weekly* and the concern that you have that chemicals have little to do with the decline of the bees and that it is other factors. Are you doing research on what those other factors might be that are contributing, how are you testing that, and how is that in the public domain or not in the public domain?

Dr Little: Mike has already mentioned in a lot of detail Operation Pollinator, which essentially demonstrates that if you have more nesting sites, more foraging sites, you have more pollinators. That is one area that we recognise that European agriculture has to do better at. It has to improve, quite simply, the amount of food that is out there. Specifically to Bayer, we have been a bee health company now for nigh on 30 years, producing products to control disease and pests in bees. We see that as a massive step forward. If you can control varroa, as they have managed to in Australia, you have the healthiest bees on the planet. We view that as being the best way of dealing with the problem with honey bees. Quite simply, blaming the nearest chemical doesn't make sense.

Q211 Chair: In respect of the tests that you would be doing, would that be part of the official licensing of products? Would that be included in the testing that you would be carrying out?

Dr Little: All of these are looking at the problem with bee health or pollinator health. They are not compound-specific, they are not product-specific. It is really about improving what we see as the big problems with bee health rather than, as we say, the use of insecticides per se.

Q212 Zac Goldsmith: We heard evidence last week that, for the last couple of decades at least, the amount of area that provides good habitat, in terms of both foraging and nesting, has if anything grown in the UK, but the total number of pollinators, not just bees but across the board, has plummeted. I don't think there is any argument about the numbers in relation to pollinators—maybe the details, but the general direction of travel is downwards and I think everyone accepts that. I would ask you to go back on the point that you made earlier about the need for greater habitat, greater foraging areas and so on. It cannot be the reason why we are seeing such catastrophic falls in the number of pollinators. If I can add to that question, I don't think anyone argues that chemicals are the only reason why we are seeing this decline, but I think a lot of people are arguing that it is a significant contributing factor. No one disputes the existence and the dangers of varroa, because it would be impossible to do so, but we have also heard concerns from previous scientists that we have spoken to that varroa is becoming more effective at destroying bee colonies, that something is weakening the general colony immune system and that that itself could be chemicals. I would be interested to hear your response to both of those points.

Chair: Very, very quickly.

Dr Little: A couple of things, very briefly. Norman Carreck down at Sussex—in fact I think he was with Rothamsted at the time—did some very good work looking at not just varroa but also the viruses that it carries. It showed that colony health was not particularly affected by varroa itself, but a combination of virus that it would be carrying plus the varroa itself had a catastrophic effect on the hive. What is very clear is that varroa mites are carrying more and more of these viruses and are causing more

and more problems. So that is at least one area of research that we are looking into a lot.

It is also true that not all bees and not all pollinators are going down. Bombus hypnorum, for example, has just arrived in the UK but is spreading north very quickly. It arrived in my garden last year. It is no more sensitive to pesticides than any other bumble bee but it is thriving. So it is not as simple as one thing or another. I think right at the very beginning Mike said this is a multifactorial problem that is far more complicated than probably we know.

Dr Bushell: I would add two things. Again, you all will be aware of the massive amount of work done by John Beddington's Foresight project. The principal finding from that, as Charles Godfray said last week, the inescapable conclusion from the Foresight work is that the sustainable intensification of agriculture is a critical issue. That means, of course, growing more productively but getting better outcomes environmentally and using all the resources and inputs that go into agricultural systems more efficiently. When we talk about bee health, again we have to look at the systems level. I think again, although varroa mite is getting more difficult to control because the acaricides that used to be used by beekeepers to control it are now much less effective, such that they are adding more to a point where they are almost damaging the bees themselves in some cases, there are very interesting themes of research in academia on biological control agents. There is also a company called Beelogics with their RNAi technology, which again we do not have time to go into today but looks a very interesting way of controlling those viruses.

Chair: Yes, we do need to move on, because I think what you have raised is when is the right time to act and when is it too late to act, but we do need to move on. Thank all three of you for coming along this afternoon. We will move very quickly to our next set of witnesses.

Examination of Witnesses

Witnesses: **Dr Nigel Raine**, Royal Holloway University of London, **Dr Chris Connolly**, University of Dundee, and **Professor Simon Potts**, University of Reading, gave evidence.

Q213 Chair: Dr Connolly, Dr Raine and Professor Potts, I think you have each sat through the previous session, and we do need to move on very quickly indeed. We have heard from the industry and from business, and we really want to look at the academic side of things. With no further ado, I will invite Mr Spencer to continue the questioning.

Mr Spencer: Before we start your areas of expertise, do you want to comment more generally on the transparency of the process of regulation and whether you feel that basically there is enough transparency for people like yourselves to get involved and access the knowledge that you require?

Professor Potts: We certainly welcome the industry move to make things more accessible. The point at the moment is it is not as accessible as it should be. I do not think I need to repeat the argument that all academic literature is there for peer review and for comments, but a lot of industry and some government research is completely inaccessible. Anything that moves us in the right direction is very welcome. At the moment, we are not anywhere near close enough.

Q214 Mr Spencer: Do you all agree with that?

Dr Raine: Yes, I think so.

Q215 Mr Spencer: In your view, are the risk assessments sufficiently broad to capture the full range of possible effects?

Dr Raine: I will come in on that. I think they are not, would be the short answer because we are focusing very much on one species in terms of bee health. We are focusing on the honey bee, which is a reasonably atypical bee with large colonies, so it would be very important to look at other species of bee, varying in terms of their ecology and their life histories, which differ a lot. We are also looking and focusing very much on what the lethal dosages are, lethal exposure levels. I think it is very important to consider that these chemicals are mostly affecting the nervous system and they will be affecting how information is processed by the nervous system and how it is transmitted through the nervous system. One output of the nervous system is obviously behaviour, so I think we should be looking at sub-lethal effects, and if we are looking at low levels of exposure, which we have heard is the levels of residue we are seeing in nectar and pollen that bees are consuming, then sub-lethal effects are really important.

I would also say that bees are typically foraging in an environment where they are visiting a crop that may have multiple pesticides or agricultural chemicals used on it, or they may be visiting multiple crop species, so they are really exposed to more than one chemical at any one time or over their lifetime. I think we need to be looking at combinational exposure as well.

Most of the exposure tests are looking at adult bees, and there is obviously another big phase of their life, which is larval development. That is happening inside the nest or inside a particular brood cell over a long period of time for solitary bees. That could be really important, because their environment is controlled by other individuals within the hive or their mother, who is provisioning that nest. They could be exposed to potentially much greater residues there, where they are being concentrated. We do not know what the levels are in nectar and honey in colonies. I think that would also be important.

Q216 Mr Spencer: Would you acknowledge, though, you have to be realistic in trying to achieve that?

Dr Raine: Yes.

Q217 Mr Spencer: Given the amount of agrochemicals that are on the market, given the

amount of pollinators that are out there in the environment, to assess every combination that is possible would take us for infinity. So how—

Dr Raine: There would be huge time and cost implications, absolutely, so I think we have to be smart in the way we do this. We have to prioritise key combinations. I think we could either do that based on looking at the pharmacological properties of these pesticides and looking at how they act on the nervous system and/or we could look at what are commonly used as combinations in agriculture. It is not just pesticides; obviously we are talking about fungicides and miticides that beekeepers are using for honey bee control and for control of varroa.

Q218 Mr Spencer: Dr Connolly, I know you have been quite critical publicly. Do you want to come in?

Dr Connolly: Yes. I don't think a knowledge gap can just be ignored. This is an important knowledge gap. So many pesticides, so many species; this is a big technological challenge that we have to try to find a way to face.

The other thing I should like to add to this is the kind of super-chronic. Neonicotinoids are the nicotine for the humans equivalent. We know that nicotine is bad for us all eventually, but we know it is very quickly bad for pregnant mothers and for their offspring. There is a neuro-developmental consequence, and a lot of diseases have been associated—sudden death syndrome, ADHD and so on. These things may be happening on a bee as well, so we have to think more long term over multiple years about how the bees are surviving. Are they as intelligent when they grow up in this way as they would have been before? As you would expect from a scientist, it is not easy: it is a very complicated story.

Q219 Mr Spencer: But it is possible to extrapolate results to draw comparisons to other pollinators or combinations of chemicals?

Dr Connolly: It is possible, because we know where the targets are and it would not be too difficult to clone all the targets. It is more difficult to express them and work with them in the cell lines, but we can at least identify what the targets are. We can compare them, and using biophysics you can see where the neonicotinoid works in the receptor. You could probably identify which species are likely to be affected and which ones may get away with it.

Professor Potts: Just one quick point to add to that: I completely agree with you, Chris, but an additional part of that is the extent of exposure and the fact that the ecology of so many pollinators is so completely different that you get very localised pollinators that will only go in a very small area around their nest while other ones travel large distances. In addition to understanding the physiological biochemical part, we need to understand how they interact with the environment and we need to pick representative species or model species that can help us get into that. I don't think we need to have an excessive number of model species, but we need to cover those major functional groups.

Q220 Mr Spencer: The previous panel talked about funding and the fact that the chemicals industry was funding a lot of the research and testing. They were not over-enthused about having to do that. Do you view it cynically, frankly, that they are funding this research? Is it good science that they are pumping the money in, or should we read anything into the fact that they are funding it?

Dr Connolly: Is that a rhetorical question? It seems quite clear that it would be inappropriate. Not to say that they are fiddling any data or anything, but it is just naturally inappropriate to test the safety of your own compounds.

Q221 Mr Spencer: Would all three of you go as far as to say that the public purse should pick up the tab for that research?

Dr Connolly: Not necessarily. It can be organised so that if the product is licensed, then the user of the product could pay, but not directly by relationship with the academic. It could be siphoned via BBSRC, NERC and so on, and so it becomes truly independent but still answers the questions that need to be answered, and is fair to everybody. Then the industry can defend their statement data and say, "Look, it is totally independent. It is safe."

Dr Raine: Can I jump in on that? I think the key issue there is really about scrutiny of information, and Simon already alluded to this asymmetry of information. Dr Little was talking about levels of neonicotinoids in crops as it goes through and, if we could get access to data more readily, that sort of data would be fantastically useful for us to know what are the residues in pollen and nectar. These kinds of data are there, and it is very hard for us to see them, so we cannot really know how useful the data is until we can see it. In terms of the regulatory process, I think it does not matter necessarily that the industry is paying for it; it is who is doing the research. If you could divorce those two and it could be done by someone independently, that would presumably be better.

Q222 Zac Goldsmith: Just on this point before we move on, I think all three of you were here for the previous session so you heard the evidence that we had and you heard that both companies supported moves towards freeing up or opening up the research that they do and getting over the issues that we heard about commercial confidentiality and sensitivity and so on. They did not go into much detail about what that would mean, but the principle was clear. I am assuming that is something that you would support. If so, does that cover the concerns that you have just raised? If you had access to the data that is currently inaccessible, would that allow the level of safeguards that are necessary? Is it enough?

Dr Connolly: The biggest barrier that I have to make the research that we do relevant is to know what the concentration that we should be looking at is. At the moment we are relying on data from the US to do so, and I am sure we have the data here to address the issues. But still—

Q223 Chair: You say that you are sure that we have the data here. When you say "we", who do you mean?
Dr Connolly: I guess the agrochemical companies presumably have the data to say what the exposure—

Q224 Caroline Lucas: If that were released, I don't see why that would compromise their competitive issues, if you are just talking about the concentration of the dosage and so forth. It seems to me that what we are trying to get at is to what extent are the companies hiding behind the shield of commercial confidentiality and how much is it a genuine issue. If you are talking about things like the intensity and concentration of a dosage, then I cannot see why that being in the public domain would compromise commercial issues. Can you?
Dr Connolly: I agree—I cannot see.

Q225 Chair: Do you all agree?
Professor Potts: Yes. I can understand the need to protect the actual formulation specifics, but it is actually the impacts that we are interested in as academics.

Q226 Chair: Can I come back to you on that, because I think you were in the room when we had the evidence just now? The point is made all the time about commercial confidentiality to stop other competitors, but is that really a valid reason not to go ahead with that? What would the companies have to lose if other competitors came forward as a result of their work being in the public domain?
Professor Potts: I think if it is a novel formulation, that would be something, but I do not see why the actual impacts would put them at a commercial disadvantage. But this is not particularly my area so I am not—

Q227 Zac Goldsmith: I want to try to be clear. I was very clumsy in my last question. Following on the question you had from Mr Spencer about the contribution and the fact that the industry is paying, effectively, for this work, on the one level I think you said that you thought that was inappropriate. My question to you is, if you had a system that was much more transparent, if you were able to ensure that the research that they paid for was publicly accessible except for those bits that might genuinely compromise commercial advantage, would that suffice? Is it really an issue of transparency, rather than of funding?
Professor Potts: Yes, I would say it is an issue of transparency.

Q228 Zac Goldsmith: Would you be happy with the status quo if the data collected and generated were more publicly available?
Professor Potts: Providing it is everything except the commercially sensitive aspects, and that needs defining very clearly so all data is put forward, that would be—

Q229 Zac Goldsmith: Is that something you also agree with?
Dr Connolly: More or less. Obviously it is not the gold standard.

Zac Goldsmith: My last question was very clumsy, and I wanted to—

Q230 Mr Spencer: I think this is really important. Clearly, the chemical formulation is the bit that drives the whole thing forward. I wondered how useful that data would be if it did not include that chemical formulation.
Chair: In terms of disclosure, you mean?

Q231 Mr Spencer: Yes. If you say, "Here is everything apart from the most important bit," how useful is that, frankly?
Dr Connolly: It is still quite useful. Obviously, in the case of the neonicotinoids, imidacloprid is a partial agonist on the receptor and clothianidin is a full agonist on the receptor. These can have quite different effects. As it transpires from our research, they actually do the same thing, but it could be important. So, yes, there is some information that you could potentially lose, but maybe that could be released under some kind of confidentiality agreement so that work can be done.

Q232 Caroline Lucas: From the evidence you have given so far, you have been talking about the importance of understanding that some of the effects from neonics is long term, some of the issues are around the cocktail effect of several chemicals interacting together. Are you able to say anything from that perspective about the German study that Bayer was citing in the previous evidence session in terms of how rigorous you think that study was, bearing in mind your concerns around cocktail effects, long-term effects and so forth? Maybe you don't think it is a fair question.
Dr Raine: This is the Genersch study we are talking about?
Caroline Lucas: Yes.
Dr Raine: I would not feel confident to comment on that at the moment, sorry. I could have a look at it and send some comments if you prefer.

Q233 Caroline Lucas: That would be helpful if it is not a huge job I am asking you to do. I am not quite sure how big a job I have just asked you to do, but that would be very good.
Dr Connolly: I do think the combination is important. The flu virus does not kill people but it can kill weak people. It may be if you look at these neonicotinoids on fully well fed, nourished bees that are really strong, there may not be very significant effects, and that is good. But it may be if there is something else happening, like they have *Nosema* infection, a gut parasite, or the viruses from the varroa or the varroa themselves, they now may succumb to otherwise fairly innocuous exposure to pesticides. It is really fundamentally important.

Q234 Caroline Lucas: Going back to the Gill study, which I think you were involved in, Dr Raine, could you just say a little bit more about the importance of combinations of chemicals interacting together? I know you did start to answer as well the question about how practical it is to be able to recombine 100

or more different combinations. Could say a bit about maybe if computer modelling can help us with that or what other practical ways there are of actually being able to assess it?

Dr Raine: Briefly, yes. That study was done in my lab. We aimed to do a field-realistic trial with early stage bumble bee colonies and expose them to two pesticides. We chose the neonicotinoid imidacloprid and we chose a pyrethroid, lambda-cyhalothrin. What we were trying to do was make it as realistic as possible, with the bee colonies in the lab so we could monitor their development and growth there. We were monitoring their foraging behaviour, and they were able to forage outside and collect all their pollen and most of their nectar from real flowers. We had different colonies in different treatment groups that were exposed to either one chemical or the other or both together, and obviously controls that were not treated at all.

In terms of the neonicotinoid effects, we found that there were very strong effects at both the individual worker level and also the colony level. What we found was in terms of the colonies that were treated with the imidacloprid, they sent out many more workers to go out foraging and each of the foragers was much less effective at bringing back pollen. They seemed to be struggling to meet the pollen demands of the larvae, and that had a knock-on effect over a period of two to three weeks in terms of colony growth. We saw that was much reduced compared to the control colonies. In small bee colonies like bumble bees at the beginning of the season you can see that kind of feedback effect from individual behaviour to colony level effects. That is much harder to see in something like a honey bee colony, which is much larger and there is much more redundancy in the system. In terms of combination effects, we found that with the pyrethroids and the neonicotinoids together, those colonies suffered the most and they performed the most poorly in all our measures of behaviour. Also, two of those 10 colonies failed completely, so there was a significant rise in colony failure rates.

In terms of combinations, it is a very significant problem. We have done a first step here looking at the combination of two pesticides. Clearly, it would be nice to do more and you build up to a very large number of colonies very quickly, which becomes unfeasible. I think we have to be clever about targeting and maybe using computer modelling along the lines of what Chris was talking about with biophysics of looking at different modes of action and saying, "Well, is there likely to be an active or a synergistic effect with the combination of these pesticides, and, if so, would that trigger a more extensive series of testing compared to a single pesticide, which may not?" I think the different approaches could be used in combination. Computer modelling is one approach; lab studies are really important as well for us to ground truth what is going on and then taking that to the field as well, so multiple-level testing is probably important.

Q235 Caroline Lucas: Thank you. Just one last question. DEFRA and indeed others, and maybe even the people who were on the panel just before you, have criticised recent scientific evidence or scientific studies saying that the doses of the neonics were not field-realistic, as they call it. How justified do you think that criticism is?

Dr Raine: Talking about the Gill study primarily, we are confident that they are field-realistic dosages. We have used published data on the levels of residue in nectar and pollen of crops as a guide to that, and for the pyrethroids we have used the guideline preparation instructions for application to crops. That is as close as we can get to field-realistic. If there are better data out there, that would be really useful, and we could do better with better data. I think the same is true for the Whitehorn study. They used published data to inform their exposure levels. But it is not just about the concentration. It is also about the amount of active ingredient that bees are exposed to. In our study, they had a small amount of sugar water with a neonicotinoid in it, but they were able to go and collect nectar from real flowers as well. They were not getting exposure all the time, so our effective level of exposure was probably much lower than our concentrations in the treatment solutions suggest. Similarly in the Whitehorn study, that was the only thing they could choose for two weeks, but after that they were not exposed to it, whereas if they were going out into an oilseed rape field they would be exposed potentially for four to five weeks in a flowering period. It is about not just the amount you get but what period you get it over, and they may be different effects, absolutely.

Dr Connolly: Could I add on here to give you the concentrations? Bayer have published to say there is one to five parts per billion present in the nectar and the pollen. This has been supported by Bonmatin and Blacquiere. These are major studies, and we are now talking about the Henry one. They used 27 parts per billion, a bit higher. Nigel's lab used 10 parts per billion. Whitehorn used six parts per billion in the pollen plus 0.7 parts per billion in sugar. Our research looking at the electrophysiological function of a bee brain in a lab gives major effects at only 2.5 parts per billion. So these are the right ballpark relevant concentrations to be looking at. Whether these things all are relevant in a complicated ecological system, and over a long period of time, and whether it is causing the bee decline are quite different questions.

Q236 Martin Caton: Dr Connolly, you have moved from mammalian neurology to looking at bees. What made you make that fairly fundamental shift?

Dr Connolly: An important part of this issue is the neuro-pharmacological issue. The neonicotinoids target the nicotinic receptors in the central nervous system and peripheral nervous system of all animals. Currently, I have been working on humans and I am interested in how information flow gets disturbed, how it can lead to neuro-degenerative disease, epilepsy and so on. This is really the same science; it is just a different animal. It is not really a giant step, but it is an important step. We have an enormous, robust scientific base in this country and it is time that we applied that to deliver the impact into the areas that are really important now because we have the growing population. This is not a problem that is

going to go away. This is a problem that is going to get bigger and bigger.

Q237 Martin Caton: When will your insect pollinator initiative study be published?
Dr Connolly: I have an early draft paper here, which you can have as evidence. It is really down to the review process. You might be interested to hear we got knocked back because our idea that two pesticides might work in the brain sequentially and add to the toxicity was classed as being rather obvious, so it is not such a long shot as people might consider. I have had a letter from the International Union of Basic and Clinical Pharmacology who say they are going to submit a letter to *Nature* to say that this is blindingly obvious basic pharmacology, that compounds that target pathways that converge will work together. Of course, on top of this we have what we call in pharmacology off-targets, and these are the unknowns that we cannot actually predict and they can only be determined empirically. So I am doing the same stuff I always did, really.

Q238 Martin Caton: If it is neonics contributing or causing neurological dysfunction in bees, might it be possible to fine tune this effect by changing the chemical nature of the neonicotinoids?
Dr Connolly: It is possible, and Simon has touched on the reason why this is difficult, because of the complex ecological systems in a number of species. I think it may be possible if you decided which species you were going to target and which ones you were going to protect and then ignored all the others. If you made those decisions, then it may be possible, but hard.

Q239 Martin Caton: Is there anybody actually working on this?
Dr Connolly: The only people I know working on this are trying to make them more and more effective on pest species but not less and less effective on the beneficial ones.

Q240 Zac Goldsmith: I have a question that will be very quick. You would have heard the evidence before where an enormous emphasis was put on, first of all, loss of habitat, which I think is a suspect reason, but also increasing strength of varroa. As far as I understand, that only applies to honey bees, does it not? How many of the other pollinators are affected by varroa, if any?
Dr Connolly: Well, they do affect bumble bees, don't they, Nigel?
Dr Raine: No.
Dr Connolly: Don't they? Oh.
Dr Raine: It is going to be very restricted, so it is not—

Q241 Zac Goldsmith: So it can't possibly be the reason, then, for the decline in the pollinators?
Dr Connolly: There may be different major drivers.
Professor Potts: I think one of the really telling things is, as for many other components of biodiversity where we have had declines, the scientific community has actually managed to nail the drivers. The fact that there has been a lot of ongoing research and just now we are starting to pick it apart is quite indicative that there is probably more than one driver. Certainly, there is very good evidence that habitat loss, not only in the amount of habitat but whether that habitat is fragmented, and the general quality, so that might be in terms of falling resources and nesting opportunities for all pollinators, not just bumble bees but hoverflies and so on. Disentangling all those is difficult and we are just now starting to get the studies that are bringing together two and we have not even got to the stage of bringing together three. We have only done some pairs out of maybe the half dozen potential drivers of the losses that we are seeing. It is not surprising it is a tough one for the scientific community to crack, but we have very compelling evidence that certainly single drivers, as in habitat loss, are part of the story and potentially the combinations of habitat loss with potentially pesticides, potentially pathogens, could be a big part of the story as well.

Q242 Zac Goldsmith: I suppose that leads us to the next question. Given what we do know, given the scientific documents and research that already exists, do you think that if DEFRA was adhering to the precautionary principle it would at least put a moratorium if not a ban on neonicotinoids?
Dr Connolly: I would say that there is good evidence of clear negative impact on bees, so I guess the answer would be yes. But at the same time what would be the alternative, and that has to be weighed up in this answer. If the alternative is do not use them and, as Julian Little says, that it is a disaster for the crops, then that has to be weighed in. If the alternative is something like Fipronil—and we all know that is quite bad—which is worse? I prefer that we compared the chemical choices and made a choice.

Q243 Zac Goldsmith: Do you have a view as to whether or not such a moratorium or ban would lead to worse additional outcomes?
Dr Connolly: I don't know that the crops wouldn't do just fine, but then I am not an expert.
Professor Potts: In the short term a moratorium would have huge implications for farmer livelihoods, for food security. A moratorium obviously would be good for pure conservation reasons because there is no doubt that pesticides do cause harm. The question is, is that having a population level effect—is it actually meaning that populations are going down? Does that then feed into loss of pollination services both for crops and for wild flowers? Should there be a moratorium on conservation grounds alone? Probably; for the greater, wider issues, including food security and economics, probably no.

Q244 Caroline Lucas: Why are the two separate? Sorry, but why isn't food security connected to that wider point? It is not conservation over here and food security over there surely. Surely the two are connected.
Professor Potts: No, absolutely: clearly, they are interacting, and pollinators are part of the food security picture. They provide more than half a billion

to the UK economy agricultural sector every year. However, the instantaneous loss of effective chemical control is certainly going to reduce crop productivity unless other chemicals can be brought in very quickly and we do not know whether they will be as safe or less safe than the current regime. The productivity would go down and that would have consequences for the overall economics. It might in the short term help the pollinators but what we need, in my opinion, is a longer-term phased reduction in all pesticides, not just neonicotinoids, and increasing uptake of more IPM strategies, things like biocontrol, better crop management and so on. A lot of those tools are out there and if we are going to get co-benefits of good production, food security and good environmental quality, then we need to be a lot smarter about the way we intensively farm.

Q245 Mr Spencer: Some of those biotechnologies that are out there and available, are they licensed in the European Union or are they just available in other parts of the world?

Professor Potts: Can you be specific about the biotechnologies you are pointing to?

Mr Spencer: I am thinking that you talked about new technologies—I hesitate to use the word "GM" because it takes us in a direction I do not want to go in—that are available to us. There is a reluctance to license some of those technologies in the European Union when they seem to be available in other parts of the world. I wondered if it is realistic to say that we can use those technologies here if they are not licensed.

Professor Potts: There may be some additional cost to farming, so I am thinking along the lines of better dust control for neonic drilling and I think in Germany they have a more stringent set of criteria for what farmers have to do to reduce the dust. I am also thinking more about what I call soft biocontrol technologies, so capitalising on natural enemies, those natural predators of pests, and those are well established around the world. I think they are used in some systems in the UK, but I think we have a great potential to increasingly use those to try to reduce our reliance on synthetic inputs, which are going to increase in cost anyway because of energy costs and so on. It is going to be even more difficult for farmers to be able to afford to use all these treatments, so some sort of combination would probably be the way forward in the medium term.

Dr Connolly: Can I just say one thing on this? One thing that we should consider is: do we need to allow the pesticides to be used in gardens for recreational use? Apparently, golf courses use five times as much neonicotinoids than the farmers do—I got this information from *A Spring Without Bees* so I don't know if it is accurate or not—and that US householders put as much fertiliser on their lawns as the whole of India does to produce their crops. If we can take away pesticides from gardens, we create a nice nature reserve all over that would provide us a sink from which animals might be able to re-emerge. At the moment, if they are being poisoned everywhere, we do not have this opportunity. I don't know if Simon thinks that is—

Chair: I am very conscious of time.

Q246 Mr Spencer: You are going into an area where you are going to have to draw a line between what is a garden, what is an allotment, what is a smallholding and what is a farm. Could you draw that line for us?

Dr Connolly: I think that is your job, isn't it? I don't how to draw that line. That would be difficult.

Chair: All right, okay. Zac, have you finished?

Zac Goldsmith: Yes, thank you.

Chair: Okay, I am just going to ask Simon Wright, and then I think we will move very swiftly to our next session, if that is all right.

Q247 Simon Wright: Professor Potts, what in your view is the most accurate, useful way of measuring of the economic value brought by pollinators?

Professor Potts: There are multiple ways of valuing and there are lots of different figures floating around. I hope that I can try to clarify. I think there are three basic ways. The first way would be the direct contribution to UK agriculture. That is basically looking at how dependent some crops are on pollinators. If they are highly dependent, you know a proportion of that crop relies on pollination. Something like apples is almost 90%, whereas wheat would be zero. If you sum that all up for all the crops, the most recent published figure is £510 million per annum for 2009. The most recent unpublished is it has gone up to £603 million for 2010. There is a definite trend for increase because of more demand for biofuels, more demand for locally grown fruit and vegetables, which are very dependent on pollinators, and also there are new crops coming in, things like blueberries, which are very pollinator dependent. That would be the agricultural sector, but that is actually a very considerable underestimate because it does not take into account things like the contribution that pollinators make to forage crops like clovers that are very important for meat and cattle and dairying. It does not take into account ornamental flower growing. It does not take into account seeds. It does not take into account allotments and home-grown food, which have a value. We are talking £603 million per annum plus certainly some more. So that would be the agricultural sector.

A different way of valuing it is how does the public value pollinators in terms of their cultural value. That would be things like those iconic bits of nature like bumble bees. People like flowery gardens and they like to see flowery meadows. We did some work, and other people have done work as well, that would put the willingness to pay by the general public in the region of £1.3 billion to £1.8 billion per year. That is nothing to do with the agriculture. That is just valuing it because of its conservation, its aesthetic appeal. However, there is a big caveat with that. When you do this sort of research it is very easy in an interview or a survey to say, "I would pay so much per year to support pollinators because I believe in them". If you actually ask people to dip into their pocket, it is a very different matter. But that gives you an idea of the kind of figures we are talking about. It is even more than we estimate for agriculture alone.

Very quickly, the third valuation, which we do not have a figure for, is the fact that these wildflowers that pollinators are essential to maintain, contribute a lot to other, what we call ecosystem services. Having healthy plant communities in the UK means that we have healthy soils both in terms of fertility and its structural integrity. It helps with things indirectly like good quality water. These plants help purify some of the water. It also contributes to recreational and other kinds of services. Indirectly, pollinators make a huge contribution to these other ecosystem services, but to put a figure on that is just not possible. We do not have the data or the methods.

Q248 Simon Wright: How close are we to having the methods that we would need to inform a market-based approach that would capture the cost of the detrimental impact of pesticides and also reward choices that favour pollinators?

Professor Potts: That would be going along the lines of "the polluter pays" where we would need to quantify the impact of insecticides and then come up with what is the potential financial loss of a particular pesticide—in theory, that would be exceptionally doable. In terms of the datasets and the methods, I think we are a long way off that. It is something much discussed in Europe at the moment. It goes along with the payment for ecosystem services, which is something that is very much on the horizon for the UK as well. The problem is we have not quantified three steps. Exactly how much do pesticides impact on pollinators? How much do pollinators then deliver or reduce the amount of pollination they do? Then how much does that pollination impact on the economics? We are quite fuzzy on the last two, and we are only just starting to make headway on the first. It is a great idea in theory, but I think we are quite a long way off being able to do that, except for having a very simple tax or something equivalent to a tax on pesticides where it would go into a communal pot, but that is also probably not a good fiscal instrument. I cannot imagine many people buying into that.

Chair: There we must leave it. Thank you all very much for coming along this afternoon. We shall look very carefully when we get the written evidence of what you have provided to us this afternoon. Thank you very much indeed. We would like to invite our next witness to come forward.

Examination of Witness

Witness: **Georgina Downs**, UK Pesticides Campaign, gave evidence.

Q249 Zac Goldsmith: Do you want me to get going with the first question? We have so little time before the vote, if there is a vote, so I am going to be very rapid here and ask you to be as quick as you can in your answer. I am really sorry about that, but time is not on our side. In the evidence that you provided to the Committee, you said, "Pesticides can cause a wide range of both acute and chronic adverse health effects." Can you briefly give us what hard evidence you have that pesticides have and do cause a wide range of adverse health effects?

Georgina Downs: Yes. Can I just clarify with the Chair first of all what happens? Do people go off to vote and then come back, or is it literally I have got three minutes?

Q250 Chair: No, we are expecting a vote in the House of Commons soon. What we are hoping is that we will be able to have sufficient time for the minimum of questions that we have and to try to establish that we will be able to have a quorum if we then have to come back after the vote. At this stage, let us assume that we perhaps have a good 10 minutes and then we will see where we are, if that is okay.

Georgina Downs: Okay. I think it is easiest to go through the acute and chronic effects separately. To start with acute effects, these are adverse effects that occur shortly after exposure. They can be local at the site of contact or systemic effects. I detailed at paragraph 2.15 in the written evidence the acute adverse health effects in residents and other members of the public that are recorded annually in the Government's own monitoring system as a result of exposure to agricultural pesticides in crop spraying. I won't have time to go through them all, but just to list a few, there are chemical burns including to the eyes and the skin; rashes; blistering; throat problems including damaged vocal chords; sinus pain; respiratory irritation; breathing problems; asthma attacks; and then headaches, dizziness, nausea, vomiting, stomach pains and so on. I reiterate that these are acute effects from the Government's own monitoring system, although it should be noted that the current system involves a very significant degree of under-reporting. For the last 11 years the campaign I run has received many reports of the exact same types of acute effects in residents and also children attending schools near sprayed fields as well. Just to point out about acute effects, the correlation between acute effects and exposure is usually quite straightforward because the manufacturers' own safety datasheets can have the listing for those types of effects, both the local and systemic effects.

In relation to chronic adverse health effects, there has now been over 60 years of scientific and medical evidence showing pesticides associated with a wide range of chronic adverse effects on human health. And just to give a couple of brief examples of such studies, one reputable study published in March 2009 found that exposure to just two pesticides within 500 metres of residents' homes increased the risk of Parkinson's disease by 75%. Another study—

Q251 Zac Goldsmith: Which were the chemicals?

Georgina Downs: Paraquat was one. I think Maneb was the other, but I can check that and get back to you. I think it was Paraquat and Maneb. Another study that involved nearly 700 Californian women showed that living within a mile of farms where certain pesticides are sprayed during critical weeks in

pregnancy increased by up to 120% the chance of losing the baby through birth defects. In fact, a comprehensive pesticides literature review from Canada in 2004 on the chronic effects of pesticide exposure reviewed at that time over 250 in-depth studies from around the world and found consistent evidence linking pesticide exposure to brain, kidney, prostate and pancreatic cancer, as well as leukaemia, non-Hodgkin's lymphoma, neurological damage, which is usually irreversible, Parkinson's disease and other serious illnesses and diseases. The review also found critically that children are particularly vulnerable to the effects of pesticide exposure and identified increased risks for a number of illnesses and diseases, including kidney cancer and acute leukaemia. It is important to point out that over the last 11 years the campaign that I run has received many, many reports of such illnesses and diseases in residents living in the locality of sprayed fields. Again, just the same as acute effects, in a number of these reports the individuals involved do have confirmation from either their doctor or other medical professional that the chronic effects are caused by pesticides, especially when the chronic effects are related to irreversible neurological damage and injury. If I could just make one more point on this question—

Chair: You have about eight more minutes.

Georgina Downs: Just one final point on it is that, as pointed out in the written evidence, the Government has repeatedly failed to take action when faced with, including in its own monitoring system in relation to acute effects—there is no monitoring system as such regarding chronic—they have failed to act on the evidence of harm as well as the risk of harm to human health from crop spraying under the current policy and approvals regime, yet European legislation requires that pesticides can only be authorised for use if it has been established that there will be no immediate or delayed harmful effect on human health. It also requires a proactive approach to reviewing authorisations after approval, including that authorisation shall be cancelled and pesticides prohibited where there is a risk of harm to human health. It is based on the risk. It does not even need to be that you have been damaged first. It is based on the risk of harm.

Q252 Mr Spencer: If any of that was true, surely anecdotally farmers' children and farm operators, that demographic, would demonstrate an enormous increase in those conditions.

Georgina Downs: Well, actually, going back to the British Medical Association report in 1990, that actually highlighted quite a lot of different studies back then, and this is going way back to that time, of different cancers, lymphomas and leukaemia in farming and operators. That is from the British Medical Association's own report. I should also point out I don't just get reports in the campaign of residents and other members of the public. Farmers, sprayers, ex-sprayers, ex-farm managers also contact the campaign with chronic health problems as well, particularly neurological problems and cancers.

Q253 Zac Goldsmith: Has there ever been a study into the health of farmers?

Georgina Downs: Oh, yes, there have been loads.

Q254 Zac Goldsmith: That would make the point that Mark Spencer has just—

Georgina Downs: Yes, there have. The British Medical Association's report highlighted all the various different studies at that time, and that was 20 years ago. There has been a load more since then, and I can obviously provide the Committee with information on that after the session.

Q255 Zac Goldsmith: We have heard from a number of different sources that if systemic neonicotinoid pesticides were removed, were banned, in the UK that one outcome could be that farmers would opt for older and worse chemicals as a replacement. First of all, do you accept that and, secondly, do you believe that that would, therefore, represent a regressive step?

Georgina Downs: The first point to make is that the use of systemic neonicotinoid pesticides seed treatment does not currently preclude the spraying of other insecticides on such crops. Therefore, other insecticides are still being sprayed. In any event, the reality of crop spraying in the countryside is that there are already innumerable mixtures of pesticides being applied to crops, and not only insecticides but fungicides, herbicides and other agricultural chemicals, on a regular basis year after year. As I pointed out in the written evidence, approximately 80% of pesticides used in the UK per year is related to agricultural use. Therefore, in answer to the question, the campaign I run, the UK Pesticides Campaign, supports a ban on neonicotinoids but I would stress the fact that the problems with pesticides in general is obviously much wider, especially considering the risks of acute and chronic adverse impacts on human health from the innumerable mixtures of pesticides currently used in agriculture. Therefore, it is a complete paradigm shift that is needed to shift policy away from the dependence on using pesticides altogether to the utilisation and prioritisation of non-chemical methods. No toxic chemicals that have related risks and adverse impacts for any species, whether it is humans, bees or other, should be used to grow food.

Zac Goldsmith: Okay, we should move on.

Q256 Caroline Lucas: On the risk assessment, do you think the current risk assessment process for pesticides is sufficiently transparent?

Georgina Downs: Obviously, it is not just a case of whether it is transparent, but whether it is adequate. I know that others have commented on the non-transparency side so I would like to very briefly focus on the complete inadequacy of the Government's current approach to exposure and risk assessment regarding human health. I have briefly detailed in the written evidence how the Government's current short-term bystander model does not and cannot in any way cover the exposure scenario of residents who live—and the bell is ringing.

Zac Goldsmith: It is not our bell.

Georgina Downs: It is not? Okay. It cannot cover residents living in the locality of sprayed fields as residents' exposure is chronic, it is cumulative, it is to mixtures of different pesticides, all the different exposure factors involved in the air, in precipitation, immediate drift, volatilisation, and the exposure for residents can go on for decades, like my own situation that is nearly 30 years now. The fact is that the Government has been approving pesticides for years without having assessed the exposures and risks specifically for residents living in the locality to sprayed fields and which the Government is required to do under the European legislation. This includes the astonishing fact that there is currently no assessment at all for babies that are near sprayed fields, for children that are near sprayed fields, for pregnant women and for other vulnerable groups. Considering how many millions will be living in that situation, that is an extraordinary situation. The absence of any risk assessment for residents means that pesticides should never have been approved for use in the first place for spraying in the locality of residents' homes, schools, children's playgrounds, nurseries and other areas.

Also, very, very briefly I will highlight the fact that in the written evidence I highlighted that the regulators previously failed to act on their own findings of 82 exceedances of the EU limit set for exposure, which is called the AOEL for short. In some cases, the AOEL was exceeded by up to 20 to 30 times over, which is an order of magnitude higher. In one case, based on the regulator's own figures, there would have been an exceedance of 95 times above the AOEL at three metres from the sprayer, which would have been well over 100 times at one metre and, of course, obviously some residents' homes and gardens are a metre or less away from where the sprayer would pass. Just to point out that this product that found this 95 times exceedance, calculating on the regulator's own figures, is a product that is still approved in the UK until 2021. No action was taken in relation to those findings, and yet under EU legislation any exceedance of the AOEL, even by one time over, is supposed to lead to immediate action of authorisations being refused or trigger revocation if already approved. [*Interruption.*]

Q257 Chair: I am afraid that we do have a Division now in the Commons.

Georgina Downs: Shall I wait?

Chair: I am afraid that in terms of getting a quorum it is going to be difficult because of the timing, but can I just say to you that we have the written evidence that you have provided us with, and that is part of the hearing. I think that in the interest of time we are just going to have to bring our session to a close this afternoon.

Wednesday 12 December 2012

Members present:

Joan Walley (Chair)

Peter Aldous	Caroline Nokes
Martin Caton	Dr Matthew Offord
Zac Goldsmith	Mr Mark Spencer
Mark Lazarowicz	Dr Alan Whitehead
Caroline Lucas	Simon Wright

Examination of Witnesses

Witnesses: **Professor Colin Brown**, Member, Advisory Committee on Pesticides, **Professor Peter Matthiessen**, Member, Advisory Committee on Pesticides, **Professor Richard Shore**, Member, Advisory Committee on Pesticides, and **Dr Bill Parker**, Member, Advisory Committee on Pesticides, gave evidence.

Q258 Chair: I would like to welcome you to this afternoon's session of our Environmental Audit Select Committee inquiry. Before we commence our proceedings, on behalf of the whole Committee, I would like to express our condolences on the recent death—I think it was in the summer—of the Chair of the Advisory Committee, Professor Gabrielle Hawksworth. I would like to put that on the record.
I would like to get straight into the guts of the questioning we have on behalf of the Committee this afternoon, and ask each of you a series of questions about the independence of the ACP. Could each of you tell me whether, in your view, it is possible to develop sufficient expertise to advise the Government on pesticides, without having worked in or for the agrochemicals industry? I do not know who wants to begin.
Professor Shore: Perhaps if I start. Could I just confirm you are talking about the level of the individual rather than the expertise of the committee as a whole?
Chair: The individual members, yes.
Professor Shore: For many of us, the route into our expertise has been research. We have usually gone through a PhD level and then done post-doctoral work, and we may be working for universities or research centres or other such organisations. The emphasis for research, particularly, and the ever-growing emphasis now, is on carrying out research with impact: what does it really mean, rather than just being scientifically interesting? The members of the committee are all engaged in that kind of work, so they are working on real day scientific questions that have relevance. Obviously, with the expertise on the committee, those questions often tend to be around issues of environmental fate behaviour or impacts of pesticides or other similar kinds of chemicals.

Q259 Chair: Is it possible to do your role without having worked for the agrochemicals industry?
Professor Shore: I would say so, because what we are looking at is assessing the environmental fate and behaviour and the effects of these compounds on the environment, which is akin to the work we do as research.

Q260 Chair: Assessing the environmental behaviour is an important component?
Professor Shore: Of the ACP? Yes, absolutely, the fate and behaviour; the effects as well.
Chair: Does anyone else wish to comment, and could I ask you to speak up, please, because the acoustics are very bad in here?
Dr Parker: Yes. I have probably come via a slightly different route to my colleagues who are academics. I have come more from working in the applied research and consultancy area of agriculture and horticulture. I have spent most of my career working for an organisation that prided itself on its independence. Yes, we did work for the agrochemical industry, but we were largely used by them because we were known to be independent. So we have jealously guarded our independence in that regard.

Q261 Chair: Does anyone else wish to comment?
Professor Matthiessen: Like Richard, I come from a research background. I have been researching the effects of chemicals on wildlife since about 1970, working for a series of Government research organisations. Although I am now a consultant, I do not do consultancy work for pesticide companies so I consider that the experience I have gained—just like Richard—basically covers the ground.
Chair: Professor Brown?
Professor Brown: No, there is no reason why we cannot develop the expertise without working for the industry. That is not a pre-requisite.

Q262 Chair: I would like to ask each of you—and you have your current declarations of interest, they are in the public domain—very briefly, for the record, whether you have previously been employed by or connected with the agrochemicals industry. Professor Matthiessen?
Professor Matthiessen: I have done a few extremely brief reviews of data for the chemical industry over the years, not in the last five years, but, from time to time, I have been asked to look at a piece of data and give my opinion as to its scientific value.
Professor Brown: I have undertaken research on behalf of the agrochemical industry previously.

Q263 Chair: Which particular companies?
Professor Brown: There would be several. Syngenta would be one, Bayer, Dow, Monsanto, primarily in my previous role at Cranfield University.

Chair: Thank you. Professor Shore?
Professor Shore: My interests in that respect are to do with biocides rather than the agrochemical industry. I carry out some work and have declaration of interests in relation to a range of biocides, and some of that work is supported by industry.
Dr Parker: I have never worked as an employee of the agrochemical industry. Like the others, I have certainly done contract work on behalf of some of the agrochemical industry but not in my current role.

Q264 Chair: Thank you. I want to try and get a sense of the independence and the need to have expertise. I noted in the evidence that you made great play of the fact that one of your members left the room at a recent ACP meeting on neonicotinoids and bees, because they had an external interest in the topic. I presume that person was an expert on neonicotinoids. I wonder how you cope without that expertise and how important the whole area of expertise is in terms of the work that you do.
Professor Brown: That person's expertise is in consumer risk assessment, so it was not directly relevant to the discussion we were having. However, because she had worked with this class of compounds, and with the specific compound that we were discussing, she was asked to leave the room, but the expertise was not central to that discussion.
Chair: Thank you.

Q265 Simon Wright: Your written evidence states that the standard regulatory package defined at EU level for neonicotinoids "have proved to be acceptable"—your words. In the next sentence you point out though that, "The standard requirements do not include some of the specific sub-lethal effects suggested by recent academic studies". Do you accept that the sub-lethal effects identified—for example, in the Gill study—would have a significant impact on bees if they were replicated in the field?
Professor Matthiessen: I will take that one. Yes, they could indeed have significance if replicated in the field. In my opinion, clearly, there are shortcomings in the standard regulatory data set that we see. At the moment there is only an acute study. That means a measure of lethality with bees. Between that and field studies, at the moment we do not have anything. First, there seems to me to be a need—and this has been identified by the ACP—to develop a standardised international guideline for studying chronic toxicity in bees; this is lab studies as opposed to field studies. That will probably take a number of years to develop because it has to be agreed internationally, but there is a need for a chronic study. That is undoubtedly a gap. Another gap, with the benefit of 20/20 hindsight, is that up until now we have focused solely on honeybees. That is a significant issue. It is not unreasonable—in our defence, I suppose—to say that it would be reasonable to extrapolate from honeybees to other bees but, in the light of some of the data that has been published relatively recently, that assumption may not be correct. We are not sure if it is or is not yet, but it would seem at least possible that we need to see data on bees other than honeybees in the future. That perception has been endorsed by the European Food Safety Authority, EFSA, which is the body responsible for co-ordinating the European hazard assessment of pesticides. They have developed new draft guidance on this very issue that recommends that, in the future, not only should there be testing on honeybees but also testing on solitary bees and bumblebees.

Q266 Simon Wright: Going back to the original question, failure to capture sub-lethal effects. That is not acceptable, is it?
Professor Matthiessen: I agree that there should be a test that looks at sub-lethal effects, but—and this is a very big but—most of the substances that are licensed for use on flowering crops, because of the potential risk to bees, are subjected to field trials. In fact all the big three neonicotinoids have been subjected to extensive field trials. Those field trials look at both lethality and sub-lethality, so they look at issues such as growth and behaviour of bees in the field. Once you get to the stage of field testing, if you do not see effects there you can be reasonably confident that you are not going to have problems. The problem that arises is, if you have an acute test that suggests that there is no further issue to investigate, and you do not go on to do a chronic test and do not do a field trial, you may miss something. That is why the new system will hopefully plug that gap. As I said, the three big neonicotinoids, currently in use on oilseed rape in Britain, have all been subjected to extensive field trials that showed no biologically significant effects.

Q267 Simon Wright: You have mentioned one way in which the standard EU regulatory package might be considered too narrow, covering only honeybees. We have also heard from others giving evidence that it is narrow, in that it does not encompass pharmacology or neuroscience. How do you respond to those criticisms, and what cost implications might there be if we were to look at more pollinator species and other disciplines, such as neuroscience and pharmacology, as part of the approvals process?
Professor Matthiessen: Clearly, science being an open subject, you could potentially study anything at vast expense. I think we have to focus on the issues that we consider to be of greatest importance. Ultimately, with regard to bees, you are talking about the ability of that colony to reproduce itself, to grow, and to produce adequate amounts of honey. So providing those key, what we call, apical effects are covered. In my view, there is probably no need to go into certain areas such as nerve function. There are many things you could study but, in our view, it is the apical effects of pesticides that we need to know about. The bottom line is whether reproduction growth and honey production are affected or not.
The costs are considerable. Clearly, we cannot go out into the environment and test all species. That is impossible—impractical, too expensive etc—so the whole of ecotoxicology is founded on the ability to extrapolate from a relatively small data set of toxicity data to the whole environment. That is quite a big ask, but that is what is done.

Q268 Chair: Could I go back to what you were just saying about neuroscience? Surely that is important, given how neonicotinoids work. What weight is given to that?

Professor Matthiessen: Specific measurement of neural function could be done, yes, but the bottom line has to be: how does that feed through into these apical effects that really matter to the bees and really matter to us—things like growth and reproduction?

Professor Brown: Sorry, could I just clarify?

Chair: Of course you can.

Professor Brown: Is that a broader question, because obviously in the human toxicology assessment that would be very different? Is that a broad question or is it about—

Chair: No, we are just talking about bees.

Professor Brown: Thank you.

Professor Matthiessen: Yes. You could use things like neurotoxicity to give you a heads-up about sub-lethal effects long before any of these other apical effects occurred. You could do that. That is done in human beings, because in human beings what we are concerned about is protecting the individual, so you would want to use very sensitive biomarkers of that nature when you are dealing with the risks to human beings. However, when we are talking about the risks to wildlife, it is a different paradigm. What we are trying to do there is not protect the individual. Internationally, what we are doing is trying to protect the population effectively.

Chair: Thank you.

Q269 Peter Aldous: By way of introduction, I am a partner in an arable and livestock farm in Suffolk. In your advice to Ministers on the Gill study, you highlighted the need to establish, and I will quote, "Whether there have been any impacts on UK bee populations". Does the ACP think it needs to measure a damaging outcome before you are prepared to advise on action?

Professor Shore: One of the things we asked was whether there was any evidence of a link between bee population numbers and neonicotinoid use. That would be one of the strands of evidence that we would look to examine, if those data were available. In fact, there was discussion at the ACP about how those kinds of data are quite difficult to gather and may not give you a very clear signal. When we talked about our approach to looking at the evidence currently with these compounds, we have three strands of evidence. We have been reviewing the new studies that have come out in 2012, which has given us new insights into how these compounds may affect bumblebees, rather than just honeybees, and also their mechanism of action by which they could have an effect on the whole colony level. That is telling us more about hazard.

The absolute crunch piece of evidence is whether the exposure of bees in the fields is at the same level as those effects we have seen in laboratory studies, where in those laboratory studies, the mechanism of exposure is not by the bees going out foraging normally in the fields. That is the key piece of evidence that we would put more weight on. If we also had evidence at a population level, that would be very significant indeed. That was not the main strand that we were looking at, but we would like to see if there is any evidence of such effects.

Q270 Peter Aldous: Your written evidence states that recent academic research, and I quote, "Has not established convincingly that the exposures employed experimentally are likely to occur in nature". Based on that, do you have a particular reason to think that the Gill, Henry and Whitehorn studies used unrealistic doses of neonicotinoids?

Professor Shore: This comes back to the point I was making previously: that the mechanism by which those bees are being exposed is not particularly realistic. They are exposed to an artificial system. They are not necessarily going out foraging across a range of crops, so the dosing that they may be getting may be more consistent than would occur normally in the field. This issue around the real level of exposure is the real critical piece of evidence, and that is what the ACP have asked to see evidence for. There is a study going on at the moment. We have asked the reporting of that to come as early as possible, and we are expecting that in January. That will give us better scientific evidence to benchmark what is happening in a field exposure against the studies that Gill, Whitehorn and the others have done.

Professor Matthiessen: It should be added that, make no mistake, we consider those three studies to have been well conducted. They represent good science.

Q271 Chair: Sorry, which field studies?

Professor Matthiessen: The study by Gill et al, by Whitehorn et al and by Henry et al. Those three studies published this year we consider to be sound science. The only question in our minds is whether the dosing levels were completely realistic and that has been followed up, as Richard said, in the Defra-funded field study that is now in progress.

Q272 Peter Aldous: You would agree then that such peer reviewed studies, which are repeatable in laboratories, are a building block of scientific method, and a sound basis for action in this case?

Professor Matthiessen: They certainly justify the field research that is currently being generated, yes. As you say, they are a building block and they are part of the weight of evidence that will eventually be used to make a firm decision about this group of substances.

Professor Brown: Could I add to the questions we have about the dosing? In each case the dosing occurred via sucrose solution. The bees feeding off the sucrose solution dosed at a certain level, and in each case that is an artificial construct to get a dose to the bee, which is absolutely fine from a scientific perspective. The question is how that relates to the field, and there are specific questions. For example, in the Whitehorn study—was it Whitehorn or Henry?—the dosing occurred over an hour and they tried to give a daily dose. One dose was too short. They gave a high dose over a short period, and you can imagine drinking a bottle of wine in an hour versus a day would give you different effects on your state of

being. The others have tended to use doses that are at the top end of the field measurements. So again, we have questions about how those relate to field behaviour where the bees will forage off a number of different sources. That is what we see as the key uncertainty, but we absolutely agree that the fundamental science raises serious concerns.

Professor Shore: That is why those studies are brought back to ACP. As they appear, they come back and generate discussion. The questions around those discussions: does that change the advice or the recommendations we might want to make? Does that change our understanding of what the real risk is? That is a continual process. As new evidence comes out, those studies are brought to ACP.

Q273 Caroline Lucas: How do you consider how much uncertainty is required before you might invoke a precautionary approach, and perhaps in that case have said, "Let us have a moratorium until we are clear about this"?

Professor Shore: Again, it comes back to where we ended up with our discussion. This is quite a good example to draw. These new studies moved us to a better understanding. As Colin said, they showed the mechanisms at levels probably at the top end of the field rates, potentially, but also how those effects could occur and the mechanisms by which they then affected the whole colony and productivity. It gave us a much clearer understanding that these colony effects could occur.

The issue then was is there evidence that they are likely to occur in the field? What do we know about that? What is the real exposure happening in the field? That is the data gap: the regulatory package that had field studies that gave no indication of these effects or these real field studies where the foraging is natural. So we have a gap. We can see this evidence from the laboratory or semi-laboratory studies. The field studies did not give us that indication and the key question is: what is the real exposure? Can we get better data on that, and can we do that in a short period of time? That is what we are requesting and that is the key piece of evidence.

Professor Brown: I wonder if it would be helpful to draw an analogy of a previous instance for the ACP, which was in 2007 when we considered isoproturon. Isoproturon is a herbicide. It was the most used compound in the UK at the time, and we recommended to Ministers that it be withdrawn from the market. That was based on strong evidence for the safe levels, in terms of exposure that would cause environmental issues, plus field measurements that demonstrated that those exposures were happening in reality. We did not need to see evidence of degradations from an aquatic issue at the time; we did not need to see evidence of degradation of the aquatic environment. The fact that we measured concentrations that we considered to be unsafe, from an ecological perspective, those were the two pieces of evidence that we needed.

Professor Matthiessen: The clincher was that we also did see some field data that showed that plants in the aquatic environment were in fact being damaged. Those three areas were the final clinching argument; the final weight of evidence that there was enough evidence available to withdraw the substance from the market.

Q274 Zac Goldsmith: Very simply speaking, given that there is a gap between the results of the field studies and the results of the laboratory studies, what can and does the ACP do specifically to ensure that that gap is closed as quickly as possible? What actions will the committee take?

Professor Matthiessen: As I mentioned earlier, we have certainly made recommendations that there is a need for a chronic bee study. As a committee, we cannot generate such a study. That is the province of the OECD in Paris. They are responsible for developing test guidelines.

Q275 Zac Goldsmith: What has been the reaction to your recommendation?

Professor Matthiessen: I do not know.

Q276 Chair: Whose job would it be to follow that up to find out what their response was?

Professor Matthiessen: That would be CRD in York's responsibility.

Professor Brown: There are responses on two levels. One response is very specifically to the data that we had in July, which was the Whitehorn and Henry papers, and that response was that we needed to generate information. We think the gap is that the field studies do not assess disorientation very well. To get a high level of exposure to the bees, they place the hives very close to the treated crop. That means that the bees do not have to travel a long distance to forage. If a bee is foraging over longer distances and is disorientated, the field studies would not pick that up. We recommended—and Defra had already picked this up and instigated the work by the time we discussed it—a field study to look at that. That is the data that we are waiting for.

Zac Goldsmith: That is now happening?

Professor Brown: That is happening, and it is just being analysed. We expect that at the start of January and then we will reconvene to discuss that.

Q277 Zac Goldsmith: That is work that is being conducted and funded by Defra?

Professor Matthiessen: It is, yes.

Q278 Zac Goldsmith: Going back to my original question, your recommendation was that there were other questions that needed to be asked and answered. That has been delegated to the CRD. It will be for them to respond?

Professor Matthiessen: My response was a general response about the effects in bees in general, whereas Colin has dealt with the specific one about neonicotinoids.

Q279 Zac Goldsmith: You do not know what the CRD response has been yet to your recommendation?

Professor Matthiessen: I do not know, no.

Professor Brown: We do, sorry—I only got half of my answer in. The second part is to look at the risk assessment, which is a slower process. This study was put in more or less as an emergency requirement and rushed through the system. So that is happening and will report. There is then a slower process of assimilating new scientific information, which re-evaluates the risk assessment and considers whether we are collecting sufficient data. That has to go through the European Food Safety Authority, and that has already happened. They have recommended where that should go, and that has been out for consultation.

Q280 Caroline Lucas: I would love to know if, in your deliberations around that, there was any discussion by any member of the ACP about whether a moratorium would have been an appropriate measure at that point, given that the gap between field trials and laboratory trials sounds like quite an important gap and given that countries like France had already gone ahead and implemented some kind of moratorium. Did anybody raise that at your ACP meeting?

Professor Brown: Of course it was discussed. The scientific advice that came out of the scientific analysis in France and the UK was almost identical.

Q281 Caroline Lucas: Why was there a different judgment?

Professor Brown: There was a political decision in France that led to the moratorium. At the time we considered it in July, the advice we had was that the seed for sowing in that autumn was already in the system and that you would not be able to sow areas of oilseed rape if we withdrew. Given the doubt that we had, because remember there was a huge stack of evidence from well conducted field studies that looked at non-lethal end points that demonstrates that there are not these problems occurring.

Chair: We must move on.

Caroline Lucas: Sorry, this seems to be really crucial.

Chair: Go on then.

Q282 Caroline Lucas: In a sense, you are almost saying that, because the seed was ready to be planted, that was the reason that the political decision here was different from the one in France.

Professor Brown: No. It was not. Our understanding is that we will have what we consider to be on a scientific basis, the critical piece of information will be available in January.

Q283 Caroline Lucas: You did regard it as an emergency, which is why you fast-tracked it in order to get this extra bit of information.

Professor Brown: Absolutely. We take this very seriously.

Q284 Caroline Lucas: Therefore, given that it was such an emergency, I want to understand why there was a different political decision about whether to go for a moratorium here from that in France, when you said the evidence that you were looking at was much the same.

Professor Brown: I do not think I can answer that. That would be for the politicians.

Q285 Chair: Who was it referred to specifically?

Professor Brown: We made recommendations to the Minister.

Chair: The Minister of?

Professor Brown: Environment, Food and Rural Affairs.

Chair: Defra. Okay.

Q286 Mr Spencer: Can I draw Members' attention to my declaration of interest, particularly, that I am a farmer in Nottinghamshire?

We have heard that the suspension of neonicotinoids might lead to farmers using different chemicals, which could be more lethal to pollinators on a more regular basis. Is that the sort of advice you might give to Defra Ministers when discussing whether to approve these chemicals or not?

Dr Parker: I think that is heading my way. If I could preface by putting into context what the major areas of neonicotinoid uses are in the UK. If you look at the usage data, over 90% of the usage is seed treatments on cereals and on oilseed rape. It is about 50/50 between the two. Nothing is being sprayed on to crops. These are treatments that are applied to the seed, the seed is then planted. One of the principal routes of exposure then may be bees on the crop when it comes into flower the following year. You need to bear in mind that the major usage of neonics is seed treatments. It is not crops being sprayed with insecticides. When it comes to thinking about alternatives, because of the multitude of uses there are for neonicotinoids—not just on cereals and oilseed rape but on a range of minor crops—you have to consider what is proportionate, and you have to look at it on a case-by-case basis.

If you ask the bald question on, for example, cereals: are there alternatives? The simple answer is: there are, but—and there is quite a large but here—there are a number of complex interactions going on, and perhaps an example would help to illustrate. One of the major uses of neonics on cereals is to control aphids in autumn, greenfly, which transmit barley yellow dwarf virus. For many years, the mainstay of barley yellow dwarf virus control has been the use of pyrethroid insecticides, applied as sprays in the autumn to the cereal crop, and they have proved to be very effective. There is now—and this has only happened in the last two years—a developing problem with insecticide resistance to one of the two main aphid vectors of this particular virus. The most effective alternative is a neonicotinoid seed treatment. If you remove that neonicotinoid seed treatment, you do not have a particularly good alternative for controlling this particular virus. Is there a non-chemical alternative to control this particular virus? There is, but it involves sowing the crop late in the autumn so that it misses the aphid migration period. In an autumn like this, you are not going to get the crop in the ground basically. You get into these sorts of complex multi-level interactions when you start to think about whether there are alternatives or not.

Q287 Mr Spencer: Do you take that into account when you are giving Defra Ministers advice? Do you look at a neonicotinoid chemical, and say, "Minister, if you remove this, these are the implications"?
Dr Parker: We are bound to give that sort of level of detail, yes. I think we have to.

Q288 Mr Spencer: In your opinion, would it be worse to remove other chemicals that are available to us? Are they going to have a greater or a lesser impact on those pollinators?
Dr Parker: Again, it depends exactly which case you are looking at. If you take possibly a worst case scenario, which would be the removal of seed treatments from oilseed rape, the particular neonicotinoid treatments are again targeted at controlling pests in the autumn, but the potential impact on bees is due to bees feeding on the crop when it is flowering the following year. There are a whole series of oilseed rape pests that potentially need to be controlled during or around the flowering period. Again, there are alternatives, and again, some of those pests have pesticide resistance issues associated with them. Up to now the major alternatives have been pyrethroid insecticides, which are by far the biggest single group of insecticides used in the UK. They are acutely toxic to bees, but the way they have been used over the years indicates that if they are used correctly then the risk to bees, in terms of acute problems, is relatively low, otherwise they would never have been approved. We are in a swings and roundabouts situation. As I said, you do have to look at this on a case-by-case basis. It is not possible to take a blanket approach, because it does not give you the definition you need on particular problems.
Professor Matthiessen: You would also consider the wildlife implications of the alternatives. For example, synthetic pyrethroids are extremely toxic to aquatic life. Therefore, we would need to ensure that there were sufficient buffer zones, for example, around treated fields, so that spray drift did not carry into surface waters. We would have to look at the whole issue.
Chair: Thank you.

Q289 Caroline Lucas: We are interested in a specific example of imidacloprid, which as you know was re-approved for use in the EU in 2008, and we were hoping that we might have the benefit of your expert advice. I know that the Committee in advance of this meeting has sent to you pages 637 to 640 of Annex B8 of the 2006 Draft Assessment Report. Looking at those pages, do you think that it was reasonable for the regulatory authority in the member state—which was Germany—to conclude from those trials, as they did, that imidacloprid has no potential for accumulation in soil?
Professor Brown: It is not that it does not have any potential for accumulation in soil. It is a persistent compound. There are two distinct sets of evidence. There are laboratory experiments into persistence in soil, there are field experiments into persistence, and then there are accumulation trials. If we stick to the German accumulation trials, laboratory and field data all suggest that—are you okay with the word "half-life"?
Caroline Lucas: Yes.
Professor Brown: Okay. The half-life is somewhere between 100 and 300 days.

Q290 Caroline Lucas: What I want you to look at, though, is the table that we sent you that looks at the concentrations in Bury St Edmunds and in Wellesbourne.
Professor Brown: Yes. If you want me to specifically, first of all—

Q291 Caroline Lucas: What I want you to do is look at those two tables and tell me if you think that the conclusion, which the German authorities drew that there was no accumulation in the soil, is or is not correct. That is a fairly simple question.
Professor Brown: That is fine, but I need to go back to the first bit. Their conclusion is based on the other parts and assumes and concludes that levels will accumulate, but only to a minor extent. Clearly, something very different is happening in the UK. So there they derive half-lives that are just over 1,000 days, which is completely outside the current data set. I have not looked at the raw data. The ACP is allowed to look at raw data but I have not had to evaluate that information so far.

Q292 Caroline Lucas: Who at the ACP would be looking at that raw data?
Professor Brown: We would not do that. That was done by EFSA, so it would have been done by the rapporteur member state, which I think was Germany.

Q293 Caroline Lucas: It was Germany. But what I want to know is, from your expert advice looking at these graphs, those bar charts in figure B8.1, do they or do they not show that there is accumulation in the soil?
Professor Brown: What I think—
Caroline Lucas: I just want you to say "Yes" or "No".
Professor Brown: It is not a "Yes" or "No" answer. I can give you a "Yes" or "No" if you want, but it is slightly more complex than that, so I would rather give you what I think—

Q294 Caroline Lucas: The German authorities themselves said very clearly, they did not worry about subtlety, they said, "No potential for accumulation in soil". They were very, very clear and I am asking you—
Professor Brown: That is clearly an oversimplification for the UK. What is happening in the UK is that the compound is being taken up into the plants and the plants are being reincorporated. My intuition—and I do not have data for it—is that the residue then stays bound to plant material, and that breaks down very slowly, so what you do see is an accumulation in soil bound to plant material.

Q295 Caroline Lucas: Do you think that the graphs in that figure show evidence of plateauing? If you look at what you see there, would you call that plateauing?
Professor Brown: No, and that is the conclusion from EFSA as well, that they have not plateaued yet. They are getting close to plateauing but they have not plateaued yet.

Q296 Martin Caton: You have indicated in your written evidence that you think the European regulatory regime, as it applies to the Annex, is acceptable. But if we look at what happened in this case, as you have said, it was EFSA's job to look at it. What they said at the time, looking at the Draft Assessment Report for 2006, "At the two UK study sites accumulation occurred over the full six year duration of the studies and the experts considered that a plateau was not reached". They then concluded that, "Plateau not reached at the end of the study. Data gap identified". They then said, "The risk assessment to soil dwelling organisms cannot be finalised because the assessment of soil accumulation is not finalised". That was then referred to the EC Standing Committee on the Food Chain and Animal Health, which completely failed to pick up on that. Then it went to the Commission, which again failed to pick up on it. This is a gross failure, is it not? A gross failure of the system that you have told us is acceptable.
Professor Brown: I think the specific statement that you are giving us back referred to the bee risk assessment. We have not been asked to look at this piece of data; it has not been referred to the ACP. We can give you our scientific opinion, based on what we see now.

Q297 Martin Caton: I completely accept that this is not a failure at your level, but it is a failure of a system that you thought was working well. Does that give you cause to rethink?
Professor Brown: I would anticipate that you would need to go back and determine what was causing that behaviour at those two sites, yes.

Q298 Caroline Lucas: My question is on the same subject because I think what we are seeing here is a pattern, whereby the EU regulatory system is not working as well as it should. In the documents that we sent you, did you notice anything strange? The reason I ask is because this document, when it was first sent to us, had figures that simply do not match. When you look at the bar chart that we have been focusing on so far, figure B8.1–9, those figures are not the same figures that then appeared in the table. A simple schoolboy error was made of adding two columns together instead of averaging them. It seems very odd to us that you can still get this document in the public domain now with no addendum to it, nothing in this document saying that those figures are wrong. Originally, it looked like the amount of concentration and accumulation was even worse, and it is worrying that those figures are out there and no one seems to be correcting them. Then we found a second document that put the right figures, but even then, the scientific advice that we have received from some people suggests that that level of accumulation could be lethal. I wonder what your view is then if you focus on the bar chart rather than on the figures, because the bar chart is correct and the figures were wrong.
Professor Brown: I think there is a difference between the presence of a chemical and its bioavailability. What I would expect to happen out of that study is to understand where those residues are residing. My suspicion—without looking at the raw data and doing further work—is that the chemical is bound up with the plant material. That limits its availability for degradation, which is why it persists for so long. It also limits its availability for uptake into organisms for leaching into soil and so on. That would be my expectation, but you would need to do further work to determine that.

Q299 Caroline Lucas: Bayer CropScience told the Committee that imidacloprid had a half-life of between 16 and 200 days. What is your understanding of the half-life?
Professor Brown: From everything, apart from those two studies, I would put it higher than that. Somewhere in the range 100 to 300 looks like the data set that you can see, apart from those two studies.

Q300 Caroline Lucas: Because you know that EFSA is talking about looking at those two studies—
Professor Brown: Yes, the difference in that study is that it is a seed treatment. The compound is taken up into the plants and the plants are reincorporated and that difference causes greater persistence.

Q301 Caroline Lucas: The British trials also involved annual soil sampling, which took place just a number of days before the next year's seeds were drilled. Is that kind of timing normal?
Professor Brown: Yes. What they are looking for there is to understand how much has dissipated before the next addition of chemical into the soil, so that would be a standard part of the protocol and then you would take another sample immediately after the sowing.

Q302 Caroline Lucas: It has been put to us that other trials use average readings, which are taken during the course of the year, and if you have your trial just before the next planting, in a sense, you have chosen the time when it was most likely to yield the lowest possible figure.
Professor Brown: That is true, yes. I would normally expect that you would also take samples after the sowing, yes. It is not unusual to have a sampling just before.

Q303 Caroline Lucas: In conclusion, would you say that the European Draft Assessment Report that we have been talking about of these field trials, provides a sound foundation for the UK's approvals regime?
Professor Brown: Scientifically, I would say that they are open questions and if it came to the panel we would expect to look into those questions. Politically, we are not a political panel. We are a scientific

advisory panel, so I cannot give you a political answer to that question, but we would certainly ask questions if those data came to us.

Q304 Dr Whitehead: Could I try and clarify the issue that you raised concerning the reincorporation of residues by plant turnover in the soil? The suggestion from that is, conceivably, that practices in the UK, therefore, in terms of turning plants over in the soil, are different from those, say, in Germany, which you might then hold to be the explanation for the long persistence in the UK trials and apparently relatively shorter observed persistence elsewhere. Is there any evidence that there are different practices in different parts of Europe for returning plants to soil, or is it the same practice?

Professor Brown: You already have an artificial system in the Bury St Edmunds and Wellesbourne trials so, rather than removing the straw and reincorporating just the stubble, they have left the whole of the straw, chopped it and reincorporated it into the soil. It is not a real agronomic situation. In practice, that straw would not be reincorporated, so it creates an addition of residues that would not happen in practice.

Q305 Dr Whitehead: Never?

Dr Parker: Probably not never, but it is not common practice.

Q306 Zac Goldsmith: Just going back a couple of questions. Very simply, you have repeatedly emphasised that the difference between the policies here and in France are based on more or less the same evidence, the same data. You have repeatedly said that it is a political decision; that we need to ask the politicians. Are you subtly telling us that you think the political decision that has been taken in one of those countries is wrong, or do you remain neutral? I cannot work out whether you are telling us the French have it wrong politically or whether we did, but it would be useful to know what your view is.

Professor Brown: It is useful to clarify, because the advice in both cases stopped short of suggesting a moratorium. It expressed great concern, and some serious doubts, about whether these effects would occur in the field, and my understanding of the precautionary principle is that it asks for a proportionate response. The proportionate response that has been taken in the UK is to undertake some field work over a very short period that will come back and answer a very specific question. That is due back in January. That seems to me like an appropriate response. Obviously I cannot comment on French political decisions, or even UK political decisions, so I do not have an opinion on it.

Q307 Zac Goldsmith: Is there any research that we should be looking at with a view to having a genuinely informed and correct decision on this that we are not doing? Will the answers in January satisfy your curiosity as a board?

Professor Brown: Perhaps I might ask if Professor Matthiessen could talk about the epidemiology work.

Professor Matthiessen: Yes. One of the pieces of work that is in progress is being done by FERA up in York, which have been asked by CRD to look at the available data on bee populations—numbers of hives, etc.—and also see if they can correlate that with usage of neonicotinoids to see if there is any relationship between the two. It is an extremely difficult issue because of all the various confounding factors out there. Weather, bee disease and a number of other things, can confound the data, and the numbers of beekeepers, for example. All those considerations have to be taken into account when they are doing this. At the end of the day, we are not expecting to get absolutely crisp unequivocal information from that, but we hope it will tell us a bit more than we know now.

As far as we know at present, we have not seen any clear evidence of a relationship between neonicotinoid use and damage to bees in the field. For example, the Wildlife Incident Investigation Scheme, which regularly looks at bee kill incidents, analyses the bees for neonicotinoids and has never found any. There is some data already that suggests that perhaps there is not a link to neonicotinoids. But we anticipate getting better data in January, and that is one of the pieces of data that will be put into the weight of evidence to make the decision. But basically, yes, we believe all the studies in progress will be sufficient to help us make this decision in January.

Q308 Chair: Can I ask, what you just said, that you have possible reasons but none of it has really being checked out. Whose responsibility would it be to check out the basis on which the re-approval is then approved?

Professor Matthiessen: Sorry, I do not quite understand. Do you mean the epidemiology data?

Q309 Chair: Yes. What you said to us just now was that you have suppositions that are not based on the evidence. Who checks out the evidence, which was the basis for which there was then a re-approval on the database that was given?

Professor Brown: The ACP did. When the Whitehorn and Henry papers were referred to us, we did go back to the raw data regarding thiamethoxam and look at the field studies, because there was clearly a conflict between some field studies that look at sub-lethal end points and showed no effects of this compound, and then these data appearing in the literature. So we did go back to the raw data at that point, and that became a—

Q310 Chair: I am talking about the reassessment of imidacloprid.

Professor Brown: We have not gone back specifically. We have looked at the bee risk assessment for imidacloprid. We have not gone back—that would not mean we would go back and check the whole risk assessment.

Professor Matthiessen: After the Buglife report, we did look at some of the imidacloprid data.

Professor Brown: For bees, yes.

Q311 Mark Lazarowicz: A point of clarification about the data. You said you will get the data in January, does that mean making an assessment of the data in January, so we will know what the thinking is? When we know the thinking, will there be a period of assessment after that?
Professor Matthiessen: There will be an assessment in January. We hope very much that this will produce conclusive evidence one way or the other. If the conclusion is that the neonicotinoids are causing a problem, that information will come in before the autumn sowing season for oilseed rape. It will be too late to affect the spring sowing, but it would kick in with the autumn sowing.

Q312 Mark Lazarowicz: Just to be clear, when do you expect to make this decision—January, February, March?
Professor Matthiessen: I would anticipate that at the January meeting of the ACP—if all these data come together as we expect—we will be in a position to make a fairly clear decision.

Q313 Mark Lazarowicz: Will that decision be published at that stage, and indeed will the data be published?
Professor Matthiessen: Yes. All our proceedings are published.

Q314 Caroline Lucas: Two quick things. In terms of making a decision, does it come to a vote? I am sorry, I should know this but when you discuss, for example, a moratorium, would there be a vote of the members of the ACP?
Professor Matthiessen: In all my experience of the ACP, which is six years now, we have never, ever had to take a vote. It would not be like that. There would just be a minority and a majority view, I guess, but it has never happened.

Q315 Caroline Lucas: Going back to my question about the moratorium earlier, was there a minority view in favour of a moratorium?
Professor Matthiessen: No.
Professor Brown: No, it was a unanimous view.

Q316 Caroline Lucas: My last question, again going back to the Draft Assessment Report. It said that they thought that 50 parts per billion in the soil of imidacloprid was a rather low residue level. Would you agree with that, that 50 parts per billion was a rather low residue level?
Professor Brown: It is worth pointing out that that residue level is lower than the accumulation from soil applications in the German field studies. The German field study, with the shorter half-life, accumulates to 70/80 micrograms per kilogram. The UK, even with that very long half-life, accumulates to a lower level because the rates of application are so much lower with seed treatments. We would need to look at ecotoxicology in order to understand whether that was a safe level or not of soil dwelling organisms.

Q317 Martin Caton: On the question of the half-life, you have talked about the Bury St Edmunds and Wellesbourne research, but there is some international advice that seems to think that, in fact, even that is on the low side. The Canadian Pest Management Regulatory Agency, in a note said the dissipation time for imidacloprid is in the order of one to two years. German research, Hellpointner in 1994, talked about—this was in potatoes—a half-life of approximately two years. The US Environmental Protection Agency talks about a half-life of 7,000 days. There is a body of thought and evidence that suggests that perhaps the UK research was not way off the mark.
Professor Brown: It does very much depend. We could offer to come back with an opinion on that. It depends on the system. People will look, for example, at low temperature systems, anaerobic systems that have no micro-organisms in them, and all sorts of things. Without knowing the details of those studies, it is impossible to give an opinion.
Dr Parker: Just very quickly, if I may?
Chair: It must be very quick because we have our next set of witnesses waiting to come in.
Dr Parker: This is a very, very practical point, and that is that the use of imidacloprid in the UK is declining very rapidly indeed. It is being replaced by another neonic, clothianidin.
Chair: There we must leave it. Can I thank all four of you very much indeed? Thank you.

Examination of Witnesses

Witnesses: **Lord de Mauley**, Parliamentary Under-Secretary of State, Defra, **Professor Ian Boyd**, Chief Scientific Adviser, Defra, and **Dave Bench**, Director with responsibility for the Chemicals Regulation Directorate and Chief Scientist, Health and Safety Executive, gave evidence.

Q318 Chair: Minister, and the other two witnesses, I welcome you—I think for the first time—to our Environmental Audit Select Committee. I think you were here for some of the previous session, and I apologise for the slight delay in getting started. I am sure you understand this is an important inquiry for us. We are very pleased that you are here this afternoon.
We have been talking about the European regulatory regime, and we have all kinds of questions about whether it is fit-for-purpose and if we might have reassessments on a database that goes back to a regime that appears—to us at least—to have certain question marks about it. I wonder about the extent to which you and your scientific advisers think it is fit-for-purpose.
Lord de Mauley: Perhaps before I start, can I say that I am rapidly going to get out of my depth, in terms of technical things, so I hope you will be happy if I perhaps make an initial comment on some of your questions and then turn to my right or left for more detail?

Q319 Chair: I am happy to do that, but I think that you were here when our previous witnesses said that issues were put before the Defra Minister and perhaps there had not been any resolution, so I do not think we want to let you off the hook entirely.
Lord de Mauley: No. I am not asking for that, of course.
Chair: Thank you, but by all means please do.
Lord de Mauley: Can you ask me the specific question again, please?

Q320 Chair: Given that there seems to us to be important questions about how fit-for-purpose the European regulatory regime is, in terms of how imidacloprid was taken through its assessments and its reassessments, and the further work that is now being done by the Advisory Committee, my question to the Defra Minister is how fit-for-purpose is the European regime? Have you looked at that? Are you aware of issues? We want your view on how fit-for-purpose it is.
Lord de Mauley: Yes. We are constantly looking at it, and certainly any particular concerns we have we follow up. At the moment I am satisfied that the system is working adequately. Can I ask the Chief Scientific Adviser if he would like to add to that?

Q321 Chair: By all means, if the Chief Scientific Adviser would like to add, please do, Professor Boyd.
Professor Boyd: I think that we are always testing any regulatory regime for its fitness-for-purpose. From a scientific perspective, when one has to make scientific decisions, science is continually moving on, and in a cyclical process new information is being continually fed back into the regulatory regime. As a result of that, we always have to look again at whether the regulatory regime is doing the job, considering the science that is available. With regard to your specific question about the European regulatory regime, the situation is no different and so we also do that in the UK. The science is moving on. I think you have already heard a lot about the science of neonicotinoids, and we are gaining an immense amount of information all the time. We would like to see the regulatory regime adapt itself to that new scientific evidence. Science is always uncertain and, as we gain more certainty, we want to make sure the regulation is aligned to that certainty.

Q322 Chair: In terms of the previous questions that we have just been asking the Advisory authority, I think we shared with you certain questions that have been raised with us about the accumulation in the field studies, the extent of the half-life etc. We are interested in whether you have had a chance to look at that, and to comment to our Committee on whether, in the light of that, you do or you do not have concerns about the European regulatory regime.
Professor Boyd: I always have an open mind, and I know Defra always has an open mind about these sorts of things. So, yes, we do by definition.

Q323 Chair: But have you already?
Professor Boyd: Already had concerns? We continually have concerns about the regime. Given the evidence that you have already heard, we are continually making representations in Europe to move the regime on in a constructive way. We are continually faced with new kinds of evidence, and we have to be able to have a regime that takes that into account.

Q324 Chair: Does not what we have raised give you concern that the European system has failed to get a proper decision in terms of the regulatory regime?
Professor Boyd: I think "failed" is not the right word. The regime is continually reconsidering the evidence base, and this has to be evidence-based. Then a weight of evidence approach has to be taken, thereafter, as to what to do about it. If one person's opinion is that one should have taken a certain action, and another person's opinion is that there is another action to be taken, that depends on their view of how the evidence is weighted. That is what the Advisory Committee on Pesticides is there to do for us, it is there to advise us on that weight of evidence that exists out there, and it takes the European Regulatory Regime and the new evidence into account in doing that.

Q325 Chair: But the limits were exceeded, were they not?
Professor Boyd: The limits?
Chair: The decision was based on a set of limits that were exceeded.
Professor Boyd: Which decision specifically are you referring to?
Chair: The decision on imidacloprid.
Professor Boyd: In the European regime?
Chair: Yes.

Professor Boyd: I cannot comment specifically about the decisions of the European regime. What we are doing is making decisions here based on our regime, and trying to base those on evidence particularly.

Q326 Chair: My point is that, if the European regime is not fit-for-purpose, where does that leave UK decision-making?

Professor Boyd: Perhaps Dave could say something on that.

Dave Bench: Yes. Perhaps I should say that the decision on imidacloprid, and any other active substance, will be on the basis of the whole data package, so all the data, not just the ones that we have been talking about this afternoon. There will have been a consideration during that process, both by my experts in CRD, by the Advisory Committee on Pesticides—the membership in place at that particular point in time for imidacloprid—that will have preceded all the members that you have been talking to today because of the time at which it was done, so they will not have first-hand memory of those discussions.

I am talking on the basis of an active substance that would come through us and be considered by us as a rapporteur member state. If we dealt with that, we would consider all those issues in the round. If it is an active substance, where another member state is the rapporteur, we will get the chance to be involved at the point at which EFSA do their peer review process. So they look at it, they do their peer review and our experts get involved at that stage. The whole of the evidence base, at the point at which an active substance is considered, is taken into account and the respective end points—in this respect, the ecotoxicology will be of particular concern—those will be taken into effect at that point in time.

As Ian has said, regulatory science is always developing and we are consistently looking in the European process to see whether any of those requirements need to change. You have already heard about the way in which the bee risk assessment is in the process of being updated and revised. Indeed, there was a meeting in EFSA last week, which our experts attended, attempting to move that forward and gain some conclusions.

I would say that the process, as a whole, works on the basis of considering each active substance to the standards that are in place at the point in time that that consideration is done. Then we have a whole system of continuous review so that, over a 10-year period, each active substance will then come around again and be reconsidered in the light of any developments in the regulatory science at that point in time. So every single active substance on the market in the European Union has been reviewed, since the point at which a pan-European process was put in place in the early 1990s.

Q327 Caroline Lucas: It is precisely that process of review that I think we are pointing to some concerns about, because it is not as simple as saying, "There are a couple of people out there, and they do not agree and, therefore, we cannot quite decide what the issue is". We have the situation where EFSA itself had looked at the German review, the Draft Assessment Report in 2006, and said, "We cannot sign off this German report because it says very clearly that, contrary to what the German report said, the experts at EFSA consider that a plateau was not reached". In other words, soil accumulation was happening and, again, it says very clearly, "The risk assessment to soil dwelling organisms cannot be finalised because the assessment of soil accumulation is not finalised." So you have real concerns being expressed by EFSA and yet, when it comes to the European Commission, they are somehow able to sign it off simply saying, "There are no unacceptable effects on the environment", so there does not seem to be any consistency between what EFSA is saying, in other words, raising really big concerns here, and then the fact that it gets the green light and comes into force by the Commission.

Dave Bench: Essentially, at that part of the process, what you are looking at is the kind of distinction in the European process between EFSA taking a risk assessment view, and then the Commission taking a risk management view and asking whether it is possible to include the active substance on a positive list, and then handing it over to member states to consider individual product registrations. That is essentially the process that occurs. When they make that decision they then say, "Are there any issues?" and, in the case of most active substances, they will say something about whether there are any issues that member states should particularly take into account. For a number of these compounds, they have particularly mentioned that we should consider issues in relation to movement to ground water, for example, and that then is taken up as we do the product re-registration process on a national level.

Q328 Martin Caton: There is no evidence that the Commission ever had sight of or were aware of EFSA's recommendations about the inadequacy of the research. It was not a matter of them deciding, "We are not going to take a risk assessment approach. We will take a risk management approach". They just did not know that the research was incomplete and that more work needed to be done. You have said that, at the peer review stage with EFSA, that you get sight of the Draft Assessment Report. Were you aware of the inadequacy?

Chair: Minister?

Lord de Mauley: No. I am going to have to turn to Mr Bench here.

Dave Bench: I cannot say at that point in time because that goes back to 2005, so I would have to check out what was going on at that point. I cannot answer that here.

Q329 Chair: It is important for the record that we know whether anyone—either ACP or CRD—raised it with Defra, and that there were issues that needed to be looked at before the whole thing then was the basis on which future decision-making is made.

Caroline Lucas: Did they notice, as well, that the graphs on which they were making the decision were completely wrong, because the two columns had been added up instead of averaged? It does not give one

confidence in the robustness of the regime when so many errors appear to be happening.

Lord de Mauley: Can I ask, in that this was a while ago, whether we can look into it? I think it would be helpful, perhaps, if we wrote to you on that particular one.

Q330 Chair: Yes. We would be very pleased to receive a written response. Professor Boyd, do you want to come in?

Professor Boyd: Yes. Could I make a general point about the use of evidence? You have zeroed in on a particular item of evidence here. In making these sorts of decisions, quite rightly, a very broad range of evidence is used. In the particular circumstance you are talking about here, it is very possible for different regimes to make different decisions, based upon that evidence, because of different circumstances that they have to take into consideration. Different evidence can be weighted differently under those different regimes, and different items of evidence can be used under those different regimes. So to pull out one item of evidence and say, "The decision is wrong", based on that one item, is probably misrepresenting how the process works in weighing up evidence.

Q331 Chair: But presumably you would have concerns if one of the limits has been breached, particularly in relation to the half-life that was considered appropriate in environmental terms?

Professor Boyd: Absolutely. We have lots of concerns about neonicotinoids and that would just be one of them.

Q332 Dr Whitehead: I want to draw attention to the EU regulation that came out, after imidacloprid had initially been approved as an active substance within the EU under the directive. That regulation did a number of things, but two things are perhaps worthy of underlining. Firstly, the regulation specified that "any plant protection substance approved for use in the EU must have a half-life in soil of less than 120 days". Secondly, that regulation gave member states a power to reassess previously approved active substances if information of concern came the way of that member state, after the initial approval had taken place. Could you tell me generally, on the basis of that regulation, how many times Defra Ministers have exercised that power?

Professor Boyd: I cannot tell you.

Q333 Dr Whitehead: Do you know whether they ever have?

Professor Boyd: We need to come back to you on that.

Lord de Mauley: I am so new to the job that I do not know the answer, but we had better include that in our letter.

Dr Whitehead: Could you possibly write us a note about that?

Lord de Mauley: Of course.

Q334 Dr Whitehead: That would be excellent. I appreciate what is being said about homing in on particular aspects of wider issues, but in the light of the existence of that regulation, and the apparently enormously varying results in the UK of soil tests, i.e. a half-life of 10 times what is in the specification that the regulation had, would you consider, if that is information of concern, Minister, that that would be something that the UK ought, under the regulation, to bring in and reassess in the way that the regulation works?

Lord de Mauley: Clearly, that sort of thing should be and would be considered very carefully, yes. I do not know whether you have anything to add to that?

Professor Boyd: Like Lord de Mauley, I am fairly new to the job but one of the earliest things I did in my job was to ask the question about the soil half-life of neonicotinoids. I got a response along the lines of that, yes, there was some evidence indicating that soil half-life was rather longer than would be considered ideal, but that there is other evidence that suggests that some of the experiments that were done were not entirely applicable in the circumstances in which neonicotinoids are used. For example, the reincorporation of straw in the experiments into the soil in some cases, but also that it depended very much on environmental conditions.

As a result of that I was concerned, and I continue to be concerned, about the potential soil build-up of neonicotinoids because, if one was continually cropping a location, you could potentially continue to accumulate neonicotinoids in the soil. However, the evidence suggests that that does not happen, so at the end of the day what is important is what happens in reality, not what happens in theory. One could say that about some of the tests that have been done on bumblebees, for example, which are laboratory-based tests and, in a sense, are then projected theoretically into the field. It is the same with the soil accumulation issue. It is what really happens in those circumstances that is important.

Q335 Dr Whitehead: Yes, but I think you would accept that in these trials, these things actually happened under field trial circumstances. Once one had the data sorted out, the relationship of the data to the charts, and an assessment of whether the charts that were pasted over—the original research—were accurate, appeared to suggest that there was a continuing accumulation that was not plateauing in soil under real, non-laboratory conditions as far as the tests were concerned.

Professor Boyd: That is correct, but those studies were carried out under certain specific conditions that again do not replicate the reality of the field situation in normal circumstances in agriculture. Going back to the basic science, the science requires one to ask a question in a consistent way and, in this particular case and also in the case I mentioned about the effects on bumblebees, the question is not quite the right question. The question is: what are the soil concentrations in real fields in real circumstances?

Q336 Dr Whitehead: Bearing in mind that the only way you can enact exactly real circumstances is just to undertake life and not experiment on it, what is the point at which something becomes real enough to count as reality, as far as field trials are concerned?

Professor Boyd: What has to happen is that it provides an indication that there is an issue, and then you have to go and conduct studies in real situations that incorporate all the kind of variables that sit there, and get results back from that and make a judgment based on those results.

Q337 Dr Whitehead: I am sorry to dwell on this, but I think, for example, we heard earlier that the possibility, under apparently real circumstances, of the concentration under these two particular field trials related to the reincorporation of plant matter into the soil, which is fairly standard farming practice, whether it is stubble or a full plant. Because there is not stubble burning going on, the plants are reincorporated into the soil, are they not?
Professor Boyd: Stubble is reincorporated very regularly, but my understanding is that straw is not normally reincorporated.

Q338 Dr Whitehead: Yes, but it is the case that plants are reincorporated into the soil in the way that would suggest accumulation?
Professor Boyd: That is possible. Also, in some of these studies, what happened was that, for example, barley was grown year-on-year. Normally, you would have a rotation where you would have several years in between, so again it is not replicating a real situation on a farm, and what we need to do is be able to see it in those real situations.

Q339 Chair: Before we move on from this initial questioning, can I go back to when we were discussing with the Advisory Committee on Pesticides in relation to bio-crop science, where the actual rapporteur was Germany? I want to check whether you think it is appropriate for this assessment to be done by the European member state in which the business is based.
Lord de Mauley: I am so sorry could you be more specific about the question?
Chair: Yes. The case that we were discussing previously with the Advisory Committee on Pesticides related to bio-crop science, and the fact that the assessment, the DAR, was done by Germany, and Bayer, of course, is based in Germany. I wonder whether, as a general principle, Defra thinks it is right that these draft assessments should be done as part of the regulatory regime by the state in which the business resides.
Lord de Mauley: Yes. The studies that companies submit have to be conducted to internationally recognised guidelines. They must also carry out verified good laboratory practice and quality assurance certification, and there is also now a requirement for companies to include recent scientific peer-reviewed open literature in their dossiers. The dossiers are constructed around a pre-determined set of requirements. I think the principle, that those being regulated should carry the burden of generating the appropriate information needed for regulatory decision-making, is widely accepted and employed in regulatory systems around the world.

Q340 Chair: You do not think there is any conflict of interest in the rapporteur country's being the country in which the business is located?
Lord de Mauley: Do you want to comment on that?
Professor Boyd: Yes. As long as the process is one similar to the one we have here—and I have no reason to think it is not—in the sense that there is independence of the advisory process, and, as long as it is evidence-based, I cannot see a conflict in those circumstances.

Q341 Zac Goldsmith: We have already heard from the previous panel, the ACP, that there is an element of politics when it comes to decision-making. We have the example that we have already heard in relation to France, where the same set of data with the same results have led to two political decisions. Do you not think it is possible that there would be political contamination of the decision-making process, in the circumstances that have just been outlined by the Chair? There must be a risk.
Lord de Mauley: If there is, it would err on the side of caution. We have taken a decision, based on the advice from the ACP and the CRD, and we are absolutely confident in that decision.
Chair: We are about to move on to the precautionary principle.

Q342 Zac Goldsmith: Before we do that, I want to go back to a point you made earlier, Professor Boyd. You stressed that the Government has made representations to EFSA, and made all kinds of recommendations and suggestions as to how the system can generally be improved. You implied that the Government has been critical of the workings of EFSA. Can you give us a couple of examples of where there are particular problems with EFSA's approach that you have sought to improve?
Professor Boyd: Can I pass this one to Dave?
Dave Bench: I am not sure I would give you specific examples in relation to substances, but certainly the generality of the approach that EFSA takes is quite technocratic, and the way in which we interact with EFSA can sometimes be difficult to move the process forward and have some of the discussions that we think, perhaps, we would like to have at all times. We need to recognise that, in the way in which the system is set up, member states have a responsibility, when they are acting as rapporteur to do the initial assessment. In relation to the previous question, I would say that certainly I, and my teams in CRD, would offer no favour to any particular applicant, everybody would be treated equally and everything would be done on the basis of the evidence provided to us. When we get into the European process and we give our assessment to EFSA, and then that is opened up for peer assessment across all member states, it would be unrealistic for a rapporteur member state to take a position that was in favour of a particular applicant. That would simply be picked apart in the peer review process when other member states were involved.
In relation to the specific question about difficulties with EFSA, one of the areas where we have had some issues over a number of years is in the development

of guidance. We have the legislative base that sets the framework for how we work, but in actual fact there is an enormous amount of guidance in many specific areas that describe how regulatory authorities should deal with particular types of data. We think that the ways in which some of that guidance has been developed have essentially taken a technical focus in many areas, without thinking how you are going to answer the regulatory question. That, to me fundamentally in all areas, is: what is the level of protection to human health or the environment that we are trying to achieve, and how do we develop a position where we can be sure that we are achieving that level of protection?

Zac Goldsmith: Can I—

Chair: I am very conscious of time. Can we move on to the next set of questions, and if we have time we will come back at the end.

Zac Goldsmith: All right.

Q343 Martin Caton: The Defra document *Neonicotinoid insecticides and bees: The state of science and the regulatory response*, which you published in September, does not mention the words "precaution" or "precautionary" anywhere, whereas your evidence to this inquiry includes several paragraphs under that heading. What is Defra's position on the precautionary principle and has it changed?

Lord de Mauley: Let me be very clear that Defra fully accepts that the precautionary principle applies to decisions on the regulation of pesticides. In making decisions about neonicotinoids, it must be accepted that these are insecticides and carry a risk to non-target insects. The regulatory regime requires that authorised insecticides have no unacceptable effects on the environment, including impacts on non-target species. Neonicotinoids meet the current regulatory requirements. The expert advice Defra has received is that the current evidence does not indicate that unacceptable effects should be expected in field conditions. However, we have some important work going on. Can I ask the Chief Scientific Adviser if he would like to comment?

Professor Boyd: Certainly. Thank you, Minister. Clearly, with respect to the precautionary principle, we have to come up with decisions that are proportionate, non-discriminatory and consistent, and we do that through the advice that we get from the Advisory Committee on Pesticides and the CRD. From a scientific perspective, I have already mentioned the weight of evidence approach. I think that is central to how one plays through the precautionary principle.

We have a very large weight of evidence with respect to neonicotinoids, which has been submitted as a result of the regulatory process. What we are seeing now is some new evidence coming to light—mainly from academic studies, some funded by Defra, within the context of a specific funding stream that we put in place recently on pollinators. We are beginning to assimilate that evidence into the weight of evidence approach that is being applied under the auspices of the precautionary principle.

It is beginning to tip the balance, and that is why we are looking at it very, very closely. That is why, as soon as the Gill paper came out in *Nature* recently, we went straight to the Advisory Committee on Pesticides and said, "What do you think about this? What is your advice about it?" I think they have already said that they are concerned, and we share that concern. As a result of that and as a result of the previous studies, we have commissioned a number of studies to try to get to the bottom of the problem. It comes back to what I said earlier about addressing the real question at hand. The real question is: what is the impact of these chemicals on pollinator populations in the field? That is a very difficult question to answer. It is one that is only partially answered by all the evidence that we have in front of us at the moment, including the dossiers that have been submitted by companies who are looking to license the pesticides but also including the recent studies. What we want to do is get closer to answering that question, if at all possible.

The studies that are being carried out at the moment are, specifically, one on the effects of neonicotinoids on bumblebees in real field conditions. That is partly experimental, but it is getting as close as we can in an experimental paradigm to real field conditions. We are also looking at the presence of toxic chemicals on bees that are returned in a scheme that we have whereby wildlife is sent in. We look for toxic chemicals on the animals that are sent in, and that includes bees. We are also carrying out a long-term study on the survival of honeybee colonies over winter and a correlation study, which is an epidemiological study looking at the interaction between the use of neonicotinoids in the countryside and the survival of honeybee colonies. Honeybees are a very useful species to use in this because obviously they are farmed. They are present in clearly-defined hives and can be studied quite easily over longish periods of time.

So there are a number of studies in place to respond to this need for more evidence, and more evidence that is targeted at the very specific questions we need to answer, in order to be able to make sure that we are coming to a proper conclusion on this weight of evidence approach.

Q344 Martin Caton: In September, Defra justified its decision not to suspend neonicotinoid licences, in response to the Henry and Whitehorn studies, by referring to the lack of unequivocal evidence that sub-lethal effects with serious implications for colonies are likely to arise from current uses of neonics. Do you believe that there is unequivocal evidence that sub-lethal effects of neonics do not have serious implications?

Lord de Mauley: I fully accept that the use of the word "unequivocal" was inappropriate. We are not seeking unequivocal evidence, and recognise that scientific studies can never meet such a test. The reality is that we do consider the weight of evidence and, at present, the evidence suggests that the effects do not occur in the field.

Q345 Martin Caton: Professor Boyd, you just listed some further research that you commissioned. Can you give an idea of when each piece of that will be published?
Professor Boyd: The key piece of research is the bumblebee study in as realistic field conditions as possible. In science there are different stages of publication, but we hope the results will be made available sometime in January, so that the Advisory Committee on Pesticides can adjudicate over those results. The results are now in and they are being analysed. I have commissioned some additional work around that, which will take a bit longer to come through. But hopefully the basic results will be with us in January.

Q346 Martin Caton: That will be in the public domain then?
Professor Boyd: I guess it will be, yes. There is a recognised process for publication in science, which involves peer review. We would like to be able to get through a peer review process before publishing that. We can accelerate that peer review process, but normally we would send the results out to a scientific journal, which would do an independent peer review on the study. That would give assurance that the study is done to an appropriate standard. That takes time, but we know that we do not have time on our hands so we will try and find an accelerated process to make sure that it is in the public domain as quickly as possible.

Q347 Mark Lazarowicz: What does that mean in terms of an accelerated process, how long?
Professor Boyd: We would see the Advisory Committee on Pesticides, for example, as being essentially like a peer review body. We have no influence on what they say or anything like that, so we will probably give the whole study to the Advisory Committee on Pesticides and ask them to adjudicate on it and to provide their view on not just the methodology that was used—which they are already aware of—but certainly the results and how the results have been interpreted. That is probably the most rapid way of doing it. I may ask the Advisory Committee on Pesticides to independently send it for peer review to other individuals as well, but that would take a bit longer because we have to give people a few weeks to be able to review these studies appropriately.

Q348 Caroline Lucas: We heard earlier from the ACP that the decision on whether to call for a moratorium, at a moment of lack of sufficient evidence, is a political decision. It is obviously a decision that was taken differently in France. Would you think that the French are just more risk averse, or what difference would there have been or what could you do direct us to that would give us a different result?
Lord de Mauley: It would be inappropriate for me to comment on decision-making elsewhere. What I can say is that our decision-making is based entirely on the advice of the ACP and the CRD.

Q349 Caroline Lucas: In a sense, they are coming to you saying that the evidence is not clear and then you have a political decision—as we have heard—about whether to go for a moratorium, or to leave things as they are but to find more evidence. The worry I have is that it can take a long time to get sufficient evidence to act. I want to understand a bit more about the political decision-making that goes on to say, "This is enough".
Lord de Mauley: I absolutely understand the question but, as I have said earlier, the advice has been, and remains, that there are no unacceptable effects. However, we have this extra work going on, which we are accelerating the conclusions on, and if that gives rise to a change of the advice we will take it.

Q350 Dr Offord: Many people in the agricultural industry have been awaiting the publication of the UK's action plan on the sustainable use of pesticides. Could you please advise us when it will be published and why there has been a delay, because we were expecting it at the end of November?
Lord de Mauley: Yes, absolutely. It was due to be submitted to the Commission on 26 November. It is almost finalised, following a public consultation. We are finalising our consideration of the responses to the consultation and the UK plan will be published shortly. It may be worth saying that we understand that only seven member states met the 26 November submission date but, as I say, it will be published shortly.

Q351 Dr Offord: Would you be able to elaborate on why it has been delayed?
Lord de Mauley: It is purely the process of giving due consideration to the responses to the consultation.

Q352 Dr Offord: That concerns me slightly because it feels as though there is not a great priority—not only in Defra, but you also mentioned other member states—for the sustainable use of pesticides. Would you say it is a priority for your Department?
Lord de Mauley: Yes.

Q353 Dr Offord: Even though we have not gone through the consultation document and submitted it on time?
Lord de Mauley: We are working hard on it and it will be out shortly.
Chair: But it was due on 26 November, was it not?
Lord de Mauley: Yes.

Q354 Dr Offord: I will move on from that then. The draft action plan did not include any binding targets or timetables. Could you confirm whether the plan will feature those when it is published?
Lord de Mauley: I cannot give you an answer to that.
Dave Bench: For quite some time now, the UK Government has preferred not to set binding targets of the kind that you are talking about, because they have the potential to skew behaviour in unintended ways. There is a whole raft of initiatives, both regulatory and non-regulatory, that are described in the national action plan. In essence, much of what is in the national action plan is an extension and an explanation of what

has been going on in the UK for quite some time. In relation to the sustainable use directive of pesticides and transposing national legislation, in effect, the UK has already had in place most of the things required for quite some time. In effect, the national action plan is an updating of national strategies in relation to the sustainable use of pesticides that we have had in place for many years.

Q355 Dr Offord: I have been trying to get an answer to a question from Defra, and I will ask it in a roundabout way, which is: as a matter of policy, would you be prepared to trade off certain sectors of the agricultural economy to conserve the contribution of pollinators to UK agriculture? I ask that is because I have been trying to determine what the economic worth of bees to UK agriculture, and I have not been able to find that out.

Dave Bench: Perhaps you are asking something of a political question there, which I suggest I probably should not answer.

Chair: Then we will invite the Minister to answer that.

Dave Bench: In terms of the regulatory regime, it does not take economic benefit into account. It sets a high level of protection as an absolute level, regardless of the usage.

Q356 Dr Offord: Would the Minister like to comment on that?

Lord de Mauley: I would like to ask the Chief Scientific Adviser before I accept.

Professor Boyd: It is a very interesting question. As you are probably aware, we carried out something called the National Ecosystem Assessment. That has a methodology within it that allows the assessment of the financial worth of different parts of what we call our natural capital. You could include pollinators as part of our natural capital. There are a number of estimates of what pollinators are worth, something like £0.5 billion, in very round terms, is kind of the number that comes out. Do we do a cost-benefit trade-off? Yes, I think we do. We perhaps do not do it explicitly at the moment, but I think that is something that is a perfectly valid thing to do. Although I would say that any effect of any pesticide on pollinators is something we want to avoid at almost any cost, even small effects may be sustainable, because the advantages that the pesticide use brings, in terms of increased yields, for example, are much greater than the disadvantages that you would get from reducing the numbers of pollinators, assessed along the lines of the national ecosystem assessment in financial terms. That is the whole point of doing these types of assessments.

My suspicion is that we do have an effect on pollinators but we cannot measure it at the moment. It may be impossible to measure it because it is small, relative to a lot of the other things that affect pollinators, like changing weather conditions, changing forms of land use, changing food supply, these sorts of things. I would be very surprised if neonicotinoids did not have an effect but it is a small effect, relative to all those others, and it is a small financial effect. The other thing is that these are what we called non-linear processes. If we were to remove, let us say, 5% of the pollinators it might not reduce the value of pollinators by 5%. It might reduce it by a much smaller amount than that. Explicitly, we do not use it, but implicitly we do use these cost-benefit trade-offs.

Q357 Chair: Minister, with all the discussion that there is about natural capital and having a joined-up approach across Government through the Cabinet Office, how does all this tie in with the decision of where the weight is finally given on the value of pollinators as opposed to other considerations?

Lord de Mauley: We think pollinators are extremely important. They have a clear economic value, but they are also important to our diversity. I hope that what is coming out of this discussion is that we take them extremely seriously and the use of insecticides—which, of course, are designed to kill insects—are subject to very rigorous procedures, specifically on non-target species, and their impact on the environment generally. It is an extremely important subject and we take it very seriously.

Q358 Dr Offord: My final question is: have you considered suspending the use of neonicotinoids?

Lord de Mauley: Of course, we would not go through all this process unless it was an option at our disposal. There are lesser options, such as restrictions on use, which must also be considered. I have already said it, but as yet the evidence suggests very clearly that there are no unacceptable effects but, as soon as that changes, we have those tools at our disposal, yes.

Q359 Dr Offord: You say "restrictions on use". What I was particularly thinking of is that I am aware that people have to be licensed in the agricultural commercial side. I am talking about people going down to their local garden centre and using them. If we suspended their use there, it would enable an opportunity for some research to be conducted, between urban and rural pollinators, to see the likely effects of the public using it. Have you considered it from that point of view?

Lord de Mauley: It is an interesting suggestion but I think it might be a bit hasty to make a sudden distinction between urban and rural.

Dr Offord: It is a very crude measurement.

Lord de Mauley: It is slightly crude. The products for use in gardens have very clear instructions for use. No product is approved for garden use if the correct use would require either training or protective clothing. The levels of toxicity for products that are approved for garden use are generally considerably lower than for professional use. So we think that the level of control is appropriate. Dave, you were keen to come in.

Dave Bench: I would add the point that, as part of the ACP discussions throughout the course of this year in relation to neonicotinoids, they have addressed the issue of home garden products and whether they should be treated in a different way. To this point, they have said there is no reason why they should be, but that is something that they will return to whenever

they have another discussion. The next one will be at their meeting on 29 January.

Q360 Mark Lazarowicz: A couple of questions, which I think are mainly for Mr Bench, on the chemicals regulation directorate. Generally, do you operate on the basis that any product or any active substance, which is approved at EU level, has achieved a risk assessment? Is that your normal approach?
Dave Bench: Clearly, the risk assessment is done through that European process, and then there is the inclusion on a positive list of the active substance and, of course, we accept that, being part of the EU.
Mark Lazarowicz: So you accept what comes through?
Dave Bench: It is then for us to deal with individual product authorisations on a national basis.

Q361 Mark Lazarowicz: The risk assessment is always done on an EU basis—that is something you would take as a given?
Dave Bench: No, we do not take it as a given, because we are involved in the peer review process if we are not the rapporteur member state, so we are engaged and involved at the point the risk assessment is conducted.

Q362 Mark Lazarowicz: If you had concerns, they would be fed in through the peer review process?
Dave Bench: If we are not the rapporteur member state to start with then, yes, we would feed in at the peer review process. Of course, there is also the process in the commission at the standing committee, which deals with the risk management process, and as part of any inclusion decision will consider whether there are any conditions related to that inclusion, and we can be involved at that point too.

Q363 Mark Lazarowicz: How far is the CRD's own funding dependent on the turnover of pesticide companies, because presumably the pesticides that are approved also are another way in which you get some of your funding? Is that not the case?
Dave Bench: Yes, it is. We apply fees and charges, so that all the application work is funded by the applicant companies. Those companies that hold authorisations are also charged on the basis of their turnover each annum. That contributes to the broader cost of some aspects of the regulatory system like, for example, the monitoring schemes that there is a benefit derived from.

Q364 Mark Lazarowicz: You have a fast-track approval scheme within the directorate. What is the basis on which a product is placed on the fast track?
Dave Bench: At the moment, if a company has a particular application that they would like to be fast tracked, they are allowed to nominate that, so it is completely at their nomination, and we allow one per year per company at the moment.

Q365 Mark Lazarowicz: Is that a frequent occurrence?
Dave Bench: Some companies take advantage of that, yes.

Q366 Mark Lazarowicz: Does the fast-track procedure have any difference in terms of the assessment procedure?
Dave Bench: Absolutely not.
Mark Lazarowicz: Why do you have to have a fast-track procedure and the others go through a slow-track one?
Dave Bench: The assessment procedure is absolutely the same. It is simply allowing them to target some applications where they may have a pressure, in terms of wanting to hit a particular growing season for the marketing of that product, and it allows that acceleration. We cannot do that for all applications, of course, because then you are going through the process at the same pace. It is essentially paced through the process. It is not about the way the assessment is conducted or the number of hours of assessment time that is taken to do that assessment.

Q367 Mark Lazarowicz: You have a number of targets for the consideration process—the approval process. What are the targets that apply to how you deal with applications? Is there a target on the number of days it takes to complete the approval?
Dave Bench: There are, although we are going through a process of reconsidering targets. Different targets apply for different streams, depending on whether there is data applied or you have a lot of data. The new European legislation, regulation 1107/2009, applies some legislative targets, and, in the most part, those targets in the legislation are in excess of what we have typically delivered. We are going through a process of considering how we should adapt to that. What we do not think is a good idea is to extend the time dramatically just because the legislation says that we can.

Q368 Chair: Before we conclude, can I just go back, Minister, to what you were saying about the national action plan and the fact that it has been delayed? Can I ask you what you hope that it will be? Do you envisage it as being an action plan with specific actions in it, or is it going to be a more descriptive summary of the state of affairs?
Lord de Mauley: It will address the requirements of the sustainable use directive, of course. Priorities for action will include protection of water, encouraging best practice among amenity users and the development and encouragement of integrated approaches to pest, weed, and disease management. I do not know who is the best person to ask.
Professor Boyd: I could probably give a little bit more but not an awful lot, I think, because at the moment it is still being put together. It will include something called SCEPTRE, which is the Sustainable Crop and Environment Protection Project that is co-funded by industry partners, so industry will be involved in it. As the Minister mentioned, there is the integrated pest management system that we would like to put in place, and that is a requirement that has to be in place by the beginning of 2014. I think that presents huge opportunities for looking anew at how we develop

more intelligent pest management procedures. There is a sense that perhaps pesticides are used more often than perhaps they should be. Through appropriate research and advice coming from that research to farmers, we have an opportunity for opening up a dialogue, especially trying to get the industry itself to appreciate that a lot of the solutions are going to come from industry, and industry then has to pass those solutions on to other members of industry. Through that early adopters process and then the learners within the industry taking up new ideas, we have the potential to develop probably quite imaginative new systems for integrated pest management that, at the end of the day, might use a lot less pesticide than we use at the moment. We can probably achieve that without banning pesticides as well, but just—

Q369 Chair: Will it be linked and integrated into the discussions that are going on about the reform of the common agricultural policy as well?
Lord de Mauley: Yes, there is reference in the national action plan to that.

Q370 Dr Offord: Just very quickly, when will the plan actually be published?
Lord de Mauley: I said shortly; I cannot go further than that.
Chair: Before Christmas?
Professor Boyd: We will need to come back to you on that. I do not know the answer to that.

Q371 Dr Offord: Because you will be in breach of the European directive if it is not published by the end of the year.
Lord de Mauley: We will try and get you a letter before the document.
Dr Offord: Thank you.
Chair: You have been generous with your time, all three of you. Obviously you will appreciate that a large number of people are very interested in our inquiry. Thank you very much indeed for your evidence this afternoon, and for offering to come back with more information.

Wednesday 30 January 2013

Members present:

Joan Walley (Chair)

Peter Aldous	Dr Matthew Offord
Martin Caton	Mr Mark Spencer
Zac Goldsmith	Dr Alan Whitehead
Mark Lazarowicz	Simon Wright
Caroline Lucas	

Examination of Witnesses

Witnesses: **Dr Julian Little**, Government Affairs, Bayer CropScience, and **Dr Christina Garside**, Environmental Safety Manager, Bayer CropScience, gave evidence.

Q372 Chair: I formally welcome you both—and I welcome you back a second time, Dr Little. We appreciate your coming back, and thank you and your colleague, Dr Garside, for coming here today. The reasoning for our wanting to have you return to the Committee is some of the issues that relate to the evidence that you gave and also to the DAR report, which was the reason for the regulatory regime in the first place.

Before we get to that, I think everybody is aware that there have been various developments over the last few weeks, one of which is the European EFSA report. While we have you back in front of the Committee, we wish to try to tease out some of the issues there and to understand Bayer's position in relation to that. What weight should we accord to EFSA's recent assessment that neonicotinoids should not be used on crops that are attractive to honey bees? Have you had a chance to give us a response to that?

Dr Little: First things first: thank you very much for allowing us to give further evidence. I was going to start with an apology to the Committee for not being able to fully answer the questions around the environmental fate of neonicotinoids—I should be able to say that—hereafter known as "the neonics". Clearly, you will be aware that we followed that up by submitting further written evidence, and we are very happy today to come in with a little bit more experience in terms of people, like my colleague here, who knows a lot more about this subject.

On the EFSA report, what I would like to do is take issue with the particular question, because the EFSA reviews do not in any way recommend that neonicotinoids should not be used in flowering crops. That is not what it says—

Q373 Chair: Can I cut you short there?

Dr Little: Okay.

Chair: I did not suggest that. I was just asking for your response to the assessment that you have made and to EFSA's recent assessment.

Dr Little: All right, so what does the assessment say?

Chair: The assessment that Bayer has made.

Dr Little: Sure, of course, and we will give that very clearly. Essentially, our assessment is—and that of anybody, such as EFSA if you were to ask them—that what they were asked to look at was the difference between what we know at this precise moment about neonicotinoids and the regulatory system around it; what we may have to know if EFSA's suggestions on new regulations come up in the future; and what knowledge gaps there might be between those two areas of legislation.

Not surprisingly, you find knowledge gaps, as you always will if you decide in the future to increase the regulatory control. Our view is that those knowledge gaps are not insurmountable. We would argue that knowledge gaps are continually being plugged and always are, and that when you get a regulatory approval of a product, such as imidacloprid or whatever particular pesticide, that is only the start of the knowledge process—in other words, that is the point where you have the minimum information that you need for the regulatory approval of a product. We will continue and always have continued to increase our knowledge about these products, and we probably know more about neonicotinoids than most pesticides, let alone insecticides.

Q374 Chair: Can I take it from that that you support the assessment that EFSA carried out on neonicotinoids?

Dr Little: The assessments are what they are. Unfortunately, they decided to omit large quantities of information for various reasons. For example, despite being asked to look at field trials, they either did not have time or for whatever other reason did not do so. Therefore, from our perspective, they have not been able for whatever reason to include large quantities of data in their assessments, but you cannot complain about the assessments themselves.

Chair: No, but what I would like to know is that if you look at the graph in the EFSA report, there are many products where they have not been able to complete the risk assessment at this stage, but there are some that relate to honey bees where they have. So I am just trying to understand whether or not you support the assessment that they have made and where they have suggested that there are risks associated with it. It is a yes or no.

Dr Little: It depends on what you mean when you say "risks associated". If you like, we are talking about a knowledge gap between what we have and what we might have to have in the future. If those particular rules were implemented tomorrow, then, yes, there would be a risk, but—

Chair: Could I cut you short there? Does that mean that you would accept in those circumstances, where

they have completed that risk assessment with the information available, that you would agree with their assessment that neonicotinoids should not then be used on crops that are attractive to honey bees?
Dr Little: No, because EFSA do not make a recommendation that these things are not used.
Chair: No—their assessment; I am not talking about their recommendation. If they have made an assessment that there is a risk, would you at least concur with their assessment?
Dr Little: We would agree that there is a knowledge gap. It does not mean to say that these things cannot be used. It means that there is a knowledge gap between where we are now and where we might be in the future.

Q375 Martin Caton: Just to clarify, yes, not a recommendation, but EFSA's own press release says, "Exposure to pollen and nectar. Only uses on crops not attractive to honey bees were considered acceptable". I think that is fairly clear. That is not saying there is a knowledge gap; it is saying this use is not acceptable.
Dr Little: What it is talking about if you look into the report is that the knowledge gap in non-flowering crops is not as big as it is in flowering crops. So if those rules were put into place tomorrow—and they have not been addressed or validated by member states or the Commission—the knowledge gap for non-flowering crops would be smaller than it would be for flowering crops. That is what that statement is saying.

Q376 Martin Caton: So you accept the risk assessment that I have just read out?
Dr Little: I accept the fact that—
Martin Caton: These are not my words. These are EFSA's words.
Dr Little: I accept that the knowledge gaps in flowering crops are larger than they are in non-flowering crops.

Q377 Chair: But surely the point is that there are some knowledge gaps in the assessment that they did but there are some categories where they are quite clear in their assessment—where they say that there is a risk to honey bees. We just need to know first of all whether or not you would accept their assessment that there is a risk.
Dr Little: Okay; I would accept that if you only looked at the evidence that EFSA looked at, you would conclude that there was a risk.

Q378 Chair: All right, so the evidence that EFSA looked at, in Bayer's view, is not the whole picture? They were looking at the wrong evidence?
Dr Little: No, they were looking at an incomplete set of evidence, so there were large amounts of evidence that were out there that they did not use in their review. Because of the very strict method by which they looked at the evidence, they excluded wide areas of research, including things that we had in our own submission—for example, the German and French studies that looked into what happens in real situations. Hence, what you are left with, if you exclude those areas—as EFSA did, because they did not see that all of that information was complete—are studies that essentially show that insecticides have an effect on insects. So, yes, as a result, you would conclude there would be a risk issue.

Q379 Chair: Are you saying then—I have probably read you wrongly—that the European Commission should wait for actual harm to occur before managing that risk because you are saying that that information is incomplete?
Dr Little: No, of course not, because if EFSA had taken the full data set that was open to them, you would have seen all the work that has been done in real in-field situations, using real bees from real beehives in real fields. They decided not to include that data set in their assessment so, not surprisingly, what they ended up with is assessment of a risk. Also, in those reports, because that is not what they were asked to do, they have not looked at any stewardship, any mitigation or any other reasons why that risk assessment is not valid in a real agricultural situation.

Q380 Chair: All right. I am still not absolutely clear about what concerns you have about the regulatory regime that applies. You are somehow suggesting that because you do not accept the assessment that EFSA has made, because somehow it is incomplete, because it has not looked at all the different options, that somehow from your point of view that seems to relate back to the failure of the European regulatory system altogether.
Dr Little: No—on the contrary, the regulatory system looks at all things. So, for example, you will do your initial tests. For example, if you do a laboratory test where you take a neonicotinoid and apply it to a bee, there is an effect on that bee. Whenever you see that effect, and you will tend to see it with whatever insecticide you use, you will have to do higher-tier studies, and then you will start to look at real-field studies where you can look at all the impacts on bee health, and those higher-tier studies, which were not looked at in these EFSA reviews, demonstrate that you can have safe use of these products in the field, in real agri-environmental situations.

Q381 Martin Caton: Sorry, I am going back to my first question. Are you saying that because they have not done these higher-tier studies you basically disagree with their statement that only uses on crops not attractive to honey bees were considered acceptable?
Dr Little: But I go back to my answer last time.

Q382 Martin Caton: Why can you not just answer that question?
Dr Little: Because the question is about what is it that EFSA were showing and what they were looking at was knowledge gaps. So what they do is they look at those knowledge gaps and say, "Are those significant enough in a particular crop for there to be a concern?" In a non-flowering crop, they are considering that those knowledge gaps are relatively small but in flowering crops, they are saying those knowledge gaps are relatively large.

Q383 Chair: Can I just try to look at it from a different perspective? In a way it could be argued that what the recent EFSA report did was to apply enhanced standards of environmental protection for bees in a way that was perhaps different or had moved on from the original regime that was first introduced—

Dr Little: I absolutely agree with that, yes.

Chair:—leaving aside whether or not the actual regime in the first instance was or was not fit for purpose. I wonder what views Bayer has of those enhanced standards that would have been underpinning the research or the assessment that EFSA has most recently made?

Dr Little: EFSA put together some ideas around what a regime might look like in the future, and that was published, I think, in the middle of last year. It is yet to be looked at in detail by the member states, who are involved in the regulatory process, to the point where they have yet to be validated, so there are some ideas about what you might want to do in the future. I think it is worth noting that if you talk about these knowledge gaps that occur between these theoretical enhanced regulatory—

Q384 Chair: Sorry, you keep on talking about knowledge gaps. I do not know what you mean by knowledge gaps. Can you just basically set that out for us?

Dr Little: All right, let us find an analogy. Essentially, you are in a situation where you are asked as a company to demonstrate that your products are safe, so they are safe to whatever level is being required from you. The European regulatory system is the toughest one in Europe and essentially if you can pass all of the tests in Europe, you can pass the test just about anywhere because they are seen as the gold standard.

The regulatory system moves on. Usually, it moves on incrementally, so there will be a recommendation that we would like to have a little bit more information here or a little bit more information there. What invariably happens is that you either already have that information and you submit it or you go away and get that information and submit it. Very occasionally—we saw it with the last major review of 91/414: there was a massive loss in products because there was a step change in what was being required from Europe. We lost something like two-thirds of all pesticide products and that was because either the data gaps were so large that it was going to be difficult to plug them in the time allocated or it was not worth the effort of doing so. That is, the cost of doing so would be prohibitive.

Therefore, when you have those very big step changes, you see large losses in products, and that is always because of knowledge gaps. It is because you need to be able to plug where you are now to where you need to be next. In the case of EFSA's proposed guidance for insecticides, which was proposed last year, again the gaps are very big. This is where I come up with explaining about the knowledge gaps.

We have estimated that 96% of all pesticides, whether it is an insecticide or otherwise, would fail on that knowledge gap. There is a big knowledge gap between what we know now and what we would need to know in the future. So if your assumption that knowledge gaps equals a need to ban, the logic would therefore be that you would have to ban pretty much all insecticides and an awful lot of non-insecticides as well.

Clearly, that is not a sustainable situation to be in, and that is why we are very keen to make it clear that neonics are one class of compounds. They are very much in scrutiny at the moment, but they should not be treated any differently from any other product when looking at knowledge gaps and risk assessments.

Q385 Chair: Does that not beg the question that if that is happening, a company such as yours would need to have time to adjust what it is producing? It also fails to respond to the question that I asked previously, which was whether or not you agree with the tighter standards that were at the core of EFSA's most recent assessment.

Dr Little: The guidelines themselves are extremely onerous. They clearly have taken the gold standard further and would take a significant effort to bridge. Whether or not you agree whether it would be nice to have all of the information that EFSA has come up with, yes—and we are always working to get that information on all of our products. But to use that guidance as an excuse to take out particular products, for us does not seem appropriate or proportionate.

Q386 Chair: No, I was referring to enhanced standards.

Dr Little: Sure, and as I said, enhanced standards are part and parcel of our industry. What we are concerned about is any use of enhanced standards in a punitive way targeted at a particular type of chemistry.

Q387 Chair: So would you see this as being a punitive proposal?

Dr Little: As I said, if you were to—

Chair: If it were a proposal; if it were translated into a recommendation.

Dr Little: If it were to be translated untouched, it would be very onerous, but we would continue to move towards those standards, of course.

Q388 Martin Caton: EFSA in their report acknowledge that there are what you call "knowledge gaps" and that there are shortcomings because of data. They accept that, and they draw attention to where they find those shortcomings. Again, they did not hesitate to draw the conclusion that only uses on crops not attractive to honey bees were considered acceptable. They knew the knowledge gaps they had come across, but they still felt able to come to that conclusion and put that forward.

Dr Little: If those rules were put in place; I think in that particular case they make it clear in lines 35 to 45 or something like that.

Q389 Martin Caton: They are about the process of drawing up new rules, so obviously that is what they are going to be talking about, is it not?

Dr Little: Yes, that is fine, but we do not know what those rules will be once the member states and the Commission have looked at those proposals.

Q390 Martin Caton: Can you understand scepticism among observers of this? You have an independent body that reaches certain conclusions and does not make recommendations but makes an assessment, and then a company that has huge financial benefits from producing these products finds opportunities to criticise. Even if you just delay a ban or a moratorium, you are going to make a lot more money, are you not?
Dr Little: It is a difficult one for me to argue with, because by definition the fact that you have said that because we are a company we would say that—anything I say from that point onwards—
Chair: But presumably you would have done those—
Dr Little:—falls foul of that, but let me—

Q391 Martin Caton: I am just asking if you understand that there might be some scepticism when you criticise an independent body that comes to a conclusion.
Dr Little: All right: what is the consequence of a loss of neonicotinoids? Farmers will have to go back to the old way of doing things.

Q392 Martin Caton: There are questions on that. You have made those points before. I have taken up too much time, but you will have an opportunity to make those points.
Dr Little: What I was going to say was we have a very large portfolio of spray chemicals as well. What we would lose in one area, I have no reasons to believe we would not gain in another.

Q393 Zac Goldsmith: Just very quickly picking up on that point you made, before we go back to the specifics, are you saying that 96% of the chemicals on the market today are chemicals about which we do not know enough in order to be able to regulate them properly? That seems to be what you are saying. If that is the case, does that not suggest that the market is rushing way ahead of the science?
Dr Little: No—on the contrary, what we have is very good information on all products that are on the market. As I said, Europe has the gold standard on pesticide legislation. What I am saying, though, is if you make a massive step change in the regulations, and EFSA has come up with some ideas about what you might do, then an awful lot of products would have exactly the same knowledge gaps as neonicotinoids—in some cases would have bigger ones, because we know so much about neonics.

Q394 Mr Spencer: Dr Little, are you aware of any chemical product on the market where there is zero risk to insects?
Dr Little: If you are talking about an insecticide, it is purely about dose. It is purely about how much insecticide does that insect come up against. You will be aware that for a company to be able to sell an insecticide, you have to control your target species to a very large degree at the dosage that you will see in the field. So no, there are no products that have zero risk. The neonicotinoids are beneficial in many ways, especially on things like human risk assessment.

Q395 Mr Spencer: By conclusion, if you went to a system where there has to be zero risk, there would be no chemicals available to you?
Dr Little: Absolutely none at all.

Q396 Dr Whitehead: Just a brief thought on the question of what we do know and what we do not know: if we have gaps in knowledge, to what extent is it your understanding, particularly in terms of what EFSA has said, that the gaps are contingent or the gaps are primary? In other words, if you have a piece of knowledge that you do know about but is contingent on something you do not know about, clearly the validity of that piece of knowledge is undermined. If that is the other way around, then it is not. To what extent would you put the information that EFSA have put forward under either of those two categories?
Dr Little: That is a very good question. I will try to answer it. I think when you look at your normal data package and what you have to demonstrate, you have to demonstrate that you can control, as I have explained earlier, the things that you are supposed to control. You are not supposed to control the things that you are not supposed to control, so non-target organisms are out.
If it is an insecticide, it should not be having a big effect on either fungi or other sorts of biodiversity out there, so the specificity has to be there. On top of that, you are talking about safety—and that can be to mammals and non-mammals—and when you are talking about mammals, of course, you are quite focused in on humans. You would have to look at what is going on in the environment. All of these things are a huge data package that you have to submit, and then that is reviewed by a large number of people.
With these new proposals, it is about building on what we know, but it takes us a long way ahead of what we know in many cases today. It is not absolutely new information, although in this particular case what I will mention, and I mentioned it in the last evidence, I believe, is in this area of non-bee pollinators—because the focus in the risk assessment has always been about the impact on the honey bee. The honey bee is seen as the prime example of a pollinator, and they ask for information specifically on that in a large amount of detail.
The biggest areas from my perspective between where we are now and what EFSA are proposing lie in the area of understanding all non-honey bee pollinators. That is a huge area, and I think we discussed it at the last Committee meeting. You have one honey bee but 20 bumble bees or 200 solitary bees or maybe 2,000 other pollinators. Which ones do you select? That is where the knowledge gaps start to build up very quickly.

Q397 Chair: The Advisory Committee on Pesticides met yesterday, and we certainly have no way of knowing what the outcome of their discussions were or indeed what their recommendations will be to

Defra Ministers. In terms of what you have just said to the Committee about EFSA, I wonder what your reaction would be in a hypothetical situation whereby they would recommend that there should be concerns about the risk to bees?
Dr Little: Sorry, risk to bees?
Chair: The whole risk assessment in terms of use of imidacloprid.
Dr Little: Yes, all right. Like you, I am not party to—
Chair: It is a hypothetical question.
Dr Little:—what is going on, but if ACP look at new evidence and feel that it changes their view on a particular type of product, then they have the ability to advise the Government accordingly.

Q398 Chair: But they would be looking at the recommendations of the EFSA Committee, would they not?
Dr Little: Yes, I guess they would, but the Advisory Committee on Pesticides is a group that advises the Government as to whether a product should be or should not be put on the market.

Q399 Chair: If they were to put forward a recommendation that, in this case, it should not be on the market—I am talking now particularly about imidacloprid—what would your response to that be, hypothetically?
Dr Little: To be honest, it is not my response. It is the Government's response.

Q400 Chair: But you are here representing Bayer.
Dr Little: Sure. We would be very disappointed, but we would look at the evidence that the ACP took to come to that conclusion and if it—

Q401 Chair: But would you accept that evidence?
Dr Little: It is difficult for us to say. How do you mean "accept", because essentially the Advisory Committee is there to give advice? Do we accept that advice? It is not advice to us; it is advice to the Government. So if the Government looked at that advice and said, "As a result we will make a decision on whether this product is available in the UK", again, it is not for us to say that we disagree. Of course we disagree but if the Government makes that decision, then we have no choice but to comply. That is the way that these things work.
Chair: All right. We must move on. Martin Caton.

Q402 Martin Caton: All right. We do not know what ACP has done, but we do know what the Dutch Parliament did last week. It noted EFSA's risk assessments and proposed a European moratorium on all applications of neonicotinoids unless it is conclusively proven that they have no harmful effect on the health of bees. How do you feel about that political response to the growing evidence?
Dr Little: I think you used a very clear word—a "political" response. There is plenty of evidence out there that suggests that if they take all the evidence, there is no need for a ban.

Q403 Martin Caton: In the end it is going to be a political response. You have just pointed out to us that the ACP will make a recommendation to Government and Government will make a decision. That Government is by definition a political body. It is a decision made by politicians, so it is perfectly appropriate for a Parliament to come to the conclusions that the Dutch Parliament has.
Dr Little: Which is that unless you can demonstrate that these things can be used safely, they should not be used. We would argue that you can use these things safely.

Q404 Martin Caton: So you believe that you can, and presumably therefore you will provide to the Dutch Parliament something at least approximate to conclusive evidence that it is safe to use neonicotinoids.
Dr Little: What we have is evidence from real-life situations and we have discussed this both previously and this afternoon. When you look at what affects bee health in real situations, what it is not is pesticides; it is varroa, various viruses, habitat issues and nesting opportunities.
Martin Caton: That is a very selective choice of scientific evidence. Clearly, there is evidence pointing in the other direction—evidence that has led EFSA to reach the conclusions it has just very recently. But I think we will move on, Chair.

Q405 Chair: Is there any likelihood that whatever evidence you do have you might be prepared to put into the public domain?
Dr Little: The evidence around the safe use of these products is very well demonstrated.

Q406 Chair: The evidence that is demanded by the Dutch Parliament.
Dr Little: We absolutely will be supplying the Dutch Parliament with our views on the safe use of these products. Yes, of course.

Q407 Mr Spencer: I am asking you to speculate to a certain extent, but given that different member states have different rules in place for different products, I wonder why the Dutch Government called for a European ban rather than just one within the Dutch borders.
Dr Little: It is an interesting observation. You are right that there are a few countries that have taken steps to do something within their own borders. Up to now we have not seen any improvement in bee health as a result of those. But nevertheless, you are right; the Dutch could have made that decision. Why they chose to do otherwise, I think, is because they were aware that this was an area up for discussion.
There was evidence put on the table around Europe in terms of an impact assessment, and that impact assessment essentially shows that if these products were to be taken off the market, farming of certain crops becomes less competitive. Now, if you take it from a purely political perspective, there is a disadvantage in terms of competitiveness in taking off a product in one country if it is available to farmers in another. You ask me to speculate. It may well be that they took the view that it is better to lose these

products across Europe rather than just in an individual country.

Q408 Chair: In fact, this same debate is going to be the subject matter of an inquiry, or at least a debate, by the European Parliament, is it not—the European Environmental Committee?
Dr Little: Sorry. Could you repeat the question?
Chair: Yes. In relation to the issue about the Dutch decision and the question from Mr Spencer as to whether or not that related to a wider European perspective, what I am saying is that it is the case, is it not, that the European Parliament will be having further debates on this? So, it is likely that it will be looked at in a pan-European fashion.
Dr Little: Absolutely. Yes, of course.

Q409 Mr Spencer: I wonder what commercial conclusions you draw from the EFSA revised assessments. Are you changing your business patterns or looking to change the direction the company is going in at all?
Dr Little: When we saw the initial proposed guidance last year, we of course made our own assessments of what knowledge gaps there are. Broadly speaking, if you look at the areas that EFSA looked at, we concluded that there were knowledge gaps. We then looked at the whole raft of information and said, "Okay, if those rules were to come in tomorrow, what extra would we have to supply?" In many cases, we believe that the higher-tier studies that have been done, and other areas to mitigate around that, mean that those knowledge gaps are nothing like as big as were suggested in those EFSA reports.
I go back to saying that whenever you get a regulatory approval of a product, it does not stop your process of understanding your molecules; we continue to work on them right up to the point where they are withdrawn from the market. That is a very normal process.
What I would say also is that where those knowledge gaps are quite big we are looking at mitigation, stewardship and making sure that these products are used in the safest way possible to minimise any risks as a way of mitigating against those knowledge gaps. Again I think that is important. If you say, "But we don't know what's happening specifically on this particular pollinator", then we will say, "Okay, what can we do in terms of how these products are used to minimise those impacts on that pollinator specifically?"

Q410 Mr Spencer: Obviously, you are suggesting you are engaged in R&D then, to fine-tune these products. But am I hearing you suggest that fine-tuning takes the format of how those chemicals are applied, rather than fine-tuning the chemical make-up of those products?
Dr Little: In some cases, it is about the formulation of the product. We talked in the last session about dust and things like that. So, how do you reduce dust levels to below 10% of what used to be out there? We believe we can do that. There is a lot of technical stuff in terms of making those products physically as safe as possible. But then we are looking at how these things are applied. Who are using what piece of machinery? How do we train farmers and professional contractors to use the products in a way that maximises their benefit and minimises their negative impact?

Q411 Mr Spencer: So in the light of the EFSA report, will you be investing less time in that sort of R&D, the same amount of time, or more?
Dr Little: Absolutely we will continue. But I would say that we have been doing that since the new proposed guidance notes came out. It is not as a result of these reviews, because we already had done our own review of what they meant. So that work has been ongoing for a long time but of course has been redoubled since we knew that new guidance was coming our way.

Q412 Mr Spencer: Right. Okay. Again, I know you do not want to break any commercial issues that you may have, but I just wonder if there is son-of-neonics on the horizon. How much investment is your company putting in to the next generation of products? Will we get to a point where this debate does not matter because there will be another generation of product that is safer and more effective?
Dr Little: Okay. The timescale for new-product development is somewhere in the region of 10 years. It is somewhere in the region of £300 to £400 million to bring something new. That is a very big investment and one that fewer and fewer companies are prepared to make, especially for products destined for Europe, simply because we have little confidence in what the regulatory system will be and we have no idea whether or not, by the time we get it to the market, we will be able to use it.
Neonicotinoids are ageing. For example, imidacloprid is already off-patent and is used by companies other than Bayer. However, they represented a massive step-change in human safety; traditionally, insecticides were quite a big problem in terms of their impact on operators and everything else. The development of a class of chemicals that had very, very low mammalian toxicity and were very good at controlling things at low dosage meant that, for us, the industry, farmers and the whole of the supply chain, neonicotinoids were seen as a major step forward. What is interesting is that we narrow down and narrow down what we consider to be acceptable for our products without necessarily recognising the huge steps forward that we have made over the last 30 to 40 years.

Q413 Mr Spencer: So, if we take a step back and speculate again and they are removed from the marketplace, what happens to European agriculture?
Dr Little: There is nothing major new coming through. Talking to all of the companies in this area, there are not these sorts of blockbuster insecticides coming through. What they tend to be are more narrow niche products that might work pretty well in certain circumstances but not in others. I think there is a real issue here—that we are losing technologies that are considered to be quite big steps forward elsewhere in the world and are making farming more and more competitive, being able to produce more and

more food from less land, from less water and from fewer inputs. We are in danger in Europe of almost enshrining some sort of museum agriculture.

Q414 Mr Spencer: So does Europe continue to grow those crops with old chemicals, or does it cease to grow them and import those products from other parts of the world? Which?

Dr Little: There are very few blanket bans or restrictions for countries anywhere in Europe, but what we are seeing is they become less competitive. You see a drop in yields. You see a return to using more insecticide in terms of sprays. That is the norm of what we are seeing. You do not necessarily see a massive reduction in yield because if you carry on spraying more and more, you can approximate the same level of control of the insect pests. We would always argue, though, that the trouble is that you are controlling insects that are living in a crop rather than just those insects that are eating the crop. That is essentially where seed treatments come into their own.

Q415 Chair: Just before I bring in Zac Goldsmith, you said—I think I got your words correct—that you have little confidence in what the regulatory system will be. I wonder if you could just slightly expand on what you really meant by that.

Dr Little: Of course. So, for example, I explained that previous major revisions of pesticide legislation led to the demise of a whole swathe of pesticides. The issue always is that if you take a gold standard and keep improving upon it, that is fine. But if you make a gold standard and say, "Next time we are going to make a platinum standard"—that is, these huge step-changes that are not happening elsewhere in the world—you end up having a regulatory system that is out of kilter with other countries.

We already see that with most places in the world having access to a lot more products than we see in Europe. Now, I personally absolutely support very, very strict regulation, but not to the point where, as we believe, you are taking out major advances in chemistry and agriculture with no discernible improvement in bee health—and that is our assertion—whereas other countries will continue to use these products.

Q416 Chair: Where does that lead you in respect of the value that you attach to the precautionary principle?

Dr Little: "The precautionary principle" is one of those expressions used essentially to damn anything that people do not particularly like. I think that the precautionary principle should have a proportionate addition to it that says, "Let us look at the reality of things"—if you like, "What do we know?" not always, "What don't we know?" What we know about these sorts of products is huge. We know an enormous amount about these products. So, it is not a question of looking at this and saying, "We don't know anything about these products. The precautionary principle says they should not be used". We have a long history of safe use of these products.

Q417 Caroline Lucas: I am concerned about where scientific evidence featured in your analysis. It seems to be much more driven by your assessment of what would happen to your commercial advantage, and indeed to pesticides on the market more generally, rather than saying that if we gather more evidence from the science that suggests that old regulations were not sufficiently stringent because we have new information and therefore we should build better regulations based on that new information. How does that fit into your very dismissive response about the precautionary principle?

Dr Little: I would argue that it is not dismissive at all. I think the precautionary principle has its place where you are essentially looking something that is very, very new. But this technology is not particularly new.

Q418 Caroline Lucas: More and more recent evidence is showing us that there is a bigger danger than was previously thought.

Dr Little: Yes, a bigger theoretical danger, but what we see in the field does not back up that those particular concerns are realistic in real agricultural situations.

Q419 Caroline Lucas: Does that mean that the whole EU regulatory system is based on flawed analysis?

Dr Little: No, it is based on risk. Again, whenever you do your initial experiments to show that there is a risk to bees of an insecticide, for example—and I should say that most insecticides fail the initial tests on bees because bees are insects and it is about dose—you have to do those higher-tier studies. It is very disappointing that EFSA either did not have time, or for whatever reason, did not look at the whole data set and preferred to narrow-in on to a very narrow data set that excluded all of the real agronomic situations.

Q420 Martin Caton: My colleague, Caroline Lucas, has largely dealt with this but you have just painted a caricature of the precautionary principle, have you not? As has been indicated, the precautionary principle is enshrined in European legislation and is not that, "Oh, we can see a bit of a risk, ban the stuff"; it is, "Look at the science". If the science reaches a certain level, then the precautionary principle kicks in. That seems to me a very sensible scientific approach, and it should not be dismissed in the sort of caricature that you just made.

Dr Little: I am sorry if you feel that is a caricature, but the fact is that in this particular case we have a huge raft of evidence that suggests you can have safe use of these products.

Q421 Martin Caton: That still does not excuse your dismissing the precautionary principle, and it certainly does not excuse your suggesting that the precautionary principle should only apply to new products.

Dr Little: What I am suggesting is that with new products there is less information. There are bigger information gaps. With products that have a history of safe use, there is a lot more information that suggests that these things can be used appropriately, in which

case the precautionary principle does not really seem to apply unless there is convincing evidence to the contrary.
Martin Caton: Exactly.

Q422 Zac Goldsmith: I want to refer back to your previous evidence where you discussed the extent to which neonicotinoids accumulate in the environment. I shall read you what you said in answer to Caroline Lucas, who asked you about how long the chemicals persist in the soil. I quote: "But if you are looking at something like imidacloprid or clothianidin, you can be talking about a half-life of anywhere between 16 and, say, 200 days." Just before I go on with that, are you familiar with the bio-termite treatment called Premise in which the active substance is imidacloprid?
Dr Little: I am not aware of that particular treatment, but it does not surprise me that these treatments exist because termites are very sensitive to neonicotinoids.

Q423 Zac Goldsmith: Just before I go on, as far as I know, you commented on that very product on 30 March 2011 in *The Independent*. So it must have crossed your radar at some point. I am very happy to have you jump in at any point.
Premise was marketed in the US initially with a guarantee that it would kill termites for seven years, and I have a quote here from the promotional material. Bayer marketed Premise with this guarantee. I quote: "If Premise insecticide fails to stop termites at any time within seven years of initial treatment, we will gladly reimburse you for your product". So, I am interested in knowing how Bayer was able to provide such a guarantee.
Dr Little: I can certainly go back and find out, but what we are talking about here is obviously a termite bait with a formulation that keeps imidacloprid stable in that situation for a long time.

Q424 Zac Goldsmith: But with the same active ingredient that we are talking about now in the neonicotinoids.
What conclusion can this Committee draw from that guarantee about its propensity to accumulate in the environment, and how can we relate that—how can we reconcile that—with the evidence you provided us with when you last appeared in front of this Committee?
Dr Little: Okay. As I said, what you are talking about here is probably a block bait, or something along those lines, of a very stable form of imidacloprid—entirely different to what you would see in an agricultural environment. In an agricultural environment, you have active breakdown of these products in the soil. So it is an entirely different system.

Q425 Zac Goldsmith: How can you know that, given that a few minutes ago you said you were unaware of the product that two years ago you had written about in *The Independent*?
Dr Little: What I am saying is that I did not know the specific product that you mentioned. What I am also saying is that for something like termite control, you are not talking about termite control in a field. You are talking about termite control in a house, in which case you use an entirely different formulation that would keep that thing stable.

Q426 Zac Goldsmith: But there is a relevance also to bees. I have chunks of the promotional material here. In short, your literature describes Premise as "working because imidacloprid disorients termites and prevents them from grooming each other, which allows diseases to take hold". Now, obviously, there are similarities between the behaviour of termites and bees—they clean each other and exist in large colonies. So, what research, if any, has Bayer conducted that would shed light on the impact of this chemical on bees and honeybees in particular?
Dr Little: When you do your initial studies, you are looking at a large number of different factors in terms of the colony's susceptibility to disease: things like how long the bee brood will survive; the extent to which you see a change in behaviour; and whether a colony survives over winter—all those higher-tier studies that would be normally expected.

Q427 Zac Goldsmith: Can I just interrupt for a second?
Dr Little: Of course.
Zac Goldsmith: Can you point us to any research at all, either Bayer research or other research, that shows that this effect that the company brags about in relation to termites does not also apply to honeybees? Is there any research that you can point to?
Dr Little: I believe there is, and I will certainly come back to you on further evidence that we can show.

Q428 Zac Goldsmith: Just for the record, without casting doubts on your integrity, I want to cast doubts on your belief, given that you were not aware of the product's existence until a few moments ago.
Can I just make just one point? The imidacloprid's approval for use in the EU has been described, I think it was by you in our last session, as being environmentally sound because it is not bioaccumulative. I think that is what you said at the time. Given what your promotional material tells us about that very same chemical in relation to termites, surely at best it is a disingenuous claim.
Dr Little: No. Absolutely not. What we are saying is that in an agro-environment this particular product does not bioaccumulate. That is an assertion. What we can also do, and it is true for a number of other insecticides, is formulate them in a way that means that they are extremely stable and will work for a lot longer.

Q429 Zac Goldsmith: For seven years—seven-year durability.
Dr Little: Yes.

Q430 Zac Goldsmith: That is not in any way linked to bioaccumulation?
Dr Little: Not at all, because what you are talking about there is not repeat use. It is a single use. So you are talking about a formulation of a product that is not exposed to what a field application of a product would be exposed to and will have an effect over that time.

Yes. I have no reason to believe that is not the case. It is entirely normal. For example, the stability of sugar in a sugar bowl is much different to that in a cup of tea. It is that different.

Q431 Zac Goldsmith: I am going to end this particular area by asking you if you could send us a detailed response to the points that I have just raised, when you have gone back and found the research that disproves that there might be a link.
Dr Little: Of course. Yes.
Chair: That would be very helpful. Thank you very much.

Q432 Caroline Lucas: I want to pursue the point of the accumulation in soil. Back in November, you told us that the imidacloprid had a half-life in soil of between 16 and 200 days. In December, you submitted some written evidence stating that in worst-case scenarios the half-life in normal soils would be variable, but could be around 288 days and would be expected to plateau upon repeated doses after three years. I wondered if you could tell us what caused you to change your calculation between November and December.
Dr Little: The difference between 200 and 288 days? It was with the help of my colleague here, Dr Garside, who went through it with me. I had been given information, which I believed to be correct, that we were looking at a half-life of up to around 200 days. Actually it is 288 days. If the question is how do we calculate a half-life of between 40 and 288 days, I am very happy to go through that.

Q433 Caroline Lucas: It would be interesting to know—288 days is very specific. It would be interesting to know a little more about that.
Dr Garside: These are measured days in the fields. So we performed 16 studies in the field across Europe, in central northern Europe and southern Europe, and in these you apply the compound once and then over a period of two years you measure its decline by taking samples of the soil—between 10 and 12 samples across the period of the study. Then, by measuring the difference in the concentration of imidacloprid in the soil, you can calculate how long it takes, with the half-life how long it takes to derive.
Just one point: these are done across Europe, and the half-life, because it is under field conditions, does vary depending on the particular year you are doing it and the climatic conditions. Just by coincidence, both the shortest and the longest half-life were both studies performed in Italy, but at different times.

Q434 Caroline Lucas: What is your response to UK trials? I know in the original submission there was an example from Germany and an example from the UK. Defra has told us that the UK trials in the '90s were based on a worst-case scenario, but they also confirm that those trials showed a half-life in the soil of around 1,300 days and that a plateau had not occurred after six years. So has Defra misinterpreted the UK evidence?
Dr Garside: This is a very different study from the one that we use to determine half-lives. Basically in this particular study it was a treated seed that was sown for six years.
Chair: When you say "in this particular study", can I just double-check—
Dr Garside: Yes. Sorry. I am talking about the UK accumulation study that is being discussed here. It is a very specific study that is not designed to derive half-lives. That is important, because when I just said about studies we do to derive half-lives—we take a lot of measurements of soil concentration. In this particular study in the UK, where it was a seed treatment, there was only one sample taken each year, and that was taken at the end of the year, just before the next sowing. So we do not have a measure of the concentration initially. We only have this measurement of one time a year.
This study was also different in its design. Normally when we do these studies they are designed to reflect common agricultural practice. In this particular study, the barley was sown and we took the harvest of the grain, but then the straw remained on the soil and the straw was chopped and shallow-incorporated back into the soil bed.

Q435 Caroline Lucas: It was a trial that you chose, or that was chosen, to be part of a demonstration within the assessment to demonstrate the long-term field dissipation?
Dr Garside: No, the study does not answer the question. I cannot speculate as to why the study was designed the way it was. But we generated the data. We have to submit it. So whether we believe now, looking back at a study performed from 1991, that it was a reasonable practice—I happen to believe it is not, because I know in the UK straw is quite a valuable commodity and therefore it is normally harvested. We still have the data, so we have to submit it and it has to be assessed by other member states.

Q436 Caroline Lucas: So why do you suppose it was done? If it was looking at something that was so utterly extraordinary that it would not normally happen, then why would someone pay for it to be done?
Dr Garside: I cannot speculate as to why the particular study was designed the way it was in 1991. All I can say is it was very early for this type of study and perhaps the design was not thought through properly. I can't speculate as to why it was done that way.
Dr Little: But other studies have been done.
Dr Garside: Yes. We have a study that was performed in Germany, not with seed treatment, where we do not have incorporation of a lot of organic material, and that study was done.

Q437 Caroline Lucas: Going back to the UK trial for a moment, though, do you think it demonstrates anything other than that imidacloprid has an unacceptable effect on the environment in a worst-case scenario?
Dr Garside: I do not think it demonstrates it has an unacceptable effect on the environment.

Q438 Caroline Lucas: Why? It is showing that it is not plateauing and it is increasing significantly.
Dr Garside: No. Because when we take into account the plateau, when we do risk assessments, if it passes the risk assessment demonstrating safety, then it is not an unacceptable effect on the environment.

Q439 Caroline Lucas: But we have new EU regulations that suggest that there should not be a half-life of more than 120 days. We are talking about something that has 1,300 days.
Dr Garside: No. There is no EU regulation suggesting there should not be a half-life of 120 days.

Q440 Chair: But is it not the case that the guidance subsequent to the regulation's coming into force, the supplementary guidance, laid that down as a guideline?
Dr Garside: It is not a cut-off. It is not a definitive figure that is greater than 120 days. That is not—

Q441 Caroline Lucas: We have here essentially a new regulation covering active substances that was introduced in 2009 that specifies that any plant protection substance approved for use in the EU must have a half-life in soil of less than 120 days.
Dr Little: Is that not a cut-off only if you have the other two?
Dr Garside: That is in combination. There are three criteria that apply. It is not a cut-off just on one criterion.
Caroline Lucas: Sorry?
Dr Garside: It is not a single cut-off criterion. It is also in combination with bioaccumulation and toxicity. So, it is not a figure that is itself a cut-off figure.

Q442 Caroline Lucas: Let me come back to the point that, however unusual the situation might have been around the UK trial, if those trials demonstrated a half-life of around 1,300 days and a plateau had not occurred after six years, if that were to be normal usage, would you agree that that would probably represent harm to the environment?
Dr Garside: I would say that if we did a risk assessment, so we look at it not in isolation, we look at the effect it has on the environmental organisms and if it has no effect and it passes the safety criteria, then in itself it is not having a detrimental environmental effect. The figure itself does not say that.
Dr Little: Also, as we have already made very clear, the experiment that was done was not to determine half-lives. Those experiments that were done to determine half-lives have demonstrated very clearly that you get a half-life of somewhere between 40 and 288 days depending on the circumstances.

Q443 Caroline Lucas: But it was about accumulation in the soil. It was about how soon the chemical is no longer present in the soil. If we have evidence that seems to suggest that after six years it is not plateauing, I do not quite understand why that would not represent harm to the environment.
Dr Garside: It related to a very specific set of circumstances, where this straw was ploughed back into it.

Q444 Caroline Lucas: I appreciate that. I am not arguing that this is an unusual scenario. What I am trying to get from you is: in that unusual scenario, if that were happening, would you agree, from everything we know, that that would be damaging to the environment? Because you will know that the same regulation that talks generally about the number of days of half-life also says that substances should have no unacceptable influence on the environment.
Dr Garside: Yes.

Q445 Caroline Lucas: So, something that is not plateauing after six years and we would argue had this half-life of around 1,300 days—would you not say that would have an unacceptable influence on the environment?
Dr Garside: I would still say you have criteria by which you define an unacceptable or an acceptable risk. If it passes those criteria in the risk assessment, then it cannot by definition be an unacceptable risk.

Q446 Caroline Lucas: But it did not. The interesting thing, of course, is if you go back to the original EFSA review, what EFSA said was—and I am reading here that EFSA picked up the issue of soil accumulation in the risk assessment—that at the two UK study sites, accumulation occurred over the full six-year duration of the studies and experts considered that a plateau was not reached. Now, that was in spite of the fact that the German authorities were saying that a plateau had been reached.
Dr Garside: Yes, because the German authorities commented that you cannot calculate the half-life from this study, and they commented on the design. EFSA also commented on the very fact I am mentioning about the design of the study, with the reincorporation of very high amounts of the straw. And in Germany the RMS looked at all the data that we had, not just one single trial.

Q447 Caroline Lucas: Let me ask you one last question. Are you confident that imidacloprid was subject to sufficiently rigorous and relevant environmental testing before it was approved for use as an active substance in the EU? Do you have absolutely no doubt about that whatsoever?
Dr Garside: Yes.
Caroline Lucas: Dr Little?
Dr Little: That is the good thing about having a whole weight of data rather than just a single time-point in a, as you have just heard, flawed experiment. I would much prefer to go with experiments that were designed to come up with answers that you need rather than focusing on a flawed experiment that essentially will definitely throw up a wrong sort of number if you do it in non-agronomically appropriate way. So, there are data on half-lives from across Europe that are in agreement that the half-life is indeed acceptable. Likewise, the accumulation data that has been done elsewhere according to appropriate criteria, appropriate methodologies, has come up with

an accumulation that peaks at four years and you do not see any further accumulation.

Q448 Caroline Lucas: Let me just clarify one last thing. The reason why it was included in the original documents that were forwarded to EFSA for assessment was that there was a mandatory requirement to do that. Because the tests had been undertaken, it had to be put in there. Is that correct?
Dr Garside: Yes. Yes. Whether we comment on the design of the study or not, we generated a set of data. We have to submit it in our dossier. We cannot pick and choose the data that we use.

Q449 Chair: But that data that you submitted did not comply with the standards that were required for authorisation for the product.
Dr Little: That does not matter. We are obliged.
Chair: That does not matter?
Dr Little: Yes. We are obliged to submit all data. We do not have a choice. That is the rule. If you put data together, you have to submit it.

Q450 Chair: Surely if the data that you are submitting does not comply with what was being required in terms of the accumulation of the half-life in the soil—
Dr Garside: Sorry, in what sense do you mean that it does not comply?
Chair: My understanding is that the guidance that was subsequently issued when the initial regulation was reviewed required that there would be an assessment that would give assurances that there certainly would not be over 1,000 units for the half-life. So, the measurements that were done did not comply with what the regulatory regime was asking for.
Dr Garside: That particular study does not comply with the aims—

Q451 Chair: That study was what the initial authorisation was based on, was it not?
Dr Garside: No. It was not. The initial authorisation is based on all the data. So it is based on the 16 half-lives that we have derived from the different trials, also considering the accumulation study. But it is recognised that these studies have a lot of weaknesses because of the accumulation-type studies themselves. Now the requirement is to calculate a plateau based on the longest half-life that you measure in a field study. So, we no longer are required to do this type of study, because it is recognised that you cannot derive the information that you want from them. It is very difficult to determine whether you have a plateau or not when the climatic conditions change year to year.

Q452 Chair: True. But is it not the point that in the two UK studies, a plateau was not reached?
Dr Garside: Yes. From when you look at the data you do not appear to have a plateau, but this does not represent a relevant agronomic scenario. So we are not looking at the actual use, because you are ploughing this very large amount of material back into the field and that does influence the behaviour.
Chair: Okay. Mr Spencer, you wanted to come in.

Q453 Mr Spencer: Just to clarify for my own knowledge whether there is a difference in the impact on the environment between the chemical present in the soil or the chemical that is present in plant residue within the soil—
Dr Garside: I am not sure. What you tend to find is that when a compound is present in the soil for a length of time, the plants can no longer take it and it no longer has harmful effects on organisms. There is a difference between what we call a residue that has been there for six or nine months and one you apply freshly to the soil.

Q454 Dr Whitehead: I think we would lastly like to have a brief look at whether we ought to be considering neonicotinoids collectively or individually. Does imidacloprid have a different impact on pests and the environment from other neonicotinoids?
Dr Little: There are essentially two classes of neonicotinoids. The ones that are essentially imidacloprid, thiacloprid and thiamethoxam—these are used in the UK essentially as seed treatments. Then there are a number of other ones, possibly the ones that you will have come across are thiacloprid and acetamiprid, which have an extremely good profile in terms of non-target organisms, especially bees, and can be used to spray over a crop. So basically there are two types. They are very different in their absolute toxicity in terms of target and non-target organisms.

Q455 Dr Whitehead: Bayer manufactures products containing both?
Dr Little: Bayer produces imidacloprid and clothianidin and also thiacloprid as a spray. Syngenta have thiamethoxam. Sumitomo also use clothianidin. Then there are a host of generic companies who use imidacloprid.

Q456 Dr Whitehead: As far as Bayer CropScience's sales are concerned, what proportion does indeed come from plant protection products containing imidacloprid?
Dr Little: Are we talking UK, or globally?
Dr Whitehead: Both.
Dr Little: In the UK, it would be a tiny fraction for imidacloprid. I think almost all of it now is generic in the UK. We use mainly clothianidin and again from the spray perspective, thiacloprid. Imidacloprid is irrelevant in terms of our turnover in the UK. The turnover on things like clothianidin is significant, but it is by no means the biggest product that we sell.

Q457 Dr Whitehead: When you say it is insignificant, is that because it is out of patent and, therefore, is only generically made?
Dr Little: Actually, the use of imidacloprid in the UK has largely been supplanted by clothianidin; so, very similar products, but from our perspective clothianidin is more suitable.

Q458 Dr Whitehead: The ACP said that they thought that imidacloprid use in the UK was declining very rapidly indeed.

Dr Little: Yes, absolutely. It is down to a minimal level; as I said, essentially a generic level.

Q459 Dr Whitehead: Is that the same in EU, worldwide, or is it just a local thing?
Dr Little: Imidacloprid remains a product that is used extensively globally. It depends a little bit on country by country, and essentially if you combine the use of imidacloprid, clothianidin and thiamethoxam, one or more of those will be used extensively in most places in the world. Not everywhere, but in most places.
Chair: Unless any of my colleagues have any further questions, at this stage I would like to thank you very much indeed for returning, Dr Little, and for making time available as well, Dr Garside. Thank you very much indeed.

Examination of Witness

Witness: **Professor Vyvyan Howard**, University of Ulster, gave evidence.

Q460 Chair: Welcome, Professor Howard. I realise that you have sat through the previous hearing, and the Committee members are aware that you do have travel plans to return home, so we are very conscious about—
Professor Howard: I think I am okay for the time being. I have a flight at 7 pm from Gatwick.

Q461 Chair: Okay; well, we will make sure you do not miss your flight.
I just wondered, first of all—you have had an opportunity to hear from our previous witnesses—whether or not by way of introduction you would like to give us your perspective and make any comments on what you have just heard. We will also wish to refer to the role of the Pesticide Advisory Committee, which we understand met yesterday and will be making recommendations to Ministers. The floor is yours.
Professor Howard: Thank you, first of all for the invitation to come and give evidence. There were some very interesting things said in the previous session, some of which I disagree with, but I think there is an emphasis on the economics of this, clearly. But I think that these neonicotinoids are a very good case study for what is deficient in the current risk assessments that we use. There was a lot of talk about data gaps, and a very interesting statement that Dr Little made was that, prior to neonics, pesticides represented a big problem for human health. I have never heard that before; we are always being told that they are perfectly safe, but this was a step change.
I think the things that were not discussed were the behavioural problems that these compounds seem to induce. In a way, because nicotine is known to affect the brain, there is a specific receptor that these compounds interfere with. It is also that particular part of the system, with acetylcholine as the transmitter, that is very important in the development of the nervous system.
When you do a risk assessment, the first step is hazard identification, and when you have identified a hazard the next step is characterising that hazard. That is expensive—lots of experiments and time. Then, finally, you do an exposure assessment, and then you do a risk assessment. It is all predicated on those first three steps. In this first step, hazard identification, one of the things you could have said was, "Well, this is a neuroactive substance so, therefore, we really ought to look carefully at the effect it has on the nervous system". Yet, as I recollect, most of the toxicity testing that was done was based on mortality. So these are standard pallets of tests over specific periods of time, from days to 14 days, to a medium-term study up to 90 days, and then multigenerational studies.
If we knew what we do now about the low-dose effects that affect the behaviour of these insects, I do not think they would ever get licensed; I do not think they would have been licensed. But at the time when they were licensed that was a data gap. Now they are licensed, they are continuing to be used, but clearly EFSA have identified that as one of the data gaps and have applied the precautionary principle.
The only other thing I would like to comment on about the previous presentation was that they clearly do not seem to understand precautionary principle. I published a letter in *Nature* about this a few years back, which I can furnish to the Committee. The precautionary principle is a tool that decision-makers can use at any step along the process—not just when it is new—of whether it is better to go on or not, taking the risks and benefits into account. That is what EFSA has done now. At this stage in the development of these compounds, they have weighed up the scientific evidence as it is, and they are basically applying the precautionary principle.

Q462 Chair: You would say that in the case of something already licensed, if further evidence comes up it is all right to go back to the beginning, as it were, and to undo that authorisation if the evidence is there.
Professor Howard: Yes. That exists, of course, in the pharmaceutical industry anyway, and pharmacovigilance is a kind of concept that people have been talking about applying to pesticides.

Q463 Caroline Lucas: Can I explore that a little further? It does seem quite extraordinary, in a way, that it does not already apply. I was really struck by the way in which Dr Little was basically saying that these chemicals have been around a long time, they do not seem to have done any harm, they got through the tests that were provided at the time and, therefore, it is an odd thing to do to reapply the precautionary principle to them.
I guess what we are saying, just to try to make sure we are clear, is that if new evidence shows that those early tests were flawed because, for example, they did not take into account sublethal effects, then it is entirely proper and appropriate—indeed, essential—to apply that new bit of understanding that we have

about sublethal effects to those older chemicals and to revise the standards by which they are judged. If what I have said so far is correct, then it seems to me to be very odd that there is not an automatic way in which that happens. Am I right in that—

Professor Howard: I think it is very difficult. It is not like pharmaceuticals, where they can just be whipped off by the relevant committee and there is no debate. I hope I was not saying that the tests that were submitted were incorrectly performed—I think they were probably okay—but—

Q464 Caroline Lucas: No, but the questions they were trying to answer were not the same questions we are trying to answer now, with the benefit of more—

Professor Howard: There has been a movement over the last decade or two, really, in the States and here in Europe, to try to get the risk assessments for pesticides moved away from these pallets of protocolised standard tests, to ask the developer to do relevant science.

A colony of bees is like an organism in itself. This bit of the population depends on that bit, and they are all in different states of development. So instead of looking at individual worker bees, which was originally what was done and toxicity tests were applied to those, one should look at the whole colony as the standard unit that you are trying to assess the outcome of. I do not think that was really done.

Q465 Mark Lazarowicz: First of all, sorry that I missed the beginning of your evidence; I had to go out for one second. Can you tell me a bit about your experience of the Advisory Committee on Pesticides and how far it really represents part of a coherent EU-wide system of regulation?

Professor Howard: I was on the ACP for six years, and I am a pathologist and toxicologist, so I was contributing in that way. I think the ACP does a pretty thorough job on applying the risk assessments that we have classically had over the years. Looking at these pallets of standardised tests, they look at pesticides in isolation and the toxicology has largely been predicated upon adult toxicology, although more recently developmental toxicology has come in. They try to come up with a regulatory level, and then they can recommend that they are licensed. To get on to annex 1 they have to be approved at EU level, and what the EU does is to farm out different pesticides to different equivalents of ACP in the different European countries and it feeds back into that.

The UK has been a rapporteur on a number of these. I remember Gaucho being discussed when I was on ACP. But it only goes as far as it does, and there are some areas where I think I would like to see what they do extended. I submitted a statement from the Endocrine Society yesterday by e-mail, so I think that is a very relevant document—and here I come back to one of Dr Little's statements; he said it is purely about dose. That is classical toxicology. It is Paracelsus: the dose makes the poison. I disagree with that, and most developmental biologists would disagree with it as well.

It is also to do with timing. What we are learning is that exposure to certain chemicals, which will have little effect on adults, will affect foetal development at a 1,000 times lower dose. So, in this development stage of life the toxicology is completely different, and the people who are making the running in the science here are not classically trained toxicologists—they are embryologists and developmental biologists. There is low-dose fatal toxicology, and I think with these bee colonies it may be a factor. They need to have that expertise.

Q466 Mark Lazarowicz: Is that expertise not sufficiently in the ACP at the moment, then, in your view?

Professor Howard: Well, they do have developmental biologists, but this is a really new area. For example, in Ana Soto's lab in Boston they have shown that you can affect the development of the breast in way which looks suggestive of possible breast cancer later in life in an animal at 1:250,000 of the No Effect Level. That is just one example, but the document I have provided you with looks at a whole range of these things.

Q467 Mark Lazarowicz: Do you think the Government should be reviewing the membership of the ACP in terms of strengthening certain areas, or are they doing that anyway?

Professor Howard: I think they should have that expertise on board. There are other areas as well; I think the mixtures problem is another one. Again, I think this neonic is a good example because there is literature now showing that they may synergise with certain other things—fungicides and things like that. So there are some people around—Professor Kortenkamp, for example—who have done a lot of work on mixtures, and that sort of expertise, again, would probably be rather important. Another area is the nanotechnology that is coming into agro-delivery systems now. If you nanonise things, you actually affect the transport systems around the body, and that is another area. When I left ACP I said, "This is one that you have to watch because it is coming".

Q468 Mark Lazarowicz: If there is a disagreement within ACP, how would that resolve itself? Does it work almost entirely by consensus, or are there actual decision-making procedures that have to be applied?

Professor Howard: Most decisions are arrived at by consensus. Occasionally, there is a vote. I think the response that the ACP made to the Royal Commission on Environmental Pollution eight years ago—I was one of the four who dissented from that. There is room for dissent. Dr Chris Stopes wrote a dissenting opinion once on another aspect, so there is the chance to do that.

Q469 Mark Lazarowicz: Was that dissenting opinion then sent to Government along with the majority opinion as well?

Professor Howard: Yes. It is minuted and available, yes.

Q470 Zac Goldsmith: Just very briefly on the point you made—and it is something you have written about in the past—about the synergistic effects of chemical mixtures. Taken to its logical conclusion, if

you were to assess all the different combinations of chemicals that are likely to react with other chemicals, you would be presumably setting yourself a task that is administratively impossible. Is it, therefore, possible to have a genuine precautionary principle? Is it possible to have a regulatory system that takes into account the impact of all these new chemicals coming into the market?

Professor Howard: You are right. We published papers where we compare two compounds together, and it is three years of a PhD to do that. Then, if you asked me to do three, I would be starting to struggle. If you permutated any three combinations from the number 1,000, you come up with a number like 15 million different combinations. That would all be at one concentration. You can see that the experiments very rapidly get out of hand.

You can obviously try to pick out the ones you think are going to be the most likely interactions and look at those, but this soup effect is a really problematic one. Professor Kortenkamp has been looking at mixtures of up to, say, 15 pesticides that are commonly there and at very low dose and finding synergistic effects, so it is clearly something we have to consider. But I agree that if you really want to go to town on that, then precaution is something that comes to the fore.

Q471 Mr Spencer: I am quite interested in your comments about chemicals and how they react together if they are applied, if you like, at the same time. But, clearly, if we move from a system of neonicotinoid seed treatment, we then move to an insecticide programme at the same time as a fungicide programme. You would be applying those chemicals at the same time and could exacerbate the problem.

Professor Howard: That is the status quo ante, isn't it? That is what has been going on for a long time in integrated pest management, the spraying of several things at once. There are various aspects to this; the chance of human exposure from spray drift is discussed and well aired. We are assured if sprayers take the right precautions and spray in the right conditions, that is minimal.

One thing that I am not sure has been fully aired yet with neonics is their ability—they are water soluble—to get into surface water. There have been studies in Holland and America that have shown that they are getting there. One question that I would certainly like to see covered would be what the significance is, say, of children drinking water that has these compounds in, because we know they are neuroactive. Again, I don't think that has been fully addressed or addressed at all in a risk assessment. But if there is evidence that they are getting into surface waters and maybe, therefore, drinking water, I would certainly flag that up as an area that needed to be looked at.

Q472 Mr Spencer: Just so we can get a feel of the scale of the issue, I wonder if you could make a layman's comparison to human exposure to nicotine. Could you compare the drinking of water, as you described, to the effect on a child in the back seat of a car where a mother smokes in the front? How far apart are those in terms of exposure to nicotine?

Professor Howard: I would have to go away and get a calculator out and have a look. I don't know. I would think the water would be rather lower, because we know that passive smoke has an effect on cot death. That is well documented. It is one of the big factors. Again, this is a neuroactive thing, that was Professor Fleming's big epidemiological study. If one parent smokes, there is a high risk, and if both parents smoke, there is a yet higher risk. This is certainly associated with tobacco smoke. Whether it is specifically the nicotine, nobody knows.

Q473 Peter Aldous: I will just say at the outset—it is on the Register of Members' Interests, but I am a partner in a family farm in Suffolk, arable and livestock. Just taking it further forward, Professor Howard, the possible impact of pesticides on human health: what pesticides do you regard as being particularly hazardous to human health?

Professor Howard: That is an interesting one. The one that I am most perturbed about, I think, is chlorpyrifos. There is a burgeoning scientific literature on the fact that low dose chlorpyrifos during the foetal period, delivered by the mother, has neuro-behavioural effects on the offspring. Indeed, when I was on the ACP, I went with Michael Meacher to Defra. We had a meeting with them about chlorpyrifos. They did reduce the ADI at about that time. I was putting all these papers on the table and saying that maybe they should consider going further than that, but they didn't. That is certainly one that I would like to see come under the spotlight.

Q474 Peter Aldous: Leaving aside fungicides and herbicides, which particular insecticides raise the greatest concerns in respect of their impact?

Professor Howard: Chlorpyrifos is an OP, isn't it?

Q475 Peter Aldous: Yes. Have you identified any cases of human health effects specifically from the use of neonicotinoids?

Professor Howard: No.

Q476 Peter Aldous: Thank you. I want to take further something that Mr Spencer commented on. One consequence of a hypothetical moratorium on the use of neonicotinoid seed treatments in the UK might be an increase in the use of foliar pesticide sprays. Would such change in agricultural practices lead to an increase in risk to human health?

Professor Howard: If they are improperly applied, yes, I think that could be argued, although systemic pesticides are a very new development and I think we are only beginning to understand what it means. But I think this threat to pollinating species, from a financial point of view as well as from an ecological point of view, is severe, as I read it. I think that EFSA is right to be proposing a precautionary stance on this.

Q477 Dr Offord: I wanted to ask you a couple of questions on the Royal Commission on Environmental Pollution. They produced their report in 2005 on crop spraying, and that was right in the middle of your tenure on the Advisory Committee on Pesticides. They concluded in their report—we do have sight of

it here—that they could not draw firm conclusions on causality between recorded ill health and pesticide exposure. I wanted to gain your opinion on that and ask if you felt that they came to the correct conclusion.

Professor Howard: I think the conclusion is correct. The thing is that human exposure patterns are very complex. If you think about the two examples where medics have been able to say, "There is something going on here", one was thalidomide and the other was diethylstilbestrol, which was given to women in the 1940s to stop miscarriage, and 20 years later young women started turning up in clinics with a very rare cancer of the vagina. There were six or seven. They said, "What's going on?" With thalidomide it was such an obvious thing you couldn't miss it. "What's going on?" When someone put two and two together and went back to the mother's case notes there was the history of exposure, so you had an exposure history.

What we are dealing with, with pesticides, is diffuse low-dose mixture and nobody is monitoring who is exposed to what very much, and particularly they are not monitoring what the foetus is getting. It is almost impossible without that history to be able to say there is a tie-up. You can do these very large cohort studies and look at pesticide usage in certain areas—and they have done that with Maneb and things like that, with respect to Parkinson's—and you can get an inkling. But what they are saying is that there is a large degree of uncertainty and that was what a lot of the argument within the ACP was about. The RCEP were saying, "You're putting this forward in a much too confident way to say there is no risk. You are not in a position to give it that level of confidence". The majority of ACP argued back that they thought they could, and that was the nub of the argument then.

Q478 Dr Offord: But your answer to that question fits in well with your response through the Committee to the Royal Commission's report, and I understand that you cautioned about being too ready to acknowledge potential human health risk. But in response to that position, would you say that those people who were reporting ill-health due to exposure to pesticides in some ways had a slightly psychosomatic effect?

Professor Howard: Most illnesses have one or both. The evidence that was put forward there was not a properly constructed epidemiological study, so I think it is very difficult to draw hard-and-fast conclusions. It is what is known as anecdotal evidence. But they put themselves forward, and there were quite a number of them with conditions. When you find clusters of things like that, then it often is worth looking further into, but it doesn't prove anything.

Dr Offord: Right; okay, that is great. Thank you.

Q479 Chair: Just finally in conclusion, I think you appreciate that this is a timely report that we are undertaking. In a way, there are fast-moving developments. We have had a retail ban, I think, either today or yesterday, and obviously we have had the EFSA report. Is there anything that you would wish to cover and raise with us that you have not had an opportunity to raise that is particularly pertinent to the stage we are at with our inquiry now?

Professor Howard: Yes, I think the main thing that I want to see introduced into regulatory process is a much closer look at subtle functional deficits. Hitherto, developmental toxicity has largely been measured by looking at gross malformations, spina bifida, skeletal malformations—things you can see with the naked eye. It is changing slowly but not fast enough, in my opinion.

I will give you examples of these subtleties. One would be, say, a reduced ability to produce sperm. You don't see any deficit by looking at the anatomy; you have to measure the physiology, and neuro-behavioural deficits obviously fall into that as well. The subtle deficits are the things that we are finding increasingly following exposure during the foetal period. I think if we get to a stage where we can manage to protect the foetus, then we protect everybody—that is the most vulnerable state.

Q480 Chair: When you say "we"—

Professor Howard: I mean society through its regulatory processes, yes.

Chair: Okay. Thank you very much indeed for going to such lengths to be with us this afternoon. We appreciate your evidence, and we shall see where our inquiry takes us. Thank you.

Wednesday 6 February 2013

Members present:

Joan Walley (Chair)

Neil Carmichael	Caroline Lucas
Martin Caton	Caroline Nokes
Chris Evans	Dr Matthew Offord
Zac Goldsmith	Mr Mark Spencer
Mark Lazarowicz	Simon Wright

Examination of Witness

Witness: **Herman Fontier**, Head of Pesticides, European Food Safety Authority, gave evidence.

Q481 Chair: Mr Fontier, it gives us great pleasure to be able to welcome you before our Committee this afternoon, and we are very grateful to you for coming especially, I understand. I think it is particularly appropriate, given the stage of our inquiry and the recent work that you have done. What we would like to do is begin by asking you if you could perhaps share with us the role and the remit of EFSA—the European Food Safety Authority—and if you could tell us a little bit more about the way in which the pesticide approval system works and the background to the current assessments that you have had just done.

Herman Fontier: Okay; thank you. The European Food Safety Authority was established following a number of food crises in the 1990s. There was the BSE, the dioxin crisis in Belgium, and at that point it was decided that there was a need to change the system; that there was a need in fact to split the risk assessment from the risk management. This is reflected in the preamble to the Food Law. The Food Law is the regulation establishing the European Food Safety Authority. In the preamble we can read, "In order for there to be confidence in the scientific basis for the Food Law, risk assessments should be undertaken in an independent, objective and transparent manner on the basis of available scientific information and data". That is exactly what we are doing in the EFSA: independent risk assessments on scientific information in an objective and transparent manner.

The European Food Safety Authority is more than just food safety, and particularly in the area of pesticides, the remit of EFSA goes far beyond food safety. For reasons of efficiency, it has been decided that in fact EFSA would be responsible for the full risk assessment of pesticides, including other aspects than consumer health. That is operator, bystanders, workers' exposure and health and, also very important, the whole environmental risk assessment is done within EFSA, although obviously this has not much to do with food safety. Is that sufficient?

Q482 Chair: Yes. I think we are interested to know whether or not you can initiate assessments of this kind or whether you have to wait to be asked to do it, and how it works that you came be to do this particular assessment.

Herman Fontier: This is also regulated. You can in fact ask us to perform a risk assessment. It can be at the request of the European Commission. It can be because there are legal provisions allocating this task to EFSA. We can also perform a task on our own initiative, and, finally, the members of the European Parliament and also member states can task EFSA. As regards the pesticides, most of the work we are doing—and by that I mean evaluations of pesticide active substances—results from legal obligations laid down in several regulations.

Our role has been clearly defined by the legislation. In this particular case of the three neonicotinoids, the situation was different because we have been mandated explicitly by the European Commission to undertake this work. Last year, the Commission sent us a mandate and has requested us to come up with a conclusion on clothianidin, imidacloprid and thiamethoxam. The Commission has also clarified or imposed upon us certain information to be used. That is, we had to use all the information as submitted by the applicants for the EU approval of these active substances; all the information submitted by the applicants in the context of applications for authorisations at national level for plant protection products containing these active substances.

We have been tasked to use the scientific opinion prepared by EFSA last year, a scientific opinion that is a preparatory document that will lead further to the development of a guidance document with a risk assessment methodology for pesticides impact on bees. We have been asked to use a scientific opinion that is only preparatory to a guidance document, and I am emphasising this because this is explaining a lot of the uncertainties we have highlighted in our conclusions. Further, we have been asked to take into account new scientific literature, which is already incorporated in the scientific opinion on the science behind the risk assessment document.

Q483 Chair: You said you have been asked to take into account new certification.

Herman Fontier: New scientific studies, published literature, and, further, all monitoring data that was made available by the member states. We had to consider all uses authorised in the EU and that is for seed treatment formulations and for granules. This was the mandate, as we have received it from the European Commission.

Q484 Chair: Thank you. One final question from me: why did you not look at honey bees earlier?

Herman Fontier: We have not been involved in the process for clothianidin and thiamethoxam for the very simple reason that the process had started before EFSA was established and there was no legal basis for us to step into the process. For imidacloprid, on the other hand, which was considered later in the review programme by the European Commission, we have been involved, and in 2008, we delivered a conclusion on imidacloprid.

Q485 Chair: Can I just clarify, then: does that mean that your predecessors or whoever was involved prior to you being involved, if there had been an assessment done of a certain product of one kind or another, that you would not revisit that? You would just take as read the basis on which that authorisation had been given?

Herman Fontier: Yes. In principle, we could have started revising all evaluations done in the past, but the resources are not there to do that, and, as I say, our programme is extremely challenging. We have to deal with all the new active substances, but at a certain point we also stepped in the process of the evaluation in view of the review of existing active substances, and there were 1,000 existing active substances when the EU legislation was put in place. That was adopted in 1991 and applicable in 1993. This was a huge programme, and at a certain point we got involved in the programme. All our resources were absorbed by that work, and there was no way for us to start doing other things spontaneously.

Q486 Zac Goldsmith: Colleagues are going to be asking you specifically about the 16 January risk assessment, so I am going to leave that for one second. I just want to ask you more about the composition of EFSA. Can you tell us what kind of skills and areas of expertise are brought together when assessing pesticides?

Herman Fontier: In general, or specifically for the—

Zac Goldsmith: In general, when it comes to assessing the risk of pesticides.

Herman Fontier: Yes. The process we have been following—and, again, this was the result of the mandate we received from the Commission—was quite different for the neonicotinoids compared to the normal procedure leading to the conclusion following an EFSA peer review. The normal procedure is that the dossier is submitted by the applicant to a rapporteur member state. The rapporteur member state has to evaluate the dossier and lay down its evaluation in what is called a draft assessment report that is then sent to EFSA. EFSA, as the next steps, has to organise a commenting. That means we are sending the draft assessment report to all the member states, inviting them to comment generally within 60 days. In parallel, the draft assessment report is made publicly available, and also the public at large has a possibility to send in comments.

These are then considered by the rapporteur member state and by EFSA, and generally a number of issues that have been highlighted during the commenting are selected for further consultation in a series of expert meetings organised by EFSA involving experts from the member states. We ask the member states to nominate experts for participation in these meetings.

Q487 Zac Goldsmith: All member states?

Herman Fontier: All member states can participate, but typically we would see something like 12 member states designating.

Q488 Zac Goldsmith: Did the UK Government recommend any experts?

Herman Fontier: In most cases, they do.

Zac Goldsmith: But in the case of the risk assessment that you released in January—

Herman Fontier: No.

Q489 Zac Goldsmith: We did. I probably ought to know this, but just to be clear the preliminary risk assessment goes out to member states. Member states then have a right to comment on it and raise issues before you reach your own conclusions. At that point, before you reached your own conclusions, did the UK Government make any representations? Were there any issues that it raised?

Herman Fontier: I have to admit I do not know by heart what member states, out of the 27 we have, have submitted comments in the commenting round. I was explaining the general way it works, and, as I said a moment ago, there is a difference here in the case of the neonicotinoids and the difference is that there was no rapporteur member state involved. Normally, the procedure is the dossier is submitted by the applicant to a rapporteur member state. In that particular case, the Commission has tasked us to collect the information directly from the applicants, from the member states, and we have collected the information and drafted a draft conclusion. As there was no draft assessment report, in an annex to our draft conclusion we submitted what we call study evaluation notes; for each study, a quite detailed note with our evaluation of the study. Then this whole package was sent out for commenting to the member states.

Q490 Zac Goldsmith: You are still collecting responses from member states now?

Herman Fontier: No. We have been collecting the comments. We have organised, in almost one week, an expert meeting to discuss the three neonicotinoids. Then we have made available to the member states another draft of the conclusion, sent it to them for final written comments to be made on our draft conclusion, and then we had finalised by the end of December these conclusions, after the sanitisation process—elimination of confidential information—have been published.

Q491 Zac Goldsmith: When you talk about EFSA, who makes those decisions? Whose job is it to look at all the evidence that is submitted and take a view? What kind of background do they have?

Herman Fontier: We have a big unit. The pesticides unit is almost 50 persons, and we have experts in that area. We have four experts in the area of ecotoxicology, and these persons have been in charge of evaluating the studies and of drafting the conclusion.

Q492 Zac Goldsmith: To what extent are your experts reliant on research that has been paid for by the industries in question and how much are you able to generate yourself?
Herman Fontier: For sure we cannot generate studies ourselves. We certainly do not have the resources for that, but we have been mandated by the Commission to take into account the studies as generated by industry, and so we have done. We have also been tasked to look into independent scientific literature, and so we have done. We have taken into account, I think, all relevant information that is available.

Q493 Zac Goldsmith: Could I ask you what happens now? You released your findings halfway through last month. Is that the end? Are member states now supposed to come back to you responding to what you have done, or is it now entirely to the discretion of other decision-makers as to where to take this? Is your job done now on this issue?
Herman Fontier: Our job is done, at least for this, because we are now working on another similar conclusion for an active substance called fipronil having similar effects on bees. We have delivered our risk assessment, our conclusion, and we have tried to make it clear what the risk is and what the uncertainties are associated to our risk assessment. Now, it is up to the risk managers—that is, the European Commission together with the member states—to take a decision, and we are not involved in that decision-making process, nor do we advise the decision-makers what they should do.

Q494 Zac Goldsmith: I know colleagues are going to come to this in a second, but even where you highlight that there are gaps in the research and, by implication, you are asking questions and providing answers, there is no obligation on anyone to come back with those answers?
Herman Fontier: There is no such obligation.

Q495 Zac Goldsmith: Theoretically, this could just disappear into the ether and be ignored by member states? There is no body that is going to be taking the information you provided and following through with it?
Herman Fontier: The member states together with the European Commission have to come to a decision. This is done through the so-called comitology procedure. That is, the Commission should try to find, in the Standing Committee where all member states are represented, a qualified majority for a certain proposal. Now the Commission is consulting with the member states. It is making proposals. It is seeking a proposal that, at the end of the day, might achieve getting a qualified majority. This can include that within a certain time limit data gaps must be addressed by the applicants. That is a possibility that has been used many times by the European Commission.

Q496 Caroline Lucas: If there is not a qualified majority, if there were a simple majority, would that still be enough to move in a certain direction? I seem to remember from my days in Brussels there were examples when you fell short of a qualified majority, there was a simple majority but because it was not qualified the status quo ante remained, if you see what I mean. You got the sense that there was a will there to do a certain action, but it did not happen because it did not quite get that QMV.
Herman Fontier: A qualified majority is needed. The Commission needs a qualified majority in order to adopt the decision it has proposed, but, of course, if there is no qualified majority, then it goes to a higher level. It goes to the Appeal Committee. In former days, it would go to the Council of Ministers, but, with the change in the comitology, it now goes to the Appeal Committee. We are not involved in that process, as an EFSA.

Q497 Caroline Lucas: When Zac was talking about member states being able to comment and so forth, are they commenting on the methodology, or are they commenting on the assessment that you are making as well?
Herman Fontier: They are commenting on the assessment because, to a large extent, the methodology is laid down in the legislation.

Q498 Caroline Lucas: Is it already a political decision they are taking at that point? People sometimes make distinctions between risk assessment and risk management. Risk management is clearly a much more political issue, where you are measuring trade-offs and so forth. Would you agree that the risk assessment is quite a political process as well in that case?
Herman Fontier: There is indeed a separation between risk assessment and risk management, and it is acknowledged at the level of risk management that other elements than just EFSA's scientific advice is taken into account. This is also laid down by the preamble to the Food Law, where it is acknowledged that—

Q499 Caroline Lucas: Yes, but on the risk assessment side of it; I think on management it is clear. On the risk assessment, to what extent do you think that is open to political pressure? It does not sound like it is quite the neutral process that it might sound as if it would be.
Herman Fontier: We have our expert meeting with the representatives of the member states. This is a scientific meeting, so it is focused on the science. It would become immediately clear if a member state representative would try to insert in the discussion other elements that are not science-based. That would become immediately clear, and, at the end of the day, it is important to understand we are not bound by the outcome of the expert discussion. We listen carefully to them. It is useful to have a discussion with the experts of the member state, but, at the end of the day, the conclusion is not merely a conclusion of the expert discussion. It is the conclusion of EFSA as an independent scientific organisation, and in many cases member states do not agree with us for whatever reason. They wish to see highlighted in the meeting minutes that they have disagreed with our approach,

and that is fair. We note it in the minutes, but we are responsible for the content of our conclusion.

Q500 Caroline Lucas: Those minutes are public, aren't they?
Herman Fontier: Yes.

Q501 Mr Spencer: How easy is it to go back and re-look if new evidence comes to light? Do you have the power to revisit any recommendations, or does someone have to engage you to do that?
Herman Fontier: To revisit our own recommendation?
Mr Spencer: Yes; for example, your recommendations around dust levels and there being an acute risk to honey bees through dust. If there was a technological advancement where the dust is reduced or if there is further scientific evidence to the contrary, do you have the ability to go back and revisit that?
Herman Fontier: In principle, we could do that, but, again, the workload is such that we would simply not be in a position to start revisiting conclusions we have delivered earlier. However, if it becomes clear that there was new evidence—and this would apply more to adverse effects, in fact, being highlighted in a new scientific publication—at such a point there is no doubt that the Commission would ask us to revisit a conclusion we have delivered earlier.
Chair: I think we will return to the precautionary principle.

Q502 Zac Goldsmith: On the point that has just been made, the minutes are public. Are the submissions by member states also public? All the feedback that you have had from member states: is that all publicly available?
Herman Fontier: Yes, it is. Obviously, we make our conclusions publicly available and the background documents to the conclusion as well. That is quite a lot of documents. It is many hundreds and hundreds of pages.

Q503 Zac Goldsmith: I realise I am hogging this, but I have one other question before I get to the precautionary principle, and that is: what measures are taken by EFSA to ensure that your experts are also independent? In other words, what measures are there to prevent the potentially corrosive effect of the revolving door between business and regulators?
Herman Fontier: We have an independence policy in EFSA that, in the first instance, mandatorily applies to all external experts involved in EFSA's activities, but EFSA has decided that also the staff members must make an annual declaration of interest.

Q504 Zac Goldsmith: I am going to finish with one question that is on the precautionary principle, which is at the heart of your risk assessment. The position taken is based on the application of the precautionary principle, and I am just interested to know: is there a standard threshold of risk that you apply? Is there a specific formula that you apply that would enable us to understand how you apply the precautionary principle generally speaking, not just in relation to this?
Herman Fontier: I do not think we apply the precautionary principle. My understanding is that it is up to the risk managers to apply the precautionary principle and to weigh several elements; but of course, there are criteria we do use saying when a substance can be considered as being safe: yes or no. These criteria are laid down, to a certain extent, in the legislation.

Q505 Zac Goldsmith: I just want to question that, because in the risk assessment that you have released there was some quite specific advice given on where neonicotinoids should and should not be used. Presumably, that is based on your application of the precautionary principle.
Herman Fontier: I would not say so. To come back to the uniform principles laying down the methodology for the evaluation of pesticides, that is a legal text, and also the criteria for authorisation. The one clear criterion for the bees is the hazard quotient. If the hazard quotient is more, which is putting in relation the dose rate and the toxicity to bees, it is a very simple approach in fact. The hazard quotient: when it is above 50—that is the criterion laid down in the legislation—then an authorisation cannot be granted. The problem we have been facing is linked to the fact that we are developing a new risk assessment methodology for bees.
As I explained, we have adopted this scientific opinion, which is the first step leading towards the adoption of a guidance document. When we were performing our evaluation, we did not have the guidance document. We had the scientific opinion, which is not a guidance document. In the guidance document, you need to lay down the criteria. The criteria so far have not been laid down other than the hazard quotient I have just mentioned, and the criteria have to be laid down in dialogue with the risk managers because, "What is safe?" is not just a scientific question. It is a question that has to be answered in dialogue between the risk assessors and the risk managers. If you put the safety level extremely high, then probably you do not have any products left in the market. It has to be decided by the risk managers what is the safety level. There is the criterion. This has not been done, and from there the fact that on many occasions we have written in our conclusion, "No criteria. We can't for sure finalise the risk assessment. There is a high level of uncertainty." This is explaining also a lot of the Xs in the table at the end of the conclusions.
Zac Goldsmith: I am going to have to stop there, I think.

Q506 Simon Wright: I would like to ask a few questions about your risk assessment of 16 January, which says that using neonicotinoids only for crops not attractive to honey bees would be acceptable. I would like your views. With such an assessment, it would seem perhaps that the only response that the UK Government could take would be to ban their use for oilseed rape and other flowering crops grown in

the UK. Does your assessment leave any room for a different policy response?
Herman Fontier: There is nothing binding about our conclusion. It is a conclusion addressed to the risk managers. The decision has to be taken by the European Commission, together with the member states. What member states can do will depend on the decision that will be taken at the end of the day by the European Commission, together with the member states. There is no direct consequence resulting from our conclusion as regards the authorisations in the member states. This consequence will be there once the decision has been taken by the European Commission. The Commission might decide that only uses on crops not attractive to bees can be authorised. The Commission might take another view.

Q507 Simon Wright: What might that other view be?
Herman Fontier: You should ask the Commission. I don't know.

Q508 Simon Wright: Is your assessment that using neonicotinoids only for crops not attractive to honey bees would be acceptable because you do not know the extent of the potential harmful effects to bee populations, or is it because you have strong evidence of harmful effects?
Herman Fontier: In some cases, it is because there is evidence. In other cases, it is because we were not able to finalise the risk assessment; in most cases, because we did not have sufficient data to do so; so we could not conclude that it is safe.

Q509 Simon Wright: Your risk assessment reflects the more stringent tests of the effects of pesticides on bees and how field trials are interpreted. Have those higher standards yet been approved by the European Commission?
Herman Fontier: No. Again that is linked to the use we have been making of the scientific opinion on the science behind the risk assessment methodology for bees, and, again, where we have used the scientific opinion, it is because we have been requested by the European Commission in the mandate to do so.

Q510 Simon Wright: When would you expect new standards for approving new pesticides to take effect?
Herman Fontier: The guidance document we are developing should be finalised by the end of May of this year. The next step then is for the European Commission to take note of the guidance document in the Standing Committee and to decide on a date as of when the guidance document has to be implemented to be applied in the risk assessment process. There are other elements. There are the data requirements that have been laid down back in the 1990s by the European Commission in a series of directives. These data requirements have been revised, because a text to be published has been voted in the Standing Committee in July last year and should be published, I hope, in the next few months. These new data requirements will impose more studies with regard to bees, and that was necessary because we have now also a new regulation in place, the regulation 1107/2009—adopted in 2009, obviously, but only applicable since June 2011—with criteria added to the criteria compared to the previous legislation. In particular, criteria for the approval after evaluation for bees have been highlighted very clearly in that new regulation.

Q511 Simon Wright: One last area of questioning: I do not know whether you have seen the evidence provided to our Committee last week by Bayer, but they complained about knowledge gaps being created by EFSA changing the risk criteria and that the new standards were extremely onerous. Did EFSA take into account how long it might take for the pesticides companies to be able to do the research necessary to fill in any new knowledge gaps?
Herman Fontier: I would not say that we have created a knowledge gap. For sure in our scientific opinion and in our guidance document the result is that we will ask for more studies. Why do we do that? Because there is evidence that there are effects—sub-lethal effects, effects on bee colony development and effects on bee behaviour—and there are effects that, with the current methodology, cannot be assessed in a reliable way. In order to be able to make a reliable assessment of these important effects on bees, I think we had no other choice but to adress this in our risk assessment methodology, resulting thus also in the submission of further new studies in order to demonstrate whether these effects occur: yes or no. I am aware this is a burden on the companies, but I think it is also the result of us taking into account new scientific insights.

Q512 Caroline Lucas: I just wanted to go back to the risk assessment and the risk management, particularly around the assessment that, as Simon has said, is quite strong in terms of the language in which it is worded; in other words, "Only uses on crops not attractive to honey bees: we consider that acceptable". If a member state chooses in its risk management procedure to override that, to ignore it and to do something else, are you party to the discussions and debate that goes on for them to come up to that conclusion? I am wondering what happens to something that looks like it is coming from a fairly scientifically rigorous process and then it arrives in a member state who might then be thinking about the strength of the farming lobby or all sorts of other issues that it has to take into account when it makes its decision. Do you still have any voice at that time?
Herman Fontier: No. We can listen, but we can't really speak up.

Q513 Caroline Lucas: Do you think EFSA should have that power?
Herman Fontier: No. We have been created as an EFSA because there was a need identified to separate clearly the risk assessment from the risk managing process. We are just doing our risk assessment, and we would not wish the risk managers to interfere with our activities. Similarly, I do not think we should interfere with the activities of the risk managers. It is their job to sort it out now and it all depends on how the measures at the end of the day are adopted by the

Commission; what level of stringency, if I can say that. The Commission can just say, "Well, member states must pay particular attention to this and this," and member states can ignore it at the end of the day, or the Commission can say, "Member states shall not authorise neonicotinoids on crops that are attractive to bees." That is an option, but we have no say in that.

Q514 Caroline Lucas: I suppose all I am getting at here is that the process that has gone into your coming to the conclusion of saying, "Only uses on crops not attractive to honey bees should be possible," an awful lot of scientific rigour has gone into getting yourself to that process. You have had some of the member states' experts in that process as well, and you are not just saying, "Well, you might keep an extra eye on it," or, "It might be dangerous; you might want to look at it." That is a fairly categorical statement, and I am just wondering about the process, that if then a member state decides to do something completely different, you just say, "Fine, so be it." There is nothing more you can do?

Herman Fontier: There is nothing more we can do. At the end of the day, it is a recommendation from our side. It is up to the risk managers to implement this recommendation in one or other way in a legal text, which can be more or less mandatory for the member states. I can just repeat: it can be, "Member states, you shall or shall not do this and that," or, "Member states, you must pay particular attention. You must ensure that there are risk mitigation measures put in place in order to avoid that there will be an unacceptable impact on bees." All these are possibilities.

Q515 Mr Spencer: You clearly came to the conclusion that you did not want to go down that route of, "You shall not use these chemicals." I just wondered, is that because you are uncomfortable with the gaps in the knowledge?

Herman Fontier: We do not say, "You shall not use it." It is not our role to say that. We just come to the conclusion that it has not been demonstrated that use on attractive crops is safe, but if member states can convince the European Commission that they are in a position to impose efficient risk mitigation measures to the area with that risk, the Commission may choose not to use wording "shall" or "shall not".

Q516 Mr Spencer: In your assessments, did you look at the possible implications then of what might happen if they were removed from the toolbox and we decided not to use neonicotinoids? Did the risk assessment take into account what other chemicals might be used?

Herman Fontier: No, we did not do that.

Mr Spencer: That does not take any part in that assessment?

Herman Fontier: No.

Q517 Mr Spencer: Do you look at the impact on European agriculture at all? Is that taken into account, the impact on yields across Europe?

Herman Fontier: Not at all. Again, I think this was very explicitly the intention of the legislator when creating the European Food Safety Authority when separating the risk assessment from the risk management. To come back to the crises that occurred in the late 1990s, what went wrong was a proper risk assessment could not be performed because there was this interference all the time from risk management considerations, leading to a lack of transparency, a lack of clarity on the scientific issues at stake. Therefore, we just look into the science, but it is acknowledged that socio-economic aspects can be taken into account indeed by the risk managers and they should put things in the balance.

Q518 Mr Spencer: Obviously, if there is a containment of use of neonicotinoids within the European Union and the EU looks to procure those products from outside the EU, are we in a circumstance where those chemicals can still be used in other parts of the world but we just import that product?

Herman Fontier: We could import. I am now speaking in general. It is always possible for a substance that has been banned in the EU, and many of them have, that import tolerances are set. That means that for food commodities imported from third countries where the substance is still in use, it is possible to apply for the setting of an import tolerance, which of course can only be set and accepted in the legislation where it has been demonstrated that it does not involve any risk for the consumer.

Q519 Mr Spencer: Given that neonicotinoids, by their very nature, are designed to kill insects, in your professional opinion is it possible to design an insecticide that does not have an impact on bees, given that they are insects?

Herman Fontier: I think that neonicotinoids are very toxic to bees; not all of them. In the European Union, five neonicotinoids are approved: the three we have now revised, but two further neonicotinoids are approved as well. It is acetamiprid and thiacloprid. In the first instance, we had been mandated by the Commission to look into these as well, but then, because the task was just too much for us, the Commission said, "Forget for the time being about acetamiprid and thiacloprid." Why? Because they are much less toxic to bees. It is a factor of 1,000. It is a huge difference.

Q520 Mr Spencer: It may be possible for member states to continue using those chemicals that you have not assessed but just take out that one neonicotinoid at this stage? I am asking you to look in your crystal ball.

Herman Fontier: For the time being, I do not know what will happen with the three neonicotinoids that we have assessed, and, of course, it is an ongoing process. Active substances are approved for a period of 10 years, and every 10 years they are all assessed again. When we have adopted our guidance document, in the next 10 years all the active substances that are approved will be evaluated against the guidance document. But, yes, there is time needed to do so.

Q521 Zac Goldsmith: When you talk about the risk managers, just to be clear, are you principally talking about individual governments, or are you talking about a European level of risk management?
Herman Fontier: I am talking about both the European Commission and the member states, because the decision-making is in the Standing Committee, where all member states are represented but where the Commission has the initiative.

Q522 Caroline Nokes: Last week, Bayer told the Committee that your imidacloprid risk assessment at EFSA had not taken into account all of the available research, including studies that had been referenced in earlier draft reports. Their feeling was that EFSA had not given sufficient weight to real-world higher-tier field trials, which showed that imidacloprid was safe. How would you respond to that criticism?
Herman Fontier: I am aware of this allegation made by Bayer; that leaves me a little puzzled, because we have indeed requested applicants to submit all the available data and they have done so, I thought. They had submitted a data package, which we have evaluated from the first to the last study. If you look into our conclusion—the imidacloprid one, if we talk about Bayer—then you will see that we talk about higher-tier studies, semi-field studies and field studies and that we try to use these studies, which is not always easy, because there are issues with representativeness of the study conditions for the actual uses as authorised in the EU. But we have used them, and where we could come to more a favourable conclusion then we have come to that conclusion. Just to give an example, the impact of nectar and pollen contaminated with neonicotinoids in rapeseed, we have, in the case of thiamethoxam, relatively good studies that have evaluated, in that particular case, the acute toxicity to bees. The outcome of thiamethoxam is different to clothianidin and imidacloprid. That is because we have duly taken into account these studies. There is still an "X", but for others there is not. We have taken into account field and semi-field studies, higher-tier studies, and if we have missed studies, then Bayer should tell us, but I am not aware of that.

Q523 Caroline Nokes: The recent risk assessment, and I have the table in front of me, seems to identify risks far more readily for potential acute effects than for long-term or chronic effects on honey bees, and there still seems to be a number of knowledge gaps for some types of crops. How confident are you that all neonicotinoids that you assessed do in fact present unacceptable risks when used on crops that are attractive to bees?
Herman Fontier: I do not think we say they have unacceptable effects. We have considered the different routes of exposure—the acute, the chronic, the bee brood—where possible. Then in each case we have tried to give the necessary information to the risk manager. Could we do a risk assessment? In some cases, not at all. Dust, chronic, long-term exposure—it was difficult. Therefore, we have all these Xs in the tables. In a lot of cases, we identified a risk, but very often that was at the first-tier risk assessment. Does that mean that the risk is for sure unacceptable? No. It means that for first-tier risk assessment the outcome is negative, but it does not mean that if higher-tier studies in future are submitted that it may appear that the risk is acceptable. We just do not know, because they are not there, but if we have been able to do a first-tier assessment and the outcome is there is a risk using that methodology, then we put an "R" in the table.

Q524 Mark Lazarowicz: If we could look more generally at the system of reviewing pesticides in the UK—you have regulatory bodies at member states level and you have EFSA and the European Commission—do you think that this system of a number of bodies leads to increased rigour in the assessment process, or are there ways that the system could be usefully improved?
Herman Fontier: I think it is useful to have different players in the process. There is also a question of volume. I will explain. Every year, we deliver something like 60 conclusions on pesticide active substances. Behind each conclusion, there is a dossier submitted with between 400 and 1,000 studies. One study can contain several thousands of pages. Considering this volume, I think it is obvious that, even if the pesticides unit is relatively big with its 50 staff members, we would not be able to handle such a volume if we would have to do the evaluation from the start; therefore, this contribution, as you could call it, where member states or member states' competent authorities do a first evaluation giving the opportunity then to all the others—and also to the applicant, by the way—to comment on the evaluation, build further on this commenting and consider them further in expert meetings. I think we have quite a balanced and sophisticated approach to take on board all the expertise at large within the EU but still ensuring at the end of the day that the conclusion by EFSA is an independent one.

Q525 Mark Lazarowicz: When you do receive a draft assessment report seeking approval for a new pesticide, do you rely entirely upon the research which is provided to you, or can you yourself carry out checks or commission further research as a matter of course?
Herman Fontier: Carry out research, no. We cannot do that.

Q526 Mark Lazarowicz: Is that because you are restricted by legislation on that issue, or is it just a question of resources?
Herman Fontier: It is not at all foreseen in the legislation that we would do that. The applicant has a duty to generate the dossier and, of course, the quality assurance elements in the system—the dossier, the studies that are relevant for human and animal health and environment—must be performed according to the Good Laboratory Practices, which is a quality system. On top of that, the new regulation 1107/2009 says that a literature search must be performed in order to retrieve from the published literature, published in the last 10 years, all relevant information for the purpose of the assessment, and we have developed guidance on how to do that.

Q527 Mark Lazarowicz: Can you, as the agency, ask further questions when you get all the assessments sent to you? Can you at that stage question the research that has been provided to you?
Herman Fontier: Yes, we can. There are several points in the procedure where a stop of the clock is possible. It is possible at the level of the rapporteur member state. The rapporteur member state can ask for additional information, but so can we during our peer review process. We can identify the need for the submission of additional data, which generally are clarifications on the studies as submitted by the applicant, and we do that routinely. We do that for almost all of the active substances.

Q528 Mark Lazarowicz: Are there cases when you do not feel that you are provided with satisfactory information, and, if that is the case, do you then eventually, in your assessment, report to the Commission that you do not feel sufficient surety of data that has been provided or something of that nature?
Herman Fontier: I do not think we have ever delivered a conclusion without a list of data gaps. A dossier seems never to be complete. There are always data gaps. These data gaps can be very small things that are not really necessary for the decision, but we also identify—and that is trickier—issues that could not be finalised, and these are important issues. We make it clear to the risk managers we are not at all satisfied with the way this issue has been addressed in the dossier, that there is an important gap and we could not conclude. We also identify the so-called critical areas of concern where we highlight those risk assessments that, to our opinion, do not lead to a favourable outcome.

Q529 Mark Lazarowicz: On this specific case, to give you an example of the case of imidacloprid in 2008, EFSA had identified some failings in a draft assessment report submitted by Bayer, and the German regulatory authorities and EFSA picked up the failure. I think it was issues about the calculations or the accumulation of soil. Is that correct?
Herman Fontier: We deliver 60 conclusions per year, and you will understand that I do not remember for all of these conclusions what happened exactly.

Q530 Mark Lazarowicz: Perhaps you can answer more in generality, then. Do you think that the Commission has the adequate structure itself to consider your assessments, or are they themselves under a similar kind of pressure as yourselves, leaving aside any issues of political decisions that are made as well at a later stage?
Herman Fontier: You put me in a somewhat difficult position. I would prefer not to make any comments on the Commission and the risk management process; the quality of it in general.
Chair: What about a hypothetic comment?

Q531 Mark Lazarowicz: I can see why you do not want to comment on that, given the position of your agency. Let me ask you this question. If the Commission does reach a conclusion, at that stage do you have any ability to input into that conclusion or to respond to a conclusion if you feel it is missing any of the points on the assessment, or is it something you could not do?
Herman Fontier: We are participating in the Standing Committee. Of course we are not participating in the vote of the Standing Committee, but we are there and we scrutinise very carefully the proposed decision making. If we feel that the Commission has missed a point, we will not hesitate to draw the Commission's attention to that, and very often the point is then picked up by the European Commission, but if the Commission decides to ignore our comment, they can do so, and there is nothing we can do about that.

Q532 Mark Lazarowicz: Finally, we were told last week by Bayer in their evidence that fewer companies invested in new insecticides because they could not be sure of the standards the new products will be required to meet. Is that a fair comment, in your view? Is there a case for not revising standards frequently, or is that something you disagree with?
Herman Fontier: I think I would tend to disagree.

Q533 Mark Lazarowicz: You would tend to disagree about the fact that companies are still investing, or that there is no problem with companies not being certain of new standards?
Herman Fontier: If I look at the decision-making for the new active substances, then I can only conclude that almost all of them do make it into the positive list and that is since the EU system has been put in place and has been operational since 1993. Hardly any of the new active substances have not been approved. I think that demonstrates that the companies know very well what is expected of them and they are able to anticipate and to put together the dossier that is meeting the expectations of the regulators. It was totally different for all the existing active substances which have been reviewed between 1993 and 2008, many of which failed to meet requirements.

Q534 Caroline Lucas: Just coming back to that example—and I appreciate you will not remember the details, but just to use it as a case study—as I understand it this was the DAR from Germany looking at imidacloprid, and the original German DAR said that a plateau had been reached when it came to accumulation in the soil. EFSA said the experts considered that a plateau was not reached, and then you go on to say, when you kind of forward it on, "The risk assessments to soil-dwelling organisms cannot be finalised, because the assessment of soil accumulation is not itself finalised". You are flagging some real concerns there. It goes to the EC Standing Committee on the Food Chain and Animal Health and they kind of miss that, it seems, and they conclude, "The review has concluded that under proposed and supported conditions of use there are no unacceptable effects on the environment". Just using that as a case study, does that seem as if the system is working properly?
Herman Fontier: Yes, that is a difficult one because, again, the risk managers are entitled to take into

account other elements than just the scientific elements.

Q535 Caroline Lucas: What sort of elements might they take into account?
Herman Fontier: As I say, socio-economic elements. They listen also to the member states; what is the position of the member states. The Commission is seeking to find a qualified majority at the end of the day.

Q536 Caroline Lucas: But would you not expect the EC Standing Committee on the Food Chain and Animal Health to be an authority that would put the food chain and animal health as its priority rather than worrying about the socio-economic impacts of a conclusion that might be uncomfortable for the member states but nonetheless essential as far as the science might suggest?
Herman Fontier: Maybe I am not the right person to answer that type of question, which I think should be directed to the risk managers.

Q537 Caroline Lucas: Let us talk about the system a moment. Could I not put it to you that something does not appear to be working quite as effectively as it might if you have the experts from EFSA flagging a concern that is then completely ignored by the Standing Committee? You have explained that it is their right to do that, and under the present system it certainly is, but do you still think that that is a good system, or do you think that there could be amendments made to that system that would make it more rigorous?
Herman Fontier: I am sitting here as an EFSA representative. You have to understand that. I am not here as a private person having my personal ideas on it. As EFSA we have not made up any position on this. I cannot come up with an EFSA position on this question. I cannot say what I think. I am an EFSA representative, and we have—

Q538 Caroline Lucas: We wanted to hear evidence from you because you are an expert when it comes to European policy making, and that is what we need to have fed into our Committee. Of course you are speaking as EFSA, but presumably you are also speaking as somebody who knows how the system works and would have a very upfront first-hand experience of where things perhaps just do not match up as well as they might. It would helpful to have some indication of whether you think that is something that could be looked at further or whether you think it works very well.
Herman Fontier: I think it is always useful to look at the system and to reflect further and to learn indeed from examples from the past and to see whether there is any improvement possible and, if such a reflection would be initiated, of course we would be willing to contribute to it with our views on it. Probably, the system is not the best possible. There is always a way to improve.

Q539 Chair: I think the concern is that evidence that EFSA had that was presented in the report that was being reviewed was not given any weight or taken into account when the further decision was made, which did not mean presumably to say that what you were saying was not important; it just was not taken into account, or it was not acted upon. So, what is the point of the EFSA in those circumstances? Hopefully, the current assessment will bring about a different set of circumstances.
Herman Fontier: Yes. It is not the only example you could find, I must say. There are many examples where we have highlighted risks, and while this has been taken on board by the Commission—

Q540 Chair: But do you think that some of the risks that you identify are buried and just not even taken into account?
Herman Fontier: Generally, they are taken into account in one way or the other. It can be at several levels. It can be as confirmatory data and the Commission says, "You have to provide within two years confirmatory data in order to fill the data gap," or it can be that member states must pay particular attention to a certain issue. We should not forget that our evaluation is performed for representative uses. That may be important to highlight. The neonicotinoids was the exception, because we were requested to do so, but normally an approval is based on an evaluation of a number of one or two representative uses, and if the Commission, together with the member states, are of the opinion that the issue we have highlighted is maybe not of any relevance to other uses, that could be applied for—
Chair: Time is pressing on, and I think there we must leave it. I have no doubt that your current assessment is going to be influential in one way or another, so, once again, can I thank you for coming before the Environmental Audit Select Committee this afternoon. Thank you very much indeed.

Examination of Witness

Witness: **Georgina Downs**, UK Pesticides Campaign, gave evidence.

Chair: I would like to give you a very warm welcome, Georgina, on your return to the Select Committee. I can only apologise to you that when we had our last session previously, time did run out because of Divisions that we had over the House of Commons at the time. We are very grateful to you for coming back. We have three sessions this afternoon, and what we would like to do is take up where we left off, obviously looking at the concerns about human health from insecticides. I would like to turn straight away to Dr Offord.

Q541 Dr Offord: Thank you. Good afternoon, Georgina. The question I wanted to ask was: which pesticides do you consider particularly a hazard to human health?

Georgina Downs: All chemical pesticides are deliberately designed to be toxic—that is their purpose—and therefore all chemical pesticides have inherent hazards for human health. In fact, the authors of the 2004 *Pesticides Literature Review* that I referred to in the previous oral evidence session on 28 November—I referred to it because it found consistent evidence linking pesticide exposure to brain, kidney, prostate and pancreatic cancer, as well as leukaemia, non-Hodgkin's lymphoma, neurological damage, Parkinson's disease, among other serious illnesses and diseases, well, the authors of that literature review concluded that they did not support the idea that some pesticides are safer than others, as they found that there are different health effects for different classes of pesticides, and therefore their overall message to people was to avoid exposure to all pesticides whenever and wherever possible. The campaign I run would agree with that, based on the evidence that exists.

I would also just add to that, as Members may have seen at paragraph 2.5 of the written evidence, I pointed out previous statements from the European Commission regarding the known adverse health impacts for just three of the pesticide groups: organophosphates, carbamates and pyrethroids and pyrethrins, which comes sort of as one. But I would also stress again the fact that, as I did in the previous session, the reality of crop spraying in the countryside is that innumerable mixtures of pesticides are being applied to crops, obviously not just insecticides, but fungicides, herbicides and other agricultural chemicals. That is on a regular basis, year after year. I also pointed out previously that 80% of pesticide use in the UK is related to agricultural use.

Q542 Dr Offord: You have me at a slight disadvantage, as I was only appointed to the Committee after you gave evidence.

I would like to follow up with just two questions. One is: what concerns do you have about insecticides, and which ones in particular?

Georgina Downs: That answer to that last question probably covers that, because, from the point of view of the campaign that I run, residents living next to farmland are exposed to a whole raft of different pesticides throughout every single year. You have insecticides, you have fungicides, you have herbicides and they are all mixed together, and the mixtures have not been covered in any way, shape or form adequately in the approval system. So you have a whole cocktail of pesticides being—

Q543 Dr Offord: If we focus particularly on neonicotinoids, do you believe there is any concern to human health through neonicotinoids use?

Georgina Downs: I did again say a little bit about it in the last session, but you wouldn't know. The campaign I run has not specifically focused on neonicotinoids. It focuses in the round in general in relation to pesticide use and exposure for residents. I did not say too much about neonicotinoids in the written evidence, but I am aware that others have. The Soil Association raised some studies and some information to do with the World Health Organisation classifying imidacloprid and thiacloprid—apologies if the pronunciations were wrong—as class 2 under the World Health Organisation's classification. There is also some emerging science that has demonstrated neonicotinoids may also have neuro-developmental effects and some are considered likely carcinogens by the US Environmental Protection Agency. Aside from that, I have not looked into neonicotinoids specifically, but again I would make the point that it is the whole cocktail of pesticide soup in the countryside that is being applied and neonicotinoids are just one of the many that are approved for use. I think there are over 2,000 products the CRD told me that are approved for use currently in the UK in agriculture.

Q544 Martin Caton: In your written submission to us, you draw our attention to the fact that the Advisory Committee on Pesticides has two working groups looking at the health impacts of the use of pesticides. Do you have any sense of whether these will bring the sort of changes to the risk assessment process that you would like to see?

Georgina Downs: Just as a little bit of brief background to these reports for Committee members' information, I pointed out in the written evidence that as a direct result of the legal case I took against the Government regarding the residents' issue and the arguments and evidence that were presented in that legal case, a review of the policy and approach began back in March 2009. It seems extraordinary it is now 2013, but it began, and it was meant to be short-life working groups as well, I have to point out, over six months. It is now four years later. But the review of the policy and approach began in March 2009, directly following a Court of Appeal judgment at that time that ruled that the Government needed to get on with its policy review. So, as part of that policy review, there have been the two working groups co-ordinated by the ACP to review the current UK exposure and risk assessment approach, as well as the existing UK monitoring system regarding adverse impacts. As a result of that, the ACP is actually now in the process of advising Ministers for a number of key changes to the exposure and risk assessment approach, as well as changes to the UK's monitoring system.

What I would say about that is, although that is finally a sign of admittance from the Government's advisers of some of the inadequacies of the current approach that I have been highlighting for over 11 years now, it still does not address the extent of the very serious flaws of the policy and approach in this area. The two advisory groups have not in any way recommended all the changes that are necessary. To give just one example in relation to residents' exposure in particular, the changes recommended by the ACP and the Committee on Toxicity—which is one of the other advisory groups that has combined on the BRAWG report—they still exclude many of the exposure factors and exposure routes that are relevant to include in the exposure and risk assessment for residents.

Most importantly, and I emphasise this and I can't stress this enough, the ACP still has not recommended the introduction of any measures to be introduced into the statutory conditions of use for the necessary protection of the health of residents and other people exposed in the countryside. To give an example of what some of those measures would be, most importantly, the prohibition of the use of pesticides in the locality of residents' homes as well as the locality of schools, playgrounds and hospitals.

Could I just add one other point about the BRAWG report, because it is quite important: in the advice that has currently gone to Ministers now there is an important recognition in the report that some individuals may become sensitised to pesticides or indeed other substances, and that risk factors for sensitisation are not well understood—this is BRAWG saying this—either for pesticides or for other substances. The BRAWG report also notes concern that sensitisation could have longer-term consequences, in that an individual can become sensitised as a result of exposure to a substance that can then induce a specific immunological reaction, such that the individual then reacts to much lower concentrations on further exposure.

As a direct result of this, the BRAWG report considers it is important to identify the extent to which current or new formulations may change the ability of chemicals to act as sensitisers. The reason I highlight this, the reason why this is an important admittance in the BRAWG report, is because of the continued assertions over many, many years from the Government's advisers, such as the ACP, that chemical sensitivity does not exist and that pesticides will not result in pesticide, or indeed other chemical, sensitivity in humans. I have highlighted for many years that the campaign I run has continued to receive reports from people who not only have suffered acute and/or chronic health impacts as a result of exposure to pesticides, but a number of reports where people have developed chemical sensitivity as well.

Q545 Chris Evans: Ms Downs, your submission said "It is now beyond dispute that pesticides can cause a wide range of both acute, and chronic, adverse effects on human health, including on the health of residents exposed to them. This includes irreversible and permanent chronic effects, illnesses and diseases." The Royal Commission report said, "We have tried to review the evidence afresh and reconsider the hypothesis." They report that health may be linked to pesticide exposure: "We are not persuaded that the evidence from individual cases is so weak as to rule out the possibility." Why do you think they were wrong?

Georgina Downs: First of all, I would point out that the RCEP report was eight years ago and has been seriously superseded since then, so I am only going to make very brief comments about it. It is important to start with the clarification regarding causality. The RCEP clearly acknowledged that acute effects can be and are being caused by pesticides, as can be seen in, for example, paragraph 2.9 of the RCEP report that stated, and I quote—it is only a short statement, so I will say it—"The evidence from the residents and bystanders visited identified a series of well-defined acute symptoms immediately following pesticide spraying. These include upper and lower respiratory tract irritation, eye irritation, skin rashes, headaches and in susceptible subjects, asthma attacks." So that was their quote. They clearly accepted causality in relation to acute effects.

In relation to chronic effects, there were very serious concerns raised by the Royal Commission about all the chronic health conditions that were being reported by residents; for example, cases of various cancers, Parkinson's and other neurological conditions that are being reported in rural areas. The RCEP had serious concerns in relation to the connection with pesticide exposure. However, I reiterate again that the Royal Commission's report has been seriously superseded since by a considerable number of subsequent developments and this of course includes, for example, the important statements issued by the European Commission in July 2006 confirming the chronic long-term health impacts of pesticides, including for those living in the locality of pesticide-sprayed fields. Those important statements were made at the time that the Commission was publishing the proposals for the new European legislation on pesticides, which Members will be aware has since come in.

Therefore, the chronic health impacts of pesticides are really no longer in any doubt, and can include irreversible and permanent chronic effects, illnesses and diseases. Obviously, I already previously referred to the critical evidence that exists for both acute and chronic adverse impacts on human health from pesticides in response to the first question in the oral evidence session on 28 November, which Dr Matthew Offord would not know, but hopefully you have seen the transcript to see that, so I will not repeat all that again. But yes, obviously, I point to that.

Q546 Chris Evans: Neither have I; I only came on at the same time as Dr Matthew Offord. You have two brand-new Members here.

So you basically say you can disregard the Royal Commission report then completely?

Georgina Downs: It is just completely superseded since then. There is so much that has happened and taken place. There was all the evidence that went forward in the legal case, and obviously now there is the European Commission firm statements. The new legislation, particularly the sustainable use directive,

has as one of the main objectives to reduce the adverse impacts on human health and the environment from the use of pesticides. They would not put out new legislation to try to reduce the adverse impacts on human health and the environment if there were not adverse impacts occurring in the first place, so the acknowledgement is clearly there; perhaps not in relation to the UK Government, but it is clearly recognised elsewhere.

Q547 Chris Evans: Can I just focus on the Royal Commission report? ACP, when it responded, said that it cautioned about being too ready to acknowledge the potential for human health risks, because that might bring forward more people reporting such ill-health. How did your campaign respond to that?

Georgina Downs: First of all, I point out again that the ACP's 2006 response to the RCEP report, just like the RCEP report itself, has again been seriously superseded since by the considerable number of subsequent developments, and obviously I have just referred to a few of them in the previous question. But also, the 2006 ACP response again was prior to all the evidence presented in the legal case I took against the Government regarding the residents' issue, that, as I pointed out earlier, has led to the review of the policy and approach regarding the exposure for residents and the two working groups—BRAWG and PAHES—that are co-ordinated by the ACP.

I think a good example to highlight the marked differences between that 2006 ACP response and the current two reports by the ACP's BRAWG and PAHES groups is that there is no suggestion or assertion of caution about bringing forward more people reporting such ill-effects; in fact, quite the opposite, as the PAHES group was specifically to consider changes to the current monitoring system, to improve the surveillance and monitoring in the UK, so that such systems are able to deal with both the acute and chronic effects.

At the moment, I raised in the previous evidence session that the current monitoring system can only really deal with acute effects, so changes are being recommended in relation to having systems for both the acute and chronic effects of pesticides being reported by residents and others, and this includes how to deal with the current severe under-reporting that is recognised to be a problem within the current monitoring systems and thus improving such systems in the UK, so that there is a better way of collecting such data.

Therefore, I reiterate again there is quite a stark contrast to the previous 2006 ACP response. I would also say that people coming forward to report health problems and people being aware to come forward to report health problems is very important, and it certainly should not be deemed a negative, which is what the ACP's previous response deemed it to be. It is very important to know the full extent of the numbers reporting health problems and for the clusters that are being reported in rural areas for people living near sprayed fields to be able to be investigated; otherwise, if you don't have reports coming forward, how are you going to be able to investigate them? So it is really important.

Finally in relation to this question, I want just at this juncture to respond to something that was asked at the previous evidence session last week. I want to be absolutely clear that the reports of adverse-health impacts that the campaign I run has received from residents all over the UK over the last 11 years are predominantly of various different cancers, especially breast cancer among rural women, leukaemia, Parkinson's, MS, motor neurone disease and various other physical health conditions. These are all medically diagnosed confirmed conditions, and therefore it would obviously be wholly inappropriate for anyone to try to suggest that such conditions are psychosomatic or imagined or all in the mind or whatever suggestions there have been in the past, these are the types of conditions being reported by residents that are living in the locality of sprayed fields. A number of these conditions are those that the European Commission, as I have said, previously acknowledged in its statements in 2006 can be caused as a result of exposure to pesticides, especially exposure over the long term, such as is the case for residents. So, I would just add to that that considering—

Q548 Chris Evans: I have a serious concern. How many of those cases are linked to pesticides? I remember years ago when there was a council tip at the top of a valley where I lived at the time, and this tip had some sort of substance that was causing a smell for the residents. There were 15 reports. There was nothing up there, yet everybody then started blaming all their medical ill-health on this tip, yet there was no actual direct correlation between the tip and somebody suffering from certain cancers or suffering from some sort of bronchial disease or anything. There was no direct link. So when you say things like, "These pesticides are linked to certain cancers or neurone disease, Alzheimer's"—what sort of medical evidence do you have for that?

Georgina Downs: No, no. First of all, I went through all of that in the response to the first question in the last oral evidence session.

Chris Evans: I was not here for that, sorry.

Georgina Downs: Oh, I didn't realise you were not here. But I have never suggested that pesticides are the only cause of various conditions that they are known to cause. I have always said they are one of the causes, and in fact, in the written evidence, I made that statement quite clearly and emphasised it in bold and probably underlined it as well, because it is known to be one of the causes—there are a number of different causes—but when you have so many different people reporting the same sorts of clusters of different health problems in rural areas, where the only real overriding link between them all is that they live next to sprayed fields that are sprayed on a regular basis throughout every year, and knowing that the Commission and others clearly acknowledge that pesticides can cause such chronic effects, then it is absolutely right that those suffering such effects have a right to know if pesticides are the cause of their health problems, and also those that haven't yet been damaged, have a right to be able to try and protect their health and the health of their family from harm.

If they don't have the information on what is being used in their locality, then they are not going to be able to take measures to try to do something to either protect themselves or to challenge the system.

Q549 Chris Evans: This all sounds like the example I said with the tip up where I used to live. There is no—

Georgina Downs: But there are various different environmental pollutants; there are very different environmental things that can cause health problems, but that is one and pesticides is another, and hence why I have again emphasised the fact that I am not saying every single case is necessarily going to be associated with pesticides. But irrespective as to whether some are not, if people are already suffering health problems, they are vulnerable, and they are vulnerable to further exposures to any environmental contaminant. If someone is suffering a very serious case of cancer or another condition, they have the right to be protected from exposure to further toxic exposure, irrespective as to whether it was the cause of their health problems or not, which in many cases people do have confirmation from their doctor of—

Q550 Chris Evans: Did you mention motor neurone disease and the development around pesticides?

Georgina Downs: Yes. There have been a number of studies. I can send that in after the session.

Chris Evans: It would be interesting to see that, because I met recently with the Motor Neurone Disease Association, and there was no mention of that at all.

Georgina Downs: I can send that.

Chris Evans: I would be interested to see that.

Georgina Downs: Also, as I pointed out in the previous evidence session—but you will not know—the principal aim of pesticide policy and legislation under the European legislation is supposed to be based on the risk of harm and not that harm has to have already occurred. Therefore, the Government, under the European legislation, should not be exposing people to any risks. I noted that that was clearly acknowledged by Committee members in the previous evidence session last week in relation to bees, but it should be stressed that under the European legislation the duty on member states to protect human health is even higher than that of bees, because for human health the article 4 duty is for no harm, which is absolute, with no qualification, whereas for bees, as Members know, it falls under the protection afforded to the environment, which is for no unacceptable harm.

I just want to be absolutely clear that I am not in any way suggesting that any harm to bees is acceptable, because to me it isn't. I am merely pointing out that there is supposed to be an even higher protection standard afforded to human health, and I urge the Committee to be as concerned and very concerned about human health in the same way as it is for bees, because there is a gross failure of the UK policy and regulatory system in general, whether it be in relation to protecting humans, bees, or indeed other species.

Q551 Chris Evans: I will ask one more question; I have gone over my time. Does the current risk assessment framework take sufficient account of the effect of the combination of chemicals on human health?

Georgina Downs: No is the short answer. The current UK exposure and risk assessment approach regarding human health is based on exposure to just one individual pesticide at any time. As I pointed out in the written evidence, agricultural pesticides are rarely used individually but are commonly sprayed in mixtures. Quite often a mixture will consist of four or five or even more different products mixed together, and each product formulation in itself can contain a number of different active ingredients: solvents, surfactants and other co-formulants that can have adverse effects in their own right, even before considering the adverse effects that there might be in the mixture. As was also pointed out in the written evidence, various studies have shown that mixtures of pesticides or other chemicals can have synergistic effects on human health.

I go back to stressing the point that this type of spraying regime and this mixture, this type of ongoing exposure, is the reality of crop spraying in the countryside, and yet this reality is simply not reflected in any of the risk assessments under the Government's existing approach, whether it be for humans, whether it be for bees or indeed other species. Any species can be exposed to innumerable mixtures repeatedly throughout every year, because it is the reality of crop spraying. We live next to it; we know the reality of it.

Q552 Chris Evans: The major question that comes out of that is you have obviously said about the various combinations. Surely, there are thousands more—infinite amounts of combinations. How can those be fitted into some sort of risk assessment? How can thousands of combinations or infinite combinations of chemicals that are in pesticides be fitted into a risk assessment?

Georgina Downs: I would say with great difficulty. Considering that, as I referred to earlier, there are approximately 2,000 products currently authorised for use in the UK in relation to agriculture. I think it is most likely nigh-on impossible to do it. As I said in the previous oral evidence session on 28 November, in the absence of having any assessment in the UK of the risk to those exposed to innumerable mixtures of pesticides, repeatedly throughout every year and for years, means that pesticides should never have been approved for use in the first place for spraying in the locality of residents' homes, schools, children's playgrounds among other areas. I would say that the Government's existing policy has put members of the public, particularly residents living in the locality of pesticide-sprayed fields, in a guinea pig-style experiment, and for which many of us residents have had to suffer the serious and devastating consequences of. It is absolutely clear that if a proper and full

assessment was undertaken to assess the exposure and risk for humans to mixtures of different pesticides, then the result would be that pesticides would simply not be allowed to be approved for use at all in this country.

If I could just add to that, I realise this is going to be a particularly firm statement to make, but I think it is the appropriate place for me to make it, having campaigned for the last 11 years and having been the only person to take a legal case to date in this country against the Government's policy and seen all that happened within that legal case: I think it is really important to stress to Committee members that this is no longer really an issue of science. It has not really been an issue of science for years. This is an issue of massive legal and political implications for the Government, along with considerable financial implications for the industry if there are any changes to the policy and approval system for pesticides in the UK.

The Government's continued line that there is no evidence of harm to human health from pesticides, as well as no risk of harm, is really untenable and inexcusable. The evidence is there. It has been there for a considerable time. The Government has just been determined to date not to act on it. I still remain hopeful, even after 11 years, that that may change, but the Government's response to this issue to date has been of the utmost complacency, is irresponsible and is not evidence-based policy making.

I think we have obviously seen the parallel in relation to the bees situation. I have always maintained from the outset—and I stand by the statement—that this is one of the biggest public health scandals of our time, because the Government has fundamentally failed, without having any risk assessment for residents, to protect people in the countryside before approving these pesticides, has knowingly allowed people to continue to suffer from adverse health effects and has not taken any action to date to prevent the exposures, risks and adverse impacts from occurring.

Q553 Chris Evans: Just one final question: why do you think Government has not taken any action at all?

Georgina Downs: I think that is covered in what I have said, from the massive political and legal implications in relation to—

Chris Evans: What are the political and legal implications?

Georgina Downs: First of all, they would have to say, "Sorry, chaps, we have had this wrong for the last 50, 60 years, we have not had a risk assessment for residents, we have approved pesticides for years and allowed loads of people to be exposed to the risk of both acute and chronic health impacts." That is huge. That is absolutely huge. When I won in the High Court in the original judgment in 2008, there were a number of law sites that had articles on websites—you know they go up temporarily, and then they come down—that were saying this would set a precedent for opening up the floodgates for people to take compensation claims. We have seen this with lots of issues. We have seen it with asbestos; we have seen it with all sorts of other things in the past where there are issues of potential compensation; but also there is a really important point here in that the companies would, without a doubt, I am sure—and maybe they already have in relation to bees; I don't know what has gone on behind the scenes—but companies, certainly in Europe, have taken legal action against the Commission when they have not renewed a pesticide on annex 1, and the threat of legal action from the industry over the Government is always there if a pesticide is to be suddenly ceased and cancelled. The Government, to my knowledge, has not really done that in relation to human health, but there would be that issue of the companies because, particularly in the Court of Appeal, the Government's witness statements that were put forward after the High Court judgment were extremely concerned about the financial impacts on the industry and the fact that it would cost so much in lost business and productivity if there were any changes to the approval systems. So there are a lot of factors here, and I have put that quite clearly in the written evidence.

Chair: We have that. I have just one very final question from Neil Carmichael, and then I think we should be bringing this part to a close.

Q554 Neil Carmichael: You obviously do not approve of pesticides. In part you answered it when Chris was asking you this, but the question I would like to ask is how can you isolate the role of pesticides in rural areas when you have already admitted that there are other possible causes of ill-health.

Georgina Downs: Quite easily—if you have people that live next to farmland, don't live next to or in the vicinity of any other environmental contaminants, and you have people who are living in such a close proximity and they are being exposed to this ongoing cycle of exposure, that has not, I stress, been assessed at all in relation to that type of scenario to date in the UK. That is extraordinary. The European legislation requires that pesticides can only be approved for use if it has been established that there will be no harm to human health. It has not done that.

This is meant to be based on the risk of harm, not that harm has to have already occurred. Therefore, even if there was just one or two studies or suggestions in relation to a link with pesticides, which it is much further than that, there is confirmation that pesticides can cause a number of acute and chronic health effects, but even if it was just based on the suggestion—"Could they be causing…?" "Could they be…?"—action should be taken, because it is meant to be based on the risk of harm, and they have never done a risk assessment in the UK to assess the risk to people. They have allowed people to be exposed in this type of experiment that they have—as I have called it earlier, the guinea pig-type experiment—and action should have been taken a very long time ago.

I have been raising these issues for 11 years; they have always been solid arguments, and so far the policy has not changed. Obviously, we don't know what will come out of the advice that has gone to Ministers now, but—does that answer the question? I wasn't quite sure. I have forgotten what the question was now, sorry.

Chair: I think the point really behind it was about how you would have disclosure or notification of what has been used, but thank you very much indeed. Thank you. I think that brings this part of the session to a close. Thank you very much for coming back. We do appreciate it. We know that it has not been easy to find the relevant slot, but many thanks indeed.
Georgina Downs: Yes, thank you.

Examination of Witnesses

Witnesses: **Chris Bean**, Agronomist, Agrii, and **Peter Riley**, Agronomist, Prime Agriculture, gave evidence.

Q555 Chair: Mr Chris Bean and Mr Riley, you have sat very patiently through the previous two sessions that we have just had. We very much wanted to have agronomists before our inquiry, and I just want to thank you very much for your patience and for appearing before us this afternoon. We do, as you can see, have Members who have other commitments elsewhere in the House, but I do want to get across just how important your evidence is this afternoon. I would like to begin just perhaps by you sharing with us what the role of an agronomist is. In a way, you are concerned with is the farmers and the benefits to the farmers, and not least obviously farmers' incomes, but also the environmental stewardship aspects of all of this, and how, when giving advice, you balance the two different sets of priorities. Mr Riley.
Peter Riley: In my case, we specify crop protection, fertilisers and varieties to farmers, and we charge them a fee for our advice for so doing. They would then go and purchase these materials from typically agricultural co-operatives. So our income is 95% from farmer fees, and we have no interest in the materials that are used on the farm in terms of their value.

Q556 Chair: But presumably you would have an incentive, incentivising the fees that you get from farmers in terms of the insecticides that are recommended?
Peter Riley: What we are trying to achieve with farmers is to maximise their arable contribution but also to have a sustainable and integrated farm management system for their farms, so that they have a sustainable farm for a long period of time.

Q557 Chair: So on what basis do you give advice about environmental stewardship?
Peter Riley: We take advice from the manufacturers' environmental impact information sheets. We also take the general sort of advice from independent research bodies, and we are obliged under our BETA classification under BASIS to take account of the environmental advice around that. In our case, we are keen to suggest that farmers use modern techniques. For example, in the last year, all the sprayers that have been purchased on farms that I deal with have had GPS and boom-levelling and also use very low drift nozzles, so that we are able to put the materials where we want them to go. We encourage people to enter into the environmental schemes that are operated by Government, so, in my own personal case, just under 80% of the land I deal with are involved in the entry-level scheme, and just short of 80% are included in the high-level scheme.

Q558 Chair: Picking up on what you just said about encouraging farmers to use modern techniques, is that advice linked to extra commissions that you would be getting for selling certain products or taking up certain techniques? Is that incentivisation embodied in how you give the advice?
Peter Riley: Absolutely not. We charge entirely for our advice, and we have absolutely no interest in the materials or machinery that are sold on to farmers whatsoever.

Q559 Chair: So your revenues are not bolstered by the advice that you give? Thank you. Mr Bean, did you wish just to add to that?
Chris Bean: Yes, I should explain that I work for a company that is slightly different to the one that Peter works for. I work for a company called Agrii. We are deemed as being a distribution business, and in that case we do work on behalf of manufacturers, breeders and so on; fertiliser manufacturers. We do sell to earn our living, but we classify ourselves as being a leading provider of agronomy services. So we do give very similar advice to that that Peter gives. I work with 299 other agronomists in the company. Different people work in different ways, but some of them—in fact, quite a large majority of them these days—will charge a fee for their advice, very much as Peter and his colleagues do, and then it is up to the farmer to buy his inputs where he deems relevant to do so. The hope is that he will buy them from our company, but it does not have to be.

Q560 Chair: If I could just go back before I move on to Dr Offord, in a previous evidence session that we had, we had Professor Goulson as a witness before us. He said, "I had a meeting earlier this year with a company called Agrii, who are agrochemical middlemen, and they employ 300 agronomists, who spend all their time going round farms advising farmers on what pesticides to use and which seeds to plant and so on. They openly admitted that 90% of their profit comes from the mark-up on the agrochemicals that they then sell to the farmers, having recommended them". It just seems to be slightly at odds with the response that you gave us, because there is the implication there, as he put it, that UK farmers are primarily receiving their advice from people who have huge financial motivation to encourage them to use more pesticides. I would like to give you the opportunity to perhaps respond to that.
Chris Bean: Yes, he was talking about us, because he came and had a meeting with some of my colleagues last summer, because we were interested in digging further into the bee debate.

Chair: Sorry, I should have directed that to you, Mr Bean; I do apologise.

Chris Bean: That is all right. Yes, as a company, we do earn a living from selling agrochemicals, but at the end of the day it is down to the farmer and the adviser to decide what is right for the crops that they are dealing with. In terms of wilful misuse of chemicals or overuse of chemicals, it doesn't happen. There are plenty of regulations in place to ensure that that sort of thing cannot take place. Not least of all, there is the ethical good nature of the people involved, and as Peter said, one of the things that we all have to do, and one of the strictures that is placed upon us by the farmer customers that we deal with, is that we have to achieve an end product to a quality specification and to a financial specification that that customer is happy with, and therefore that sets very natural boundaries in the first instance.

Q561 Chair: But you just said that you would leave it to the farmer to decide what is right. So you think that the farmer has necessary information to be able—

Chris Bean: No, it is a joint decision between the farmer and his agronomist, but although there are 300 of us in the business that I work for, there are plenty of other people out there always looking to take that business, and therefore market forces do govern an awful lot of how people react and work together.

Q562 Mr Spencer: I was just going to ask how competitive the marketplace was and how easy it is for a farmer, if they are not satisfied with the margin they are receiving on their gross margin on their crop, to walk to another company where the gross margin might be bigger?

Chris Bean: Very easy. As a business—and you can look on our website; there are all sorts of wonderful market-led sort of facts and figures on there—we would probably give advice on about 25% of the arable cropped area in the UK, which means that 75% isn't going through our business. There is plenty of room for farmers to manoeuvre around if they wish to do so.

Q563 Dr Offord: I was just looking through a biography of the pair of you, and one of the questions that strikes me from that is what do you advise farmers particularly about pesticides and the differences? What I am trying to tease from you is that obviously farms, soil, geography and all kinds of things are very different, so how do you tailor your advice?

Chris Bean: Sorry, Peter; you can jump in as you see fit. The first point is that there are different relationships between different agronomists and different farmers. Some farmers are looking for far broader-spectrum advice; some are looking for a relatively narrow spectrum of advice. An agronomist generally is equipped, depending on the individual, to deal with virtually anything, or else to act as a signpost to somebody who can deliver the advice but he doesn't feel comfortable to do so. As a business, we would set out to offer not only advice on pesticides, controlling weeds, pests, diseases, growth regulation in crops, and we are also talking about the interaction with nutrients, fertilisers, whether they are major fertilisers or micronutrients. We are working with varieties, so at the beginning of each season, depending on the farmer, we will be planning out what varieties to grow for the forthcoming year and starting to develop ideas around the issues that that choice of variety might present.

Also, as the question has been asked and we didn't get the chance to mention our input, we do either through the agronomists directly or through colleagues within the business—and one of them is sitting behind me this afternoon—give a substantial amount of environmental advice, whether that is in terms of entering ELS schemes, HLS schemes or once the farmer has decided off his own back or in line with another advisor to go through one of those schemes, how to manage them to the best possible effect for the outcome of the scheme in order to deliver exactly what that scheme wants to deliver. Tailoring advice is very much a discussion between the agronomist and the farmer. It is a very unwise person with a farmer who goes along and tells the farmer what he wants. It very much has to be a decision-making process, perhaps led by the agronomist, but the final decision is always upon the farmer as to exactly how he wants that business relationship to proceed.

Q564 Dr Offord: You certainly implied that the relationship with customers, the farmers, it is a two-way process and they give you information back. What discussions have you had with farmers, and what have farmers told you about the use of the neonicotinoids?

Peter Riley: I was asked last week by one of my major farming clients about the concerns that one of the directors had about these particular materials and there are other farmers that have felt the same. We, as partners of an agricultural consultancy, feel the same way when we see the evidence that is coming out from EFSA and the like in recent months. We are all scientists and we understand the value of pollinators within the ecosystems that we work in, and indeed in my case I spend quite a lot of my time in crops that are treated with crop protection, so I have to have some faith in the regulatory authorities in this country. But yes, I would say the professional arable business man is likely to be quite concerned about some of the developments that are coming and will be questioning their agronomist quite heavily in the coming months.

Chris Bean: If I could jump in on that, I came up from a meeting in Kent where I have been speaking to a group of 70 farmers this morning in terms of the profitability or the profitable growing of oilseed rape, and obviously with the sort of comments that are coming out of the Commission and EFSA and the like there is a high degree of concern, not only in terms of the negative impact that what they had been doing might have been causing but also looking ahead to what the negative impact could be upon their businesses and how they respond.

Q565 Dr Offord: Just a couple of supplementaries to that—particularly thinking of Georgina and the previous person who gave evidence—have farmers

ever spoken to you about any health problems that they have experienced possibly through a causal link of using pesticides or other chemicals?

Chris Bean: Not that I am aware of. I have been in the business now since 1976 and have dealt with a lot of farmers across a wide area. I am not aware of any direct or indirect link of the illness on a farm that has arisen as a result of farming operations, other than perhaps being run over by a tractor or something like that.

Dr Offord: Yes, okay.

Peter Riley: I would say the same, with the exception of older materials where people didn't like the smell as such, which are all not used these days.

Chair: Sorry, just before you move on I think Mr Spencer wanted to come in on that point.

Dr Offord: Yes, please, yes.

Mr Spencer: Chairman, could I just draw your attention to my declaration of interest in the Register of Interests?

Chair: You may, indeed.

Q566 Mr Spencer: I don't have anything to do with these companies. I just wonder if you can just give us a quick flavour as to the change in terms of regulation of the pesticides industry in terms of its application and how that has changed over the last 15 to 20 years; whether it has got more regulated or less regulated as an agricultural industry.

Peter Riley: As an adviser I can say that it has got a great deal more regulated, and I feel very comfortable about that, again, because I am in these fields treated with crop protection. When I first started work, there were some fairly ordinary practices by farmers and the material, and I am quite confident in the regulatory authority that those excesses have now gone. Farmers are a great deal more professional generally these days than when certainly I entered the industry and are very careful to use these products. It is in their interest to use products correctly. They are not cheap; they are very often quite expensive. To get the best efficiency out of them and to use as little as they need to do to get their outcomes must be in their interest.

Chair: Okay; back to you, Dr Offord.

Q567 Dr Offord: Okay; thank you. Based on the evidence that you provide farmers, do you feel that there is a body of evidence from the scientific community that enables you to give good advice? Is there enough evidence out there?

Chris Bean: In general or on specific issues?

Dr Offord: Specific issues, pesticides mainly; neonicotinoids, if you can comment specifically upon that.

Chris Bean: Yes, I think on the vast majority of products then there is a great deal of data sat there behind them to an extent. Although both of us have scientific training, for the specialist scientific input we are quite dependent upon the regulators. But the track record from them appears, over the last 15 to 20 years, to have been very adequate. The advice given is good. As Peter has said, the amount of regulation that has come into the industry—while we are very comfortable with it—has increased greatly. The sort of things that might have been acceptable 30 years ago would no way be deemed acceptable today.

As Peter said, down to very sometimes basic things like ways of mixing pesticides in sprayers, the type of safety equipment that people are required to use and do use on a regular basis, the introduction of things like maximum residue levels in foodstuffs, the withdrawal intervals between application and harvest—there are so many things around how a farmer and an adviser uses a can of chemical that it is a very scientific process these days. On top of that—and perhaps because of that—then ourselves and all of our colleagues within the industry are required to be qualified and required to be annually updated to a specified level, both in terms of the pesticides we use and also in terms of the nutrients that we use as well. As Peter said, there are also requirements out there for training on environmental matters. Everything is there to govern what we do very, very closely.

Dr Offord: Okay.

Chair: Did you want to come in, Mr Riley?

Peter Riley: Yes. I would say that there has been a continuing increase in cultural methods within farming, for example, in our case there is a gene within a wheat plant that protects it against a midge that appears in the summer. We would specify that the farmer grow one of those particular varieties in a situation where they have a high risk and, therefore, they avoid using a pesticide. In terms of using pesticides, then we are dependent on subscribing to as many independent research development companies that we can, and I am bound to say there is not so many of those around since, it would appear, the Government withdrew from near market research a few years ago.

Q568 Dr Offord: You just mentioned a point and I did not catch all of it. I wanted to ask you: is there any pest-management control techniques that you advise your clients to use that do not involve pesticides? You mentioned something just then.

Peter Riley: Loads; delay drilling, so that you avoid a particular hatch from a particular pest, or populations so that you reduce the level of disease in a particular crop. There are loads of cultivations to consolidate soil so that you don't get a particular bug; there are absolutely loads, and that would be best practice, without a doubt.

Q569 Dr Offord: Okay. I have one more question within this kind of topic: what do you see as the balance between using treated seeds and prophylactic spraying as and when required?

Peter Riley: I am not sure, with the balance—

Dr Offord: What is best in what conditions?

Peter Riley: As advisers I guess we have been led, in the past, towards seed treatments on account of the much lower levels of active ingredient used. In the case of neonicotinoids, it has made a huge difference, particularly in something like oilseed rape, which means that we get a much more consistent establishment of crop. Generally, the industry now uses something like probably a third of the seed that we were using 10 years ago, as such, and before these materials came in we would be using post-emergence

broad spectrum insecticides across the crop, which we don't have to use to such an extent now. Yes, seed dressings in general are something that we see as a benefit to farmers.

Chris Bean: Yes, very much so, and I think, as Peter said, it is issues around reductions in seed rates; there are fewer failures of crops these days than there were in the past. Take something like oilseed rape as an example; the brassica flea beetle can annihilate the crop almost before it has come through the ground, and we have not had an issue like that since the days of the neonicotinoids being approved. But also it is about other pest management as well, because if these things do suffer some sort of reduction in availability, then we also have—I declare an interest here; I sit on a group called the Insecticide Resistance Action Group, which is a group of individual scientists and advisers who meet on a relatively regular basis just looking at the problems around pest resistance. Peter has issues in crops of sugar beet with turnip yellows virus. There are issues in oilseed rape as well. It is a shared problem; it is a virus that is spread by aphids, and we have virtually no insecticides that will control the aphids, other than the seed treatments, so that would be a big gap in the armoury.

Q570 Dr Offord: Can I go on to the final section? There have been some calls for a moratorium on the use of neonicotinoids. If that happened, the Government decided that that should happen, what other pesticides would you recommend?

Peter Riley: In my case I specify all the winter oilseed rape crops to be treated with neonicotinoid seed dressings, 100% of the sugar beet crops in the spring also and approximately 30% to 40% of the winter wheat crops. I think you were referring to an overall moratorium. It would have a—

Dr Offord: Yes.

Q571 Chair: I think it is just really rising out of the EFSA, who we had previously, if there is a recommendation subsequently on the basis of that assessment from the European Union. It is that hypothetical situation.

Chris Bean: This would be crops that were attracted to bees rather than winter wheat.

Chair: Yes.

Chris Bean: Yes; okay.

Peter Riley: I think it would have a very significant effect. We occasionally get involved in growing crops of kale, which are very similar to oilseed rape, in the spring that, in the past, have not benefited from these treatments. We have had tremendous difficulty getting them to establish. I don't really know quite what would happen within that, but I suspect, with the hectarage of rape seed that exists in the country, we might have tremendous difficulty in having reliable establishment of rape seed crops. We definitely have to be using post-emergence insecticides and a great deal more.

Chair: Sorry, have to be using—

Peter Riley: Post-emergence insecticides; that is, insecticides after the crop has started to grow. We would probably have to increase the level of seed rates quite significantly but the reliability of establishment and the number of crop failures, I believe, would increase quite dramatically.

Q572 Dr Offord: Can I just follow up on that; I just want to establish, so we have it on the record, what crops are you saying would become uneconomical?

Peter Riley: I am not necessarily suggesting that it would become uneconomical, but it would have a profound effect on the average margin that a farmer would have. I simply don't know exactly what the full ramifications were, but I could imagine it could be quite difficult for farmers certainly.

Chris Bean: It is the sort of question that you can't give an exact answer to because things will differ from year to year. As I said earlier, and Peter mentioned again, establishment because of the damage from brassica flea beetle—it can be extremely severe, but it doesn't necessarily have to be a whole field, and it is not necessarily every field on the farm, but some fields would be badly affected. For those that were badly affected, prior to the development of the seed treatments it was a case of re-drilling or giving up on the oilseed rape and putting some winter wheat in or something instead. That is a significant drain on a farmer's resources.

Even if you manage to establish a crop, then aphids carrying virus vectors can be a severe problem. Certainly, trials that we have done, trials that the manufacturers of the seed treatments have done have suggested anything from a 10% to 25% yield loss as a result of virus damage to the crop and in sugar beet, which suffers from the same virus, and, therefore, if you have no seed treatment, you potentially increase the problem for the two crops, either on the farm or within the same area. In sugar beet, I would imagine it is far more damaging than that.

Peter Riley: It would be, and we also would be very concerned about turnip yellow virus in oilseed rape, which is probably being kept to a lower level very strongly by the neonicotinoids. The control measures we have with insecticides outside of that class it is not strong at all.

Dr Offord: I am happy to leave it there; thank you. Thank you very much.

Q573 Neil Carmichael: Can I just ask one question: what would the impact of GM crops have on the need for insecticides and pesticides?

Chris Bean: On insecticides, and particularly these sorts of insecticides, I guess it would depend on whether or not they can develop a gene that breeds resistance to the pest that you are looking to control.

Q574 Neil Carmichael: That would be the long-term intention, would it not?

Chris Bean: It would be the long-term intention, I guess, if the gene was available to give that desired effect. There is work going on, I know, for insect resistance, so that is one thing. Aphid resistance and then coming down the scale to something like brassica flea beetle is a totally different factor.

Q575 Neil Carmichael: What is this time scale? Do you have any idea on the time scale of aphid resistance?

Chris Bean: I don't think, for the sort of problems that we are talking about controlling this afternoon, that there is anything on the horizon, certainly in my working lifetime. I am not even sure that GM crops are on the horizon in my working lifetime. It is a long-term issue, I think.

Q576 Chair: Okay. If I could just bring it back to insecticides, if I may. Just carrying on from Dr Offord's question just now, in the event of a moratorium what would be the financial and employment consequences, do you think, for farmers? Do you think that we are prepared for what that could mean?

Peter Riley: No, oilseed rape is one of the most profitable break crops that we have within the arable rotation in our part of the world. The broad-acre combinable crops outside that are nowhere near as profitable. It would be difficult to totally come up to a figure, but it would be substantial in some years and, perhaps, less in other years, but it would be substantial. It would affect maybe how they organise their cropping and their rotation if they do not have the reliability of establishment and reliability of control of turnip yellows in the autumn.

Chair: Okay; and, finally, if I could turn to Mr Caton.

Q577 Martin Caton: Just on that last point, obviously we have very strong suspicions now because of the systemic nature of neonicotinoids, they are having an impact that you could not predict and nobody else could. When you start making a financial assessment you have to balance it against the value for, apart from the environmental, the financial value of our pollinators and certainly we have taken some evidence that that is considerably more than the value of what neonicotinoids offer to the crops, but that is a completely different tow what I am going to ask you about.

The European Commission, as I am sure you are aware, is currently trying to negotiate a new package for the CAP for 2014-2020 to include ecological focus areas within Pillar 1. Have you had the opportunity to look at what they are proposing, and do you think there might be the possibility of greater financial incentives to introduce more pollinator-friendly measures?

Peter Riley: I would say that is happening on farms at the moment. Most of the clients I work with, certainly, have a very strong awareness of their conservation and environmental responsibilities they have and take quite a lot of advice from the likes of FWAG and conservation agencies to draw up corridors of wildlife as such. For me, as I say, at least 80% of the crops I deal with have a buffer around the outside that we are trying to manage sympathetically to wildlife. The industry is just believing that to be good practice to prevent drift on to non-target issues. I think that is being dealt with to a certain extent, and probably some businesses are doing it more than others maybe, but that has been a continued trend over recent years, I would suggest.

Chris Bean: I have just answered that, if the Commission came up with a system for paying farmers to produce margins around the edges of their crops that provided a habitat for pollinators, that would be music to our ears, because we have been talking to Defra and their predecessors for 25 years, I should think, asking them what the value of great swathes of grass from one end of the country to the other is when, for a little bit more attention to detail and a little bit more cash incentive, farmers could be putting something in that is far more beneficial in terms of not only honey bees but bumble bees and a whole range of other pollinating species. I would be wholly in favour if that is the route they are going to go down.

Q578 Martin Caton: Right, that obviously is a possible route that the European Commission will go down. What about our own Government? You have said you have been talking to Defra; do you think our own Government should be taking its own initiative on encouraging that sort of good practice?

Chris Bean: Between myself and various colleagues over the years, it is something that we have been trying to encourage, but it is not an easy thing to do. It takes a bit more work and probably requires a little bit more money to fund the process.

Q579 Chair: We have overstayed our session, but, just on that point in terms of discussions that you are having with Defra, ongoing ones and the reform of the CAP, what are the hurdles that have to be overcome for that vision that you have or having that incentive for pollinators? What is the timeline for where changes could be brought about? How are you linking in with the discussions that are going on at the moment, beyond GDP, looking at the importance of natural capital?

Chris Bean: Looking at natural—

Chair: The discussions that are going on, we understand, inside Government looking at, if you like, new ways of assessing GDP so, for example, that you start to add value to natural capital: I would assume that what you were just suggesting there would be very much a proposal that would link in with incentivising farmers with cash incentives to provide some of that pollination that is obviously important to food production?

Chris Bean: Some of that happens anyway in the field of corner mixtures that are available through the ELS scheme, but to be doing that on a wider scale we think would be of value.

Q580 Chair: But you seem to be suggesting that you were not getting anywhere with Defra, or there is more that Defra could do, so what more could they do?

Chris Bean: We have been talking for years and making noises as a business and as the previous business that we were before we were Agrii. Things are moving—

Chair: Okay, what would you—

Chris Bean: Without saying too much, I had a very positive meeting with senior people within Natural England, but you still have to persuade those who hold the purse strings to release them accordingly.

Q581 Chair: Sure, but from the point of view of this Committee and any recommendations that we may wish to make, it would be very helpful for us to know what specific recommendations might be very helpful on this precise issue in relation both to Natural England and also to Defra, because if you thought that there were things that could help with promoting natural pollination, that would help enormously. I am sure you could—

Chris Bean: Peter might want to jump in as well, and I will just say my piece because I have been on my soapbox for long enough. I think one of the potential risks of a moratorium or a longer-term removal of these types of materials might be a decline in the rape acreage, and we have to remember that the rape crop does provide a valuable food source for bees in the first instance. If we could arrive at a position whereby there were more pollinator species within the grass margins or whatever that we put around our fields, then I think it might address a lot of the problems that we have with pollinating insects.

To my mind, one of the big issues for bees of whatever type and other pollinators is a lack of habitat, and habitat and food source—at the end of the day, they are two very vital factors for all of us, whether it's bees or humans. We need to eat and we need somewhere to live. I think a more sympathetic, more holistic approach to environmental issues of that sort would be beneficial to everybody and everything.

Q582 Chair: Okay, and if we were talking with Natural England right now, what might they be telling us is ongoing in terms of ways in which they are taking this idea forward?

Chris Bean: I think from discussions with them, they are knocking on the door and lobbying, but, as somebody said earlier, then cutbacks within Defra and funding budgets and what have you will have an effect, and they will have to decide where they put their resources and where they put the cash out of the EU.

Chair: Okay; do you wish to add to that, Mr Riley?

Peter Riley: I am an agronomist, so I will wait until the powers that be to decide these things and work with my clients to attempt to continue to have an environmentally sustainable farm and an economically sustainable farm.

Chair: Right; okay. Unless my colleagues have any more questions, can I, once again, thank you very much for your patience and for appearing before us this afternoon? Thank you very much indeed.

Wednesday 27 February 2013

Members present:

Joan Walley (Chair)

Peter Aldous
Martin Caton
Zac Goldsmith
Dr Matthew Offord

Examination of Witnesses

Witnesses: **Lord de Mauley**, Parliamentary Under-Secretary of State, Department for Environment, Food and Rural Affairs, **Professor Ian Boyd**, Chief Scientific Adviser, Department for Environment, Food and Rural Affairs and **Dave Bench**, Director of Science, Engineering, Analysis and Chemicals Regulation, Health and Safety Executive, gave evidence.

Q583 Chair: Order. Minister, I would like to welcome you back to our Environmental Audit Select Committee this afternoon. We appreciate that on your first appearance before us you were just new to your post, so obviously it is a great pleasure for us that you have come back this afternoon obviously equipped to look in some detail at the issues that we have. Also a big thank you to your two colleagues for coming along here this afternoon.

Given that there have been a lot of recent developments of one kind or another, both with the EFSA survey that was done and also with the developments in European Commission, what we want to start by doing is try to get a handle from you, Minister, at the political level, on what is going on in Europe and what was the reason for the scheduled meeting not taking place. But more importantly politically, just exactly what is the UK Government's position on neonicotinoids?

Lord de Mauley: Thank you very much indeed.

It might just be worth rehearsing what has happened since we last met, if that is helpful.

Chair: That would be perfectly in order.

Lord de Mauley: In addition to what you referred to going on in Europe, the ACP has been considering a number of pieces of evidence, including the results of our fieldwork, and have recommended further work, which is under way. EFSA, as you say, has done a report, which is still in draft, on the application of new risk assessment to the existing regulatory data. As you mention, the Commission has made a proposal to restrict the use of neonicotinoids, which we are considering.

Q584 Chair: That is the bit I want to try to press you on. Considering: what exactly is considering? Have you not reached a decision on that at the moment?

Lord de Mauley: We have seen a current draft of a proposal but as you know, they postponed the meeting. We have not seen the actual proposal that they will table for the meeting in March.

Q585 Chair: Just so that we are aware and up to date with what is happening, you say that you have seen a copy of the draft of what would have been considered had that meeting taken place. Is it possible to know what was being considered to be voted on and also what the UK Government's position on that was: how you would have voted on that draft proposal?

Lord de Mauley: The key elements of the draft proposal were a ban on the use of clothianadin, imidacloprid and thiamethoxam on crops attractive to bees and that is a long list, including oilseed rape, maize and spring cereals and a ban on the sale and use of all seeds treated with the three active substances for those crops; both these measures allowing limited exemptions for use in greenhouses and for the production of seed; a complete ban on amateur use; all measures to apply from 1 July 2013; suppliers, being required to compile further scientific data and submit these by 31 December 2014. A recital in the draft regulation commits the Commission to starting a review of these further data early in 2015.

The Commission circulated a draft proposal on 21 February and, as I said, this may change before a vote is taken. As to how we would vote, we are still considering our approach but in discussions we have put the case for a proportionate and evidence-based approach to this whole issue. On the one hand, there are important issues about the protection of pollinators and on the other, there are real economic concerns. Europe should therefore consider this issue urgently but carefully. We have pointed out our new science, which is nearing completion, and have offered to share this to help guide a decision. We have asked the Commission for greater clarity on what is proposed and particularly on the evidence and reasoning behind it and we have asked them for information on economic and agricultural impacts. We await that.

Q586 Chair: Just so that I am absolutely clear, because it is a very technical subject, the draft proposals, which were not discussed because the meeting was cancelled—we will come to that in a minute—the draft decision, if you like, included the option of a temporary suspension of imidacloprid for the two-year period.

Lord de Mauley: For a range of uses. Yes.

Q587 Chair: Had that vote have taken place on the scheduled date, were it not cancelled, what would the UK Government's position have been?

Lord de Mauley: As I said, we have asked a number of questions and we need the answers to those from the Commission. How to vote is a very difficult decision. As I have said, on the one hand there are real issues for pollinators. On the other, there are real economic issues. They are potentially quite finely balanced. We have asked for more information and we

have not yet received it. We have not decided how we would vote.

Q588 Chair: Okay. You have not decided
In your initial response you say that you were having discussions with other people and I wonder if you could perhaps share with us who those discussions were with.
Lord de Mauley: Of course we have spoken to some other countries.
Chair: Could you share with us which ones?
Lord de Mauley: Can I think about that before I answer?
Chair: You may, indeed.
Lord de Mauley: There are a number of other countries with which we are holding discussions to understand their perspectives and to explain our concern that action needs to be evidence-based and proportionate—I think this would be entirely normal for an important issue such as this. Our discussions with those countries have not reached any conclusions because, as I say, we are still waiting for data.

Q589 Chair: Have there been meetings with the industry as well in relation to the European proposals?
Lord de Mauley: I am not sure that I have an answer for that. I don't know. Do you know?
Professor Boyd: I don't.

Q590 Chair: Not with yourself, then?
Lord de Mauley: Certainly not with me, no.

Q591 Chair: With officials?
Lord de Mauley: I am not aware of such.
Professor Boyd: Not formal meetings, no, nor meetings with industry.
Dave Bench: It would be normal for companies to ring my colleagues up to ask for clarification as to what is going on so there may have been some contacts of that nature. Not any that I am aware of, but it would be quite normal if there had been. Certainly there have been no formal contacts and no meetings.
Chair: Zac, do you have a question on that specific point?

Q592 Zac Goldsmith: Jut a very quick one. I am interested to know if you are able to identify what is the key information that you are looking for that would give you the confidence to take a decision were the vote to come back. Secondly, when are you like to get that information?
Lord de Mauley: Sorry. Let me just go back. I think one key aspect that we want to be absolutely sure about is that the Commission has thought through both the economic and the agricultural/pollination aspects of this thing and weighed up the balance properly.
Zac Goldsmith: Do you mind if I follow up?
Chair: Not at all.

Q593 Zac Goldsmith: Do you feel that you have enough information on the effects on pollinators? Is it the economic bit that is missing?
Lord de Mauley: Can I ask the Chief Scientific Adviser to talk a bit about that because there are some aspects of our field tests, some work that is still to be done, which impacts on this.
Professor Boyd: Just to respond directly to your question, no, we don't know enough about pollinators to be sure of making the right decision here. As you are aware we have been involved in carrying out a number of studies, one of which is in a late stage of analysis and I can provide you with details verbally of the outcome of that study if you wish. But the outcome of that kind of study, and other of studies that are currently in train, is important to this decision. One of the problems that we face is that this decision is being made by the European Commission without sight of that evidence. We feel that evidence has a very significant bearing on that decision.

Q594 Zac Goldsmith: In terms of the timing, what are you doing, then, to access the information you need to fill those gaps and how long will that process take?
Professor Boyd: At the moment we have some studies commissioned and some of those studies will take several months at least before they report. We have a study that is coming to a close. I was hoping that it would be published by now but there are some complications associated with that study that require further fairly difficult statistical analyses to be done. That may take several weeks if not a month or two to carry out. We feel it is really important that the European Commission has sight of those studies before it makes a decision.
Chair: I am bringing Mr Caton in on that.

Q595 Martin Caton: I am a little concerned about what you said in explaining why the Government has a dilemma. Forgive me for paraphrasing you, but you seem to be saying that there is evidence of a threat to pollinators on the one hand and obviously clearly we are very worried about that. On the other hand there are the economic interests that we have to take into account. Under the EU regulations, do you have the freedom to balance those two? As I understand it, an active substance shall have no unacceptable effects on the environment having particular regard to a number of considerations. You know we had questions about your letter in response to the Buglife report where you talked about needing overwhelming evidence before you would take action against neonicotinoids. It is worrying that that same sort of attitude seems to prevail in your Department.
Lord de Mauley: The key word, if I may, that you mention is "unacceptable" and the key question is whether the harm is acceptable or unacceptable. It is a matter of a level.

Q596 Martin Caton: And EFSA have said it is unacceptable.
Lord de Mauley: Sorry?
Martin Caton: EFSA have suggested that it is unacceptable, hence their recommendation.
Lord de Mauley: EFSA's report did not say that. It does not reconcile with their press release, which I

agree with you mentions that word. But the report does not say that.
Martin Caton: We had a representative from EFSA here. He certainly did not question the press report that was quoted to him several times.
Lord de Mauley: Are you referring to Mr Fontier: your witness Mr Fontier?
Martin Caton: I think it was. Yes.
Lord de Mauley: If I can quote from his evidence to you in answer to question 523 on 6 February, he said, "I do not think we say they have unacceptable effects" and he went on in similar vein.

Q597 Martin Caton: But they were saying that these particular products should no longer be used on pollinators, hence the nature of their report. That is true, is it not?
Lord de Mauley: That is not what their report says. I agree with you that their press release says that but they do not reconcile with each other.
Martin Caton: I can remember his evidence and it certainly did not contradict the press report. Anyway, perhaps we should proceed.
Lord de Mauley: I can quote you some more from what he said.
Martin Caton: It is all right. I was there. Thank you.
Lord de Mauley: Of course you were there.

Q598 Chair: Just two more quick things, Minister. On the balance that Mr Caton was just referring to between the economic aspects of this and the risk, could you just clarify for us what are the economic considerations that you took into account?
Lord de Mauley: The critical question is the amount by which, in the case of oilseed rape for sake of example, the annual harvest is reduced by such pests as are unable to be dealt with by the pesticide. I have to say that this is an exercise in which there are a lot of variables and they are quite wide variables. I think it is probably too early to go into detailed numbers but it is a fine balance.

Q599 Chair: Has there been work done, either by your own Department or by peers, looking at economic considerations, particularly in respect of the suspension of imidacloprid?
Lord de Mauley: That work is under way, as I understand it.
Chair: On the economic considerations?
Professor Boyd: Yes. The economic analysis that has been done so far suggests that there could be quite a significant economic impact if there was total withdrawal. If neonicotinoids—
Chair: Can you respond specifically about imidacloprid?
Professor Boyd: Because it is used a lot less, the economic impact of imidacloprid would be a lot less.
Lord de Mauley: We talk about the three.
Professor Boyd: In the analysis we have done we have looked at the neonicotinoids in total. We have not divided down between those different neonicotinoids as substances.

Q600 Chair: So there is no work going on in relation to imidacloprid.
Professor Boyd: Not specifically.
Dave Bench: It will include the analysis in relation to imidacloprid as well as the other neonicotinoid active substances.
Professor Boyd: Yes, it does.

Q601 Zac Goldsmith: Once the research is done, will it be possible to distinguish between the impacts of the removal of the individual products? Or would you only be able to assess the potential impact of the removal of the entire class of pesticide?
Dave Bench: You will have some resolution beyond just the totality but the more that you try to drill down, the more speculative you become. As the Minister has quite rightly said, there are some very broad variables involved here and some larger functions that have to be made in order to make these kinds of analyses.

Q602 Chair: Okay. And almost finally from me now: the meeting that was scheduled to take place in Europe was cancelled and we would just really like to know from you what is going on and why it was cancelled.
Lord de Mauley: So would I. I don't know particularly why it was cancelled. We have been trying to find out. But I have no doubt that there will be a meeting sooner or later. I think there is a meeting in March, isn't there?
Dave Bench: In March, yes. Mid-March.

Q603 Chair: One of the things that concern us is that I understand that Martin Taylor, the chief executive of Syngenta, described the proposed moratorium as "Brussels shenanigans". He also said that "the French are determined to export their ban" and that "the European Food Safety Authority has been nobbled". I wonder whether or not you think he was right in that.
Lord de Mauley: It is news to me. I have not heard that.

Q604 Chair: Whether or not you have heard it, I have just quoted what he has said. Would you agree with that?
Lord de Mauley: It would not be an assertion I would make, no. No. I think the Commission is thinking very carefully.

Q605 Chair: I am not talking about the Commission's views: what are your views on it?
Lord de Mauley: You were asking me why has the Commission deferred and has it—it is really the Commission, I think, we are talking about, because EFSA advises the Commission

Q606 Chair: What I am saying is that there have been these comments from Syngenta about this particular cancellation and irrespective of the fact that the meeting was cancelled and will no doubt be re-scheduled, I am asking you whether or not you think that Martin Taylor was right in what he said.
Lord de Mauley: Can you remind me what he said?
Chair: Martin Taylor, the chief executive of Syngenta described the proposed moratorium—this is the proposed moratorium that you said was in the draft proposal—as "Brussels shenanigans". He also said

that "the French are determined to export their ban" and that "the European Food Safety Authority has been nobbled".
Lord de Mauley: I would not associate myself with those remarks. No.
Chair: You would not. All right. Thank you very much.

Q607 Peter Aldous: I draw attention to the *Register of Members' Interests*. I am a partner in a family farm where oilseed rape is grown.
Minister, what weight do you attach to EFSA's revised risk assessments here for neonicotinoids?
Lord de Mauley: EFSA has done what the Commission has asked them to do. As I have explained earlier in answer to Mr Caton, we do have an issue with their press release, which goes much further than their actual conclusions. They have used draft guidance, which is still under development, and have applied it to existing regulatory data. Their conclusions therefore should not come as a surprise. In some cases they were unable to reach a conclusion because there is insufficient data or no agreed method for doing the assessment. In others they have reached a conclusion that there is a possible risk on the basis of the risk-assessment scheme used. I don't know whether either of my colleagues would like to add to that.
Professor Boyd: That is fine.
Dave Bench: No.

Q608 Peter Aldous: In reaching Defra's view on EFSA's revised risk assessments, how much have you relied on ACP advice?
Lord de Mauley: We rely very much on the ACP's advice. In reaching that conclusion I do not know that we specifically rely on the ACP advice.

Q609 Peter Aldous: Did the ACP issue you and other Ministers with unequivocal advice on EFSA's revised risk assessments?
Lord de Mauley: No. In fact the ACP advice to us has principally been on evidence they have themselves been examining and indeed it is not as yet complete. They have asked us to get more work done.

Q610 Peter Aldous: Were you aware, or are you aware, from the minutes of the ACP meeting on 29 January, that the ACP was split on EFSA's risk assessments with some ACP members favouring the introduction of a moratorium?
Lord de Mauley: Two members gave an alternative view. Yes, I am aware of that.

Q611 Peter Aldous: Was Defra happy about this difference?
Lord de Mauley: I beg your pardon. I do not think they were members. They were attending a meeting, anyway. Two people attending a meeting had an alternative view. I am so sorry.

Q612 Chair: Were they not members, then?
Lord de Mauley: I believe that is right.
Dave Bench: They were two former members.
Chair: So two?
Dave Bench: Former members.

Q613 Chair: Two former members. Were they members at the time?
Lord de Mauley: No.
Dave Bench: No. They had attended because it was the first meeting attended by the new members appointed to those positions. They attended for the sake of continuity of seeing through this issue.

Q614 Chair: Can we just have the names of those two members, please?
Dave Bench: It was Peter Mathiessen and Colin Brown, who you received evidence from at a previous evidence session here.
Chair: Thank you.

Q615 Peter Aldous: Were you concerned at all that there appeared to be differences of opinion among ACP members, whether it is existing members or those just carrying on in an advisory role?
Lord de Mauley: Yes, of course. We take notice of both views, and all views are considered.
Professor Boyd: I had the pleasure of attending that meeting and I think that in any of these meetings one of the functions is to distil down a common view from a number of sometimes opposing views. It is quite normal to record the minority view in those cases. But I have to reflect the fact that the two individuals involved were not members of the committee and the committee took a collective view at the end of the day, which was roughly similar to the previous view but informed by some additional evidence. They asked for some additional work to be done as well.

Q616 Peter Aldous: As I understand it, that ACP advice to Ministers is not in the public domain at present. Would we be able to have a copy of that advice so as to inform our own deliberations?
Lord de Mauley: Yes, of course you can.
Chair: That is very helpful.
Peter Aldous: That's great.
Lord de Mauley: I should say for the sake of this meeting, it is pretty well encapsulated in the minutes, in fact. But of course we will supply it to you.

Q617 Peter Aldous: You would consider publishing that advice, given the high level of public interest in this matter?
Lord de Mauley: We would consider that. I think normally the publication is at the next meeting.
Dave Bench: Yes. And normally the tenor of the advice is encapsulated by the publication of the minutes. It is not normal to publish the separate advice direct to Ministers except on specific occasions. But there is no reason why we cannot do that.

Q618 Chair: This could be one of those specific occasions.
Lord de Mauley: We will certainly provide it to you. Can we consider publication? I do not see any reason why not but I would like to consider it.
Chair: Thank you.
Peter Aldous: Thank you.

Q619 Martin Caton: At our 12 December evidence session the ACP and Defra both highlighted that the results of two Food and Environment Research Agency research projects on bumblebees and on bee health and pesticide usage would be available in January and that those studies would fill key evidence-gaps on neonicotinoids. Were the results of those studies worth waiting for? Have those evidence gaps been filled?
Lord de Mauley: Can I ask the Chief Scientific Adviser to answer that question?
Professor Boyd: I think the results of those studies are probably worth waiting for. The problem we have at the moment, particularly with the bumblebee study, is that it is incomplete. The other honeybee study is ongoing and will take some time to complete. I can give you a verbal update on the bumblebee study if you wish but it might take a little while and it is quite technical. But you may be interested in it.

Q620 Martin Caton: Could you let us have a written note on that if it is going to be that sort of length of time?
Professor Boyd: I can certainly do that. I could give you a very quick update on the outcome if that would help. It is entirely up to the Chair.
Martin Caton: If you are quick.
Professor Boyd: Okay. Basically the study involved putting bumblebee colonies next to three different sites, one of which was a control site with no treatment. This is oilseed rape I am talking about. Another one was treated with clothianidin and the other one was with imidacloprid. In very quick summary, there was no difference at all in the performance of the bumblebee colonies between the control site and the clothianidin site. There was a difference in the growth rate of the colonies in the imidacloprid site. But there was no difference across all of the sites in terms of the number of queens that were produced. So the two end points were growth and the number of queens that were produced. The number of queens represents the reproductive output. The problems with the study are first of all that at the control site there were residues of a neonicotinoid in the pollen and the nectar at that site. So the bees were foraging on other fields in the district that had been treated with neonicotinoids. The second problem is that in the imidacloprid site, where the growth was not so high, the study was started later and the overall temperature at the site was lower than in the other sites. It was also started with colonies at a lower weight. All of these things have to be taken into consideration in subsequent analysis and may well account for the differences that we have seen.

Q621 Martin Caton: Is part of what you said in that answer the fact that the control site was contaminated?
Professor Boyd: The control site was contaminated. This is the nature of field studies, unfortunately. You cannot control for everything.

Q622 Martin Caton: Particularly with the widespread use of neonicotinoids—
Professor Boyd: Absolutely.
Martin Caton: That brings me to this: we took expert evidence from someone who told us that a meaningful field study on bumblebees would cost £20 million and take 10 years, just because of the level of the use of neonicotinoids and therefore the fact that they are everywhere.
Professor Boyd: It may well take that amount of time and that amount of resource to do an absolutely complete study on bumblebees. But I would point to the fact that some of those studies have been done on honeybees in the past and came up with no direct effect in the field.

Q623 Martin Caton: Again, we have taken evidence during this inquiry where scientists have told us that the evidence is looking like honeybees are far more robust than a lot of other pollinators, including bumblebees. So I do not think we can just say because we have comparatively lots of evidence on honeybees, we should be complacent about what is happening to bumblebees. With the rate of decline of pollinators in our country it has to be suggested that perhaps the precautionary principle should kick in here.
Professor Boyd: You are absolutely right and there is certainly no complacency. However I think we have to be clear that we cannot test all pollinators to the same extent as honeybees have been tested in the past. The bumblebee studies are difficult to do. I think at my last evidence I said that one of the biggest problems was in translating what has been done in the laboratory into the field. One of the important outputs from the study that was done on bumblebees was that the residue levels in bumblebees in the field were round about one tenth to one hundredth of the dose levels that were being used in laboratory studies. I think that tells us something about the realism of the laboratory studies that are tending to drive the logic with respect to the impact on bumblebees. The reality is that we do need to carry out these field studies. Whether they are over a 20-year period and cost £20 million is a complication but we do need to carry out these studies if we want to come up with definitive outputs.

Q624 Martin Caton: This is my last question. You said at the beginning of responding to this question that the bumblebee study was incomplete. But if we know the control site was contaminated, it is not just incomplete, it is inconclusive and you have to start again, haven't you?
Professor Boyd: The information is there, the problem is that we have to re-analyse it using a different hypothesis from the one that was originally intended, because of the contamination of the control site. There are methods for doing that but they are post hoc methods and as a result of that the statistical power and the inference you can draw from the study is not as great. But there are methods for doing it and that is what is being applied at the moment.
Martin Caton: Thank you.

Q625 Dr Offord: Good afternoon, gentlemen. When we met back on 12 December I asked some question about the UK National Action Plan on the sustainable use of pesticides. During that evidence session I asked

the Minister why the Action Plan had not been published at that point. Reading back through the minutes, the Minister said, "We are finalising our consideration of the responses to the consultation and the UK plan will be published shortly". I am aware that the Department published the plan yesterday. Could you please tell us why there was a delay of two and a half months?

Lord de Mauley: The important thing was to ensure that the National Action Plan clearly sets out our position and that it meets the requirements of the directive. It is a record of measures and intentions and so I think it is fair to say that a hiatus in completing it does not mean a hiatus in action on pesticides.

I think it is also fair to say that work on the National Action Plan could have proceeded more rapidly if it had not also been necessary to deal with the important issues raised on neonicotinoids. We took the view that the neonicotinoid work had the priority.

Q626 Dr Offord: My recollection is the description of the word neonicotinoids does not appear at all in the Action Plan.

Lord de Mauley: The safety of neonicotinoids is firstly an issue for the authorisation system: should these chemicals be permitted? The National Action Plan is about how to minimise impacts from the use of authorised products. A number of initiatives under the plan will be relevant, of course, to neonicotinoids as well as to other products.

Q627 Dr Offord: Perhaps you could illustrate to us what the substantive differences are between the plan that was published yesterday and the draft plan that went out for consultation

Lord de Mauley: Is either of you in a position to do that?

Professor Boyd: No, I think we need—

Lord de Mauley: May we respond in writing to that?

Q628 Chair: Given that we have already extended our inquiry by a couple of weeks in order to be able to take further evidence and we were expecting this plan to be published, I think by 26 November, it would be a little bit difficult for us to be able to take account of your response if we delayed further because we have a report to produce. The three of you together perhaps might find a way to answer Dr Offord's question.

Dave Bench: I will answer, if you like.

Chair: Thank you. Very kind.

Dave Bench: The Action Plan that you have seen published contains broadly the same content as the draft had a little while ago. What we have done in the intervening time is make sure that in relation to the responses we got from the consultation—you can see some of that in the response to the consultation—we have clarified some of the wording in a number of places, not least in the section on integrated pest management, to make it clearer what we need. So in terms of substantive content, is there anything radically different in this draft to what we would have had in draft prior to the Christmas period? No, there is not anything radically different. There are some clarifications, some changes in the wording, to try to meet some of those points that were raised by the consultation responses. The main reason, which the Minister has already raised, is that we have a very small team working on policy in relation to pesticides and they have been almost entirely working on neonicotinoids issues over that period.

Q629 Dr Offord: If there are no substantive differences, as you mentioned, are you concerned that perhaps the consultation was not as effective as it could have been?

Dave Bench: No, I do not think so. I do not think I would accept that contention.

Q630 Dr Offord: Thinking specifically about the content of the UK plan and the directive itself, the directive says. "Member states shall adopt national action plans to set out their quantitative objectives, targets, measures and timetables to reduce risks and impacts of pesticide use". Can you identify any quantitative targets in the plan that you believe will change the use of pesticides in the UK?

Dave Bench: Our position has been for some time that we are not in favour of quantitative reduction targets of that kind of nature because they are generally fairly meaningless. What we are interested in is a range of different activities that encourage, as the UK Government has done for many years, an approach aimed at the minimisation of use of pesticides and their use only when it is appropriate .

Q631 Dr Offord: You kind of promote two further questions. Are you convinced that a UK plan does meet the directive's requirements then—

Dave Bench: Yes, absolutely, so. Yes.

Dr Offord:—because it explicitly says that it wants to see objective targets and measures?

Dave Bench: One of the things that we do do is make reference to a large number of indicators that we use to track usage progress in relation to risk in general. Some of those measures are proxies for risk. We are very keen to do that and continue to do that.

Another thing that is important to remember about our actions in relation to the National Action Plan is that this is an extension of a national pesticide strategy that we have had in place for many years and that is intended to look at many of the areas that are covered by the directive now. The directive's main intention is to bring up the standards across Europe as a whole. If you do an assessment of where the UK is in relation to all other member states, we are right at the top of that table and therefore it would not make a great deal of sense for us to be trying to write in very prescriptive targets to improve standards further when we already have among the highest standards in Europe.

Q632 Dr Offord: It is interesting you say that. As a supplementary, one of the things that the UK plan does include is improved training for those who apply pesticides but we already have a relatively strong record in that area, so why did you feel that you needed to increase that directive burden?

Dave Bench: We have not. What we have done about the requirements in relation to training is simply

change our existing national requirements to meet the very slightly different requirements in the directive. But in large measure what we have attempted to do is to recognise that there has been a very effective training mechanism and arrangements in the UK for a long time and to build on that rather than to rip it apart.

Q633 Dr Offord: My second point from the previous question was that we mentioned particularly alternative use to pesticides. Again, specifically considering the EU directive and its statement that the National Action Plans should encourage the development and introduction of integrated pest management but in the UK plan it simply says, "We will consider what more might be done to help and encourage users in this area". So how will the plan bring about the increased use of integrated pest management in the UK?
Dave Bench: Of course integrated pest management is about much more than just the pesticides legislation, the pesticides strategy. It links into a wide range of policy areas that are the responsibility of Defra. So what we are trying to recognise in relation to this specific plan is that there are these many broader links and we can think about how much more we can do in relation to the pesticides area specifically but there are all sorts of other issues that are both Government-led in relation to agri-environment schemes, for example, or indeed a whole range of industry-led initiatives, not least the various assurance schemes that place a high premium on the use of IPM or ICM, integrated crop management, in the production of produce and livestock.

Q634 Dr Offord: You still have a great deal of influence upon those different stakeholders.
Dave Bench: Yes, we do, and we work with them on a regular basis and will continue to do so, not least through the Pesticides Forum, which is our main regular stakeholder forum on pesticides.
Dr Offord: Okay. Thank you.

Q635 Chair: Minister, can I just go back to the National Action Plan and the lack of timetable and targets in that? Your officials mentioned indicators. But really it is the case, is it not, that indicators are not quantitative targets and that the European directive specifically says that there should be a timetable and that there should be targets? How are the two compatible?
Lord de Mauley: Can I ask you to answer that, Dave?
Dave Bench: Sure. Again, under the way that the directive is set up, it requires us to have a national action plan.

Q636 Chair: Is that an optional?
Dave Bench: No: it says that we have to have a national action plan. So the obligation is to have a national action plan. It suggests a range of different things that member states can put into that national action plan. Now we believe, and have checked with our lawyers, that what we have put into the National Action Plan—which of course is intended to be an ongoing, developing document; not static—is compliant with the requirements of the directive.

Q637 Chair: I cannot help but think in view of that response, Minister—it was the phrase, "having checked with our lawyers"—that it sounds as though you are trying to get by with the lowest common denominator.
Dave Bench: Absolutely not. As I have said, in relation to many of the areas covered by the directive and indeed beyond the areas of the directive, the UK has amongst the highest standards in Europe already. What we are intending to do within the plan, as in previous national pesticide strategies, is to reflect those activities and the way that the statutory and non-statutory initiatives fit together.

Q638 Martin Caton: Mr Bench, you are saying that the directive says that you can use various tools within the action plan, but from our reading—and Dr Offord has made this point perfectly clear—the directive absolutely says that the action plan should include quantitative objectives, targets, measures, and timetables. It says on the integrated pest management that the National Action Plans should encourage the development and introduction of integrated pest management. You just seem to be cherry picking things that are not suggestions or possibilities; they are things that the directive wants to see.
Dave Bench: Directives of course are purposive, they are drafted in a way that sets out what the Commission intends; the Government policy is to implement directives as they are required, not to go beyond the requirements of directives. We, in this area, very much had the intent of building within the National Action Plan the various initiatives that we already had in place; we didn't want to change things for the sake of changing things, where we have good mechanisms that work well. We have added in new mechanisms where the directive has required those, although those are relatively few and far between. What we have done is take the opportunity to bring all of those initiatives into one document. But it is in essence an overview of a whole range of initiatives and all of the detail of those initiatives does not appear in the document itself, and nor did we intend it to.

Q639 Martin Caton: So does the action plan explain why the UK Government has decided not to follow the approach that the directive wanted to see?
Dave Bench: We believe we have followed the requirements of the directive. We believe that it is compliant.

Q640 Chair: I think it is just raising more questions as we receive the responses. Just going back to the National Action Plan, where it says that more work is needed in terms of integrated pest control, I just wonder what it is that is missing and why that work could not have been done in time for when the National Action Plan was actually published. I am talking about pages 25 and 26, paragraph 16.2.
Lord de Mauley: Mr Bench did explain that this is a working, on-moving, iterative process. Did you want to say more about that?

Dave Bench: Yes. That is exactly right. The point that I made was that what we are intending to do here is to give a flavour of the current position and where there is likely to be further work to do. As I explained specifically in relation to IPM, this is an area where there is some locus in relation to pesticide policy and the usage of the pesticides regulatory regime, but there are a much wider range of Defra policies that tie in to the way in which you might promote and encourage the use of IPM or ICM, or however you want to define it. Much of that is linked to incentivisation through the use of agri-environment schemes, for example, or other guidance in other areas of agricultural policy that is not specifically about pesticides policy.

Q641 Chair: Just finally from me now on this, could I just say in that respect, given that the plan was due on November 26, as Dr Offord reminded us, it was published late just before our meeting today. Does this mean, in view of what you have just said about the continuing work, the integrated pest control, that the plan is incomplete?
Dave Bench: No, I don't believe it is an incomplete plan.
Chair: It is complete, although it needs more done?
Dave Bench: It was never intended to be a document that would be published and then fixed at that point in time. It has always been intended to provide a snapshot of how we see the position at this point in time and then for it to be developed on an ongoing basis in future.

Q642 Martin Caton: So an action plan is not a plan for action?
Dave Bench: The terminology of an action plan is that which is used in the directive, and that is reflected here. If you wanted to use a different definition of plan, then that would be okay, but it is called National Action Plan because that is what the directive requires and the contents within are the things that are covered by the directive.

Q643 Chair: Did you consult your lawyers about that?
Dave Bench: No.

Q644 Zac Goldsmith: Just before I come to the question I was going to ask, can I go back to the point that Peter Aldous was asking about, the ACP and its advice. I think, Professor Boyd, you said the two people whose advice differed with the majority were the former members. Is it therefore the case that all the existing members took a unanimous position? Was there unanimity there in terms of their view or was it also split among existing members?
Professor Boyd: I think it is probably for the ACP to answer that, not me. I was there simply as an observer because I wanted to learn about their processes. Because of the way the meeting worked, it is not done on a majority voting system, it is done on a consensus system, what I would say is that the rest of the committee seemed to come to a consensus about their view and agree that view.

Q645 Zac Goldsmith: But if that is the case, how do you record the fact that the two former members took a different view, and rejected the consensus of the members? How is that formally recorded?
Professor Boyd: The Chair agreed to formally record those views of those individuals.

Q646 Zac Goldsmith: So among existing members there were no requests for formal recognition of differences of opinions?
Professor Boyd: Not that I saw.

Q647 Zac Goldsmith: That wasn't the question I was going to ask, I just wanted clarity on that. A question for the Minister. On 12 December when we had our last session with you, we talked about home gardeners and whether or not they need access to neonicotinoid pesticides; since then Wickes and B&Q have both voluntarily removed these products from their shelves. I am just interested to know whether or not you welcome that move and whether you would like to see other retailers follow suit?
Lord de Mauley: I think it is not really for me specifically to welcome or otherwise. I am aware they have done it. As we discussed at the last meeting, in fact the pesticides that are authorised for sale to home users are considerably less powerful anyway, they contain clear instructions on their use and they pass the necessary regulatory tests.

Q648 Zac Goldsmith: Do you think therefore that they have over-reacted?
Lord de Mauley: I think that would not be for me to comment.

Q649 Zac Goldsmith: When you gave evidence in December, I just want to quote what you said about the precautionary principle. You said, "Defra fully accepts that the precautionary principle applies to decisions on the regulation of pesticides". In this case, you have two big retailers who have exercised the precautionary principle themselves; I am just interested to hear from you why it is such a stretch then for Defra to adopt a similar position, to take the precautionary principle as seriously as some of these front-line retailers are managing to do?
Lord de Mauley: As I said before, we accept the precautionary principle; perhaps it is a question of how you interpret it. We think that steps must be taken that are proportionate.

Q650 Zac Goldsmith: Does that mean, therefore, that you think the retailers—given that they are dealing with products on a lower level of toxicity—have exceeded the precautionary principle, that their action has not been proportionate?
Lord de Mauley: As I say, that is a matter for them.

Q651 Zac Goldsmith: Did the ACP's advice to Ministers on neonicotinoids cover domestic gardening? I think Mr Bench said it was going to.
Dave Bench: Yes. What I said when we gave evidence back in December was that previous discussions within the ACP on neonicotinoids had included discussions in relation to amateur use. That

did not turn out to be a specific focus of the discussion in January, and the key area of discussion ended up being the two new studies from the Food and Environment Research Agency and the implications of those. It was on that there was this difference of opinion, which wasn't a difference of opinion in terms of the potential implications of the studies; it was in terms of the potential timing of any action in relation to the conclusions. That was the alternative view that the two former members were posing. The majority of the discussion was around that area and there was no separate discrete discussion in relation to amateur products.

Q652 Zac Goldsmith: So was there no relevant conclusion at all drawn by the ACP in relation to amateur users?

Dave Bench: Except in so far as in the documents that they had available to them had an analysis in relation to the different existing uses, which mostly, of course, focused on the agricultural uses, and they homed in on the fact that where there are areas of concern, and should the possible concerns highlighted by the FERA work be borne out by further analysis, that their areas of concern related to large scale crops attractive to bees, and that they would not be recommending action in relation to smaller scale crops or, obviously, crops not attractive to bees. I would have to go back and check whether it was explicit there, but implicit within that part of the discussion was the fact that I do not believe that they were as concerned for amateur crops as they were for bee attractive large scale crops, like oil seed rape.

Q653 Zac Goldsmith: It has been suggested by a number of people that if neonicotinoids were entirely withdrawn, either compulsorily or voluntarily, from the amateur market, you would be creating very large areas that are highly neonicotinoid free. Given the discussion, as with Mr Caton, about the problems you have with the control groups in the FERA study, you would therefore be creating an opportunity to have much purer analysis of the effect of neonicotinoids or the lack of neonicotinoids on pollinators. From an experimental point of view, in terms of filling in some of the gaps that you began the session by talking about, is that not something that would be of enormous value?

Dave Bench: Ian may well wish to comment in terms of experimental design, but I think what you are essentially proposing is a very different kind of experiment from one that would look at whether wide-scale agricultural use on bee attractive crops is of any serious risk to bees, be that honeybees, bumblebees or solitary bees.

Q654 Zac Goldsmith: I would love to have your answer, just from the scientific point of view, but it is not just scientific. I don't think anyone doubts that there are risks at the very least associated with the use of neonicotinoids, that there is some impact on the pollinators, that is the nature of the pesticide in any case, so there must be some impact. I understand the point you made earlier on, Minister, about balancing those risks with the economic risks of removing the product. That tension would not exist among amateur users; it is hard to imagine what economic downside there would be to withdrawing the neonicotinoids from amateur users. That tension, therefore, doesn't obviously exist. I wonder whether therefore, for now at least, you would consider a two-tier approach; one which allows you to take into account the very real threats with the use of neonicotinoids and the damage it does to pollinators, by starting in urban areas, for example. Creating these very large areas that would be entirely neonicotinoid free. Is there any argument against that?

Professor Boyd: Can I say that the argument against that is an evidential one. There actually is no strong evidence to support the hypothesis that the use of neonicotinoids in those circumstances is significantly detrimental to bees.

Zac Goldsmith: Generally speaking?

Professor Boyd: Generally speaking. You are absolutely correct to say that because these are toxic chemicals, they will affect bees in some way or other. The question is whether that is significant at the population level. We do not have evidence to support that hypothesis as it stands at the moment.

Q655 Zac Goldsmith: I find that puzzling. We have had stacks of evidence and other Governments have seen enough evidence to convince them to apply the precautionary principle. There are stacks of evidence that there is a detrimental impact on pollinators. I understood the issue to be a question of balancing that against the economic risks of removal. I don't think anyone doubts that the risk is there; therefore it ought to be much easier, much less cumbersome for Ministers to make a decision in favour of the precautionary principle, where you don't have that tension. It seems to me that the threshold that Defra wants to apply in relation to the precautionary principle is so high that it can almost never be reached. Where there is no economic tension, surely that threshold can be lowered. Maybe it is a political question.

Professor Boyd: I cannot comment on the economic tension, but I can comment on the evidence that is available and I would dispute what you said about stacks of evidence. There is a lot of evidence from laboratory studies that show that these neurotoxic chemicals for insects are harmful to bees when delivered in doses that are higher than we measure in the field, as far as we can see so far. That is not surprising. The real question is: are they toxic to bees in the field at the kind of doses that bees actually experience? The evidence to date does not support that. So I have to be absolutely clear about this. If we see evidence that supports that, then I am sure the Minister will act on that very quickly. But at the moment we do not see that evidence. It is not without having looked for it, as well.

Q656 Chair: Before we move on, Professor Boyd, could you just say in terms of what you have just said, the evidence that you are referring to, are you talking to evidence in the UK, or are you talking to evidence worldwide?

Professor Boyd: I am talking to the totality of the evidence that we have available to us; the scientifically verifiable evidence that we have available to us.
Chair: I was just trying to check exactly what evidence you were referring to, and that would include evidence that has come from France?
Professor Boyd: Yes.
Chair: You would take that into account?
Professor Boyd: Yes, absolutely.

Q657 Zac Goldsmith: Nevertheless, and this is probably not the time to argue about the evidence, but there are plenty of scientific studies out that point to problems—enough problems that EFSA issued the guidance that it did, that France has taken the position it did, that a great many scientists are calling for moratorium. I don't think there can be argument about that. The question really is for the Minister, given that we are facing a crisis in terms of the collapse of pollinators—that is also undeniable—the trends, if they continue, head in a very unpleasant direction. Given that neonicotinoids at the moment are a culprit, a potential culprit, and there is a lot of evidence to suggest that it is a very significant culprit, my question to you then is: does it not make sense, at least within the context of amateur users, within the context of large urban areas, to pull the plug on neonicotinoids to enable you to gather the science that you need and potentially also to create a safe haven for some of our pollinators? Does the precautionary principle not justify that at this stage?
Lord de Mauley: Clearly, we consider all these issues extremely carefully. As I am advised by the scientists who advise me, we do not consider that neonicotinoids are the major pressure on bees and pollinators. There are a number of other things that they have to contend with and which make their lives very difficult. My advice is that it is a finely balanced judgment, but the political position we take is that we don't regulate until it is appropriate to do so, and we do not yet consider it is appropriate to do so.

Q658 Zac Goldsmith: Last question. What I am interested in is why you would use the same language to describe the tension between the pros and the cons of implementing a moratorium in relation to urban environments, amateur users, as you would to conventional users. We can all recognise that there is a very significant economic question mark over the implications of removing neonicotinoids from commercial agriculture. It is very hard to see the economic downside of removing neonicotinoids from amateur users, and therefore if it is finely balanced—the decision you have to take in relation to the conventional use of neonicotinoids—surely that balance tips very much more heavily in favour of the precautionary principle in the context of amateur users given that you don't have such a strong economic case? If it is finely balanced in relation to the former, necessarily it cannot be finely balanced in relation to the urban environment.
Lord de Mauley: I don't know that I would accept that contention. I have to say, I have not spent a lot of time considering that specific point, but it may well be that there are some economic issues in urban use.
Professor Boyd: If I can just add to what the Minister said, I think there are some economic downsides from the point of view of the horticultural industry. If you were including the horticultural industry in what you are saying there, then from the point of view of managing pests within garden centres and places like that, there are probably some economic downsides. It is difficult to estimate those, but they probably exist.
Zac Goldsmith: Just for the record, I am not suggesting there are no economic downsides, but I am suggesting they cannot be that significant given that the two big retail players in this field have voluntarily removed them from the shelves. They would not do that if they were unable to provide consumers with some kind of alternative.
Professor Boyd: Again, it is a matter of assessing what the cost benefit trade-offs are here. What we don't know is how important gardens and garden centres are for bees. They may be very important, they may not be important. It is a matter of getting those cost benefit trade-offs correct, and we don't have that information, I'm afraid.
Zac Goldsmith: Okay, thank you.

Q659 Peter Aldous: If we could just look at a little detail on the soil accumulation tests on imidacloprid, which led to its approval as an active substance in the EU. I think I am directing these questions at Professor Boyd and Mr Bench. You were kind enough to write to us after the 12 December evidence session, setting out Defra's view on how imidacloprid was approved for use in the European Union. In that letter you pointed out the UK soil accumulation study, which indicated that imidacloprid has a half-life in soil of 1300 days, which was a worst case scenario, because it involved material being reincorporated into the ground, rather than being harvested. Approximately 50% of stem and leaf material produced by oil seed rape cannot be harvested, and is normally ploughed back into the ground. With that point in mind, would you still maintain that the UK trial was a worst case scenario?
Professor Boyd: Certainly at the time it was done, it was probably a worst case scenario for barley—I think that was the crop that it was applied to. It is perfectly possible that some of those studies need to be repeated, but I would also point out that imidacloprid is used very little now in the UK. There would again be a cost benefit trade-off about doing those studies, because to be honest it is used very little. It may become more of a moot point than a practical one as to whether one wants to really get a final definition of what the soil accumulation rates are for that chemical.

Q660 Peter Aldous: Your letter also asserted that imidacloprid met the requirements of the EC directive 91/414/EEC, which was enforced in the 1990s and which has since been superseded, your letter omitted to mention that the regulation included a catch-all provision that approved substances should have "no unacceptable influence on the environment". Do you therefore think that the half-life in soil of 1,300 days is environmentally acceptable?

Dave Bench: What I would say is that I think we have become a little bogged down in this one study giving you a half-life value of that, and I think that the Bayer person who gave evidence to you at a recent session indicated that at the time that study was initiated in the early 1990s, these studies were not well developed, the ways in which the studies were done were not well developed, so different methodologies were being tried to see what happened to develop standard tests. Certainly, the way that barley study was done in the 1990s would not be recognised now as a standard method of deriving a half-life in soil. What is also true is if you look at the range of different accumulation and dissipation studies for imidacloprid and other neonicotinoids, you do end up with a range of different half-life values derived. Many of them are in the hundreds of days, and you would describe a compound that has a half-life of hundreds of days as somewhat persistent or moderately persistent—it certainly has persistent as part of its profile. The question then is having established that there is that persistence for a compound, is given the other aspects of its profile is that then considered to be an acceptable risk profile in the way that it is used, and it would be expected to degrade or you accumulate and plateau in any particular agricultural situation. Those issues were considered both through the European process and will be considered again when imidacloprid products are re-registered in the next year or so. Also, they were discussed by the ACP when imidacloprid was considered on a national basis prior to the consideration of the European process.
This issue of persistence has been fully known and acknowledged for both imidacloprid and the other neonicotinoids as the active substances have been considered both at European and national level, and that has been taken into account in the risk assessment and risk management approaches.

Q661 Chair: Just on that you referred a response to Mr Aldous' question to one study, but in fact there were two studies, weren't there? The fact that there were two studies is important because they actually formed the basis of the regulatory authorisation for the use of neonicotinoids in the first instance. That is surely why these two studies are so important, because that was part of the authorisation process.
Dave Bench: They certainly formed the basis of that initial consideration and of course EFSA, when they did their assessment, have considered the persistence issue. When imidacloprid was first considered, of course what they pointed out was that there were some elements in which they could not complete the risk assessment at that point in time and said that member states would need to be aware of that and take that into account when reaching decisions. Ultimately, the Commission decision also said the same thing.
Chair: All right.

Q662 Peter Aldous: Looking at it more widely and more globally, are you confident that a regulatory system, or regime, that entails conducting trials, identifying concerns and then actually doing nothing about those concerns, as happened in the case of imidacloprid, is fit for purpose?
Dave Bench: I don't accept the contention that nothing happened in relation to those studies. The conclusions that EFSA reached in relation to those studies were published and known; the Commission understood and knew of that assessment when they made their first inclusion decision proposal. The inclusion decision, in the way the system works, was for a protected use and that allowed inclusion on annex 1 of the then directive, and then further uses are then for member states to consider, but taking into account what is known and making sure that they consider any of those outstanding issues in considering authorisation to the different uses. I don't accept the contention that the information was either not known or not acted upon.
Chair: Professor Boyd, would you like to comment?
Professor Boyd: I would agree with Dave Bench.

Q663 Dr Offord: Minister, I particularly want to ask you this question, there are certain factors that are considered, or we should consider, in the continuing use of neonicotinoids—economic issues, agriculture issues—and also a concern that an alternative pesticide may cause more environmental damage than possibly neonicotinoids might. But are there any other considerations that we should consider or arguments in favour of continued use of neonicotinoids?
Lord de Mauley: Those are the principal ones that I can think of, can you think of additional ones?
Professor Boyd: I can think of a very general one, which is that neonicotinoids represent a very significant technological solution to a significant agricultural problem, not just in the UK, but around the world. We have to be very careful about throwing away those technologies. They take many hundreds of millions of pounds to develop; the companies that develop them are simply not going to develop alternatives and invest in those alternatives if we decide on a whim to ban their use. We may be faced, if we are not careful, with a market failure with respect to this, in that we may not have alternatives. I think it is well known that our agricultural systems are highly dependent on these types of inputs—fertilisers, herbicides, pesticides, of various different types. So we have to be extraordinarily careful in not inducing a response which is one that we would not have expected in the long run as a result of regulating without very good and strong evidence.

Q664 Dr Offord: Thank you, that is very useful. Both Bayer and ACP told us that the use of imidacloprid in the UK has declined rapidly in recent years, particularly as farmers have started to use alternative pesticides. Given the concerns about the use of the chemical, and the fact that it has a limited usage and a decline in economic and agricultural value, would you consider withdrawal of the use of that chemical, and what would the time frame be on that?
Lord de Mauley: It is part of all the consideration that is going on; we haven't got there yet. We consider these things very carefully.

Professor Boyd: I think it would be fair to say, again, that withdrawal of that chemical would really only be done on an evidential basis, and it might be fair to say that the cost benefit trade-off associated with the withdrawal of that particular chemical would be more favourable than for some of the other chemicals. But one still needs to base that, in my view—and I am a scientist—on evidence and overall I think we have, at best, equivocal evidence, even for that chemical.
Dr Offord: I think that answers my questions.

Q665 Martin Caton: Professor Boyd, you seem to have just said that an important factor we should take into consideration when considering whether we allow the continued use of, say, neonicotinoids, but I suspect it would apply to other things, is its impact on the agrochemical industry and its preparedness to continue to do research and develop new products. Surely that should not be taken into account. Surely that is against the spirit, and probably the word, of the directives applicable in these sorts of case.
Professor Boyd: I don't think it is taken into account explicitly. What I am saying, I am giving you the benefit of my advice as a scientist looking in on this problem, is that because of the need for the world to grow more food in future, which is evidentially the case, evidentially true, we need to use all the technologies we have in the toolbox. As a result of that, we have to be very careful about the kind of decisions we make and make sure they are based upon good evidence. I am not saying that if the evidence is there we should not act, we should act, and I am not saying you put that into the cost benefit trade-off, but I am saying that we need to take a very precautionary overall view of the kind of approach we take to this and not react too quickly to circumstantial evidence.

Q666 Martin Caton: Those words suggest that you apply the precautionary principle to defend the economic interests of agricultures and the agrochemical industry, instead of applying it as it should be applied to protect the environment.
Professor Boyd: I'm not protecting the economic interests of the agrochemical industry. I want to absolutely refute that in the strongest possible way. What I am doing is trying to protect the long term agricultural productivity of this country and elsewhere as well. If we take these sorts of decisions without good evidence, then we will eventually reduce the productivity of our agriculture, and that is not a good thing for us.

Q667 Chair: I would like to ask one final question, if I may, because the National Action Pesticide Plan talks about a greater range of new techniques. In view of what has just been said about the need to get this toolkit for future use, I just wonder how much consideration is being given to funding for other ways of doing that, other than through the companies that you have just referred to, given what you have just said and the comments you have just made. It seems that you have put all your eggs in one basket and that you are not looking at integrated pest control.
Lord de Mauley: I would say that we are pursuing integrated pest management with great keenness. In fact, pesticide users are going to be required to use it from 1 January 2014, and all pesticide users soon will be required to be trained in it, it includes integrated approaches. Of course, many farmers and growers already are familiar with IPM and adopt practices in line with it, but it is certainly something that we are extremely focused on.
Professor Boyd: I would just say that integrated pest management is the future. We have to move in that direction and we have to move as quickly as possible.
Dave Bench: I would also add that within Defra's crop protection research programme, a very substantial proportion of that for many years has been given over to funding projects looking at alternatives—alternatives in the broadest sense, both in terms of alternatives to chemicals in control of specific problems, but also alternatives in terms of methods of farming or cultivation. Typically, over many years, we have spent about a third of the programme funding in that area.

Q668 Chair: In view of the work that the Government is doing on natural capital and the work that the Government is doing to go beyond GDP, and to look at valuing ecosystem services, I just think it would be really helpful to know what work you have done to make sure that the value of bees as pollinators is included in that study and ongoing work at the highest level in Government in that cross cutting way?
Lord de Mauley: I am not sure I can specifically relate it to bees.
Chair: Or pollinators.
Lord de Mauley: The national ecosystem assessment is one initiative that is addressing the matter by, for example, putting a value on pollinators. The gist of this is that a proper appreciation of the value of nature will encourage us all in a responsible approach to drawing on natural capital. I don't know that I am able to say more than that at the moment.

Q669 Chair: You have taken great pains to talk about the economic value that you assessed of the industry, and I was just interested to know how much you have fed in to that work that is currently going on inside Government on the whole issue of pollinators. Can you let us have details of it in writing if it is not instantly to hand?
Lord de Mauley: Yes, of course I will. I can just say briefly that integral to the economic assessment is the balance between the natural capital value we attribute through the ecosystem—the national ecosystem assessment—to pollinators and the economic value of what might or might not be lost from the crops. It is absolutely integral to the process. Of course I will put something in writing.
Chair: Thank you. Thank you all very much indeed for coming along this afternoon.

Written evidence

Written evidence submitted by Professor Dave Goulson, University of Stirling

INSECTICIDES

I write with regard to the possible role of neonicotinoid pesticides in harming bee health, and other potential impacts on the environment. This class of compounds are widely used in the UK (1.3 million ha treated in 2010) and worldwide, mainly as a seed coating. They are absorbed by the growing crop and protect it against herbivorous insects. Concern has focused on the impact of neonicotinoids in the pollen and nectar of crops such as oilseed rape and sunflowers, which are consumed by both honeybees and wild bees such as bumblebees.

I am an academic with 20 years' experience in studies of ecology, biodiversity and conservation, with a particular focus on bumblebees. I am author of a recent study on the impacts of neonicotinoid insecticides on bumblebees, published in *Science* in March 2012, which has been much-quoted during the recent controversy over insecticides (Whitehorn et al. 2012).

Firstly, I would like to flag up my willingness to discuss any aspect of this study, and its implications, should this be useful.

I am concerned that Defra's response to this work, and other studies, seems to be focused on trying to pick small holes and then using them as a justification for inaction. No study is perfect, and in practice it is impossible to carry out the ideal study. I would be happy to explain this in detail, but in essence a proper experiment requires natural, free flying bees in multiple areas with and without neonicotinoids. There are not areas without neonicotinoids in Europe. Hence if Defra are waiting for the perfect experiment to be performed, they will be waiting a very long time.

There are major knowledge gaps which require further study. When neonicotinoids were first introduced for application as a seed dressing (rather than an aerial spray), they were welcomed as this was assumed to give better targeting of the crop and reduced environmental damage. However this may not be the case, for the following reasons:

(a) Published research by Bayer's scientists suggests that about 2% of neonicotinoid seed dressings are absorbed by the crop, leaving the fate of 98% unknown. These compounds are water soluble, and degrade very slowly in soil water. If they are drawn up by non-target vegetation, such as hedgerow shrubs, they could impact directly on numerous insects such as butterfly larvae. There appears to be just one study of levels in non-target plants, from the US, which found concentrations of neonicotinoid sufficient to kill herbivorous insects in dandelions growing near treated crops (Krupke et al. 2012, PlosONE). We do not know whether farmland vegetation in the UK is similarly contaminated.

(b) Recent studies from Italy suggest that, no matter how carefully dressed seeds are drilled, neonicotinoid dust is created, sufficient to deliver lethal doses to flying insects nearby and presumably able to drift into non-target vegetation (Tapparo et al. 2012; Marzaro et al. 2011).

It seems to me that there is an urgent need to establish the fate of the 98% of neonicotinoids which are not in the crop, and to find out what impacts they might be having on the environment. Funding permitting, I am currently attempting to pursue this line of research.

26 September 2012

Written evidence submitted by the Soil Association

SUMMARY

— The UK Government is ignoring the strong and quickly growing body of scientific evidence which points to the damaging impact of neonicotinoid pesticides on pollinating insects, including bumblebees and honey bees (see Annex 1).

— Scientists have established that very, very low doses of neonicotinoids, well below what European governments consider a "safe" level of toxic chemical, can disrupt bee behaviour in ways likely to contribute to the collapse in numbers of honeybees, bumble bees and other pollinating insects.

— Defra has made commitments to put in place new research to explore further the impacts of neonicotinoids on bumblebees and have acknowledged that the risks of pesticides to bees needs to be updated, but these plans ignore the weight of existing evidence, and will delay the action that the Government should take now.

— The European Food Standards Agency has admitted that neonicotinoid and other systemic insecticides have not been properly evaluated ever since their introduction and use of some neonicotinoids has been either banned or suspended in the USA, Germany and France. Italy banned neonicotinoid insecticide use on maize and this led to a halving of winter honey bees deaths over three years.

— There are a range of methods which farmers can use which do not require the use of neonicotinoid pesticides—in Italy government research showed banning neonicotinoid use on maize did not affect farmers' profits.

— UK and EU pesticide safety testing is not of an acceptable standard. First, it relies not on science but on industry data, which is not subject to scientific peer-review and publication. Second, there is no requirement for companies to publish all the research they conduct, with the risk that cherry-picked, favourable studies are used to obtain regulatory approval. Third, no safety testing which looks at the impact of repeated, very low doses (below accepted "safe" levels) of pesticide are required. Fourth, little or no research is done on the impact of likely combinations of pesticides (the cocktail effect) that insects like honey bees and other insects will actually encounter on farms.

Introduction

1. The Soil Association is a UK charity, campaigning for healthy, humane and sustainable, food, farming and land use. We welcome fact that the EAC has launched this inquiry and we are pleased to have the opportunity to submit evidence to it.

2. *"The world of systematic insecticides is a weird world, surpassing the imaginings of the brothers Grimm... It is a world where the enchanted forest of the fairy-tales has become the poisonous forest in which an insect that chews a leaf or sucks the sap of a plant is doomed."*

Rachel Carson, Silent Spring (2012 marks the 50th anniversary of the publication of the book).

Background

3. It is estimated that pollinating iinsects add some £430 million to the British economy by pollinating crops.[1] Insect pollinated crops have become increasingly important in UK crop agriculture and, as of 2007, accounted for 20% of UK cropland value. Future land use and crop production patterns may further increase the role of pollination services to UK agriculture, highlighting the importance of measures aimed at maintaining both wild and managed species.[2]

4. Over the past few years there has been mounting evidence of a global decline in pollinator numbers. There are number of theories for why pollinators have been suffering such declines, including the intensification of agriculture (causing loss of suitable habitats), poor weather and disease. A major cause is thought to be the type and extent of pesticide use on farmland.

5. The University of Reading concluded that: *"even when correctly applied pesticides can have adverse impacts upon bees by reducing their breeding success and resistance to disease, and by reducing the availability of valuable forage plants.[3]"*

6. A relatively new group of insecticides called neonicotinoids has been most strongly implicated. Scientific evidence against these chemicals is strong, which is why some of the individual neonicotinoid pesticides have been suspended on certain crops in several European countries (eg France, Germany and Italy). However the UK government has not yet accepted this scientific evidence.

7. Neonicotinoids are a relatively new class of insecticides, launched in 1991. They are synthetic derivatives of nicotine, the tobacco toxin. They are designed to be persistent and target the insect's immune system, binding with its nicotinic receptors and interrupting the sending of nerve impulses. These pesticides are systemic, ie they permeate throughout the plant.

8. There are seven different active ingredients: acetamiprid, clothianidin, dinotefuran, imidacloprid, nitenpyram, thiacloprid, and thiamethoxam.

9. The most popular of these is imidaclprid. It is one of the fastest growing insecticides in terms of sales and is one of the most widely used insecticides in the world.[4] It is highly toxic to bees and is the best researched neonicotinoid in terms of the threat is poses to wild pollinators and honey bees.

10. These pesticides are used in a number of ways. The most popular use in the UK is as a seed treatment, in particular for the crops oil seed rape and maize. Scientists are now discovering that very, very low doses of neonicotinoids, well below what European governments consider a "safe" level of toxic chemical, can disrupt bee behaviour in ways that are likely to be contributing to the collapse in numbers of honeybees, bumble bees and other pollinating insects.

— *The use (or abuse) of evidence in this particular case, for setting policy and regulations on pesticides.*

1 http://planetearth.nerc.ac.uk/news/story.aspx?id=988

2 Pollination services in the UK: How Important are Honeybees?
Breeze T D, Bailey A P, Balcombe K G and Potts S G
Agriculture, Ecosystems & Environment (2011) Vol 142 no. 3–4 (Pages 137–143)

3 www.foe.co.uk/beesreport

4 Yamamoto, I "Nicotine to Nicotinoids: 1962 to 1997", in *Nicotinoid Insecticides and the Nicotinic Acetylcholine Receptor*, eds. Yamamoto, I and Casida, J Springer-Verlag, Tokyo, 1999 pp. 3–27.

11. Methods used during development and initial safety and efficacy testing of pesticides should be changed as it is clear that they are insufficient to demonstrate safety. This is for four main reasons.

12. First, the current UK system of pesticide regulation relies on the use of industry data, which is not subject to scientific peer-review and publication. Second, there is no requirement for companies to publish all the research they conduct, leading to the risk of only cherry picked, favourable studies being used to obtain regulatory approval. Third, no safety testing which looks at the impact of repeated, very low doses (below accepted "safe" levels) of pesticide are required. Fourth, there is no research on the impact of likely combinations of pesticides (the "cocktail effect") that insects like honey bees and other insects will actually encounter on farms.

13. The continued decline in bird numbers and biodiversity generally in the UK makes it clear that further efforts to reduce pesticide risks and impacts should be prioritised and pursued.

14. The recent draft UK National Action Plan for the Sustainable Use of Pesticides (NAP) highlights the relative lack of concern the UK Government appears to have with regard to pesticide use, as compared to other EU countries. The draft lists existing regulatory measures and non-regulatory initiatives aimed at reducing risks and impacts. In doing so it makes no commitment to change or further reduce pesticide impacts and risks or dependency on the use of pesticides. Contrary to the relevant EU Directive which stipulates that National Action Plans should be "aimed at setting quantitative objectives, targets, measures, timetables and indicators to reduce risks and impacts of pesticide use in human health and the environment" the UK NAP completely fails to implement this requirement.

15. In March 2012 Defra said that it would review the evidence on neonicotinoids and take action if necessary. Before the review was published, Defra's Chief Scientist until September 2012, Professor Sir Bob Watson, acknowledged that the Government's focus on managed honey bees means that it knows a lot less about other pollinators and the effects chemicals may be having on them:

16. *"I fully recognise that the issues that have been raised are not just about honey bees but are relevant to a broader range of bees and pollinator species. We are considering the research in that wider context…we have less baseline knowledge of the effects of all pesticides, not just neonicotinoids, on pollinator species other than honeybees. We also have a less developed basis for interpreting the available evidence."* (Letter to Friends of the Earth, Buglife, Soil Association and ClientEarth, June 2012)

17. The EU as a whole is also taking stronger action with regard to this problem. The European Food Safety Authority (EFSA) has recently published an opinion on how the pesticide risk assessment for bees should be conducted.[5] The body has concluded that neonicotinoid and other systemic insecticides have not been properly evaluated ever since their introduction. The EFSA opinion will form the basis for new guidelines for the tests (to be published in late 2013) required to be carried out by the pesticide manufacturers and how member states should assess the information submitted.

18. These guidelines will only be relevant for new products, or those being reviewed. It is not clear what the situation for systemic insecticides already on the market will be. Individual member states could choose to suspend all neonicotinoid product approvals until the new protocols are introduced. The European Parliament is calling for stronger regulations and a review of the risk assessment, along with more independent research and public scrutiny of the system. We strongly support this approach and urge the UK Government to fully support such calls.

19. A number of other European countries have recognised the weight of evidence in terms of the case against neonicotinoids.

20. Italy temporarily suspended use of three neonicotinoid products in 2008—the suspensions have been renewed each year. Research in Italy found that the ban has led to a halving of winter deaths of honeybees over three years. France has recently banned the use of the neonicotinoid, Thiamathoxam, due to concerns about its impact on bees. This chemical remains in use in the UK—in fact its use has increased substantially over the past few years.[6]

21. In France the use of Gaucho (Imidacloprid) on sunflower seeds was banned in 1999 after one third of bees died following its widespread use; in 2004 use on sweetcorn seeds was also banned. Bee populations are reported to have increased again after the ban. In 2012, the French Government announced plans to suspend the neonicotinoid, Thiamathoxam due to concerns about its impact on bees.

22. In 2008 Germany suspended use of some seed treatments containing clothianidin, imidacloprid or thiamethoxam because of mass bee deaths caused by dust arising from seed drilling which drifted crops where bees were feeding.

23. In the US Imidacloprid was voluntarily withdrawn by manufacturers from use on almonds in 2011, under pressure from the state government of California,

— *The application of real-world—'field'—data. What monitoring there is of actual—rather than recommended—levels of pesticide usage, and the extent to which that influences policy on pesticides.*

[5] http://bees.pan-uk.org/assets/downloads/Bee_factsheet4.pdf

[6] Food and Environment Research Agency (2012) Pesticide Usage Statistics

24. Until recently there had been relatively little research using real world "field" data. We welcome the fact that there is now better evidence for such field risks, yet the UK Government is still not taking such evidence into account strongly enough.

25. The Government's review of evidence with regard to pollinators and neonicotinoids was published on 18 September 2012.[7] The review acknowledged that there was evidence of harm in laboratory studies but that more research is needed in field conditions. It acknowledged the need for more research into impacts on solitary and bumble bees. It recommended changes to the regulatory process to ensure that the risk assessment for pesticide products considers the impact on all bee species, but still took the decision not to suspend or place any restrictions on the use of neonicotinoid pesticides.

Any potential impacts of systemic neonicotinoid insecticides on human health

26. The impact of systemic neonicotinoid insecticides on human health is a relatively under-researched area. The World Health organisation (WHO) put the neonicotinoids imidacloprid, thiacloprid (the only neonicotinoids listed) as Class II (moderately hazardous).

27. Most neonicotinoids show much lower toxicity in mammals than insects, but emerging science demonstrates that many may also have neurodevelopmental effects, and some are considered likely carcinogens by US Environmental Protection Agency (EPA).[8]

28. The fact that these insecticides are systemic means that they cannot be washed off food. Neonicotinoid pesticides are regularly found in food consumed in the UK. The regular Expert Committee on Pesticide Residues in Food (PRiF) reports show details of the pesticides found in food purchased in the UK. For example the 2010 report shows that the neonicotinoid pesticide imidacloprid was found in grapes, beans and basil. The neonicotinoid which the French Government have recently announced plans to ban (thiamethoxan) was also found in lettuce and grapes. The most recent report (first quarter of 2012, published Sept 2012) showed that imidacloprid was found in beans, broccoli, grapes, lettuce, okra and peppers.[9]

What alternative pest-control measures should be used, such as natural predators and plant breeding for insect-resistance, in a bid to make UK farming more insect- and bee-friendly

29. There are a wide range of pest-control alternatives to the use of pesticides for insect control.

30. Many crop pest species have natural predators (eg ladybirds for aphids) or parasites (eg nematodes for slugs and snails). These can be deliberately introduced to a crop or encouraged by providing suitable habitat (eg rough un-farmed areas around fields). Often natural predators get removed from the system by pesticides, either directly or through dramatic reduction in prey resulting in die-off of the predators and subsequently disrupting ecosystems by adversely affecting food webs. Therefore reducing pesticide usage and encouraging natural predators can help control pest species as well as improving the health of the whole ecosystem.

31. Methods such as crop rotations (as opposed to monocultures) and a variety of measures to encourage natural predators of pest species are widely used in farming worldwide.

32. Such methods are widely used in organic farming, which does not use neonicotinoids and does not rely on pesticide use. Biodiversity, in terms of a wide range of plants, insects and animals, is key to organic farming. Each plant or animal has a specific role in the life of the farm, and this is especially true of the bee. Bees and other pollinators play a crucial role in pollination, so that we can grow fruits and vegetables.

33. Intensive agricultural techniques are causing such concern that new research is being carried out at the laboratory of Apiculture and Social Insects at the University of Sussex. Professor Francis Ratnieks, who heads the laboratory stated: "The use of herbicides and intensive forms of agriculture means that fields of wheat and barley now have few weeds. Fields of grass now have few wild flowers, clover is less used and much of the heather moors have been ploughed up.[10]"

34. The focus on natural ecosystems and native species, as well as the lack of pesticides used in organic farming, make it a haven for pollinators. Organic farms also provide the wild spaces at not just at field margins and in hedgerows, where bees nest and shelter, but also providing a diversity of flowers and habitats for bees to feed throughout the field.

35. In particular, red and white clover are mainstays of organic farming systems. Red clover (*Trifolium pratense L.*) is used extensively as part of the rotational farming systems that maintain soil fertility without the use of chemical fertilisers. In addition it is one of the bumble bees favourite foods. White clover (*Trifolium repens*) is also found in abundance on organic farms. Honeybees are particularly drawn to this plant.

36. *"In the economy of nature the natural vegetation has its essential place...Such vegetation is the habitat of wild bees and other pollinating insects. Man is more dependent on these wild pollinators then he usually realises. Even the farmer himself seldom understands the value of wild bees and often participates in the very*

[7] http://www.defra.gov.uk/publications/2012/09/18/pb13818-pesticides-bees/
[8] US EPA Factsheets. http://www.epa.gov/ opprd001/factsheets/.
[9] http://www.pesticides.gov.uk/Resources/CRD/PRiF/Documents/Results%20and%20Reports/2012/Q1%202012%20Final.pdf
[10] http://www.sussex.ac.uk/lasi/sussexplan/agriculture

measures that rob him of their services....These insects, so essential to our agriculture and indeed to our landscape as we know it, deserve something better from us than the senseless destruction of their habitat. Honeybees and wild bees depend heavily on such weeds".

Rachel Carson, Silent Spring.

Annex 1

In 2009 the NGO Buglife wrote a detailed overview of the evidence in this area: "The impact of neonicotinoid insecticides on bumblebees, honey bees and other non-target invertebrates[11]".

Since then, a number of other scientific research papers have been published which add further evidence. A selection of these is outlined below.

Title: Neonicotinoid Pesticide Reduces Bumble Bee Colony Growth and Queen Production

Authors: Penelope R Whitehorn, Stephanie O'Connor, Felix L. Wackers, Dave Goulson

Journal: *Science* (2012); vol 336 no. 6079 (pages 351–352)

DOI: 10.1126/science.1,215,025

Summary: Exposed colonies of the bumble bee *Bombus terrestris* in the laboratory to field-realistic levels of the neonicotinoid **imidacloprid**, then allowed them to develop naturally under field conditions. Treated colonies had a significantly reduced growth rate and suffered an 85% reduction in production of new queens compared with control colonies.

Title: A Common Pesticide Decreases Foraging Success and Survival in Honey Bees

Authors: Mickaël Henry, Maxime Beguin, Fabrice Requier, Orianne Rollin, Jean-François Odoux, Pierrick Aupinel, Jean Aptel, Sylvie Tchamitchian, Axel Decourtye

Journal: Science (2012); vol 336 no. 6079 (pages 348–350)

DOI: 10.1126/science.1,215,039

Summary: Exposed on free-ranging honeybee foragers labeled with a RFID tag to non-lethal levels of **thiamethoxam** (neonicotinoid pesticide) resulting in high mortality due to homing failure. Levels of mortality were high enough to put a colony at risk of collapse.

Title: *In situ* replication of honey bee colony collapse disorder

Authors: Chensheng Lu, Kenneth M Warchol, Richard A Callahan

Journal: Bulletin of Insectology (2012) Vol 65 n. 1 (pages 99–106)

ISSN: 1721–8861

Summary: 16 hives were treated with **imidacloprid**, at dosages reflecting imidacloprid residue levels reported in the environment previously. Treatment lasted for 13 weeks after which all hives were alive. However, after 23 weeks 15 of 16 imidacloprid treated hives (94%) were dead. Dead hives were remarkably empty except for stores of food and some pollen left, a resemblance of CCD. The survival of the control hives that were managed alongside with the pesticide-treated hives suggests this was down to the treatment and not other environmental factors.

Title: Pesticide exposure in honey bees results in increased levels of the gut pathogen Nosema

Authors: Jeffery S Pettis, Dennis vanEngelsdorp, Josephine Johnson & Galen Dively

Journal: Naturwissenschaften (2012) Vol 99 no.2 (pages 153–158).

DOI: 10.1007/s00,114–011–0881–1

Summary: Exposed honey bee colonies over three brood generations to sub-lethal doses of **imidacloprid**, and then subsequently challenged newly emerged bees with the gut parasite, *Nosema spp.* The pesticide dosages used were below levels demonstrated to cause effects on longevity or foraging in adult honey bees. *Nosema* infections increased significantly in the bees from pesticide-treated hives when compared to bees from control hives demonstrating an indirect effect of pesticides on pathogen growth in honey bees. Interactions between pesticides and pathogens could be a major contributor to increased mortality of honey bee colonies, including colony collapse disorder, and other pollinator declines worldwide.

Title: Influence of dinotefuran and clothianidin on a bee colony

Authors: Toshiro Yamada, Kazuko Yamada & Naoki Wada

Journal: Japanese Journal of Clinical Ecology (2012) Vol.21 No.1 (pages 10–23)

Summary: Treated eight colonies of ~10,000 honeybees with **dinotefuran** or **clothianidin**. Treatments were foods containing **dinotefuran** of 1 ppm to 10 ppm or **clothianidin** of 0.4 ppm to 4 ppm fed into a beehive. Three levels of concentration for each pesticide were 10, 50 and 100 times lower than that in practical use. The changes of adult bees, brood and the pesticide intake in each colony were examined and suggest that each

[11] http://www.buglife.org.uk/Resources/Buglife/Documents/PDF/REVISED%20Buglife%20Neonicotinoid%20Report.pdf

colony with the pesticide administered collapses to nothing after passing through a state of CCD. The high-concentration pesticides seem to work as an acute toxicity and the low- and middle-concentration ones do as a chronic toxicity.

Title: Multiple Routes of Pesticide Exposure for Honey Bees Living Near Agricultural Fields

Authors: Christian H Krupke, Greg J Hunt, Brian D Eitzer, Gladys Andino, Krispn Given

Journal: PLoS ONE Vol 7 no.1: e29,268.

DOI: 10.1371/journal.pone.0,029,268

Summary: Neonicotinoid insecticides have been found in previous analyses of honey bee pollen and comb material but the routes of exposure have remained largely undefined. Used LC/MS-MS to analyze samples of honey bees, pollen stored in the hive and several potential exposure routes associated with plantings of neonicotinoid treated maize. The results demonstrate that bees are exposed to these compounds and several other agricultural pesticides in several ways throughout the foraging period. During spring, extremely high levels of **clothianidin** and **thiamethoxam** were found in planter exhaust material produced during the planting of treated maize seed. Neonicotinoids were also found in the soil of each field we sampled, including unplanted fields. Plants visited by foraging bees (dandelions) growing near these fields were found to contain neonicotinoids as well. This indicates deposition of neonicotinoids on the flowers, uptake by the root system, or both. Dead bees collected near hive entrances during the spring sampling period were found to contain **clothianidin** as well, although whether exposure was oral (consuming pollen) or by contact (soil/planter dust) is unclear. We also detected the insecticide **clothianidin** in pollen collected by bees and stored in the hive. When maize plants in our field reached anthesis, maize pollen from treated seed was found to contain **clothianidin** and other pesticides; and honey bees in our study readily collected maize pollen. These findings clarify some of the mechanisms by which honey bees may be exposed to agricultural pesticides throughout the growing season.

Title: RFID Tracking of Sublethal Effects of Two Neonicotinoid Insecticides on the Foraging Behavior of Apis mellifera

Authors: Christof W Schneider, Jü rgen Tautz, Bernd Grü newald, Stefan Fuchs

Journal: PLoS ONE (2012) volume 7 No1: e30,023

DOI: 10.1371/journal.pone.0,030,023

Summary: In addition to testing according to current guidelines designed to detect bee mortality, tests are needed to determine possible sublethal effects interfering with the animal's vitality and behavioral performance. Several methods have been used to detect sublethal affects of different insecticides under laboratory conditions using olfactory conditioning. Furthermore, studies have been conducted on the influence insecticides have on foraging activity and homing ability which require time-consuming visual observation. This experiment tested an experimental design using the radiofrequency identification (RFID) method to monitor the influence of sublethal doses of insecticides on individual honeybee foragers on an automated basis. Electronic readers were positioned at the hive entrance and at an artificial food source to obtain quantifiable data on honeybee foraging behavior. This gave detailed information on flight parameters. By comparing several groups of bees, fed simultaneously with different dosages of a tested substance it was possible to monitor the acute effects of sublethal doses of the neonicotinoids imidacloprid (0.15–6 ng/bee) and clothianidin (0.05–2 ng/bee) under field-like circumstances. Both substances led to a significant reduction of foraging activity and to longer foraging flights at doses of ≥0.5 ng/bee (clothianidin) and ≥1.5 ng/bee (imidacloprid) during the first three hours after treatment. This study demonstrates that the RFID-method is an effective way to record short-term alterations in foraging activity after insecticides have been administered once, orally, to individual bees. Field relevant doses of imidacloprid in sunflowers and oilseed rape were estimated to be around 0.13 ng and 0.023–0.03 ng, respectively. At these doses there was no effect of treatment.

Title: Combined pesticide exposure severely affects individual- and colony-level traits in bees

Authors: Richard J Gill, Oscar Ramos-Rodriguez & Nigel E Raine

Journal: Nature (2012)

DOI: doi:10.1038/nature11,585

Summary: Reported widespread declines of wild and managed insect pollinators have serious consequences for global ecosystem services and agricultural production. Bees contribute approximately 80% of insect pollination, so it is important to understand and mitigate the causes of current declines in bee populations. Recent studies have implicated the role of pesticides in these declines, as exposure to these chemicals has been associated with changes in bee behaviour and reductions in colony queen production. However, the key link between changes in individual behaviour and the consequent impact at the colony level has not been shown. Social bee colonies depend on the collective performance of many individual workers. Thus, although field-level pesticide concentrations can have subtle or sublethal effects at the individual level, it is not known whether bee societies can buffer such effects or whether it results in a severe cumulative effect at the colony level. Furthermore, widespread agricultural intensification means that bees are exposed to numerous pesticides when foraging, yet the possible combinatorial effects of pesticide exposure have rarely been investigated

These experiments show that chronic exposure of bumblebees to two pesticides (neonicotinoid and pyrethroid) at concentrations that could approximate field-level exposure impairs natural foraging behaviour

and increases worker mortality leading to significant reductions in brood development and colony success. It was found that worker foraging performance, particularly pollen collecting efficiency, was significantly reduced with observed knock-on effects for forager recruitment, worker losses and overall worker productivity. Moreover, this provides evidence that combinatorial exposure to pesticides increases the propensity of colonies to fail.

The Importance Of Insect Pollinators

Title: Pollination services in the UK: How Important are Honeybees?

Authors: Breeze T D, Bailey A P, Balcombe K G and Potts S G

Journal: Agriculture, Ecosystems & Environment (2011) Vol 142 no. 3–4 (Pages 137–143)

DOI: 10.1016/j.agee.2011.03.020

Summary: Insect pollinated crops have become increasingly important in UK crop agriculture and, as of 2007, accounted for 20% of UK cropland and 19% of total farmgate crop value. Analysis of honeybee hive numbers indicates that current UK populations supply 34% of pollination services, falling from 70% in 1984. In spite of this decline, insect pollinated crop yields have risen by 54% since 1984. Future land use and crop production patterns may further increase the role of pollination services to UK agriculture, highlighting the importance of measures aimed at maintaining both wild and managed species.

Title: Contribution of Pollinator-Mediated Crops to Nutrients in the Human Food Supply

Authors: Elisabeth J Eilers, Claire Kremen, Sarah Smith Greenleaf, Andrea K Garber, Alexandra-Maria Klein

Journal: PLoS ONE (2011) Vol 6 no. 6: e21,363.

DOI: 10.1371/journal.pone.0,021,363

Summary: This study evaluates the nutritional composition of animal-pollinated world crops. By calculating pollinator dependent and independent proportions of different nutrients of world crops, revealed that crop plants that depend fully or partially on animal pollinators contain more than 90% of vitamin C, the whole quantity of Lycopene and almost the full quantity of the antioxidants b-cryptoxanthin and b-tocopherol, the majority of the lipid, vitamin A and related carotenoids, calcium and fluoride, and a large portion of folic acid. On-going pollinator decline may exacerbate current difficulties of providing a nutritionally adequate diet for the global human population.

29 October 2012

Written evidence submitted by Dr Christopher Connolly, University of Dundee

Summary

1. Pesticides are screened for safety on the basis of their ability to kill individual bees (LD_{50}) but no consideration is given to sub-lethal toxicity.
2. The LD_{50} is determined for individual bees, not whole colonies.
3. Sub-lethal toxicity does not, necessarily, mean the death of the individual bee.
4. Sub-lethal toxicity may induce a vulnerability to other insults such as disease.
5. Many pesticides target the insect brain.
6. Sub-lethal toxicity in bees may lead to a dysfunction in the brain.
7. Many pesticides are used prophylactically by farmers and in combinations that are not reported.
8. Pesticides can act together by disrupting related targets.
9. All chemicals, be they medical therapeutics or pesticides, exert off-target activity. How this works is unpredictable and need to be tested empirically.
10. Lab tests versus "realistic" field studies.

Detail

1. The level of pesticide required to kill a bee is important, but misses the real toxicity of compounds. Chemicals may cause chronic damage to insect pollinators (possibly even humans!) if exposed acutely (eg Asbestos exposure in humans) or chronically (eg Alcohol/smoking or therapeutic drugs like valium in humans). In both human cases, toxicity is only evident after long periods. Delayed toxicity has now been demonstrated in bumblebees (Whitehorn et al 2012, Gill et al 2012), where pesticide effects require many weeks.

2. For the social insect such as the bees, ants and wasps, it is the colony that is the breeding unit and so it is this that is most important. I accept that it is not reasonable to use whole colonies of honeybees for toxicity studies as this would be prohibitively expensive and flawed by their interaction with a complex environment that cannot be controlled.

3. Nevertheless, in the case of the social insects, individual weaknesses (non-lethal) may have a direct impact on the entire colony and poisons may even be taken back to the colony where they are stored (Mullin et al 2010) and fed to their developing young. As the neonicotinoids are based on nicotine, it is possible that the developmental toxic effects, observed in the human foetus of a smoking mother, predicts similar developmental deficits of bee larvae fed neonicotinoid contaminated food. Societal breakdown could occur at multiple levels, such as, learning (to be efficient in sourcing food), communication (sharing information regarding food resource availability/colony condition), navigation (negotiating their way in the environment)(Henry et al 2012), reproduction (queen only) and behaviour (colony dynamics).

4. Bees (or other pollinators) weakened by pesticide exposure may be more vulnerable to other threats such as disease or mite infestation. In fact the combined toxicity of a pesticide along with a disease is a common strategy of "Integrated Pest Management" as recommended by WHO to tackle malaria (using a fungus with Permethrin), cattle ticks (fungus plus deltamethrin) and maize rootworm (nematode plus tefluthrin). So, it is likely that such interactions occur in our pollinators that are facing multiple chemical and disease stresses. In support of this hypothesis, this possibility is starting to be reported (Alaux et al 2010, Aufauvre 2012, Vidau 2011, Pettis et al 2012, Wu 2012). The mechanistic basis for this is unknown.

5. We know that many pesticides target the insect brain, making the social insects more vulnerable to their exposure. The brain is a plastic structure that relies on changes to drive higher cognitive function, mood and social behaviour.

6. Dysfunction of the brain may not cause gross morphological changes. In fact, dysfunction is more likely to result in subtle changes to the structure and function of synapses (sites of information transfer between neurons and the sites of learning). Synapses can learn to become stronger, or weaker, and so directly impact the efficiency of information flow in that particular circuit. Disturbing this "plasticity" can lead to alterations in their learning ability and/or affect mood/social interactions.

7. Pesticides are now used as preventative measures, in the absence of any threat to the crop (or pets—eg Worming). Therefore, the risk to the environment and human health is much greater than necessary. We should not be killing all insects (and so the local ecosystem), only those that have become a problem. In fact, the situation is even worse as the information on what pesticides have been applied (and where and when) is not available. Therefore, should particular pesticide combinations be dangerous, we could never learn from such mistakes. Suppose 10% of local inhabitants are exposed to a cancer-causing combination of pesticides. Ten years later we may (or may not) identify a link with the local environment but would not have access to the information required to make that link. However, if the local use of pesticides were available, bioinformaticians/ epidemiologists could correlate local bee losses (we saw a 5% overwintering failure in the west of Scotland and a 20% loss in the east, Fife was particularly bad) with local pesticide use. The identity of the farmers could easily be kept confidential as it is the correlation of pesticide use to pollinator losses that is important. Achieving this important policy change would have a major impact and could fast track scientific research by targeting it to potential causes of the pollinator declines. Such information may also inform on the causes of the many idiopathic, chronic human diseases like the neurodegenerative disease and Irritable Bowel Syndrome in humans.

8. Pesticides can work together at target sites to enhance toxicity. We have tested this hypothesis in our ongoing research programme "An investigation into the synergistic impact of sublethal exposure to industrial chemicals on the learning capacity and performance of bees" (funded by the IPI), with respect to the cholinergic synapse that is targeted by pesticides that; A. Alter the release of acetylcholine (eg λ-cyhalothrin and τ-fluvalinate). B. Inhibit the removal of excess acetylcholine (eg Chlorpyrifos and coumaphos). C. Directly stimulate the excitatory acetylcholine receptors (neonicotinoids). Together, chemicals targeting these sites are likely to work in concert to increase the neural deficits or lower the dose required to perturb the neural pathway. Our studies have shown interactions between imidacloprid and coumaphos, at both the level of brain activity (Dundee—manuscript under review, Palmer *et al*) and learning (Newcastle—manuscript under review, Williamson *et al*) in the honeybee, or with imidacloprid and λ-cyhalothrin on bumblebee colony performance (Gill *et al* 2012). Similarly, interactions between coumaphos and τ-fluvalinate have been shown to enhance toxicity to honeybees (Johnson et al 2009). Interactions at other synapses are also likely, as well as interaction at other sites (eg Gut function or chemical detoxification).

9. In addition to the consequences of toxicity due to pesticide effects at target sites, significant off-target activity is also common. This is also true for therapeutic drugs where their use is determined according to their side effects. For pesticides, it is well known that many of the fungicides are much more toxic than anticipated, exhibiting unexpected synergy with other chemicals (Pilling *et al* 1995). We are, using *in vitro* models, researching a particular fungicide that appears to interact with cholinergic therapeutic agents used medicinally to treat Alzheimer's disease patients and women treated for bladder weakness (unpublished data—MRC grant application under review).

10. With respect to the criticism of the validity of all lab studies, past and future, in preference for the more relevant field studies, I consider this claim totally unprofessional and lacking all scientific credibility. Laboratory studies are the cornerstone of all therapeutic drug discovery as they provide a mechanistic description of events that can be controlled and tested experimentally. These studies identify real and quantified threats. In contrast, field studies are performed in a particular context with an uncontrolled surrounding area.

What may be found at one site could be irrelevant to that found at another site. This is especially important given the multiple stresses to which our pollinators are exposed and the likelihood that multiple threats contribute to the pollinator decline. It is true that a laboratory based mechanistic explanation does not confirm that these effects are largely responsible for the pollinator decline. This will require countrywide bioinformatics once we know what pesticides have been used. An isolated field study has limited value.

How do we proceed to put in place more appropriate testing regimes? In the absence of knowledge regarding local pesticide use this will be difficult and should not be permitted. Nevertheless, more interaction of DEFRA with university laboratories is essential to determine these new risks. Key disciplines, such as pharmacology and neuroscience must be included in the assessment process (this is seriously lacking at present). All new compounds should be subjected to these higher standards (sub-lethal and chronic toxicity on both honeybees and bumblebees) before they are released for use. This will require the companies paying (indirectly to avoid any undue influence) for the independent university study.

In summary, we are playing "Environmental Ker-Plunk", using pesticides to remove insect species (possibly also higher species) and we don't know which species will be lost and how many other species will collapse with them. Eventually, the entire ecosystem will collapse unless we monitor and regulate pesticide use appropriately. With the growing world population, with increasing appetites, we have to learn to live with pesticides, not just ignore them.

26 October 2012

Written evidence submitted by Bayer CropScience Ltd

1. Bayer CropScience

Bayer CropScience is dedicated to the development and production of safe crop production solutions for the food and farming industry. It has a long history in the agricultural world both here in the UK and elsewhere in the world, and has developed to its current position as one of the world's leading life science businesses via such well known names as Boots, Fisons, May & Baker, Schering, Hoechst, Rhône-Poulenc, AgrEvo and Aventis. Bayer CropScience employs 21,000 members of staff worldwide and approximately 170 in the UK. It is the UK's biggest supplier of crop protection products.

Bayer CropScience is a member of the Crop Protection Association (CPA) and fully supports the submission of this association on this subject.

2. Understanding Bee Health

2.1 Bayer has a long history as a bee health company, especially in the provision of products to treat the main threat to honey bee health, namely *Varroa destructor*. The *Varroa* mite is perfectly adapted to the lifecycle of the honey bee feeding on its haemolymph, and acting as the key vector for viral diseases like *Acute Paralysis Virus* (APV) and *Chronic Paralysis Virus* (CPV). The wounds inflicted by mites may also be contaminated with bacterial or fungal organisms.

2.2 Broadly speaking, where the *Varroa* is present, bee health is compromised; where the mite is absent or controlled, bee health is good. In most of the tropical and subtropical regions of the Southern Hemisphere, honey bees are of the African or Africanized sort, and bee health is good, mainly because such bees are more able to deal with *Varroa*. Australia has the European honey bee and despite the use of insecticides in agriculture at a similar level of that found in Europe or North America, has the healthiest bees on the planet; as a result of strict biosafety protocols, the *Varroa* mite has yet to reach its shores.

2.3 Bayer has recently announced the opening of the Bee Care Center at its research campus in Monheim, where its activities in promoting bee health are focused, to include finding new solutions for bee health issues and state-of-the-art stewardship of its crop protection portfolio. A second facility will open in the US in 2013 (http://www.press.bayer.com/baynews/baynews.nsf/0/615EA2E1245E4277C12579AB0049D955).

3. Real Field Data

3.1 There have been many studies that have attempted to look at what happens away from the artificial environment of the laboratory, using real bee colonies, real beekeepers in real fields. Perhaps the two most frequently referred to, mainly because of the rigour and length of the studies, are the German Bee Monitoring study that started in 2004 and is still on-going, and a French study by AFSSA.

3.2 The German study has involved more than 1,200 bee colonies from across the country, which have been monitored for the last eight years and bee health was compared to a number of factors including the presence of the *Varroa* mite, fungi such as *Nosema* and *Ascosphaera*, bacteria such as *Paenibacillus*, a number of viruses including the *Deformed Wing Virus* (DWV) and the *Acute Bee Paralysis Virus* (ABPV), environmental factors, beekeeping practices, and of course pesticides (interim results published by Genersch E, et al. (2010): *The German bee monitoring project: a long term study to understand periodically high winter losses of honey bee colonies*. Apidologie 41 (2010) 332–352). Poor bee health during this time correlated very well with *Varroa* and both the viruses mentioned above, and the age of the queen. No such correlations were observed between

poor bee health and *Nosema* or pesticides. During this time, nectar, honey, pollen and bee bread samples were analysed for the presence of insecticides. Whilst it was possible to find trace amounts of pesticide, there was no correlation between pesticide presence and bee colony health. Note that the neonicotinoid clothianidin was not detected and imidacloprid was detected only once in the 215 samples collected from 2005–07.

3.3 The second multifactorial study comes from France where the government agency, AFSSA, looked at 120 bee colonies from around France between 2002 and 2005. Where colony mortalities occurred, no statistical link was found between poor bee health and the presence of pesticide residues, with the control of *Varroa* being seen as absolutely key (http://www.anses.fr/PM9100V1I0.htm for the English summary and http://www.anses.fr/Documents/SANT-Ra-EnqueteAbeilles2005.pdf for the original study).

4. Impacts of Systemic Neonicotinoid Insecticides on Human Health.

4.1 The European Union is recognised as having the strictest regulatory system anywhere in the world when it comes to plant protection products such a pesticides. As part of this process, "plant protection products are only approved in the EU if it may be expected that their use will not have any harmful effects on human and animal health or on groundwater or any unacceptable influence on the environment" (http://www.efsa.europa.eu/en/pesticides/pesticidespeerreview.htm)

4.2 The development of neonicotinoid insecticides represented a step change in a farmer's or grower's ability to control destructive pests and the diseases that they spread, using products of very low mammalian toxicity. For example, in the public version of the Draft Assessment Report, "according to the toxicological properties of imidacloprid, harmful effects on the health of operators, bystanders, workers or consumers are not expected when the plant protection product is used in accordance with good plant protection practice" (via http://dar.efsa.europa.eu/dar-web/provision.

4.3 Likewise, the review report for clothianidin, finalised in the Standing Committee on the Food Chain and Animal Health concluded "that plant protection products containing clothianidin will fulfil the safety requirements laid down in Article 5(1)(a) and (b) of Directive 91/414/EEC."

http://ec.europa.eu/food/plant/protection/evaluation/newactive/list_clothianidin.pdf

5. Impact of Not Having Access to Seed Treatments

5.1 It is important to recognise that farmers use insecticides for a reason; they are expensive to buy and expensive to apply. They are used because farmers need to control damaging insects and the diseases that they spread, if they are to produce the ready supply of safe, high quality affordable food that consumers demand.

5.2 As previously mentioned, the arrival of innovative products such as the neonicotinoid insecticides was a step change in pesticide use in that they are comparatively very safe to mammals. Furthermore, their suitability as seed treatments means that farmers can control damaging insects in cereals, oilseed rape and other crops at the germination and early growth stages when they are at their most vulnerable, without resorting to the application of broad spectrum insecticides, which control not just those insects that are foraging on the crop but also many insects that use the crop as cover.

5.3 The impact of restricting such seed treatments needs therefore to be understood. For example, in years of high pest incidence, farmers may have to apply up to four extra spray applications of pyrethroids or other insecticides.

5.4 A recent survey of oilseed rape farmers in the UK on the consequences of losing such seed treatments suggest that 90% of them would need to apply more foliar sprays, 79% of them felt their yields would decrease, and 72% of them felt that there could be adverse environmental consequences.

5.5 It is also worthy of note that France has restricted the use of neonicotinoid seed treatments for over 10 years; despite this, bee health in France remains similar to, or worse than, that seen here in the UK.

6. *What alternative pest-control measures could be used, such as natural predators and plant breeding for insect-resistance, in a bid to make UK farming more insect- and bee-friendly*

6.1 Bayer CropScience believes that integrated pest management (IPM) is a key technique for dealing with insect pests in an environmentally sustainable manner, and has recently completed the acquisition of AgraQuest Inc., a global supplier of innovative biological pest management solutions. IPM does, however, require effective tools to do the job.

6.2 Encouraging predatory insects has been an important facet of improving the farm landscape with the provision of beetle banks and uncut margins demonstrating their usefulness in this area

(http://www.gwct.org.uk/education__advice/english_entry_level_stewardship/habitat_issues/337.asp). Such provision should continue to be encouraged.

6.3 Biopesticides are becoming an area of interest although the focus has tended to be on glasshouse and orchard environments. That said, companies such as AgraQuest do supply extracts of fungi such as

Chenopodium for field crops and *Bacillus thurengensis* has been widely used as an insecticide. This area will continue to flourish, as new opportunities arise.

6.4 The potential of innovative plant breeding in IPM is the subject of intense activity. Indeed, some of the most successful GM crops are insect tolerant varieties of crop plants, with 75 million hectares being planted with such varieties in 2011 (http://www.isaaa.org/resources/publications/briefs/43/pptslides/default.asp). There has also been a recent flurry of activity in the UK in this area with the recent trials of aphid resistant wheat having been successfully harvested at Rothamsted (http://www.rothamsted.ac.uk/Content.php?Section=AphidWheat).

5 November 2012

Written evidence submitted by Pesticide Action Network UK

The Pesticide Action Network UK (PAN UK) is the only charity in the UK that works on all aspects of global pesticide issues. PAN UK has been operating for over 25 years and is part of a global network of like minded organisations concerned about the effects pesticide are having on human health and the environment. The network as a whole and PAN UK in particular is noted for its scientific robustness and attention to detail in all aspects related to the use and/or abuse of pesticides. PAN UK is actively involved in a range of different fora in the UK including the Pesticide Forum and its sub groups and we have on many occasions submitted information to other bodies including the Advisory Committee on Pesticides and government Ministers over the years. PAN UK works closely with PAN Europe on regulatory and policy issues at EU level.

Please note that PAN UK has already submitted a series of fact sheets to the inquiry that cover the complete range of issues related to the effects of pesticides on bees and other pollinators. Much of the scientific evidence that we use to back our approach is contained with or referenced in those documents. This submission complements those fact sheets and should be read in conjunction with them.

This submission will look specifically at two areas:

- The current Defra position in regard to neonicotinoid pesticides and the effect that they are or might be having on bees and other pollinator species in the UK and
- The draft UK National Action Plan on pesticides that could help to mitigate threats to bees and other pollinators in the UK.

PAN UK comments on Defra statement Neonicotinoid insecticides and bees: the state of the science and the regulatory response, 13 September 2012

(http://www.defra.gov.uk/publications/files/pb13818-neonicotinoid-bees-20,120,918.pdf)

There are a number of key points that PAN UK would like to highlight in this response. Our overarching concern is that given the growing weight of independent evidence of the potential for harm from neonicotinoid pesticides, Defra and the UK regulatory authorities are not taking a sufficiently precautionary approach. This is particularly worrying given the serious economic and biodiversity consequences that a severe loss in pollinators would bring to the UK as a whole. We are also concerned that Defra is not prepared to implement measures within its new National Action Plan on pesticides to deliver overall reductions in the use of pesticides in the agriculture and amenity sectors and to ensure that biodiversity in the UK is adequately protected from the threats posed by pesticide use.

Methodological shortcomings in current testing by pesticide companies

PAN UK questions Defra's assurances that industry testing of neonicotinoids is sufficient and satisfactory in addressing all the potential threats posed by neonicotinoid insecticides. We believe, as does the European Food Safety Authority (EFSA) in its Opinion of May 2012, that there are serious methodological shortcomings in this type of study. For example, the tests focus on short term, acute toxicity to adult worker bees and mainly ignore chronic toxicity and sub-lethal effects on bee behaviour, on larvae and on hive overwintering. We are also concerned that there is a lack of transparency and availability for independent review of factors such as study design, methods and statistical analysis as much of the data submitted by pesticide companies for regulatory purposes is not in the public domain. This approach makes it impossible for concerned stakeholders to see and critique study methods, assumptions, results and the criteria used by decision makers to interpret studies' data and conclusions. These issues are important because of the many difficulties in designing robust and realistic studies to understand how regular, low dose exposure to pesticide traces in nectar and pollen may affect the highly complex structure of honey and other social bees at colony level. PAN UK's factsheets nos. 2 and 3 discuss these scientific and risk assessment difficulties in detail. Aspects of independent science and the undue influence of industry experts on risk assessment methodology are discussed in factsheet no.8

Implications for neonicotinoid products currently approved

PAN UK is concerned about the approach that Defra is taking to address the problems. On the one hand it now admits that there are several areas in the current risk assessment procedures which need to be revised, yet

on the other hand states that current UK regulatory studies are adequate to reach a conclusion of "no gross effects" in exposed hives. The wording in the Defra response indicates that action on changes to the risk assessment is imminent. This would be welcome, however, even if any changes are instituted, it is not clear whether the new risk assessment process will apply to currently approved products, including those containing the controversial neonicotinoids clothianidin, imidacloprid and thiamethoxam or only to new products seeking future approval. It is absolutely essential that all neonicotinoid products currently approved must be re-tested as the top priority as soon as the new EU testing regime is finalised (scheduled for early 2013). We suggest that they be removed from sale until they have been reassessed and shown to be safe. Without such a commitment we could see products that may well fail the new risk assessment requirements continue in use until their UK approvals are due for renewal, which in some cases could be as late as 2021!

Different regulatory conclusions drawn in other EU countries

PAN UK would draw the EAC's attention to the different conclusions drawn by different national regulatory authorities across Europe following review of the same evidence from the scientific literature. Whilst Defra have clearly decided that no action needs to be taken in the short term, the French regulatory authorities have taken a different view and have, for some years, instituted further controls and restrictions on some neonicotinoids. Following the publication of the Henry *et al.* and Whitehorn *et al.* studies, in March this year, the French suspended the approval for the use of thiamethoxam for oilseed rape (OSR) seed treatments in June 2012. We do not understand why Defra came to a different conclusion, particularly as the cropping systems for OSR are similar in both countries. The Italian authorities, and to some extent, the German authorities have also adopted different approaches to the UK in regard to suspensions. At the very least this is a clear indication of the scientific uncertainties that exist about the impacts of neonicotinoids and PAN UK believes that this uncertainty justifies a far more precautionary approach from the UK.

This sense that the UK has a far too complacent approach is further highlighted by the different stance of the European Commission. DG Sanco, responsible for pesticide regulation, has acknowledged that there is a growing body of evidence suggesting a link between bee diseases and pesticides. The European parliament has also been very vocal in calling for a timeframe for the withdrawal in the longer term of all neurotoxic pesticides. In 2011 they called for an immediate review of all approved neonicotinoids once improved risk assessment protocols have been developed.

Need for a more open assessment of independent scientific findings

A common response from Defra to new studies that indicate problems is to single out shortcomings in the studies or dismiss them because they do not address "real life" scenarios. We do agree that there are uncertainties inherent in some studies (see factsheets 2 and 3) however, we do not believe that this is a valid reason for simply discarding the findings from independent studies, especially as the current regulatory studies required are widely acknowledged to be deeply flawed. In our view, important findings from independent scientists should rather be a spur for further research and prompt greater precaution.

Defra's caveats about the level of "real-life" and "field realistic" exposure of several independent studies are of great concern to PAN UK. A basic element of the precautionary principle is that "Regulatory controls should incorporate a margin of safety: activities should be limited below the level at which no adverse effect has been observed or *predicted*"[1](emphasis added).Most of the studies rather dismissed by Defra clearly show that harm to pollinators could occur at field-relevant levels of exposure. Over the last 18 months, more scientists are now voicing concerns about the role of pesticides in pollinator declines, especially in relation to increased susceptibility to bee diseases and parasites. These subtle interactions and the "cocktail" effect of exposure to many different pesticide residues in the foraging environment are very poorly understood, yet Defra seems not to factor them into their conclusions.

PAN UK would like to see a broader, open and more participatory evaluation process to see where consensus lies on what the different studies contribute and to identify the pros and cons of each study in its design, analysis and interpretation of the results.

We agree with many of the comments raised by CRD/Defra over recent independent studies, for example, about the weak design and irrelevance of one widely publicised US study by Lu *et al* (2012) on replication of Colony Collapse Disorder. However, we totally disagree with the Defra conclusion that overall the four most publicised studies published this year (Henry *et al*, 2012; Whitehorn *et al*, 2012; Pettis *et al*, 2012; Lu *et al* 2012) do not provide enough new evidence to warrant any change to the regulatory system. Since Defra and CRD's response, another extremely relevant and robust study has been published by Gill *et al* (2012, in *Nature*) from British universities on bumblebees exposed to a combination of a neonicotinoid and a commonly used pyrethroid insecticide, documenting harmful effects on individual bees and on colony level performance. A useful commentary on this paper and the regulatory questions it raises was published in the News & Views section of *Nature* (Osborne, 2012).

Dealing with scientific uncertainties: Late lessons from early warnings

While no single study alone is likely to deliver the "killer facts" in such a complex issue, many of the more recent and well-designed studies are contributing important pieces to the jigsaw puzzle of pollinator declines.

PAN UK agrees that we need more research, especially on exposure patterns in the UK context, but we mustn't let this become an excuse for avoiding or delaying tough regulatory decisions. The agrochemical industry always play the "more research" card but we know from analyses of earlier environmental policy cases involving scientific uncertainty and high stakes, that earlier decisive action should have been taken- see the European Environment Agency's illuminating *Late Lessons from Early Warnings* report (http://www.eea.europa.eu/publications/environmental_issue_report_2001_22). Volume 2 of Late Lessons is now published and includes a useful chapter on the controversial debates in France over the neonicotinoid insecticide imidacloprid and impacts on bees, illustrating the problems that arise when vested interests and incorrect value judgements cloud the risk assessment process. See http://www.eea.europa.eu/publications/false-positives-2013-late-lessons-volume2

It is not just the position of Defra that PAN UK takes issue with but also that of the Advisory Committee on Pesticides (ACP), particularly their statements that "*the current risk assessments are secure*" and that "*there is no evidence as yet of neonicotinoid impacts on bees in the UK*". Again this displays a very complacent attitude: are we to wait for there to be an impact on bees in the UK before we take action? We are not aware of any relevant field studies that have been undertaken in the UK that have appropriate methodology and adequate statistical power and look at long term exposure and colony health which would allow them to draw that conclusion. The only data that we do have to our knowledge is in the studies undertaken by the manufacturers which, as already mentioned, have been called into question by EFSA. Our conclusion is that the ACP are confusing "absence of evidence" with "evidence of absence of impact"!

Supporting farmers to shift to safer and more sustainable pest management

If, as PAN UK urges, the UK does decide to restrict neonicotinoid use, then action is needed now to support farmers and other users to shift to safer, effective and more sustainable methods of managing the pests targeted by current neonicotinoid product use. Lessons from the US and Italy show that farmers have become increasingly dependent on use of neonicotinoid seed treatments as "insurance" against possible pest attack. Entomologists in both countries have warned that "insurance" applications run counter to one of the fundamental principles of Integrated Pest Management- pesticide interventions should only be made on the basis of field monitoring and when the level of pest incidence is likely to cause economic damage to the crop, on a particular field in a particular season. In the Italian case in maize, researchers found that maize pests were not problematic in fields sown with untreated seed and yields were not effected, showing that most, if not all of the time, these treatments are simply not needed. More details of the US and Italian cases and discussion of pest management alternatives are in our factsheets nos. 5 and 6.

Defra, the Pesticides Forum and the farming sector should take a much more proactive approach to looking at current levels of dependency on neonicotinoids, the actual, rather than perceived, need for treatment as "insurance" and ways to promote more effective and comprehensive Integrated Pest Management (IPM). PAN UK has outlined a concept note for a pilot scoping study to explore what a British oilseed rape IPM strategy without neonicotinoids might look like.

References

Gill, RJ, Ramoz-Rodriguez, O and Raine, NE (2012). **Combined pesticide exposure severely affects individual- and colony-level traits in bees**. *Nature http://dx.doi.org/10.1038/nature11,585*

Henry, M, Beguin, M, Requier, F, Rollin, O, Odoux, J-F, Aupinel, P, Aptel, J, Tchamitchian, S and Decourtye, A (2012). **A common pesticide decreases foraging success and survival in honey bees**. *Science Express* 10.1126/science.1,215,039

Lu, C, Warchol, KM and Callahan, RA (2012). ***In situ* replication of honey bee colony collapse disorder**. *Bulletin of Insectology* 65 (1) ISSN 1721–8861

Osborne, JL (2012). **Bumblebees and pesticides. A study showing the effects of two pesticides on bumblebees highlights the need for risk assessments to consider multiple species and the complex chain of factors that determines insect exposure to chemicals**. News and Views, *Nature* doi.10.1038/nature11,637,

Pettis, JS, van Engelsdorp, D, Johnson, J and Dively, G (2012). **Pesticide exposure in honey bees results in increased levels of the gut pathogen *Nosema***. *Naturwissenschaften* DOI 10.1007/s00,114–011–0881–1

Whitehorn, PR, O'Connor, S, Wackers, FL and Goulson, D (2012). **Neonicotinoid pesticide reduces bumblebee colony growth and queen production**. *Science Express* 10.1126/science.1,215,025

Stewart, RB (2002). "Environmental Regulatory Decision Making Under Uncertainty". *Research in Law and Economics* **20**: 76

In regard to the draft UK National Action Plan on pesticides

Implementation of the new EU Directive on the Sustainable Use of Pesticides and the development of the new National Action Plan (NAP) on pesticides could be a real opportunity to develop a range of measures that would reduce the use of pesticides throughout the UK and consequently reduce negative effects on biodiversity from pesticides.

However, it is the opinion of PAN UK that Defra in drawing up the draft NAP has failed to include measures that would help protect the UK's biodiversity in any meaningful sense. Measures that PAN UK has urged Defra for some years to introduce, but which have been ignored, include:

— restrictions on the use of pesticides in certain areas such as parks, schools and hospitals;

— a targeted phase out or reduction in use of certain pesticides;

— a fully developed plan for the promotion of Integrated Pest Management; and

— measures to adequately protect water sources from pollution by pesticides.

Included as an annex to this document is the submission by a group of NGOs, including PAN UK, to the recent public consultation on the development of the NAP that was undertaken by Defra. In it you will see a range of concerns outlined and suggestions for ways in which the NAP could be strengthened to provide better protection for biodiversity to the from the multiple threats associated with pesticide use in the UK.

Annex 1

BIODIVERSITY AND PESTICIDES GROUP: NATIONAL ACTION PLAN CONSULTATION RESPONSE

This consultation response is co-authored by a group of environmental NGOs working together to ensure that plant protection products have minimal impacts on biodiversity in the UK. This document, therefore, addresses measures required for the adequate protection of biodiversity and the environment only. However, many of the measures set out here would also contribute to the aim of reducing risks to human health. This response sets out those areas of strong mutual concern to these organisations. Some organisation will also submit their own response as different organisations do have different areas of focus and expertise.

The NGOs that support this document are:

— Buglife—The Invertebrate Conservation Trust.

— Bumblebee Conservation Trust.

— Butterfly Conservation.

— ClientEarth.

— ChemTrust.

— Friends of the Earth.

— Pesticide Action Network UK.

— The Royal Society for the Protection of Birds.

Overarching Comments

The Sustainable Use Directive (SUD)[12] requires the UK to adopt a National Action Plan (NAP). The overall intention[13] is that NAPs should be used to "facilitate the implementation" of the SUD. Article 4 of the SUD sets out in some detail the purpose and required scope of a NAP. The draft UK National Action Plan (NAP) is useful in that it summarises measures currently in place to facilitate sustainable pesticide use. Many of these measures have had some success in meeting their specific aims and providing some environmental protection. However, the SUD is designed to move beyond the *status quo.* It establishes a framework to achieve a sustainable use of pesticides and specifies two key features underpinning the operation of that framework: one of these is the reduction of the risks AND impacts of pesticide use on human health and the environment; the other is promoting the use of integrated pest management AND of alternative approaches or techniques, such as non-chemical approaches to pesticides.[14] **It is our view that the draft NAP as it currently stands is wholly inadequate to achieve the sustainable use of pesticides in the UK.** This is backed up by current evidence, which shows that current pesticide use is not sustainable and that current measures are insufficient to move the industry in a truly sustainable direction. For example, the Pesticides Forum reports that pesticides remain a significant pollutant of waterways, and that populations of birds known to be indirectly affected by pesticides continue to decline.[15] The draft NAP also fails to clearly articulate how the UK intends to use the mechanisms and procedures required by the SUD in order to meet its stated objectives. Existing measures need to be built upon and improved, and, where necessary, replaced by new approaches, *via* effective and ambitious action, which is both targeted and measured, that will lead to more sustainable pest control systems with less pesticide reliance in UK.

[12] Directive 2009/128/EC of the European Parliament and the Council of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides; OJ L309, 24.11.2009, Article 4.

[13] As commented in Recital (5)

[14] Article 1

[15] Pesticides Forum annual report (2011) pp 35—46 and pp 47—49. http://www.pesticides.gov.uk/Resources/CRD/Migrated-Resources/Documents/P/Pesticides-Forum-AR-2011-revSep12.pdf

Quantitative Objectives, Targets, Measures and Timetables

The setting of quantitative objectives, targets, measures and timetables is a requirement of the NAP in the SUD[16]; however, currently these components are not included in the draft UK NAP. These components are essential to facilitate effective delivery as well as understanding of benefits and impacts of different measures, to allow these measures to be improved upon in the future. Without them, the plan will be ineffective and very weak and not compliant with the SUD. Furthermore, the draft NAP heavily relies on voluntary initiatives. Clear targets are crucial to the success of such initiatives, so that all parties know what they are working towards and so that success can be evaluated. Voluntary initiatives require close monitoring along with consequences of non-compliance, to reduce the risk of free-riding and failure to reach environmental targets. Experience and research[17] shows such initiatives are only really successful when they are backed up by the possibility of regulation. Neither the Campaign for the Farmed Environment nor the Voluntary Initiative on pesticides would have got off the ground in the absence of the real possibility of stricter alternatives (regulation on set-aside and a tax on pesticide use respectively).

Addition to NAP: quantitative objectives, targets, measures and timetables added to all sections of the draft NAP.

Active Substances of Particular Concern

The SUD [18] requires Member States to act in relation to active substances of particular concern. A NAP is to include indicators for monitoring use, especially if alternatives are available, and to set reduction targets and timetables. The SUD also requires identification[19] of trends in use of certain active substances and identification of priority items which require particular attention. The SUD specifically notes the position of active substances which, whilst currently approved, will not meet relevant criteria when renewal is sought.[20] However, this area has not been addressed by the draft UK NAP. The NAP should establish a system for monitoring and instigating research on plant protection products containing active substances of particular concern, establishing timetables and targets for the reduction of their use and a shift to alternatives; and so take a precautionary approach to potential impacts. This is key to NGOs, the public and other stakeholders having confidence in the UK government's ability to respond where increasing scientific evidence of environmental impact accrues. For example, in the case of neonicotinoid pesticides, despite a growing body of robust science indicating cause for concern, the government does not have a clear plan to mitigate the impacts of these pesticides and promote the use of suitable alternatives. As a result, many see the government as dragging their feet on the issue and risking damage to our fragile environment.

Addition to NAP: set up a system based on collating existing evidence, or the gathering of new evidence where necessary, to identify products containing active substances of particular concern, monitor their use, and establish timetables and targets for the reduction of their use and a shift to alternatives.

Indicators

Currently, the amount of pesticides applied in terms of weight of active substance is used as an indicator of pesticide use. However, weight applied is not a meaningful indicator because it does not reflect the different characteristics (eg toxicity) of different active substances. The Bichel Committee[21] states that the *treatment frequency index* is considered the best indicator of the environmental burden. The treatment frequency index expresses the average number of times per year agricultural land can be treated with the quantity of pesticides sold, assuming that they are used in the prescribed normal dosages.

Addition to NAP: tonnes of active substance should be replaced as an indicator by the "treatment frequency index" to more accurately demonstrate environmental burden.

As noted in the draft NAP, the Wildlife Incident Investigation Scheme (WIIS) gives information about acute poisoning incidents, usually resulting from irresponsible use of pesticides. It is important to gather and act upon this information to enforce the correct use of pesticides. However, more relevant to the overall impact of pesticides on wildlife are sub-lethal, chronic effects that may occur even when pesticides are being used according to good practice. The Farmland Bird Index, reported by the Pesticides Forum as a headline indicator, is the best currently available dataset for this purpose. However, the impact of pesticides on these birds is indirect (by removing food sources), and bird populations are also affected by many other factors. There is a need for additional indicators that more directly reflect the impact of pesticides on wildlife, for example on pollinating insects or arable weeds.

The recent evidence showing the vulnerability of pollinator species to pesticides, particularly systemic pesticides, would make them ideal to assess chronic and sub lethal impacts. The importance of pollinators to food security and the agricultural economy are further reasons for their inclusion. Insects pollinate many high

[16] Article 4(1)
[17] See for example Voluntary approaches for environmental protection in the European union. OECD ENV/EPOC/GEEI(98)29/FINAL, Paris, OECD, 1998
[18] Recital (5), Article 4 (1) paras 2 and 3,,
[19] Article 15(2)(b) and (c)
[20] Article 4(1) para 2
[21] http://www2.mst.dk/udgiv/publications/2001/87–7944–622–1/pdf/87–7944–624–8.pdf

value food crops and it would cost UK farmers at least £1.8 billion a year to replace pollination services provided by insects with hand pollination.[22] There are a number of insect pollinator surveys that could be adapted eg the UK Butterfly Monitoring Scheme and the Bumblebee Walk.

Addition to NAP: the development of an indicator of direct impacts on wildlife is needed. A working group should be formed to look at how existing pollinator monitoring schemes and arable weeds could be used to provide a new indicator.

The development of resistance in pest populations is an indication that pesticide use is not sustainable, since it means that future control of a particular pest will require higher application rates or new active substances. Integrated Pest Management (IPM), by using a range of pest control strategies and resorting to chemicals only when necessary, should minimise the emergence of resistance. Therefore, an indicator or indicators that reflected the prevalence of resistance to certain chemicals in pest populations would provide useful information about the successful roll-out of IPM approaches. These datasets are already available and being collected: the Resistance Action Groups[23] actively monitor resistance in fungi, insects, rodents and weeds and maintain resistance matrices of known problems. These datasets could be used to generate a suitable indicator or indicators.

Addition to NAP: the development of a resistance indicator to help assess the effectiveness of IPM.

Integrated Pest Management (IPM)

IPM is at the heart of the SUD. It requires that Member States *"take all necessary measures to promote low pesticide-input pest management, giving wherever possible priority to non-chemical methods"*.[24] It has the potential to simultaneously improve pest control while helping farming to become more sustainable and resilient overall. From the point of view of individual farmers, it may help them to reduce their costs and avoid or overcome problems of pesticide resistance.

The SUD also provides[25] that the NAP must also set up objectives, targets, measures and timetables to "encourage the development and introduction of integrated pest management and of alternative approaches or techniques in order to reduce dependency on the use of pesticides". The draft UK NAP is very weak in this area; it asserts that many users adopt practices which are in line with the principles of IPM. However, IPM is a complete system for pest and disease management made up of a suite of different techniques. Whilst it is acknowledged that UK farmers do adopt some IPM techniques, it is also fair to say that, as a whole, effective IPM implementation is generally low. Pesticide use is on the rise on some crops and it is clear that IPM is not being used widely enough. For example, according to FERA data insecticide application rates rose 26% on oilseeds and 295% on strawberries between 2005 and 2010.

Research in the UK by the Rural Economy and Land Use Programme[26] and funded by DEFRA clearly shows that farmers will adopt some, but not the complete range of, techniques that would deliver really effective IPM. As effective IPM cannot be delivered by uptake of one or two techniques in isolation. There is a need for a clear definition of what constitutes IPM and recognition that it is a stepwise approach with a need for farmers to build on and add to the techniques that they adopt. Also, without a clear definition of IPM and a means of measuring to what extent IPM is being adopted, it will be difficult to assess compliance with the requirements of the SUD. Adoption of both of these things would enable progress and achievements to be clearly demonstrated at both national scale and on individual farms.

Successful IPM example—Demark

The Danish experience offers a clear vision of what is required by farmers to develop their IPM approach and also shows the benefits of IPM in reducing use of and reliance on pesticides. Pesticide use reduction was introduced in Denmark in 1986 by the first governmental Pesticide Action Plan as a response to a major increase in the use of pesticides and a serious decline in farmland wildlife in the beginning of the 1980's. The wild plant diversity in farmland, for example, decreased by 60% from 1970 to 1990, and the number of partridges fell by 70% from 1970 to 1985.

One of the key measures of the Danish plan was the development of advisory services for farmers. These advisory services offered farmers information on the correct use of pesticides, the feasibility of limiting use through changes in crop rotation, choice of seed varieties, mechanical and biological control, assessment of needs and improved spraying techniques. Importance was placed on financial as well as environmental considerations so it was clear where the benefits of reductions on pesticide use were being felt.

A weekly newsletter was sent out to 20,000 farmers discussing issues such as pesticide products, preventive measures against insects, damage thresholds and the use of reduced doses. Information was also provided to

[22] Breeze T D 2011. Valuing UK Pollination Services http://centaur.reading.ac.uk/25072/2/Insect_pollination_in_UK_agriculture_Final.pdf

[23] Resistance Action Groups http://www.pesticides.gov.uk/guidance/industries/pesticides/advisory-groups/Resistance-Action-Groups

[24] Article 14

[25] Article 4 (1) para 1

[26] Rural Economy and Land Use Programme (RELU) 2009 "Overcoming market and technical obstacles to Alternative Pest Management in Arable Systems" http://www.relu.ac.uk/news/policy%20and%20practice%20notes/Bailey/Bailey%20PPN10.pdf

farmers on field trips. The Danish Agricultural Advisory Service estimated in 1997 that the average dose of fungicides applied by their members was about 35% of the pesticide label recommended dose, in contrast to 90% in 1987—a very clear reduction in use and fully in line with the goals of the SUD.

The IPM plan currently under development represents an opportunity to meet many of the Directive's requirements for IPM. To achieve this, the plan should offer farmers a clear benchmark for their current performance, along with recommendations to improve and links to the resources available to help with this. A requirement to achieve a certain standard of IPM could be incorporated into existing assurance schemes as an incentive for farmers to complete the plan and implement improvements in their pest management strategies. Organic farming makes minimal use of pesticides and has clear benefits for biodiversity. Techniques used in organic farming, for example, measures to develop fertile soils and encourage natural enemies of pest species, should be incorporated into the IPM toolkit used by conventional farmers.

Addition to NAP:

- **Provide a clear definition of IPM that builds on the principles set out in Annex 3 of the SUD.**
- **Develop crop and sector-specific IPM protocols.**
- **Provide extension and outreach services to assist farmers in implementing IPM, this could be done through the existing Voluntary Initiative (VI).**
- **Integrate IPM options into agri-environment schemes eg: beneficial insect package.**
- **Based on the above incorporate mandatory training in IPM for all sectors into assurance schemes.**

Water Protection

As previously highlighted, pesticides are a significant water pollutant; for example, causing a risk of non-compliance in 15% of all surface water DrWPAs in England and Wales and 1.4% in Scotland.[27] A wide range of voluntary measures are currently being implemented to safeguard waters from pesticide pollution. Many initiatives, such as Catchment Sensitive Farming, focus only on areas which have existing problems and may neglect areas which are vulnerable, eg where a key species or habitat of conservation importance is present. Also, there seems to be limited integration of different initiatives. We therefore, propose "voluntary safeguard zones" as a method of bringing together measures in our most vulnerable water areas and ensuring better integration of measures specific to the water issue. This method could be applied to lakes, ditches, wetlands, ponds etc as well as rivers.

Voluntary safeguard zones would protect pesticide vulnerable waterbodies, particularly catchments designated under the Water Framework Directive ("WFD") or the EU Birds and Habitats Directives. This measure should be backed by a proposal for regulation should a voluntary approach prove unsuccessful. Each safeguard zone would have a series of requirements dependent on the specific vulnerability of that catchment, the species and habitats present and the specific problem in that catchment (eg a particular pesticide causing WFD non-compliance). These safeguard zones could be incorporated into River Basin Management Plans as part of the WFD, as well as other plans, such as regional biodiversity plans or locally-determined Nature Improvement Areas. They could include a range of measures such as Catchment Sensitive Farming and agri-environment as well as situation specific measures. Voluntary safeguard zones should be well supported by advice, training and assessments through integration with existing schemes and initiatives.

Species example—The Depressed River Mussel (*Pseudanodonta complanata*)

The Depressed river mussel is on the UK Biodiversity Action Plan list and has declined rapidly in the UK. It has a global threatened status of Vulnerable (IUCN), meaning it is at risk of extinction globally. High levels of Metaldehyde were found in Hurleston Water Treatment Works. Water is taken from a canal where the Depressed river mussel is found. There were worries that if no action was taken, this would result in a loss of the population completely. The Environment Agency responded by producing an information sheet explaining to local farmers about the mussel and reminding them of best practice when using Metaldehyde. This is one example of an area that would be suitable for a "Voluntary Safeguard Zone". A series of measures using a range of initiatives could be used to protect this watercourse and its population of Depressed river mussel in the long term.

Addition to NAP: Establishment of "voluntary safeguard zones", which would combine a range of initiatives in our most vulnerable water areas

Specific Areas

The SUD requires that Member States give special attention to the use of pesticides in specific areas, including protected areas as defined under the Birds and Habitats Directives (SPAs and SACs) and areas used by the general public. This is not satisfactorily addressed in the NAP.

[27] Pesticides Forum annual report (2011) http://www.pesticides.gov.uk/Resources/CRD/Migrated-Resources/Documents/P/Pesticides-Forum-AR-2011-revSep12.pdf

Areas designated for biodiversity

The PPP (Sustainable Use) Regulations 2012 specify only that when pesticides are used in protected areas, the amount used and frequency of use must be as low as practically possible. This does not offer any protection above and beyond what should be universally practiced under an IPM approach. Protection also needs to go beyond the protected areas themselves: eg aquatic sites are affected by activities in the whole catchment. We believe that voluntary safeguard zones (see water protection section for detail) should be implemented for SPAs and SACs and other biodiverse areas that may be vulnerable to impacts of pesticides, backed by a proposal for regulation should a voluntary approach prove unsuccessful.

Addition to NAP: Establishment of "Voluntary safeguard zones", which would combine a range of initiatives in our most vulnerable SPAs and SACs and other biodiverse areas

An appropriate mechanism exists to monitor and control the impacts of pesticides on SPAs and SACs in the UK in the form of the SSSI system (ASSI in Northern Ireland). Information available on the condition of English SSSIs[28] indicates that pest control practices may be a contributory factor in the adverse condition of some sites: water pollution from agriculture/run off is cited as a factor for 281 sites, inappropriate weed control for 163, inappropriate pest control for 14, and pesticide/herbicide use is specified in 2 cases. The condition of SSSIs is monitored and assessed according to the individual management requirements and features of each site, so to more accurately assess the impacts of pest control on SSSIs would require examining the individual records for each site.

If the SSSI system is to be relied upon to meet the SUD requirements additional action needs to be taken.

Addition to NAP:

1. **Ensure all SPAs/SACs are underpinned by a SSSI. Where this is not the case, it will be essential that they are protected from inappropriate pesticide use via an alternative mechanism.**
2. **Ensure all SSSI notifications coincident with SPA/SAC sites are checked and where necessary amended through re-notification to ensure that all SPA/SAC features are also SSSI features.**
3. **Check all SSSI notifications coincident with SPA/SAC are checked to ensure that all potentially damaging activities are listed, and that for each, the relevant operations list covers all relevant operations which may result in damage to the features of the site, rather than just "changes" to those operations.**

In situations where the conditions above are not met, and, therefore, where there is no existing formal mechanism via which the effects of pesticide use on an SPA/SAC can be assessed, the obligation on Government, devolved administrations and competent authorities to ensure that SPAs and SACs are not damaged remains. For further discussion of this issue see the RSPB's response to the consultation in 2010.[29]

An effective strategy for increasing and improving uptake of IPM (see IPM section above), would be the best means of delivering reduced risk to biodiversity on a landscape scale, ensuring protection beyond designated sites. Therefore, we suggest that the Government could use its 12 new Nature Improvement Areas (NIAs) to trial improved IPM delivery methods for farmers (such as farmer groups/farmer extension schemes mentioned above), which would provide useful case studies for improving IPM schemes nationally to better protect biodiversity.

Addition to NAP: NIAs used as pilot areas for increasing and improving the uptake of IPM to protect biodiversity.

Public spaces

It is surprising that the UK NAP contains no commitment to phase out or minimize use of pesticides in public spaces such as parks and school grounds. Although the 2012 Regulations (see above) include a requirement for use to be "as low as reasonably practicable" in these areas, the Government says that it will not further define this or issue guidance to pesticide users. This response falls far short of the requirement in the SUD[30] which requires Member States to "ensure that the use of pesticides is minimised or prohibited in certain specific areas" and further that specific alternative options [31] be considered in the first place.

Urban areas have a role to play in delivering the Government's aim of more and better places for nature. Cities are increasingly thought to provide important habitat for a range of biodiversity, which improves the quality of areas for living and provides health benefits. A plan to phase out the use of pesticides in parks and school grounds would not rule out exemptions being put in place to control particular incidents of pest or disease. Cities such as Toronto and Paris have managed to eliminate or significantly reduce the use of amenity pesticides—the UK Government should draw on this experience and offer leadership and guidance on this issue to local authorities. This could be delivered by changing the objectives of the existing Amenity Forum.

[28] http://www.sssi.naturalengland.org.uk/Special/sssi/reportAction.cfm?Report=sdrt17&Category=N&Reference=0
[29] http://www.rspb.org.uk/Images/RSPB%20response%20on%20SUD_tcm9–251411.pdf
[30] Article 12
[31] *Ibid;* "appropriate risk management measures shall be taken and the use of low risk plant protection products …. And biological control measures shall be considered in the first place"

In the previous consultation carried out by Defra on implementation of the SUD, it was very clear that the majority of responses from the public and NGOs were supportive of complete bans in such areas.[32] There is no reason to suspect that it will be any different this time around. Stopping the use of pesticides in such areas is much less complicated than doing so in the agricultural setting. We, therefore, urge the government to listen to the public on this issue.

Addition to NAP: set out a plan to phase out pesticide use in parks and school grounds.

Sales And Information & Awareness Raising

Members of the public want to know what the risks are to non-target organisms of using pesticides in gardens. They are particularly worried about bees: for example Buglife receives frequent requests for information about the effects of pesticides on bees and other insects, and what gardeners can do to protect them. Pan UK also receives many calls each year from the public asking about products they intend to use on their lawns or in their gardens and patios etc. Their main area of concern is whether the products they intend to use will harm birds, bees or other wildlife and whether non- or less toxic alternatives are available. This information is not readily available to the public when purchasing chemicals: it is only if they search the internet they can eventually find information. The Sales section of the draft NAP (section 10.2) requires "distributors selling products for non-professional use to provide general information on risks, good practice **and** low-risk alternatives". The non-regulatory arrangements described relate to shopkeeper training but this does not guarantee that the information will be passed on to the consumer. Although, as stated in the draft NAP, some information is provided on the label, labels can easily be misread or ignored. A reminder on risks and good practice would be very beneficial to ensure pesticides are used properly, along with information on low-risk alternatives.

Therefore, we would recommend an industry-led leaflet, developed in collaboration with stakeholders, to raise awareness of risks to non-target organisms, encourage correct use and suggest low risk alternatives; and to guide consumers to other sources of information. This would be a short leaflet offered to the consumer at the point of sale and would be a much more effective way of delivering this information. This would also be an easy way of ensuring that the regulation is being applied, particularly in relation to low-risk alternatives. This would also help deliver the National Action Plan section 11 Information and Awareness Raising as the leaflet would guide people to the HSE's pesticides information webpages; we would hope that the "alternatives" section of the website would improve as it only provide links to the homepages of other organisations at the moment.

Addition to NAP: An industry-led information leaflet at point of sale to raise awareness of risks to non-target organisms, encourage correct use and suggest low risk alternatives; and to guide consumers to other sources of information.

2 November 2012

Written evidence submitted by Dr Nigel Raine

Summary

1. Defra state they will keep regulation of neonicotinoids under review in light of new evidence on effects of these pesticides to bees as it emerges.

2. Defra's commitment to update the risk assessment for bees and pesticides by the end of 2012 is highly desirable. This revised risk assessment should include:

(i) sublethal effects of pesticide exposure.
(ii) exposure to multiple pesticides.
(iii) chronic exposure (as well as acute tests).
(iv) larval exposure.
(v) bumblebees and solitary bees (as well as honeybees).

3. A new study (Gill *et al.* 2012) provides evidence that field-level exposures of pyrethroid and neonicotinoid pesticides change the behaviour and survival of an important insect pollinator—the bumblebee (*Bombus terrestris*). All detrimental effects were most severe when colonies were exposed to both pesticides. This suggests the combined effects of pesticides could be more harmful to bees than exposure to single chemicals, something not assessed under the current risk assessment framework.

Detail

1. There is widespread interest in the possible impacts exposure to pesticides could be having on bees from a range of stakeholders, including farmers, beekeepers, the public, researchers, pesticide companies, policy makers, etc. Publication of the document "Neonicotinoid insecticides and bees: the state of the science and the

[32] (see page 33) http://webarchive.nationalarchives.gov.uk/20110318131226/http://defra.gov.uk/corporate/consult/pesticides/101215-pesticides-condoc-response.pdf

regulatory response" in September shows Defra are reacting to new scientific findings as relevant studies are published. They have also committed to continue this watching brief stating that: "As our knowledge develops, we (Defra) will continue to consider the need for further research and for any changes to the regulation of neonicotinoids."

2. At any point in time Defra will be making a decision on the regulatory status of any pesticide with partial evidence (ie the body of research and related information available at that time). It is for the committee to judge whether the evidence reviewed by Defra fully supports the conclusions drawn in the September report (pb13,818). The proposed course of action "to update the process for assessing the risks of pesticides to bees in the light of developments in the science—including the latest research" seems a reasonable response given the speed with which the evidence base is growing and the importance of neonicotinoids to agriculture. It would be unfortunate if a putative neonicotinoid ban resulted in an increased usage of other pesticide classes which might have worse consequences for bees. However, the speed with which the risk assessment for bees and pesticides is updated is completed should be closely monitored. At present this document states the aim to complete this task by the end of 2012—it would be highly desirable to see a firmer commitment to completion of this process by a specific date in print.

3. Looking forward a common criticism of the studies reviewed in this report is the lack of field-realism. A recently published study by Gill *et al.* (2012), investigated whether exposure to two of the most commonly used pesticides on flowering crops in the UK, at field-level concentrations, detrimentally affects bee behaviour and colony survival. This study, unlike any other, directly investigated whether sublethal effects on multiple individuals might be amplified to affect overall colony success. Understanding this is crucial given that the most important insect pollinators, honeybees and bumblebees, are eusocial so colony function relies on the efficient collective behaviours of numerous individuals. Specifically, we studied the effects that exposure to sublethal doses of the pyrethroid lambda-cyhalothrin (LC) and the neonicotinoid Imidacloprid (IMD) had on bumblebee (*Bombus terrestris*) colonies over a 4-week (chronic) exposure period.

4. Gill *et al.* (2012) found that whilst IMD had only subtle effects on individual worker foraging behaviour this culminated in a significant reduction in overall colony performance and survival potential. Moreover, simultaneous exposure of colonies to both IMD and LC caused a significant increase in overall worker losses in comparison to independent exposure of each pesticide, and higher levels of colony failure (collapse). These findings are of particular concern given that the methods of exposure used are typical of those bees encounter in the environment in the UK.

5. Previous empirical studies on the effects of pesticides have focused primarily on honeybees which, due to their large colony, size present a challenge when studying colony effects. Consequently, the vast majority of studies to date have investigated single pesticide effects on specific behavioural traits of individuals under relatively artificial scenarios (reviewed in Cresswell 2011). Moreover, many of these studies have looked at an acute period of exposure (ie a comparatively high dose over a short period) rather than a more realistic chronic response (low level exposure over a longer time period). Honeybees are important pollinators, but there are also a wide variety of other bee species and other insect pollinators that play a major role in pollinating crops and wild plants. However we know much less about the possible effects of pesticides on insect pollinators other than honeybees.

6. One of the few studies to date on pesticide effects on bumblebees (Whitehorn et al. 2012) recently reported that colony queen production can be affected by IMD exposure (although it was unclear from this work what mechanism underpinned this observed effect). The study by Gill *et al.* (2012) is highly novel because it reports that chronic exposure to field-realistic levels of two pesticides both produce detrimental effects on individual bee behaviour with knock-on consequences for colony growth, success and survivorship. These results indicate there is a significant need to determine the effects of combined exposure to multiple pesticides during the risk assessment process for use of these chemicals (ie the situation bees typically face when foraging in the UK).

7. The Gill *et al.* (2012) study adds much needed information about the effects pesticides can have on bumblebees.

8. As an active researcher investigating pesticide effects on bees, I am very keen to support and work with the policy/decision making community to make the best decisions with robust evidence bases to allow our farmers to continue to provide food at the same time as allowing our bees to thrive (and continue to provide their vital role as pollinators of crops and wild plants).

References

Cresswell, J E (2011). A meta-analysis of experiments testing the effects of a neonicotinoid insecticide (imidacloprid) on honey bees. Ecotoxicology 20: 149–157.

Gill, R. J, O Ramos-Rodriguez and N E Raine (2012). Combined pesticide exposure severely affects individual- and colony-level traits in bees. Nature 491: 105–108. doi:10.1038/nature11,585

Whitehorn, P R, S O'Connor, F L Wackers and D Goulson (2012). Neonicotinoid pesticide reduces bumble bee colony growth and queen production. Science 336: 351–352.

2 November 2012

Written evidence submitted by the National Farmers Union

The NFU represents more than 55,000 farming members in England and Wales. In addition we have 40,000 countryside members with an interest in farming and the country. The NFU welcomes the opportunity to make a submission to the Environmental Audit Committee's inquiry into Insects and Insecticides.

Executive Summary

- The NFU aims to base its policy on sound scientific evidence and supports a risk-based approach to regulation.
- With respect to honey bee health, the NFU position follows the general consensus of the scientific community, which is that there is no single cause of honey bee colony losses, but pests and diseases, particularly the parasitic mite Varroa, are the most important factor at play.
- Farmers and growers use pesticides to control damaging pests and diseases, and thereby enable the reliable production of the safe high quality and affordable food and plants demanded by consumers.
- The decision to use a pesticide is not taken lightly—pesticides are expensive to buy and to apply and this cost has to be balanced against the cost of crop losses arising from pest or disease outbreaks.
- Wildlife Incident Investigation Scheme (WIIS) data shows that the number of pesticide incidents with bees in the UK is around its lowest since records began in 1981.
- If neonicotinoid insecticides were not available, farmers and growers would use less-effective insecticides that pose a greater risk to bees and other insects, and would compromise the production of many agricultural and horticultural crops.
- As the science moves on our understanding improves and this enables us to identify gaps in current regulatory processes and develop ways to improve them accordingly. This process is already well underway in respect of pesticides and bees.

Introductory Comments

1. The NFU has a significant interest in the impact of insecticides on bees and other pollinating insects. The issue is very important to our industry in terms of agricultural pollination and the availability of crop protection products (pesticides), both of which are important elements of sustainable food production. We also have an interest in the insect pollination of wild plants within the wider countryside, as the majority of this land falls under the management of farmers and growers.

2. The NFU also represents the interests of commercial bee farmers, and has the Bee Farmers' Association (BFA) as a member. Through our membership of COPA-COGECA (the EU level organisation representing farmers), the NFU works closely with the BFA to represent the interests of UK beekeepers at a European level.

3. At a national level, the NFU sits on the Bee Health Advisory Forum, which among other roles acts as the project board guiding implementation of Defra's Healthy Bees Plan.

4. Negative impacts of pesticides on non-target organisms are always an issue of concern and it is right that measures are taken to minimise and mitigate any risks. It is also important that any actual risks are looked at alongside the benefits of pesticide use. Earlier this year, the European Food Safety Authority (EFSA) published a lengthy review of the pesticide risk assessment process for bees,[33] which stated that "there is a trade-off between plant protection and the protection of bees. The effects on pollinators need to be weighed against increase in crop yields due to better protection of crops against pests."

The Use of Scientific Evidence

5. Concern has been raised by a number of organisations about the impact of insecticides on insects, in particular the impacts of neonicotinoid insecticides on bees and other pollinating insects. As a result there have been calls for changes to the regulatory assessments of the impacts of neonicotinoids on bees, and some organisations are calling for precautionary bans on the use of neonicotinoid insecticides until their safety is re-examined under new assessment processes.

6. There are a number of scientific studies showing that if you feed insects with neonicotinoid insecticides you see negative effects on their behaviour and life cycles. This is the evidence that sits behind calls by organisations for changes to regulatory assessments and precautionary bans, and this is the research that attracts plenty of media attention. However, there are also a number of equally valid scientific studies that have looked for these negative effects and not found them, and in particular not found them under full field conditions.

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[33] EFSA Scientific Opinion on the science behind the development of a risk assessment of Plant Protection Products on bees (Apis mellifera [honey bees], Bombus spp. [bumble bees] and solitary bees), http://www.efsa.europa.eu/en/efsajournal/pub/2668.htm.

7. The NFU finds the way in which the issue is dealt with by the media particularly frustrating. Stories about pesticides and bees generally appear in response to the publication of a particular scientific study or handful of studies. The reporting does not assess how well the studies reflect the real-word field situation, or assess the relevance of the studies in the context of all the other known science in this area. As a result the science is reported, without any context of how significant the new findings are to the debate around pesticides and bees. The health of bees and other pollinating insects (including the impacts of pesticides on that health) is a science-based issue. Science works on the principle of testing and re-testing an idea to build a consensus—a weight of evidence.

8. The NFU aims to base its policy on fact and sound scientific evidence. With respect to honey bee health our position follows the general consensus of the scientific community, which is that there is no single cause of bee colony losses, but pests and diseases, particularly the parasitic mite Varroa, are the most important factor. There is no compelling weight of evidence showing conclusively that neonicotinoid insecticides are responsible for the widespread declines in bee and other pollinator populations. The NFU agrees that the impact of insecticides on bees and other pollinating insects is a factor that should be investigated. There is no room for complacency, but equally this factor needs to be kept in perspective. The NFU is concerned that a disproportionate focus on the issue of bees and pesticides actually diverts attention away from the key threats of pests and disease, to the detriment of bee health in the UK. This concern is shared by organisations representing beekeepers.

9. In the interest of taking a balanced and appropriate approach to the evidence on this issue, the NFU has welcomed the assessments of recent research in the EFSA Statement (on the findings in recent studies investigating sub-lethal effects in bees of some neonicotinoids)[34] and the Defra report (Neonicotinoid insecticides and bees: The state of the science and the regulatory response).[35] These balanced reviews have found the recent research to be inconclusive in terms of the sub-lethal effects that are likely to arise from current uses of neonicotinoids.

10. The NFU fully supports a risk-based approach to regulation. In the absence of a weight of evidence to support restrictions on the use of neonicotinoid products, changes (bans) would be made on the basis of a precautionary hazard-based approach, which we do not support. The NFU believes that taking a hazard-based approach, when the hazard of concern is impact on non-target insects, would undermine the EU regulatory process that is anchored in a science-based approach.

11. The long running Wildlife Incident Investigation Scheme (WIIS)[36] provides one of the few pieces of available evidence monitoring the "real-world" unwanted effects of pesticides on wildlife in the UK. WIIS data shows that the number of pesticide incidents with bees in the UK is around its lowest since records began in 1981. In the last ten years there have only been five confirmed honey bee poisoning incidents as a result of the approved use of crop protection pesticides in the UK. It is widely believed that the decline in the number of honey bee poisoning incidents in the UK has been the result of the introduction of less persistent and less toxic chemicals (such as the neonicotinoids), and improved liaison between those applying pesticides and those keeping bees. The NFU believes this evidence suggests that in the context of pesticides and honey bees, the UK agricultural landscape is around the safest it has been for more than 25 years. This view is commonly echoed back by beekeepers themselves when the NFU meets with beekeeping groups around the country.

Does the EU regulatory system governing the placing of pesticides on the market adequately assess impacts on bees and pollinators?

12. There are concerns that there are inadequacies in the way regulatory authorities assess the long-term and sub-lethal effects of systemic pesticides (such as neonicotinoids) on insects. It is very well known that the current pesticide risk assessment systems for bees were not developed to assess systemic pesticides and this is being addressed by the International Commission on Plant Bee Relationships Bee Protection Group and the European Plant Protection Organisation (EPPO). EPPO guidelines were revised accordingly in 2010, based on detailed consideration of the available scientific evidence. Even before revision, the principles underlying the changes had already being widely applied by regulators both in the UK and at the EU level for many years in assessing the risks posed by systemic pesticides, to ensure their risk assessment procedures are appropriate.

13. Further changes to the regulation governing the placing of plant protection products on the market have meant that since June 2011 pesticides have been subject to stricter requirements regarding risks to honeybees.

14. The NFU has welcomed the EFSA Scientific Opinion[37] published earlier this year, which identified gaps in knowledge and made recommendations to improve the current risk assessment. As the science moves on our understanding improves and this enables us to identify gaps in current regulatory processes and develop ways to improve them accordingly. It is right that this is done and that this is done at the EU level. Changes are already happening and the NFU is also looking forward to seeing the outcome of EFSA's current work to review the current risk assessments for neonicotinoids, due to be published in December 2012.

[34] http://www.efsa.europa.eu/en/efsajournal/pub/2752.htm
[35] http://www.defra.gov.uk/publications/2012/09/18/pb13818-pesticides-bees/
[36] http://www.pesticides.gov.uk/guidance/industries/pesticides/topics/reducing-environmental-impact/wildlife
[37] http://www.efsa.europa.eu/en/efsajournal/pub/2668.htm

Pesticide Use And Stewardship In The UK

15. All pesticides undergo rigorous assessment and there are strict regulations implemented at both an EU and UK level governing their development and use. As a result, the NFU considers that farmers and growers should be able to use all products approved through this process.

16. Farmers and growers use pesticides to control damaging pests and diseases, and thereby enable the reliable production of the safe high quality and affordable food and plants demanded by consumers. The decision to use a pesticide is not taken lightly—pesticides are expensive to buy and to apply and this cost has to be balanced against the cost of crop losses arising from pest or disease outbreaks. Having taken the decision that the risk of losses warrants the application of a pesticide, farmers and growers will use the most cost-effective product that is available to them.

17. The rate at which a pesticide can be applied is strictly controlled. All pesticides used in the UK are controlled under strict criteria as part of EU regulations 91/414 or 1107–2009. These controls set approved application rates for each product that ensure environmental protection requirements are met and that the pesticide will work effectively. These application rates include a maximum dose rate and it is a legal requirement that this must not be exceeded. This is an independently verified process and acts a regulatory control.

18. Because pesticides are expensive to buy and apply, farmers and growers will avoid higher application rates where possible to reduce costs. However they must apply products at suitable levels to achieve control, particularly as too low a dose rate would increase the risk of pests developing resistance to pesticides. Thus, actual application rates are determined by the economic need to control pests effectively and to avoid unnecessary wastage of expensive chemicals. The use of lower application rates can also be useful in enabling the option of additional subsequent applications, if these were to become necessary.

19. Application rates above recommended rates could also result in pesticide residues that exceed the permitted Maximum Residue Limits. This would result in the rejection of produce. Farmers and growers work to prevent such occurrences because the potential business impacts, such as loss of business, loss of assured status and prosecution, are huge.

20. The NFU believes that the standards of agricultural practice in the use of pesticides in the UK are among the highest in Europe, as evidenced by the high professional standards identified in the recent DEFRA Pesticide Forum report[38] and identified by ministerial comments concerning the achievement of the industry Voluntary Initiative since its inception in 2001 in raising pesticide stewardship standards.[39]

21. The basis of this achievement is the Voluntary Initiative on pesticides, which has looked to improve the standards of operators, agronomists and application equipment on an on-going voluntary basis with schemes that in all cases continue to exceed the requirements of the newly implemented EU Sustainable Use Directive. The Voluntary Initiative reports progress to Defra ministers annually. On a voluntary basis 20,359 spray operators are involved in on-going Continuing Professional Development via the National Register of Spray Operators, run by City and Guilds. Of the total sprayed area in the UK, 86.8% was sprayed using spray equipment tested annually under the National Sprayer Testing Scheme. The inclusion of these measurers in assured produce schemes, like the Red Tractor, which have very high levels of uptake by farmers and growers, have further improved standards of pesticide stewardship in the UK.

22. Growers in the fresh produce and arable sectors are supported by experts in the agronomic advice industry, many of whom have received additional training beyond expected industry standards; 847 agronomists hold the Biodiversity Environmental Training Award (BETA), designed to improve the standards of environmental stewardship and encourage best practice.

23. Following the success of the Voluntary Initiative, improved pesticide stewardship has been encouraged by a range of chemical company initiatives and also by fresh produce and arable assurance schemes. Key industry initiatives relevant to insecticide usage have focused on use of buffer zones and low drift nozzles to reduce risk of drift, while careful stewardship of all pesticide-treated seed is undertaken by the industry. This includes improving seed applications to reduce risks of pesticide dusts, and by encouraging operator care to avoid seed spills and ensure seeds are properly buried when drilled.

24. The UK 2011 pesticide survey[40] indicates that the total area treated with pesticides in 2011 (5,974,142 ha) is similar to the area treated in 1991 (5,990,717 ha). However, during the same period the total weight of pesticide applied has halved (falling from *c*. 1,023,668 kg in 1991 to 437,399 kg in 2011). This indicates that the total usage of insecticide has more than halved in the last twenty years, as a result of improvements in active ingredient effectiveness and precision application technology. These improvements are also associated with a significant decrease in the use of pesticide sprays (965,324 kg in 1991, 356,233 kg in 2011) and an increase in use of seed treatments (*c*. 58,344 kg in 1991, *c*. 81,166 kg in 2011). More targeted applications that more precisely deal with the risk (such as seed treatments) enable insecticide usage to be reduced. Foliar sprays have always been associated with higher risk to non-target insects.

[38] http://www.pesticides.gov.uk/guidance/industries/pesticides/advisory-groups/pesticides-forum
[39] http://www.voluntaryinitiative.org.uk/
[40] http://pusstats.csl.gov.uk/myindex.cfm

THE IMPORTANCE OF NEONICOTINOID INSECTICIDES TO UK HORTICULTURE AND AGRICULTURE

25. The neonicotinoid class of chemicals includes a range of systemic insecticides, with different spectrums of activity, used in many different ways. This includes neonicotinoids considered a high risk to bees, and appropriately their use is governed by strict management practices to mitigate this risk, eg not applying when crops are in flower or when bees are actively foraging in the crop. But it also includes neonicotinoids that are considered such low toxicity to bees that they can be applied when crops are in flower and are vital components of Integrated Pest Management (IPM) strategies where populations of beneficial insects need to be conserved.

26. Neonicotinoids are used very widely in the UK. For example, more or less all oilseed rape would be seed treated with a neonicotinoid. There are five neonicotinoids approved for professional use in the UK; acetamiprid, clothianidin, imidacloprid, thiacloprid and thiamethoxam. Some of these are also approved for amateur use in bug killers. Clothianidin and imidacloprid are mainly used as seed treatments for crops including cereals, maize, oilseed rape, sugar beet and some horticultural crops. Thiacloprid is an IPM compatible neonicotinoid of low toxicity to bees, which is approved for use in the UK on a huge range of horticultural crops.

27. Neonicotinoids are particularly important in controlling sucking insect pests like aphids, thrips and capsids, because they are used:

(a) to replace less effective older chemicals, such as the organophosphate, carbamate, pyrethrum and pyrethroid insecticides, which are generally more persistent and more toxic to bees and other beneficials. Eg thiacloprid has replaced more persistent and more "bee toxic" insecticides, like the pyrethroid deltamethrin, as a treatment for raspberry beetle.

(b) to control pests already resistant to the OP, carbamate, pyrethrum and pyrethroid insecticides, and as part of resistance management strategies. Eg thiacloprid is the only effective "bee-friendly" friendly" insecticide available to control aphid pests on Brussels sprout. If thiacloprid was unavailable, growers would become dependent on just a few alternatives. This dependence would increase the risk of resistance developing to these insecticides. Moreover, these alternatives present a higher risk to bees than thiacloprid itself.

(c) as effective seed treatments, negating the need for more hazardous and frequent spray applications, eg thiamethoxam, clothianidin and imidacloprid are the only insecticide seed treatments for oilseed rape and sugar beet. Without them the option would be more frequent sprays, using pyrethroids that are a higher risk to bees and other insects. On cereals, no neonicotinoid seed treatments would result in the need for multiple insecticide sprays against aphids.

(d) as part of IPM strategies, eg selective neonicotinoids like thiacloprid are increasingly important on tree fruit crops such as apples. The alternative approved actives, such as cypermethrin, deltamethrin, chlorpyrifos, and bifenthrin, are more persistent and toxic to bees and other beneficial insects.

What would farmers and growers do if neonicotinoids were not available?

28. The number and range of pesticide active ingredients available to farmers and growers has already decreased significantly in recent years, following the adoption of EU Directive 91/414 in 1993 and the subsequent Directive 1107-2009, which were designed to bring an improved regulatory framework to pesticide registration. With wide ranging evaluations of toxicological effects on human health and the environment, the number of active ingredients available for use in the EU has fallen from *c.* 900 actives in 2001 to *c.* 230 actives in 2009. This has two main implications; firstly the more toxic substances are generally no longer available, and secondly the range of pesticides available to control each pest or disease has reduced significantly, such that in many cases only one or two pesticide control options may be available. This situation can be further compounded by high levels of pest resistance seen to many existing products.

29. Neonicotinoid insecticides are relatively new products compared with the alternative insecticides available and offer an alternative mode of action. Farmers and growers use these pesticides because they are the most effective products available. As indicated in point 27 above, neonicotinoids are used to replace less effective older chemicals, which would often have to be used in higher volumes and are generally more persistent and more toxic to bees and other invertebrates. Having no neonicotinoids would leave farmers and growers no option but to use insecticides that actually pose far greater risk to bees and other insects. Assuming of course that alternative pesticides are available at all. The use of these less effective pesticides would also seriously compromise production of many crops.

30. A recent survey by Bayer of oilseed rape farmers in the UK on the consequences of losing neonicotinoid seed treatments suggested that 90% of them would need to apply more insecticide sprays, 79% of them felt their yields would decrease, and 72% of them felt that there could be adverse environmental consequences.

31. Approximately 92% of sugar beet seed sown by UK growers was treated with neonicotinoid insecticides in 2012. The neonicotinoids are used to control aphid pests and in particular the virus diseases spread by these aphid pests. Research has shown that in the absence of adequate crop protection, eight of the last 12 years would have resulted in virus epidemics that would have proved devastating to the industry. The loss of neonicotinoids would result in significant yield reductions that would render the sugar-beet industry

uneconomic in the UK. Growers have no real control alternatives to neonicotinoids as the main aphid pest concerned has developed resistance to the single alternative insecticide spray currently approved for use.

Reducing Pesticide Use and Alternative Pest-Control Measures

32. The NFU believes that farmers and growers support the opportunities for including integrated pest management (IPM) strategies in their production systems. Many farmers already undertake integrated management strategies[41] when these strategies can reliably reduce the need for expensive pesticide applications. A well-rounded IPM strategy will encourage the use of seed technologies through variety selection and seed treatments. Improving application technology to reduce the overall quantities of pesticide applied, and the use of cultural control techniques such as crop rotation and changing cropping cycles, are all measurers undertaken commonly in field crop production today.

33. The NFU and other industry groups are actively involved in promoting the uptake of IPM strategies. For example, we are supporters of the Defra and industry co-funded SCEPTRE project[42] that aims to deliver applied research to help secure approvals for new and safer pesticides and biopesticides, and develop sustainable IPM programmes for use on edible crops. These IPM programmes would be compliant with the new EU Sustainable Use Directive.

2 November 2012

Written evidence submitted by Buglife

1. Buglife considers that conserving invertebrates, and particularly those that may be affected by pesticides, is important because they provide a significant proportion of the ecosystem services that humans require, including pollination which is worth £510 million per year to UK agriculture. In addition we believe that negligently causing the extinction of a species is wrong.

2. Buglife has been involved with the issue of neonicotinoid pesticide use since 2008 and in 2009 we produced a report (Kindemba 2009[43]) that summarised all the publically available scientific evidence relating to neonicotinoid pesticides and invertebrates. What we found concerned us, a high proportion of independent studies showed serious sub-lethal impacts on non-target invertebrates. Buglife had no position on the subject before undertaking the science review (we believe that pest control measures should each be judged on need and environmental safety), but after reviewing the science our report recommended:-

- A review of the inclusion of imidacloprid, other neonicotinoids and fipronil on the positive list of authorised substances in Annex I of Directive 91/414.
- A review of existing neonicotinoid and fipronil products authorised for outdoor use in the UK.
- Until the reviews are completed a precautionary suspension of all existing approvals for products containing neonicotinoids and fipronil where these products have been authorised for outdoor use in the UK.
- The development of international methodologies for assessing the effects of systemic pesticides and sub-lethal impacts on invertebrates.

3. Since 2009 we have seen no compelling evidence that would lead us to change this position, indeed several studies have reinforced very significantly the concerns that we developed at that time (Fipronil is no longer licenced for use in the UK).

4. The evidence we would like to present to the EAC is primarily contained in the attached letter titled *"Neonicotinoid insecticides and bees: the state of the science and the regulatory response, Defra, 13 September 2012—And re. a proposed claim for judicial review by Buglife—The Invertebrate Conservation Trust"* that we have sent to Defra and that is intended to constitute a letter before claim for the purpose of the Judicial Review Pre-Action Protocol.

Our View in Summary

5. The Defra statement dated 13 September 2012 consisted of a review of some recent neonicotinoid studies and a conclusion that although some of the new studies provided evidence of sub-lethal effects of neonicotinoids, they did not give "unequivocal evidence that sub-lethal effects with serious implications for colonies are likely to arise from current uses of neonicotinoids"; accordingly, Defra considered that no change to the existing regulation of neonicotinoids is justified.

6. We consider that this decision is an administrative law decision which is susceptible to challenge by way of judicial review.

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[41] http://www.defra.gov.uk/consult/files/consult-nap-pesticides-document-20120730.pdf

[42] http://sceptre.hdc.org.uk/

[43] Kindemba V. 2009. The Impact of Neonicotinoid Insecticides on Bumblebees, Honey Bees and Other Non-target Invertebrates. Buglife—The Invertebrate Conservation Trust, Peterborough, UK.

7. What we consider to be the appropriate legal framework for the decision and the issues that need to be considered are detailed in the attached letter presented as evidence and we won't repeat them in this letter. There two broad areas of concern in relation to this inquiry 1) were the principles that should have been applied in making the decision applied; 2) were the factors that should have been considered included in the review and considered adequately.

8. Principles that should have been applied include 1) the precautionary principle, we believe that the relevant legislation is clear on this point, and 2) the principle of public participation in environmental decision making that is enshrined in the Aarhus Convention.

9. Factors associated with the use of neonicotinoid pesticides that should have been considered include, the potential:-

(a) impacts on pollinators other than bees;

(b) impacts on aquatic and soil wildlife;

(c) impacts from the dust clouds released every time neonicotinoid seed is drilled (sown);

(d) impacts on species listed for protection under the Natural Environment and Rural Communities Act;

(e) impacts on the UK's ability to meet the ecological and groundwater targets under the Water Framework Directive;

(f) impacts on sites protected by the Birds and Habitats Directives;

(g) impacts from garden and amenity use as well as agricultural use;

(h) plant protection benefit of neonicotinoid use;

(i) and an economic cost/benefit analysis that accounts for effects on ecosystem services.

RECOMMENDATIONS

10. We encourage the EAC to:-

(a) consider the increasing weight of evidence of serious sub-lethal effects;

(b) bear in mind that there is very little funding for, or research undertaken, looking for problems and hence the absence of proof may be more a function of where research funding is allocated than any reflection of the reality of the situation;

(c) examine the small numbers of studies that have suggested that at least domestic honeybee hives are not radically affected by neonicotinoids and to ask if the studies are statistically robust, or would be able to detect a significant sub-lethal effect that would operate over a period of months;

(d) bear in the forefront of their mind that honeybees are artificially sustained domestic animals that are responsible for less than 10% of pollination services and that the environmental safety and economic impact of neonicotinoids must be considered in the context of wild pollinator populations that are responsible for 90% of pollination and are inherently more vulnerable to pesticides than honeybees;

(e) include in this review the impact on freshwater life, particularly bearing in mind that the Blueprint Coalition has just scored the Government E in relation to pesticide pollution of water bodies in its annual review of progress towards a sustainable water policy—http://www.wcl.org.uk/docs/Blueprint_for_Water_Scorecard_6Nov12.pdf;

(f) consider what effects the growing popularity of neonicotinoid based garden pesticides are having on the environment and if the impact of garden and amenity use has been adequately considered by Defra;

(g) NOT limit its inquiry and recommendations to the important scientific questions that this issue raises, but also to consider the test that should be applied to reach a decision to suspend or ban a pesticide. Should the environment be protected only after there is absolute proof of impacts, or should the importance of preventing damage to the environment mean that in certain instances action of a precautionary nature is needed? What does the law have to say on these questions?

Annex I

LETTER FROM BUGLIFE TO DEFRA SECRETARY OF STATE

Dear Secretary of State

Re. Neonicotinoid insecticides and bees: the state of the science and the regulatory response, Defra, 13 September 2012

And re. a proposed claim for judicial review by Buglife—The Invertebrate Conservation Trust

INTRODUCTION

1. I write on behalf of Buglife—The Invertebrate Conservation Trust ("**Buglife**"). The purpose of this letter is to inform you of a proposed judicial review challenge by Buglife to your Department's decision, contained

in the above Defra statement dated 13 September 2012 (the "**Statement**"), not to make any changes to the regulation of neonicotinoid insecticides (the "**Decision**").

2. This letter is intended to constitute a letter before claim for the purpose of the Judicial Review Pre-Action Protocol. A summary of the information required by Annex A to that Protocol is set out at the end of this letter.

The Decision

3. In its Statement, Defra considered 15 recent studies examining the effects of neonicotinoid insecticides on bees (summarised at Annex 1 to the Statement), with a view to deciding *inter alia* whether further restrictions on the use of neonicotinoids are required: see §1 of the Statement. Defra's conclusions, as summarised at §2 of the Statement, were that although some of the new studies provide evidence of sub-lethal effects of neonicotinoids, they do not give "*unequivocal evidence that sub-lethal effects with serious implications for colonies are likely to arise from current uses of neonicotinoids"*; accordingly, while it will continue work in this area, Defra considers at present that no change to the existing regulation of neonicotinoids is justified.

4. We consider that Defra's decision not to make any changes to existing regulation (ie the Decision) is an administrative law decision which in principle is susceptible to challenge by way of judicial review.

Buglife—The Invertebrate Conservation Trust

5. Buglife is a company limited by guarantee and a registered charity (no. 1,092,293) that represents invertebrates and their conservation. Invertebrates are all the animals that do not have backbones—98% of all animal species—and even when plants, fungi and microorganisims are included, 64% of all British species are invertebrates. Buglife considers that conserving invertebrates is important because they provide a significant proportion of the ecosystem services that humans require, including pollination which is worth £510 million per year to UK agriculture. In addition causing the extinction of a species is morally repugnant and Buglife works to prevent this happening.

6. Buglife was founded in 2000 in response to a generally recognised need (brought into sharp focus by the creation of the UK Biodiversity Action Plan in 1994) for an organisation specialising in invertebrate conservation. Its aim is to halt the extinction of invertebrate species and to achieve sustainable populations of invertebrates, and it seeks to do so by practical conservation projects, enhancing education and knowledge, and assisting in the development of law and policy, among other things.

7. In appropriate cases, Buglife seeks to fulfil its charitable objectives by using judicial review proceedings to challenge administrative decisions which unlawfully threaten, or fail to protect, invertebrate life. The Decision in the present case appears to Buglife to be of just such a kind. We consider that Buglife would have standing to bring a challenge of the kind described in this letter before claim and would invite you to agree that that is the case.

The Legal Framework

Regulation 1107–2009

8. The authorisation of the use of pesticides in the UK is governed by EU law. Regulation 1107–2009/EC concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC ("**Regulation 1107–2009**") lays down harmonised rules for the authorisation of "*plant protection products"* including pesticides, and for their placing on the market, use and control within the EU.

9. Regulation 1107–2009, as its recitals record, is based on the high level of protection principle:

> *"The purpose of this Regulation is to ensure a high level of protection of both human and animal health and the environment and at the same time to safeguard the competitiveness of Community agriculture"* (Recital 8);
>
> *"The provisions governing authorisation must ensure a high standard of protection. In particular, when granting authorisations of plant protection products, the objective of protecting human and animal health and the environment should take priority over the objective of improving plant production"* (Recital 24).

10. Regulation 1107–2009 is also, as Article 1(4) provides, "*underpinned by the precautionary principle, in order to ensure that active substances or products placed on the market do not adversely affect human or animal health or the environment"*.

11. The mechanism of the Regulation, in effect, requires all pesticides available in EU Member States to undergo a two-stage approvals process.

12. At the first stage, "*active substances"* (the active chemicals contained in plant protection products) are assessed at the European level. Article 4 lays down the criteria for approval of active substances. Active substances must be approved if it may be expected, in the light of current scientific and technical knowledge, that plant protection products containing that active substance (or residues of that substance) meet certain

requirements. These include the requirement that at least one plant protection product containing the active substance must among other things (see paragraphs 3 and 5 of Article 4):

(a) be sufficiently effective;

(b) have no immediate or delayed harmful effect on human health, including that of vulnerable groups, or animal health, directly or through drinking water; and

(c) have no unacceptable effects on the environment, having particular regard to the following considerations where the scientific methods to assess such effects are available:

(i) its distribution in the environment;

(ii) its impact on non-target species, including on the ongoing behaviour of those species; and

(iii) its impact on biodiversity and the ecosystem.

13. There remains, however, a second stage, whereby plant protection products containing an active substance or substances must be approved at the national level before being placed on the market. The requirements for the authorisation of plant protection products are laid down in Article 29. Before approving the plant protection product, Member States must be satisfied that the active substances used in the product have been approved and that, in the light of current scientific knowledge, the substance complies with the requirements of Article 4(3) referred to in paragraph 12 above.

14. Compliance with these requirements must be established by "official or officially recognised tests and analyses carried out under agricultural plant health and environmental conditions relevant to the use of the plant protection product in question and representative of the conditions prevailing in the zone where the product is intended to be used." (Article 29(3)).

15. The assessment of whether the active substance or plant protection product will meet the relevant requirements (ie the first and second stage approvals) must be made pursuant to the uniform principles set out in Regulation 546/2011 (the "**Uniform Principles**"). The following Uniform Principles are of particular relevance to the approval of neonicotinoids:

(a) Member States shall ensure that the data submitted is acceptable in terms of quantity, quality, consistency and reliability.

(b) Member States shall consider other relevant technical or scientific information they can reasonably possess with regard to the performance of the plant protection product or to its adverse effects.

(c) Member States shall consider possible elements of uncertainty in the information obtained during the evaluation.

(d) Member States shall evaluate the possibility of exposure of aquatic organisms to the plant protection product.

(e) Member States shall evaluate short-term and long-term risk to honeybees.

16. Both first and second stage approvals involve input from and consideration by different regulatory bodies. At the EU level, the European Food Safety Authority (the **"Authority"**) is the technical body which advises the Commission and carries out risk assessment and risk communication in relation to food safety. In the UK, the Advisory Committee on Pesticides (ACP), an independent scientific advisory committee provides advice to ministers on pesticide related issues. Product approvals are handled by the Chemicals Regulation Directorate (CRD) of the Health and Safety Executive which works with Defra as the competent authority with strategic policy responsibility for the area. Defra also receives technical advice from other expert groups including Defra's Food and Environment Research Agency (FERA).

17. Article 44 governs the withdrawal or amendment of authorisations of plant protection products. It provides in material part as follows:

(1) *"Member States may review an authorisation at any time where there are indications that a requirement referred to in Article 29 is no longer satisfied.*

A Member State shall review an authorisation where it concludes that the objectives of Article 4(1)(a)(iv) and (b)(i) and Article 7(2) and (3) of Directive 2000–60/EC may not be achieved.

(2) *Where a Member State intends to withdraw or amend an authorisation, it shall inform the authorisation holder and give him the possibility to submit comments or further information.*

(3) *The Member State shall withdraw or amend the authorisation, as appropriate, where:*

(a) *the requirements referred to in Article 29 are not or are no longer satisfied..."*

18. Article 21 empowers the Commission to review the approval of an active substance, including where a request is made by a Member State "*in light of new scientific and technical knowledge and monitoring data....*" as well as where it determines that it should act on its own initiative.

19. Article 55 requires the use of plant protection products to comply with the general principles of integrated pest management set out in Article 14 of and Annex III to Directive 2009–128/EC. Those principles require, among other things, that pesticides "*shall be as specific as possible for the target and shall have the least side effects on... non-target organisms and the environment*" (paragraph 5 of Annex III) and that uses should be kept to the minimum level necessary (paragraph 6).

20. Regulation 1107–2009 and its associated Regulations are directly applicable and so have immediate legal effect in the United Kingdom without the need for implementing legislation; but certain provisions ancillary to Regulation 1107–2009 are made by the Plant Protection Products Regulations 2011.

Directive 91/414/EC

21. Most neonicotinoids currently used in plant protection products in Europe were approved as active substances under the procedure laid down by Directive 91/414/EC, which Regulation 1107–2009 replaced. The old procedure similarly comprised two stages ie approval of active substances at EU level and approval of products at Member State level. Authorised active substances were added to a list, contained in Annex I to Directive 91/414/EC, by amending directives.

22. Acetamiprid and thiacloprid were added as active substances with effect from 1 January 2005 following the adoption of Directive 2004–99/EC. Imidacloprid was added as an active substance with effect from 1 August 2009 following the adoption of Directive 2008–116/EC. Thiamethoxam was added with effect from 1 January 2007 following the adoption of Directive 2007–6/EC. Clothianidin was added with effect from 1 August 2006 following the adoption of Directive 2006–41/EC.

23. These directives also set conditions for the inclusion of the active substances in Annex I. For example, the inclusion of thiacloprid was subject to the requirements that Member States pay particular attention to:

(a) the protection of non-target arthropods;

(b) the protection of aquatic organisms; and

(c) the potential for groundwater contamination.

24. Directive 2010–21/EU introduced additional specific provisions relating to seed treatment use of clothianidin, imidacloprid and thiamethoxam. These provisions relate to labelling of seeds, professional application of seed treatments and monitoring of possible impacts on bees following the taking of precautionary measures by certain Member States after substantial losses of bee colonies related to accidental releases of the relevant active substances.

25. Active substances which were included in Annex I are now deemed approved under Regulation 1107–2009 and are listed in a separate implementing Regulation (540/2011/EU). This Regulation replicates the conditions for approval that were previously laid down in the amending Directives.

The Factual Background

26. The following is a brief overview of the factual background relevant to the Decision and Buglife's long-running engagement with Defra over the issue.

27. Neonicotinoids are a set of nicotine-based insecticides. They are neurotoxins which attack the central nervous system of invertebrates. They are commonly used in the form of "systemic" pesticides; unlike conventional spray pesticides these may be applied as seed dressings or soil treatments, so the chemical is absorbed by the root system and transported to all parts of the plant, including the nectar and pollen. Systemic pesticides of this kind may have certain advantages: for example, less of the chemical is required. However, such use also carries with it disadvantages: for example, it results in long-term exposure to non-target species and means pesticides are used routinely regardless of whether crops are at risk from pests.

28. Five principal neonicotinoids are currently found in plant protection products (ie pesticides) authorised for use in the UK: thiamethoxam, thiacloprid, clothianidin, acetamiprid and imidacloprid.

29. There has been growing concern that neonicotinoids are contributing to declines in populations of pollinating insects including (but not limited to) honeybees, bumblebees and butterflies. These declines are thought to be at least in part attributable to the sub-lethal and chronic (ie long-term) effects of neonicotinoids. For example, these insecticides are thought to inhibit bees' ability to navigate and communicate. In social insects such as bumblebees, the health of the colony as a whole relies on the ability of individual bees to forage effectively, therefore sub-lethal effects at the individual level can manifest as lethal effects at the colony level, and as declines at the population level. Non-social insects are unable to fall back on the support of others to survive and may be even more vulnerable to reproduction failure and population decline.

30. These concerns have led to full and partial bans of some neonicotinoid products in France, Germany, Italy and Slovenia in the recent past, including the most recent action taken in France this year in relation to Cruiser OSR.

31. In 2008, Defra commissioned a report "Are pesticide risk assessments for honeybees protective of other pollinators" stated that "*there are many cases where species are several orders of magnitude more sensitive on a per individual or weight basis than honeybees, eg Lepidopteran larvae'*, and concluded that "*more detailed toxicity and exposure information for a range of species is required for a robust assessment of the risk posed."*

32. In January 2009, a group of European NGOs submitted a request for an internal review of the decision by the Commission to authorise imidacloprid, on the basis that it does not meet the requirements of Article 4

of Directive 91/414 as evidence fails to demonstrate that it has no unacceptable effect on the environment. The Commission refused the request on the grounds that the NGOs lack standing.

33. Buglife, along with other UK NGOs, have repeatedly raised concerns about the impacts of neonicotinoids on bees and other non-target invertebrates. In September 2009 Buglife published a report, which was sent to Defra. The report:

(a) summarised several independent scientific studies published between 2001 and 2008 which demonstrated that imidacloprid, a widely used neonicotinoid, had significant negative impacts on bees and other non-target invertebrates at levels predicted to be present in the UK countryside;

(b) criticised the test methodologies used in the EU process for authorising pesticides for failing to properly assess sub-lethal and chronic risks to honeybees and other non-target invertebrates; and

(c) called on Defra to adopt a precautionary approach by suspending all existing approvals for products containing neonicotinoids pending a review of their inclusion on the list of authorised active substances.

34. The ACP responded to the Buglife Report in November 2009. The ACP reassessed the data for Chinook, a seed treatment containing imidacloprid, and concluded that "semi field and field studies indicate that there are no gross impacts on foraging honeybees."

35. However, the ACP acknowledged that there was a gap in the Government's understanding regarding the effect of the insecticides on wintering bees: "it is feasible that low level chronic (ie long-term) exposure could cause adverse effects on overwintering bees such that the ability of individuals to survive the winter is impaired. It is proposed that this issue is a potential data gap."

36. In July 2010, Defra confirmed that it did not intend to take any action in response to the Buglife Report.

37. There followed a series of correspondence between Buglife and various other NGOs and Defra during 2010 and 2011, in which Buglife continued to criticise Defra's response to the Report and its approach to the regulation of neonicotinoids. In particular, Buglife objected to Defra's focus on domestic honeybees to the exclusion of other non-target invertebrates and the environment, and its failure to apply the precautionary principle. In the course of this correspondence, Professor Bob Watson, Defra's Chief Scientific Adviser endorsed the use of the precautionary principle: "The precautionary principle should be applied to the risk management phase. The UK Government supports the appropriate use of the precautionary principle as a guide to decision-making when evidence is inconclusive."

38. Between 2010 and 2012, a series of scientific studies were published which provided further evidence that low doses of neonicotinoid insecticides have sub-lethal effects on honeybees. For example:

(a) Sub-lethal exposure to thiamethoxam was shown to reduce learning ability, reduce memory, and increase hive death rate by causing foraging honeybees to fail to navigate their way back to the colony.

(b) Imidacloprid (and when studied Clothianidin) reduced waggle-dancing, reduced the capacity of workers to produce food for their young, reduced activity, increased forage time, lowered foraging efficiency, and caused disorientation.

(c) Exposure to sub-lethal doses of imidacloprid and thiacloprid highly increased susceptibility to infection of honeybees, and mortality of honeybees already infected by, Nosema disease.

(d) Sowing dust and guttation fluid produced as by-products of standard use of neonicotinoids have been shown to be capable of killing honeybees.

These studies, many conducted under field or semi-field conditions (ie not just in laboratories), and all using concentrations that can be encountered in arable fields, indicate illustrate not only a direct risk to honeybee colonies (probably responsible for c. 9% of pollination services), but also increase concern levels for wild pollinators. When the risk to one type of insect is shown to be higher than thought, then it is highly probable that wild bees, moths, hoverflies and other insects are also more vulnerable to the effects of low doses of these chemicals than previously thought. These wild pollinators are responsible for over 90% of pollination services and are crucial to a healthy environment.

39. Between 2010 and 2012, there were also been a series of scientific studies published which provided further evidence that low doses of neonicotinoid insecticides could have additional significant effects on the environment. For example:

(a) Colonies of bumblebees exposed to imidacloprid experienced lower colony growth and an 85% reduction in queen production.

(b) Imidacloprid reduced the ability of bumblebees to feed and reduced bumblebee brood production by one third.

(c) Chronic exposure of bumblebees to imidacloprid and the pyrethroid l-cyhalothrin at concentrations that could approximate field-level exposure impaired natural foraging behaviour and increased worker mortality leading to significant reductions in brood development and colony success.

(d) Imidacloprid was shown to have very significant impacts on earthworm growth and activity.

(e) Neonicotinoids were shown to be even more toxic to solitary bees than to bumblebees.

(f) Dandelions growing near neonicotinoid treated fields and visited by foraging bees were found to contain neonicotinoids.

(g) Widespread contamination of Dutch surface waters with imidacloprid was found, with concentrations regularly exceeding the Maximum Tolerable Risk levels.

(h) Imidacloprid was detected in 67 samples (89%) of Californian surface water and concentrations exceeding the safety benchmark in 19% of samples.

These studies, many conducted in the field or semi-field conditions and all observing or applying pesticide concentrations encountered in the countryside, indicate a direct significant risk to wild pollinators and the environment.

40. The new science led to renewed calls for the suspension of neonicotinoids in the UK. In April 2012, the Pesticides Action Network UK ("PAN UK") initiated a joint letter on behalf of a group of NGOs, including Buglife, to the Secretary of State for Environment, Food and Rural Affairs (then Caroline Spelman) calling for a precautionary suspension of neonicotinoid approvals. Defra refused to take any action on the basis that "the body of evidence assessed so far supports the conclusion that neonicotinoids to not threaten honeybee populations."

41. In parallel, Buglife engaged in a further round of correspondence with Professor Watson of Defra, again highlighting concerns at Defra's continued failure to address risks posed to non-bee invertebrates and failure to apply the precautionary principle.

42. In May 2012, EFSA published its scientific opinion on the development of a risk assessment of plant protection products on bees, at the request of the Commission. The opinion identified a number of major shortcomings in the current risk assessment methodology. For example:

(a) Conventional regulatory tests based on acute toxicity are likely to be unsuited to assess the risks of long-term exposures to pesticides.

(b) Laboratory conditions fail to take account of intermittent and prolonged exposures of adult bees, exposure through inhalation and exposure of larvae.

(c) The conventional standard tests do not fully assess sub-lethal doses of pesticides.

(d) The guideline for field testing has several major weaknesses leading to uncertainties concerning the real exposures of the honeybees—better suited to assessment of spray products than seed and soil treatments.

The opinion recommends separate risk assessment for bumblebees and solitary bees. The opinion formed the basis for EFSA's new draft guidance document which was published for consultation in September 2012 and is due to be finalised by the end of 2012.

43. On 13 September 2012, Defra published the Statement. The Statement found that *"although some of the new studies provided evidence of sub-lethal effects of neonicotinoids in the conditions applied in the research, none of the studies give unequivocal evidence that sub-lethal effects with serious implications for colonies were likely to arise from current uses of neonicotinoids and that the existing studies submitted in support of the present regulatory approvals fully meet required standards."*

44. Based on these findings, Defra concluded that:

(a) It is appropriate to update the process for assessing the risks of pesticides to bees in the light of developments in the science, including the latest research.

(b) Further research will be carried out to fill identified evidence gaps.

(c) The recent studies to not justify changing existing regulation. However, Defra left open the possibility of changes to the regulation of neonicotinoids in light of new research.

First Proposed Ground of Review: Breach of Article 44 of Regulation 1107–09

45. One of Defra's stated purposes in making the Statement is "to consider whether...further restrictions on the use of Neonicotinoids are required" (paragraph 1). It would appear that Defra has conducted a review for the purposes of Article 44, para 1 of Regulation 1107–09 so as to be able to determine whether it is required to act under Article 44 para 3 to withdraw or amend authorisation of products containing neonicotinoids. Article 44 requires Member States to withdraw or amend authorisations where the requirements of Article 29 are no longer satisfied.

46. It is clear, especially in light of recent developments in the scientific literature, that the requirements referred to in Article 29 of Regulation 1107–09 are no longer satisfied in relation to any UK-authorised plant protection products containing the neonicotinoids thiamethoxam, thiacloprid, clothianidin, acetamiprid or imidacloprid. A schedule of such plant protection products (the "**Products**"), including details of their manufacturer and active substances, is enclosed,—titled "Neonicotinoid Products". In particular, none of the Products complies, in light of current scientific and technical knowledge, with the requirements provided for in Article 4(3)(e) (contrary to the requirement in paragraph 1(e) of Article 29): it cannot be established that

any of the Products "*have no unacceptable effects on the environment*". On the contrary, there is significant evidence in the recent literature reviewed in Defra's Statement, that neonicotinoids have unacceptable effects on the environment, having regard to their impact on non-target species, and bees in particular.

47. Regulation 1107–09 is underpinned by the precautionary principle. Defra itself has acknowledged in correspondence between Buglife and Defra's Chief Scientist, Robert Watson) that the precautionary principle must play a key role in the authorisation process; it follows that it must play a key role in the review of any authorisation.

48. The Statement acknowledges that there is solid evidence that products containing neonicotinoids pose a risk to bees. Further, the Statement acknowledges that the current risk assessment process is inadequate for assessing the extent of those risks:

> *"it is appropriate to update the process for assessing the risks of pesticides to bees in the light of developments in the science—including the latest research. This exercise should include the development of a new risk assessment for bumble bees and solitary bees, alongside an update risk assessment for honey bees."*

This is consistent with the findings of EFSA, the technical body responsible for advising the Commission on risk assessment.

49. Nowhere in the Statement does Defra mention, still less discuss, the precautionary principle. On the contrary, Defra appears to apply the very inverse of the precautionary principle, justifying its Decision by an assertion that none of the recent studies provides "unequivocal" evidence of serious implications for bee colonies.

50. In the circumstances the only lawful decision compliant with the obligations imposed by Article 44, interpreted in a manner consistent with the precautionary principle, would be to withdraw or amend the authorisations of the Products pending the completion of the revision of the rules for risk assessment and the further research that is underway to fill the gaps in the evidence.

Second proposed ground of review: further breaches of duty or failures to have regard to mandatory, relevant considerations

51. Further, it appears from the Statement that in making the Decision Defra has failed to have regard to a number of considerations, which, as a matter of law Defra was bound to consider, including:

(a) **Impacts on non-target species other than bees.**

(i) The Statement only addresses the impacts of neonicotinoids on bees (domestic honeybees, wild bumblebees and solitary bees). In reviewing the authorisation of a plant protection product under Article 44, Defra must, when considering whether a product has "no unacceptable effect on the environment" consider its impact on "non-target species." While the Uniform Principles specifically refer to short and long term impacts on honeybees, it is clear from an ordinary construction of Article 4(8) that "non-target species" is not limited to honeybees or even to bees. This is also clear from the various conditions laid down for the use of products containing active substances, which require member states to pay particular attention to the protection of a number of non-target species including "aquatic organisms", "non-target arthropods" "granivorous birds" and "small herbivorous animals". This is particularly concerning in light of the 2008 Defra report which highlighted the shortcomings of pesticides risk assessments for a wider range of non-target organisms (see paragraph 31 above). On the face of it, Defra has failed to conduct any "assessment of the risk posed" to any non-target species other than bees before making the Decision.

(ii) The duty to consider non-target species must also be considered in light of the Secretary of State's duties under Section 41 of the Natural Environment and Rural Communities Act 2006. In accordance with Section 41, the Secretary of State has published a list of the living organisms and types of habitat which in the Secretary of State's opinion are of principal importance for the purpose of conserving biodiversity. The list includes the following living organisms:

Barberry Carpet *Pareulype berberata*.

Grey Carpet *Lithostege griseata*.

Pale Shining Brown *Polia bombycina*.

Striped Lychnis *Shargacucullia lychnitis*.

White-spotted Pinion *Cosmia diffinis*.

Pale Eggar *Trichiura crataegi*.

Garden Dart *Euxoa nigricans*.

Dot Moth *Melanchra persicariae*.

Hedge Rustic *Tholera cespitis*.

Green-brindled Crescent *Allophyes oxyacanthae*.

Dusky-lemon Sallow *Xanthia gilvago*.
Large Nutmeg *Apamea anceps*.
Rosy Rustic *Hydraecia micacea*.
Grey Partridge *Perdix perdix*.
Yellowhammer *Emberiza citronella*.
Large Garden Bumblebee *Bombus ruderatus*.
Shrill Carder Bee *Bombus sylvarum*.
Scabious Cuckoo Bee *Nomada armata*.
Necklace Ground Beetle *Carabus monilis*.
Set-aside Downy-back *Ophonus laticollis*.
Mellet's Downy-back *Ophonus melletii*.
A Downy-back Ground Beetle *Ophonus puncticollis*.
Oolite Downy-back *Ophonus stictus*.
River-shore Cranefly *Rhabdomastix japonica*.
Iron Blue Mayfly *Nigrobaetis niger*.
Depressed River Mussel *Pseudanodonta complanata*.
Desmoulin's Whorl Snail Vertigo *moulinsiana*.

All of these species occur in agricultural habitats where neonicotinoids are directly used; in habitats adjacent to agricultural habitats that may be affected by airborne dust from seed planting; or in aquatic habitats directly affected by run-off and seepages of water from such habitats that are likely to contain the pesticides. These species are therefore likely to be threatened by neonicotinoid pesticides or the effects of these pesticides on their food supply. By deciding not to withdraw the approvals for the Products without first considering their impact on species other than bees, Defra has failed to have regard to or act in accordance with the Secretary of State's duty under section 41(3)(a) to take reasonably practicable steps to further the conservation of any of the organisms set out above.

(b) **Impacts on protected areas**. Article 6(3) of Directive 92/43/EEC (the "**Habitats Directive**") requires an "*appropriate assessment*" to be conducted in relation to any plan or project not directly connected with a special areas of conservation but "*likely to have a significant effect thereon*". Since the neonicotinoids in the Products are water-mobile and sowing dust can be air-borne, there is a real possibility or likelihood that by their continued use they will be carried into Special Areas of Conservation and Special Protection Areas, significantly affecting them by causing damage to invertebrate life therein. However, it appears that Defra did not carry out any Habitats Directive analysis of the likely effect of the continued use of neonicotinoids on Special Areas of Conservation before making the Decision.

(c) **Potential to compromise compliance with Directive 2000–60/EC (the "Water Framework Directive")**

(i) It is clear from Regulation 1107–09 (Recital 16, Recital 47, Article 21 and Article 44) that the potential for the adverse impact of pesticides on the achievement of the water quality objectives of the Water Framework Directive is a critical factor in the approval of both active substances and plant protection products.

(ii) The objectives of Article 4(1)(a)(i) and (ii) of the Water Framework Directive state respectively that Member States shall implement the necessary measures to prevent deterioration of the status of all bodies of surface water, and shall protect, enhance and restore all bodies of surface water, with the aim of achieving good surface water status by 2015.

(iii) Article 4(1)(b)(i) requires Member States to prevent or limit the input of pollutants into groundwater and to prevent the deterioration of the status of all bodies of groundwater. Member States shall review an authorisation where it concludes that the objectives of Article 4(1)(b)(i) of the Water Framework Directive may not be achieved. Further, Regulation 540/2011/EU specifically requires member states to pay particular attention to the potential for groundwater contamination from thiacloprid, clothianidin, thiamethoxam. Neonicotinoids are water-mobile, toxic chemicals which by their nature leach into surface and ground waters.

(iv) The Products are "pollutants" (by the definition contained in Annex VIII to the Water Framework Directive). It is recognised that Water Framework Directive delivery is still a work in progress in the UK. However, Defra does not appear to have carried out any analysis of the risk of groundwater contamination or to the achievement of good ecological and chemical statuses for surface waters posed by the use of the Products.

(d) **The extent of any benefit to plant protection.** Recital (24) of Regulation 1107–2009 emphasises that it must be demonstrated that plant protection products "*present a clear benefit for plant production*". This is reflected in the approval criteria for active substances and plant protection products, which requires that a plant protection product "*shall be sufficiently effective*". However, the

Decision appears to have been made without any consideration of the effectiveness of the Products or whether their effectiveness is sufficient to outweigh the environmental detriments the Products cause. There is good reason to believe that no such benefit is demonstrated by at least some neonicotinoids. For example, the Product "Biscaya" (containing thiacloprid) is marketed to destroy a pollinator population, namely pollen beetles.[44] However, it is scientifically established that oilseed rape replaces damaged flower buds by creating produces new buds when existing buds are damaged[45]; and in these circumstances it is very difficult to see how the destruction of pollen beetles could have any benefit for oilseed rape production.

To give another example, Dr Phil Botham, Head of Product Safety at Syngenta, has gone on record to say that the Product "Cruiser OSR" creates nearly €1 billion of value for farmers and the oil seed rape chain across the EU.[46] By contrast, pollination services by invertebrates across Europe are worth £17 billion.[47] if the use of Cruiser OSR reduced pollination rates by just 5% this economic cost would counteract the economic benefit of the plant protection product. Indeed there is evidence that global productivity of insect pollinated crops has not grown in line with other crops due to pollinator declines.[48]

(e) **The principle of integrated pest management.** Article 55 of Regulation 1107–2009 requires use of plant protection products to comply with the general principles of integrated pest management set out in Article 14 of and Annex III to Directive 2009–128/EC. Those principles require, among other things, that pesticides "*shall be as specific as possible for the target and shall have the least side effects on… non-target organisms and the environment"* and uses should be kept to the minimum level necessary. Systemic pesticides such as seed treatments by their nature lack targeting and cause chemicals to be used on a prophylactic, blanket basis rather than in response to specific risks of damage caused by pests. However, the Decision appears to have been made without any regard to this principle.

Third proposed ground of review: failure to ensure public participation in the Decision

52. Article 6 of the Aarhus Convention, to which both the EU and the UK are parties, requires that the public be given the opportunity to participate in decisions on proposed activities which may have a "significant effect on the environment." These requirements also apply when a public authority reconsiders or updates the operating conditions for such an activity. The continued use of the Products is plainly such a proposed activity. In those circumstances, Article 6 required the United Kingdom to ensure that the public were consulted before reaching the Decision. Defra has failed to conduct any such consultation. The Decision is therefore vulnerable to judicial review on the grounds of procedural impropriety.

Fourth proposed ground of review: unlawful inclusion of neonicotinoids in Reg. 540/2011

53. Lastly, and to the extent necessary, Buglife will contend that the five neonicotinoids in issue, on grounds associated with the evidence presented above and that previously submitted by others to the ECJ, ought themselves never to have been included as permitted active substances in Regulation 540/2011 or in its predecessor Annex to the Directive. If, as Buglife considers, the inclusion of neonicotinoids in Regulation 540/2011 is unlawful, the entire basis for the authorisation of the Products and for Defra's Decision is undermined.

54. Buglife recognises that the domestic Court will be unable to resolve such a dispute, which concerns the legality of EU legislation. Buglife proposes, therefore, if—but only if—its other grounds of review are unsuccessful, to ask the Court to refer the lawfulness of the inclusion of those neonicotinoids in Regulation 540/2011 to the Court of Justice for a preliminary ruling. Such a route is plainly open to Buglife in principle, particularly since the challenge to the inclusion of imidacloprid by Pesticide Action Network and others was rejected by the Commission on grounds of lack of standing; cf. eg *Salt Union v Commission* [1996] ECR II-1475, §39.

Request for Information

55. So that we may better understand the Decision and the basis for it, and in the light of the grounds of review we have set out above, we would be grateful if you would provide us with the following information. Please also treat these requests, to the extent relevant, as made under the Environmental Information Regulations 2004. For the avoidance of doubt, please respond to these requests within 14 days rather than the longer timeframes allowed under the Environmental Information Regulations 2004.

[44] the "control of pollen beetles in oilseed rape" (http://www.bayercropscience.co.uk/product/insecticides/biscaya/; 23 Sept 2012).
[45] Ingrid H. Williams and J. B. Free 1979 Compensation of oil-seed rape (Brassica napus L.) plants after damage to their buds and pods. The Journal of Agricultural Science, Volume 92, Issue 1, pp 53–59.
[46] (http://www.independent.co.uk/voices/letters/pesticides-and-bee-health-8005519.html; 8 August 2012).
[47] Nicola Gallaia, Jean-Michel Sallesc, Josef Setteled, and Bernard E. Vaissièrea 2009 Economic valuation of the vulnerability of world agriculture confronted with pollinator decline. Ecological Economics Volume 68, Issue 3, Pages 810–821.
[48] Garibaldia, L A., Aizena, M A., Kleinc, A M., Cunninghamd, S A. and Hardere L D. 2011 Global growth and stability of agricultural yield decrease with pollinator dependence. PNAS April 5, vol. 108 no. 14 5909–5914

(a) The Statement refers to existing studies in which "hives exposed to treated crops did not show any gross effects when compared to control hives exposed to untreated crops". Please can you send us copies of, or references to, all of these studies?

(b) Has a risk assessment has been carried out of the impact of neonicotinoids on the NERC s41 species listed above? If yes, please provide the full risk assessment, details of the process and all relevant supporting documents?

(c) Has an appropriate assessment of the risks that neonicotinoid pesticides present to SACs and SPAs been undertaken? If yes, please provide the full appropriate assessment, details of the process and all relevant supporting documents?

(d) Please describe in detail all monitoring that has been undertaken for neonicotinoids in groundwater, water bodies and freshwater habitats, including the number of sites monitored, the detection levels of the monitoring and the results of such monitoring. Please describe how the process of determining and reviewing neonicotinoid pesticide uses has considered the likelihood of environmental damage to aquatic organisms and ecosystems.

(e) Have any analyses been undertaken of the risks to achieving the aims of the Water Framework Directive from neonicotinoid pollution at site, catchment or national levels? If yes, please provide the full analyses, details of the process and all relevant supporting documents?

(f) Please describe in detail all the monitoring that has been undertaken for neonicotinoids in soil, including the number of sites monitored, the detection levels of the monitoring and the results of monitoring. Please describe how the process of determining and reviewing neonicotinoid pesticide uses has considered the likelihood of environmental damage to soil ecosystems.

(g) Studies undertaken by Bayer in the early 2000's on rhododendron[49] and imidacloprid soil treatments and a paper published in 2012 examining nectar and pollen residues in a pumpkin crop[50] indicate that where the chemical is used as a drench or soil treatment the concentrations in nectar are vastly higher than usually recorded with seed treatments, and can persist at high levels for several years. As soil treatments and drenches are likely to predominate in urban areas what studies have been carried out examining the impacts on pollinators and other non-target species in these habitats and at these nectar and pollen concentration levels?

(h) Has a risk assessment has been carried out of the impact on the environment of garden and amenity neonicotinoid containing Products? If yes, please provide the full risk assessment, details of the process and all relevant supporting documents?

(i) Please supply the evidence that the use of Biscaya to control pollen beetles has a clear benefit for plant production.

(j) Please provide the cost benefit analysis that demonstrates that neonicotinoids have a clear benefit for plant protection.

8 November 2012

Written evidence submitted by Dr James Cresswell, University of Exeter

1. Executive Summary

1.1 There is insufficient evidence to establish with high certainty that the residues of neonicotinoid pesticides in nectar and pollen threaten the sustainability of bee populations and the pollination services that they provide to crops and wild plants. But there is sufficient evidence to raise concern about bumble bees.

1.2 No experiment has demonstrated that neonicotinoids threaten the viability of honey bee colonies when delivered at realistic dietary levels. Experiments that have demonstrated impacts on colonies used unrealistically high dosages. The lack of evidence for impact is consistent with the observation that the global stock of honey bees has increased by 12% in the last decade.

1.3 Two experiments suggest that neonicotinoids threaten the viability of bumble bee colonies when delivered at realistic levels and I have medium certainty that these findings apply to agricultural landscapes in the UK. Other widely cited experiments are flawed because they used unrealistically high dosages. While there have been observable declines in certain bumble bee species coincident with the increasing use of neonicotinoids, pathogens and habitat degradation are also plausible culprits.

1.4 In the UK, oilseed rape is the principal vehicle for delivery of neonicotinoids to bees. Bumble bees can rapidly recover from neonicotinoid exposure after the crop's bloom subsides and also some/many colonies will

[49] "Residues of Imidacloprid WG 5 in Blossom Samples of Rhododendron sp. (variety Nova Zembia) after Soil Treatment in the Field 2003" (Doering, Maus and Anderson 2004), "Residues of Imidacloprid WG 5 in Blossom Samples of Rhododendron sp. (variety Nova Zembia) after Soil Treatment in the Field—Application: Spring 2003, Sampling 2003 and 2004' (Doering, Maus and Schoening 2004), "Residues of Imidacloprid WG 5 in Blossom Samples of shrubs of different sizes of the species Rhododendron sp. after drenching application in the field—Application: 2004, Sampling 2005' (Doering, Maus and Schoening 2004)).

[50] Galen P. Dively, Alaa Kamel 2012 Insecticide Residues in Pollen and Nectar of a Cucurbit Crop and Their Potential Exposure to Pollinators J. Agric. Food Chem., 60 (18), pp 4449–4456

escape the crop's peak bloom. If concern over bumble bees is justified, these details offer avenues to mitigation through smart land management.

1.5 My recommendation is to fund further research to establish with high certainty whether bumble bees are affected by the dosages that originate from UK agriculture. If concern about bumble bees is justified, the government should fund investigations of smart mitigation strategies based on an understanding of the interplay of exposure, sensitivity, resilience and recovery.

2. Introduction to the Submitter's Area of Expertise

2.1 I am an academic at the University of Exeter (Biosciences) and I lead an ecotoxicology laboratory that investigates the impacts of neonicotinoid pesticides on bees. I am a member of the European Food Safety Authority (EFSA) Working Group on Bee Risk Assessment. My research is funded in part by Syngenta (£137,000).

3. Factual Information to Support Conclusions

3.1 Below, the following words indicate judgmental estimates of certainty: very certain (98% or greater probability); high certainty (85–98% probability), medium certainty (65–85% probability), low certainty (52–65% probability), and very uncertain (50–52% probability).

3.2 My report examines only effects on bees from neonicotinoids in nectar and pollen. I do not consider effects from guttation fluid (leaf exudates). I consider only honey bees and bumble bees.

3.3 A population is unsustainable when the death rate exceeds the birth rate. Intrinsically, pesticides harm individual bees but they threaten a population only when they cause death rates to exceed birth rates by increasing death rates, decreasing birth rates, or both. I assess experimental evidence for effects on these demographic rates.

3.4 *Evaluation of evidence from experiments on honey bees*

Table 1. Summary of outcomes of experiments investigating the impact of neonicotinoids on honey bee colonies. Under increased death rates and decreased birth rates: ✓ = clear effect; 0 = no detectable effect. Under dose: ✓ = realistic dose; X = unrealistic dose.

Study	↑ *death rate*	↓ *birth rate*	*Realistic dose*
Henry *et al*. 2012	✓	0	X
Lu *et al*. 2011	✓	0	X
Cutler & Scott Dupree 2007	0	0	✓
CRD reports: SXR/Am 004/005 (1999)	0	0	✓

3.5 No study has demonstrated that neonicotinoids have the capacity to threaten the viability of a honey bee colony when delivered at realistic dietary levels (high certainty). Henry *et al*. (2012) delivered the aggregate daily dose in a single meal (like smoking 20 cigarettes at once), which would likely overwhelm the honey bee's detoxification system (high certainty). Lu *et al*. (2011) delivered neonicotinoids in feeder syrup at an unrealistically high concentration (very certain).

3.6 The failure of some field experiments to detect an effect (eg Cutler & Scott-Dupree 2007) may originate in low statistical power (Cresswell 2011). We need trials that are more incisive and the new EFSA guidelines for risk assessments will remedy this.

3.7 The body of evidence that demonstrates that neonicotinoids impair learning in laboratory tests (proboscis extension response, PER) that I reviewed in my meta-analysis (Cresswell 2011) is not applicable to field conditions (low certainty). In the laboratory, the bees are restrained in a metal jacket and their metabolic rate probably drops, which impairs their detoxification system and increases their susceptibility to neonicotinoids (low certainty).

3.8 *Evaluation of evidence from experiments on bumble bees*

Table 2. Summary of outcomes of experiments investigating the impact of neonicotinoids on bumble bee colonies. Birth rate refers to capacity to produce individuals of either worker or sexual caste (queens and males). Under increased death rates and decreased death rates: ✓ = clear effect; 0 = no detectable effect. Under dose: ✓ = realistic dose; X = unrealistic dose; ? = uncertainty about the realism of the dose.

Study	↑ *death rate*	↓ *birth rate*	*Realistic dose*
Whitehorn *et al*. 2012	0	✓	✓?
Gill *et al*. 2012	0	✓	X
Laycock *et al*. 2012	0	✓	✓

3.9 A laboratory study (Laycock *et al*. 2012) demonstrated that neonicotinoids can threaten the viability of a bumble bee colony when delivered at a realistic dietary level (very high certainty). But the dosages used in other experiments are questionable. Gill *et al*. (2012) used feeder syrup with a dosage (10 ppb) above realistic levels (high certainty). Whitehorn *et al*. (2012) used 6 ppb in pollen and 0.7 ppb in feeder syrup exclusive feeding for 14 days and their findings may apply to agricultural landscapes in the UK (medium certainty). However, Whitehorn *et al*. based their dosage on the peak level recorded in spring-sown oilseed rape that flowered in Minnesota, USA, in June (Scott-Dupree *et al*. 2001), which is higher that due to winter-sown oilseed rape in the UK (low certainty) flowering in April-May (c. 1 ppb in nectar and pollen; Cresswell, unpublished).

3.10 *Epidemiological evidence of involvement in population declines*

3.11 Honey bees are not in decline (Fig 1; very certain). According to the United Nation's FAO database, the global stock of hives has increased by 12.4% during the 21st century and the stock has decreased by only 0.5% in Europe (excluding Eastern Bloc). The global trade in honey is an important driver of change in stock sizes (high certainty). In most countries, national stocks of hives are largely unchanged in the 21st century (Fig. 2). But increases are evident principally in countries that are net exporters of honey and declines are evident in wealthy countries that are net importers of honey (Fig. 2). Epidemiological evidence does not implicate neonicotinoids as a cause of regional honey bee declines (medium certainty; Cresswell *et al*. 2012).

Fig. 1. Change in the global stock of honey bee hives in the years 2000–2010. Figures based on FAOSTAT data for 117 countries

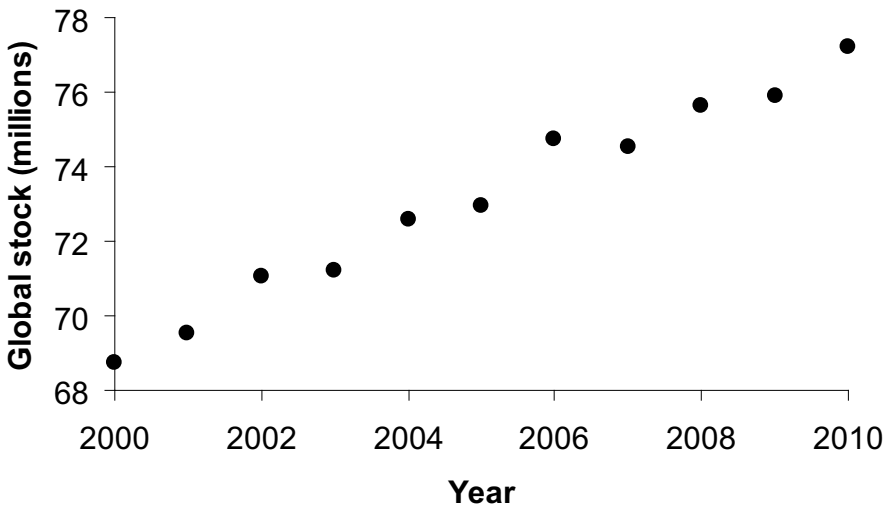
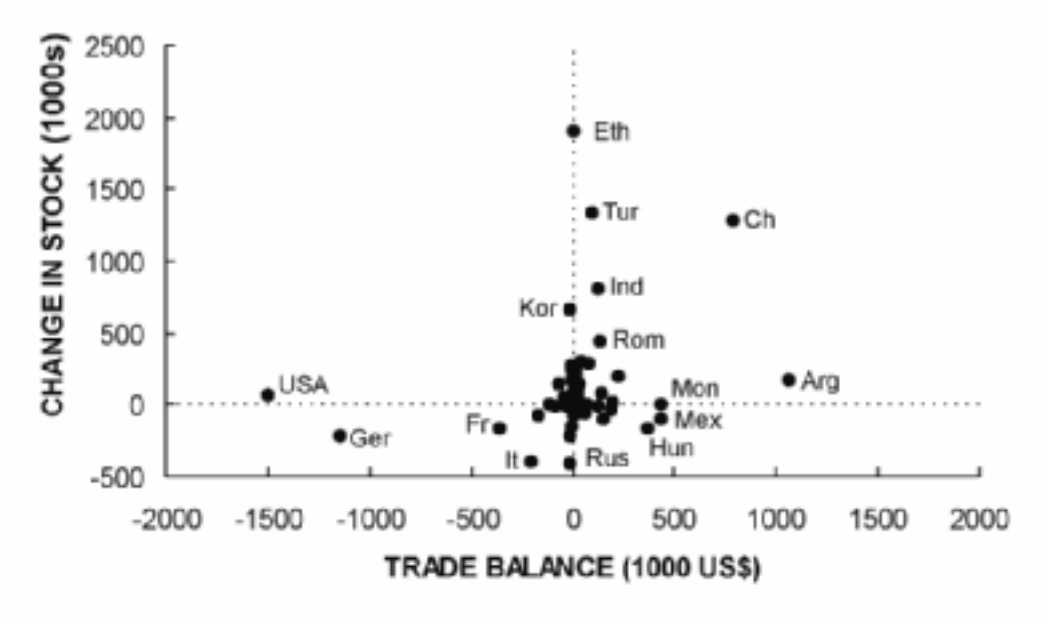


Fig. 2. Change in the national stocks of honey bee hives in the years 2000–2010 in 85 countries in relation to the net trade balance of each country for honey (value of honey exports minus value of honey imports). Net exporters of honey have a positive trade balance. Figures based on FAOSTAT data



3.12 There have been observable declines in certain bumble bee species coincident with the increasing use of neonicotinoids (Cameron *et al*. 2011) but neonicotinoids have not been implicated with any certainty and pathogens and habitat degradation are also plausible culprits.

3.13 *Demographic resilience*

3.14 Honey bee colonies will not collapse because foraging bees are intoxicated by neonicotinoid residues in nectar (high certainty). Although some foragers could be lost (Henry *et al*. 2012), a honey bee colony can produce about 1,000 new bees per day and thereby replace bees lost through pesticide-induced navigation failure (Cresswell & Thompson 2012).

3.15 Nobody has yet demonstrated that neonicotinoid exposure of bumble bees causes loss of foragers. Bumble bees are less able than honey bees to replace these losses (high certainty).

3.16 *Physiological resilience through detoxification and recovery*

Assertions that the effects of neonicotinoids on bees are irreversible (eg Tennekes & Sanchez-Bayo 2011) are false (very certain). In the case of imidacloprid, adult honey bees rapidly detoxify the neonicotinoid (very certain; Suchail *et al*. 2004; Cresswell *et al*. unpublished). Bumble bees are less able to clear ingested imidacloprid (very certain; Cresswell *et al*. unpublished) but the residues are rapidly cleared once the diet is clean and toxic effects are rapidly reversible within a few days (very certain; Laycock, Smith & Cresswell, unpublished).

3.17 *Mitigation options*

If it is established that neonicotinoids threaten bumble bee populations, a multifaceted mitigation strategy could hypothetically involve: moderation of the pesticide's application rate; landscape-scale management of crop sowing time to synchronize flowering across fields and minimize the duration of exposure; and enhancement of pesticide-free alternative forage.

3.18 *Recommendations for action by the Government*

3.19 My recommendation is to fund further research to establish with certainty whether bumble bees are affected by the dosages that occur in UK agriculture.

3.20 If concern about bumble bees is justified, the government should fund investigations of smart mitigation strategies based on an understanding of the interplay of exposure, sensitivity, resilience and recovery.

3.21 *Literature cited*

Cameron, S A, Lozier, J D, Strange, J P, Koch, J B, Cordes, N, Solter, L F & Griswold, T L (2011). Patterns of widespread decline in North American bumble bees. *Proceedings of the National Academy of Sciences of the United States of America*, **108**, 662–667.

Cresswell, J E (2011). A meta-analysis of experiments testing the effects of a neonicotinoid insecticide (imidacloprid) on honey bees. *Ecotoxicology*, **20**, 149–157.

Cresswell, J E, Desneux, N & vanEngelsdorp, D (2012). Dietary traces of neonicotinoid pesticides as a cause of population declines in honey bees: an evaluation by Hill's epidemiological criteria. *Pest Management Science*, **68**, 819–827.

Cresswell, J E, & Thompson, H M. 2012. Comment on "A common pesticide decreases foraging success and survival in honey bees". *Science* **337**:1453

Cutler, G C & Scott-Dupree, C D. 2007. Exposure to clothianidin seed-treated canola has no long-term impact on honey bees. *Journal of Economic Entomology*,**100**:765–72.

Gill, R J, Ramos-Rodriguez, O & Raine, N E (2012). Combined pesticide exposure severely affects individual- and colony-level traits in bees. *Nature*, doi:10.1038/nature11,585.

Henry, M, Béguin, M, Requier, F, Rollin, O, Odoux, J F, Aupinel, P, Aptel, J, Tchamitchian, S & Decourtye A (2012). A common pesticide decreases foraging success and survival in honey bees. *Science*, **336**, 348–350.

Laycock, I, Lenthall, K M, Barratt, A T & Cresswell, J E (2012). Effects of imidacloprid, a neonicotinoid pesticide, on reproduction in worker bumble bees (*Bombus terrestris*). *Ecotoxicology*, **7**, 1937–1945.

Lu, C, Warchol, K M, & Callahan, R A. 2012. *In situ* replication of honey bee colony collapse disorder. Bulletin of Insectology, **65**, *in press*.

Scott-Dupree, C, Spivak, M, Bruns, G, Blenkinsop, C & Nelson, S. 2001. The impact of GAUCHO@ and TI-435 seed treated canola on honey bees, *Apis mellifera* L. *http://www.epa.gov/pesticides/chem_search/cleared_reviews/csr_PC-044,309_19-Mar-03_45,422,435.pdf*

Suchail, S, De Sousa, G, Rahmani, R & Belzunces, L P (2004). *In vivo* distribution and metabolisation of ^{14}C-imidacloprid in different compartments of *Apis mellifera* L. *Pest Management Science,* **60**, 1056–1062.

Tennekes, H A & Sanchez-Bayo, F (2011). Time-dependent toxicity of neonicotinoids and other toxicants: implications for a new approach to risk assessment. *Journal of Environmental & Analytical Toxicology,* S:4.

Whitehorn, P R, O'Connor, S, Wackers, F L & Goulson, D (2012). Neonicotinoid pesticide reduces bumble bee colony growth and queen production. *Science*, **336**, 351–352.

8 November 2012

Written evidence submitted by Syngenta

1. Introduction

1.1 Syngenta welcomes the opportunity to respond to the Environmental Audit Committee's inquiry into "Insects and Insecticides".

1.2 Our recently published booklet "*Straight Answers on the disappearance of honey bees in Europe"* will be of value to committee members.

1.3 Syngenta is an integrated global agribusiness selling agricultural inputs—seeds and chemicals—to farm businesses of all scales (including smallholders) around the world. We are the global number one in the agricultural chemicals market and third in the seeds market.

1.4 In the UK, we are unique amongst our agribusiness peer group in that we have a major research and development centre; manufacturing and production facilities for chemical production and conventional seed breeding; and a major commercial sales operation here. We discover, develop, and manufacture world leading agricultural technologies in the UK.

1.5 In doing so, we employ over 2000 people and spend in excess of $250 million on research at our Jealott's Hill research site, the largest commercial agricultural research site in Europe. We also partner with hundreds of public and academic institutions in the UK in the development phases of our products. And our trained and expert agronomists engage with farming businesses of every size from single farmer operations to the largest agricultural producers in the country.

1.6 We understand farming, how our products benefit the agricultural sector, and the ways in which they interact with and help protect the environment. We are committed to delivering technologies which will enable the sustainable intensification of agriculture.

2. Position Statement

2.1 Syngenta believes that insecticides, in particular neonicotinoid based seed treatments, are an essential contributor to sustainable intensive agriculture and do not damage the health of bee populations. They significantly reduce the load on the environment when compared to many other pesticides because of their extremely low dose; long lasting protection against pests that destroy crops; and when used in via seed treatment application result in fewer sprays over the course of the growing season.

2.2 Our own active ingredient, Thiamethoxam (TMX), is used as a seed treatment and its safety is reinforced by years of extensive monitoring in the field and based on millions of hectares of treated seed use without a single substantiated report of hive destruction.

2.3 Although several Member State Governments, reputable universities, and experts across Europe share the view that these innovative pesticides are safe, there are a small number of vocal individuals and groups who continue to suggest the opposite by focusing only on the intrinsic hazard of these products. In recent years these groups have leveraged media reporting of individual alarmist studies despite the fact that they are typically based on unrealistic dose rates and/or the forced exposure of bees to the insecticides in question.

2.4 It's clear that we need healthy and thriving bee populations. The sustainability of agriculture and—indirectly our business—depends on this. But we also need safe, modern, and innovative pesticides like TMX if we are to produce the food we need. Rather than looking at the theoretical hazard we need to look at how bees and pesticides co-exist together in a sustainable agriculture system.

2.5 Syngenta is fully committed to this objective. We continue to deepen our understanding through research and by putting in place schemes such as Operation Pollinator. Today, 2,500 hectares of pollinator strips have been sown as part of this project providing essential habitat and nutrition for bees alongside field crops which are treated with pesticides. They have helped to produce a dramatic recovery in bee populations reversing the decline of some bumblebee species close to extinction.

2.6 Given our determination to approach farming in a holistic way, we would like to assure the Committee that we are open to work with any stakeholder who shares our goal of sustaining a thriving bee population in a sustainable agriculture system where the safest and most innovative pesticides are used.

3. Scope of our Response

3.1 This written submission focuses primarily on providing information regarding Syngenta's neonicotinoid active ingredient Thiamethoxam (TMX), which is used both for seed treatment application and as a foliar spray in numerous products used on flowering and non-flowering crops. Our response primarily references TMX's use in Oil Seed Rape (OSR). Syngenta's branded TMX product in OSR is *Cruiser OSR*.

3.2 By focusing on this compound and its associated products, we look to address the committee's wider announcement on 25 September, 2012 that the inquiry is "a new inquiry into the impact of insecticides on bees and other insects."

3.3 It should be noted that our response is limited in regard to the Committee's central focus and remit for its inquiry—Defra's analysis and use of a review of recent studies looking at neonicotinoid pesticides and bees—as announced on the Guardian newspaper website on 21 September, 2012.

3.4 However, we do take this opportunity to applaud Defra's commitment to a science based approach on the issue of bee decline and on issues relating to agricultural technology more widely. We believe ministers and officials at the department have acted properly and have ensured in recent times that an emotive and complex issue has not been politicised. To date, we believe that policy decisions in the UK on this issue have been based on rigorous scientific assessment and evidence.

3.5 In calling upon FERA, CRD and ACP to independently and expertly assess recent studies relating to neonicotinoids and bees we believe that Defra has acted impartially and appropriately. We note that the government's subsequent analysis and use of the assessment of these studies is in line with other major European governments including those of Netherlands and Germany.

3.6 We point out that the decision of the French government to withdraw the registration of Cruiser OSR based on the Henry et al study was counter to the assessment and position of their own advisory agency—ANSES—which supported continued registration.[i]

4. Multi-Variable Factors in Bee Decline—Points of Reference

4.1 The issue of bee decline is complex. Accordingly, we feel it is essential that political stakeholders are well informed before looking for and deciding on an appropriate course of action or recommendations.

4.2 Based on Syngenta's own detailed and expert technical assessment of the issue we believe that a number of variables are potential causal factors. Insecticides, and particularly seed treatments, when used appropriately and in accordance with label and product guidance are not responsible for colony collapse or large scale bee mortality.

4.3 Accordingly, we stand by the integrity of our insecticide seed treatments and foliar applied products and believe that they play a significant role in protecting yield and quality and by doing so also play a role in environmental protection, particularly in terms of land sparing.

4.4 There is now significant independent research that suggests that bees are impacted by a range of factors. In addition, there is also specific research showing neonicotinoids are not the key variable in bee decline.

4.5 We direct the committee to review the following research papers, which look in detail at the range of likely variables involved in this issue.[ii]

— **Data showing no effect of field relevant doses of neonicotinoids to bees or papers that state neonicotinoids are unlikely to be responsible for decline in bee health**

Schneider et al, 2012 (return to hive imidacloprid + Clothianadin) ; Cresswell 2011 (metanalysis of imidacloprid field trials); Cresswell et al, 2012 (neonics in bee food); Blacquiere et al, 2012 (Neonic bee review); Imdorf et al, 2006 (overwintering losses in Switzerland); Oliver, 2012 (bee keeper view of neonics).

— **Varroa or Varroa + disease/virus are the likely main reason for bee decline**

Dainan et al, 2012; Martin et.al, 2012; Guzman-Nova, et al, 2010; Szabo et al 2012 (bumble bees); Charriere & Neumann, 2010; Nazzi et al, 2012; Genersch, 2010; Rosenkranz et al, 2010.

— **Complicated and multi-variable nature for bee decline**

van Enngelsdorp et al, 2012; Neumann & Carreck, 2010;

5. Thiamethoxam (TMX)—Assessment of Lab Based Research and Field Data Publication

5.1 Like all insecticides TMX is intrinsically toxic to insects. In the case of honey bees, the LD_{50} for TMX is 5 ng/bee.

5.2 ***However, the committee should note that risk is a factor of both toxicity and exposure***—and the exposure of bees even within a field of TMX seed treated Cruiser OSR is correspondingly low due to the low application rate and the period of time from drilling the seed to flowering.

5.3 All insecticide applications, including systemic seed treatments such as Cruiser OSR, see a degradation of their activity and hence their effect in the field ensuring that plants have greatest protection at the early and emergent phases. In a crop such as OSR the systemic active ingredient will be at trace levels at the point of flowering, significantly reducing risks to insects such as foraging bees.

5.4 All the independent research studies to date that we are aware of relating to Cruiser OSR have attempted to "simulate" this real world scenario in the laboratory; this is fraught with difficulty and typically doses used by researchers have over- estimated the amounts of chemical that bees are exposed to in the field. For example, in the case of the recent Henry et al study at INRA we estimate the concentration tested in the study was at levels up to 30x those seen in OSR nectar in the field.

5.5 As the committee will be aware, there are also high quality in-field monitoring schemes (Wildlife Incident Investigation Scheme) run by the Chemicals Regulation Directorate (CRD), Natural England and the National Bee Unit, which have detected no incidents with bees related to the use of thiamethoxam.

The Wildlife Incident Investigation Scheme (WIIS)

https://secure.fera.defra.gov.uk/beebase/index.cfm?sectionid=33

5.6 In regard to Syngenta's own field data (ie data taken from the real environment), we have recently submitted a manuscript for publication in peer reviewed open literature, which summarises our comprehensive field study programme which has investigated the potential long-term effect of exposure of honeybee colonies to nectar and pollen from TMX seed treated flowering OSR and maize. This covers four years consecutive exposure, including the sensitive over-wintering phase, where TMX is applied at the maximum label rate.

5.7 *These in field studies have shown no effects (lethal or sub-lethal) on bee mortality. Factors assessed include foraging behaviour, colony strength and weight, brood development and overwintering success.*

5.8 In addition, Syngenta is currently drafting a second paper summarising our pollen and nectar residue data from our regulatory field trials conducted with TMX as a seed treatment.

5.9 This paper reports that TMX residues in pollen and nectar collected from bees foraging on treated oil seed rape, are typically very low (ie <1—3.5 µg/kg in pollen and <0.5—2.5 in nectar) with residues in hive pollen and nectar being even lower (typically at or below 1 µg/kg). Residues of the primary metabolite were always lower than parent TMX in both pollen and nectar.

This paper not only confirms low residues of TMX and its primary metabolite in pollen and nectar from TMX seed treated OSR and maize in the field, but will also fill a current data gap in the public literature. This paper will be submitted for publication shortly, and it is hoped that both papers will be published by end of this year/early next year.

6. Use and Utility—Benefits of Cruiser OSR to UK Farmers

6.1 Syngenta estimates that the UK planting of OSR in the UK in the 2012 season was approximately 700,000 hectares. Of this planting, Cruiser OSR was planted on approximately 400,000 hectares—~57% of the UK market.

6.2 OSR has become a very important crop to UK arable growers, driven in part by the increase in commodity prices in recent years. Previously grown as a break crop to help control pests and diseases in cereals, it now provides a similar gross output to wheat.

6.3 Often grown in tight rotations with wheat, OSR suffers from a significant number of pests and diseases. Two key autumn pests are aphids especially the Peach-potato aphid and flea beetles. Both pests invade newly emerging seedlings. Both feed on the young plants, flea beetles potentially causing significant plant loses if infestations are high. The Peach-potato aphid is responsible for the spread of Turnip Yellows Virus (TuYV), which in severe cases has been shown to cause up to 26% yield loss in UK conditions.

6.4 Control of both of these pests in the autumn is critical to establishing the yield potential of the crop for the following spring. Currently, because of insecticide resistance, there are no effective alternatives to the neonicotinoid seed treatments for control of Peach-potato aphid. There are foliar sprays that are effective against flea beetles but the timing of use of these products is very important and autumn conditions can make the optimum spray timing very challenging. Furthermore the use of pyrethroids in the autumn against flea beetles has the potential to make resistance problems with Peach-potato aphid worse.

6.5 The effect of seed applied insecticides lasts between six—10 weeks after sowing. Trials have shown yield increases of up to 0.66T/Ha for hybrids (approx. 60% of the area sown), a value-add of £231/Ha (@ £350/T).

6.6 Without the existing seed treatment technology based on the neonicotinoids , more foliar insecticide sprays would be used in the autumn to control flea beetles and new products would have to be approved to provide adequate control of Peach-potato aphid. In marginal areas OSR may be taken out of the rotation leading to tighter cereal rotations which could lead to greater problems with weed management in cereal crops which already face significant issues with Black grass control.

6.7 Cruiser OSR is only sold to seed processors in the UK who apply the treatment through machinery designed and manufactured for the purpose by trained and qualified operators. Stewardship of the product in the UK, which is an important component of safety, has been assessed as excellent.

6.8 Seed processors are required to submit representative samples of treated seed for chemical and dust loading analysis to ensure accurate application and all applicators have been independently audited to ensure they are able to apply the treatments correctly.

7. Current Regulatory Requirements Relating to Bee Health for Registration

7.1 We believe that it is important for the committee to note the current regulatory requirements for registering a crop protection product in the EU, specifically with regard to assessing the potential impact on bees.

7.2 Before a pesticide can be used in the UK, it has to be registered under the EU Plant Protection Product Directive 1107–2009 and under this Directive the following first tier honey bee safety toxicity data are required from Registrants:-

- laboratory acute toxicity (both oral and contact) of pesticides to adult honeybees;
- chronic toxicity to adult honeybees; and
- chronic toxicity to larval bees/bee brood.

7.3 These studies reflect the intrinsic hazard of a pesticide under worst case laboratory conditions and must be conducted according to published international Guidelines (eg OECD/EPPO) and also meet Good Laboratory Practise requirements.

7.4 Data from the above laboratory studies are assessed by UK CRD, under Directive 1107–2009's Honeybee Risk Assessment Framework, and if EC agreed safety thresholds are not met, either labelled restrictions in use are applied (eg "Harmful/Dangerous/Extremely Dangerous to bees: Do not apply to crops in flower or to those in which bees are actively foraging. Do not apply when flowering weeds are present"); or further honeybee safety testing is required in order to demonstrate safety to honeybees under semi-field/field conditions.

7.5 Such field studies are a better reflection of the actual risk to honeybees under in-use conditions and are targeted to support specific crop/application type scenarios eg foliar applications to OSR.

7.6 The European Food Safety Agency (EFSA) is currently reviewing the EC Guidelines for bee pesticide testing and risk assessment, and a finalised Guideline is expected in early 2013.

8. Human Health and Neonicotinoids

8.1. TMX is of low acute toxicity and is non genotoxic. TMX has been extensively evaluated in a whole range of toxicity studies up to lifetime bioassays and is not carcinogenic and is not a developmental or reproductive toxicant.

8.2. It causes no significant neurotoxicity and is not developmentally neurotoxic.

9. Henry Et Al and Our Commitment to New Research

9.1 As we have detailed Syngenta has a comprehensive honeybee safety data package for its TMX containing products, including laboratory/semi-field studies and multiple field studies covering various different crop application type uses worldwide.

9.2 We also assess all new environmental research and data relating to all neonicotinoid products (TMX and competitor compounds) and respond accordingly.

9.3 A recently published paper in Science (Henry et al 2012) reported foraging disruption for bees from an experiment simulating exposure to residues in pollen and nectar (at unrealistically high concentrations—30x above those found in OSR nectar) from TMX seed treated OSR.

9.4 In light of this study, Syngenta is in the process of developing and conducting an in-use field study exposing honeybees to TMX seed treated OSR, and using the same Radio-Frequency Identification Tags (RFiD) technology as Henry et al, which will investigate any potential foraging effects on honeybees under more realistic in-use field conditions.

9.5 Results from this study should be available after next year's bee season—2013.

9.6 Syngenta has also recently funded an 18 month Post-Doctoral Research Project at Exeter University to investigate an epidemiological study on European Honeybee health using the established "Hill's Criteria"[iii].

9.7 This study will investigate the following factors:- neonicotinoids; other insecticides; degraded honeybee forage; varroasis; bee viruses; Nosema; honeybee economical factors; and honeybee husbandry practices. This study will be completed in April 2014. The study author is open to interpret and publish the results of this work without permission or approval from Syngenta.

10. Operation Pollinator

10.1 Forage and habitat for bees are critical to their success. As part of our own commitment to sustainable farming we are supporting the rollout of pollen and nectar rich field margin strips across 10,000 hectares in key European countries through our Operation Pollinator project—www.operationpollinator.com

10.2 To date over 1,000 hectares have been planted and established in the UK—with data showing significant increases in pollinator numbers and indications of yield increase in flowering crops grown adjacent and alongside these strips.

10.3 In May 2011, as part of Operation Pollinator, a further project was undertaken in the UK to look at ways of increasing OSR yield and improving oil quality using native and managed pollinators from the landscape as an ecosystem service to enhance the OSR potential.

10.4 A team of six independent entomologists led by the Centre of Ecology and Hydrology (CEH) carried out field observations in twenty four flowering commercial crops of winter OSR across the South Central Region of the UK.

10.5 This action was carried out to establish which pollinators were active in the flowering crop, the level of flower visitation taking place, and pollen transfer active between the stigma and the stamens when pollinators were present on the flower.

10.6 The farmers growing these crops had established them in the previous autumn in 2010, unaware of the project's conception or their future involvement and had all applied Cruiser OSR seed treatments to their OSR seed , drilled the crop, applied full autumn crop protection programmes and subsequently applied a spring crop protection programme as recommended by their farm agronomist which included a foliar applied insecticide in all cases to control a significant attack on the crop at green bud growth stage of Pollen Beetle that season.

10.7 The results concluded from these observations, at peak flowering time within the OSR crop, that visitation to the OSR flowers took place by some 36 different species of bee pollinator, including the Honey Bee (*Apis mellifera*) most abundant visitors, 9 Bumblebee Species (*Bombus spp*.) and 26 Solitary and Mining bee species (*Andrena, Megachile* and *Osmia spp*)

10.8 Indications also suggest that stronger flying species such as honey bees and bumblebees moved from surrounding hives & nest sites to the crop and back whilst foraging for pollen and nectar but the less powerful fliers the solitary and mining bee species actually lived within the crop itself, often setting up nest sites within the "crop tramlines" where bare ground for their burrows could be established.

10.9 The project continues to investigate the potential of using both managed (honey bees) and native bee species (bumblebee and solitaries) within the intensively farmed crop to increase yield and oil quality as a sustainable ecosystem service.

11. Syngenta Bioline

11.1 The committee's inquiry remit makes reference to integrated pest management (IPM). Syngenta supports the principle of IPM as a component of sustainable agriculture and we work to support these approaches where applicable to context.

11.2 As part of that approach, Syngenta Bioline produces high quality products containing natural beneficial insects and mites for use in Integrated Crop Management programmes to control pests. The principal crops where these products are covered salad vegetables, soft fruit, and ornamentals.

11.3 Syngenta Bioline is an integrated component of Syngenta's wider business and our crop teams work with customers to look at ways in which beneficial insects can be used to deliver effective outcomes in terms of pest management.

11.4 Although we are ambitious for the continued growth and development of our Bioline business we also believe (based on technical assessment and data) that there are considerable limitations and inherent risks to large scale—in-field—substitution of insecticide chemicals by targeted biological pest management processes.

11.5 However, we remain committed to delivering sustainable farming systems with a range of proven inputs (including IPM practices and beneficial insects), relevant to context, and balanced to ensure optimal environmental and economic output for farm businesses in the UK and around the world.

8 November 2012

References

[i] http://www.anses.fr/Documents/DPR2012sa0092.pdf—ANSES concluded—"In the current state of knowledge, the results presented in the article by Henry et al. 2012 are not considered to challenge the conclusions of risk assessments conducted as part of the application for authorization to market the product CRUISER OSR and done according to current regulatory criteria, but the study shows that the methodologies implemented in this framework have limitations in terms of sensitivity. The bee toxicity information considered for the approval of thiamethoxam under Regulation (EC) No 1107/2009 and listed on page 8 of this Opinion are not modified by the results of this study."

[ii] Reference points—titles, authors and journals.

— **Data showing no effect of field relevent doses of neonics to bees or papers that state neonics are unlikely to be responsible for decline in bee health**

C Schneider, J Tautz, B Grunewald and S Fuchs, (2012).
RFID Tracking of Sublethal Effects of Two Neonicotinoid Insecticides on the Foraging Behavior of Apis mellifera:
PLoS One, Vol 7, Issue 1.

J Cresswell, (2011).
A meta-analysis of experiments testing the effects of a neonicotinoid insecticide (imidacloprid) on honey bees:
Ecotoxicology Vol 20: pp149–157

J Cresswell, N Desneux and D van Engelsdorp (2012).
Dietary traces of neonicotinoid pesticides as a cause of population declines in honey bees: an evaluation by Hill's epidemiological criteria
Pest Management Science Vol 68, Issue 6, pages 819–827.

T Blacquiere, G Smagghe, A Cornelis, M van Gestel, and V Mommaerts, (2012).
Neonicotinoids in bees: a review on concentrations, side-effects and risk assessment.
Ecotoxicology Vol 21, pp 973–992.

A Imdorf, J Charriere and P Gallmann (2006).
Mögliche Ursachen für die Völkerverluste der letzten Jahre
Schweizerische Bienen-Zeitung 8/2006

R Oliver (2012).
Neonicotinoids: Trying To Make Sense of the Science:
American Bee Journal, August, 2012.
http://scientificbeekeeping.com/neonicotinoids-trying-to-make-sense-of-the-science/
Varroa or Varroa + disease/virus's are the likely main reason for bee decline

B Dainat, J Evans, Y Chen, L Gauthier and P Neumann (2012).
Predictive Markers of Honey Bee Colony Collapse.
PLoS One, Vol 7, Issue 2

S Martin, A Highfield, L Brettell, E Villalobos, G Budge, M Powell, S Nikaido and D Schroeder (2012).
Global Honey Bee Viral Landscape Altered by a Parasitic Mite.
Science **336**, 1304.

E Guzmán-Novoa, L Eccles, Y Calvete, J Mcgowan, P Kelly, A Correa-Beńitez (2010).
Varroa destructor is the main culprit for the death and reduced populations of overwintered honey bee (*Apis mellifera*) colonies in Ontario, Canada.
Apidologie, Available online at: www.apidologie.org. INRA/DIB-AGIB/EDP Sciences, 2010

N Szabo, S Colla, D Wagner, L Gall and J Kerr (2012).
Do pathogen spillover, pesticide use, or habitat loss explain recent North American bumblebee declines?
Conservation Letters 00 (2012) 1–8 Copyright and Photocopying: c 2012 Wiley Periodicals, Inc.

J Charrière and P Neumann (2010).
Surveys to estimate winter losses in Switzerland.
Journal of Apicultural Research 49(1): 132–133.

F Nazzi, S Brown, D Annoscia, F Del Piccolo, G Di Prisco, P Varricchio, G Vedova, F Cattonaro, E Caprio and F Pennacchio (2012).
Synergistic Parasite-Pathogen Interactions Mediated by Host Immunity Can Drive the Collapse of Honeybee Colonies.
PLoS One, Vol 8, Issue 6.

E Genersch (2010).
Honey bee pathology: current threats to honey bees and beekeeping.
Appl Microbiol Biotechnol Vol 87: pp87–97

P Rosenkranz, P Aumeier and B Ziegelmann (2010).
Biology and control of Varroa destructor.
Journal of Invertebrate Pathology Vol 103, pp96–119
Complicated and multi-factorial nature for bee decline

D van Engelsdorp, D Tarpy, E Lengerich and J Pettis (2012).
Idiopathic brood disease syndrome and queen events as precursors of colony mortality in migratory beekeeping operations in the eastern United States.
Preventative Veterinary Medicine. http://dx.doi.org/10.1016/j.prevetmed.2012.08.004

P Neumann and N Carreck, (2010).
Honey bee colony losses
Journal of Apicultural Research Vol 49(1): pp1–6)

[ii] Hill A, The environment and disease: association or causation? *Proc R, SocMed* **58**:295–300 (1965).

Written evidence submitted by Dr Lynn Dicks, University of Cambridge

SUMMARY

1. Wild bees and other pollinating insects are known to be declining in the UK and elsewhere in response to multiple interacting pressures, including the use of pesticides.
2. There is an urgent need for data on the actual exposure of wild pollinators to neonicotinoids or combinations of pesticides in their natural environment.
3. The Defra project (PS2371) that is supposed to fill this knowledge gap seems unlikely to. I cannot scrutinise the methods, but as described it is a small case study with a potential methodological flaw.
4. Recent evidence on the sub-lethal effects of field-realistic levels of neonicotinoids on bumblebees shows that serious implications for bumblebee colonies are possible.
5. No similar evidence has been published for solitary bees or other flower-feeding insects.
6. There is a lack of transparency in the pesticide regulatory system. The details of studies supporting the regulatory assessment are inaccessible.
7. There are many alternative farm management measures to enhance the natural pest control service provided in farmed ecosystems. My team at Cambridge are compiling a synopsis of scientific evidence on the effectiveness of these.

TEXT OF SUBMISSION

1. *Wild pollinators are declining*

1.1 This document considers wild pollinators native to the UK. Following the UK National Ecosystem Assessment (Smith *et al.*, 2011) this includes all flower-visiting insect groups that have the potential to pollinate crops or wild flowers, including bees, flies, wasps, beetles, butterflies and moths. It does not consider the managed honey bee *Apis mellifera*.

1.2 Wild insect pollinators pollinate many crops and wild plants at no direct cost to farmers or land managers. For crops, the pollination service is currently valued at £510.2 million (Breeze *et al.*, 2012). Under favourable

assumptions for honey bees, 34% of the service is provided by them in the UK (Breeze *et al.*, 2011), leaving 66% that must be provided by wild insect pollinators.

1.3 There is evidence of recent declines in wild pollinators (Potts *et al.*, 2010) and indications of parallel declines in wild plants dependent on pollination (Biesmeijer *et al.*, 2006), but no evidence of declines in insect-pollinated crop yields (Aizen & Harder, 2009; Breeze *et al.*, 2011).

1.4 Much of the evidence for wild pollinator decline is inferred from changes in the recorded occurrence of species of bee, fly, beetle, or wasp (eg Biesmeijer *et al.*, 2006; Cameron *et al.*, 2011). These records are generally collected by volunteer participants without following a defined survey protocol. The primary aim of such recording is to produce distribution atlases (Collins & Roy, 2012), although methods to extract trends in geographic range and frequency from these data are developing (Biesmeijer *et al.*, 2006; Hill, 2011; Morris, 2010).

1.5 The direct evidence we have of declines in wild pollinator abundance over time (as opposed to declines in diversity or range) comes largely from long-term data on butterflies (and, to a lesser extent, moths), collected through participatory monitoring schemes with defined survey protocols involving standardised observations repeated regularly over space and time (Conrad *et al.*, 2006; Fox *et al.*, 2011; Warren *et al.*, 2001). There is some direct evidence for dramatic falls in the relative abundance of long-tongued bumblebee species in Sweden (Bommarco *et al.*, 2012). The Bumblebee Conservation Trust has recently started a national bumblebee survey in the UK.

1.6 Current scientific opinion is that pollinator decline is likely to be caused by multiple interacting pressures lowering pollinator health, abundance and diversity, rather than any single threat (Brown & Paxton, 2009; Potts *et al.*, 2010). Pesticides are one of these multiple, interacting threats.

2. *The need for data on actual exposure*

2.1 To assess the magnitude of the threat from pesticides, there is an urgent need for data on the actual exposure of wild pollinators to neonicotinoids, or to multiple pesticides including neonicotinoids, in their natural environment.

2.2 There are data on pesticide residues in nectar and pollen in crop plants (Cresswell, 2011), and in pollen, honey and wax collected or made by honey bees (Blacquiere *et al.*, 2012). Most of these data are not accompanied by data on the usage of the chemicals in the landscapes where the bees foraged.

2.3 I know of no published data on pesticide residues in products collected by free-living wild bees or ingested by other flower-feeding insects such as hoverflies. The foraging behaviour and life histories of flower-feeding insects mean that reported levels of pesticide residue in crop plant nectar and pollen do not equate to actual exposure (Brittain & Potts, 2011). Most flower-feeding insects are generalists and opportunists. They feed on a range of available resources, including wild plants and crop plants.

3. *Defra Project PS2371*

31. Defra has commissioned a project (PS2371) to "fill identified evidence gaps, including the questions raised about the relevance of recent studies to field conditions" (Defra, 2012). This project is described as an "edge of field exposure" study that will take place over a single season. It will presumably use captive-reared colonies of the buff-tailed bumblebee *Bombus terrestris*. I have not been able to see any detailed methods or plans for the project.

3.2 Whilst the project will undoubtedly provide interesting results, they will probably be limited to one common bumblebee species, in one landscape, in one year. The species, *Bombus terrestris*, is common and widespread. Its range has not declined, but there are no data on whether its abundance is changing over time. This project should be considered a single case study. It will not provide the evidence required to establish whether, or to what extent, wild pollinator declines are caused by pesticides.

3.3 One potential methodological flaw in the PS2371 study is that buff-tailed bumblebees have been experimentally shown to prefer to forage more than 100 m away from the colony site (Dramstad *et al.*, 2003). If the experimental colonies are placed on the edge of 1 ha (100 m x 100 m) fields of experimental oilseed rape, as suggested in the risk assessment guidelines, it is likely that they would choose not to forage in the rape. This species has an estimated foraging range of up to 625 m (Darvill *et al.*, 2010). The workers could be foraging anywhere in a 1.3 km diameter circle of landscape around the experimental fields and avoiding the experimental treated rape. It is unclear how this problem will be dealt with in the method.

3.4 This project provides no information about the exposure of wild solitary bees, hoverflies, butterflies and other flower feeders to pesticides.

4. *Serious implications for bumblebee colonies*

4.1 The existing published evidence about the sublethal effects of neonicotinoids on bumblebees (particularly Gill *et al.*, 2012; Whitehorn *et al.*, 2012) show serious implications for bumblebee colonies are possible, if they are being exposed in the wider environment at the levels tested. Effects have been measured on

reproductive fitness (85% reduction in new queen production) and colony foraging (69% of workers lost over four weeks when exposed to neonicotinoid and pyrethroid combined). Such effects would be unacceptable.

4.2 Defra's position seems to be that it would not change regulation unless there was unequivocal evidence that serious implications for bee colonies were likely.

4.3 The precautionary principle would suggest a planned phase out or temporary restriction of neonicotinoid use, awaiting further evidence of the likelihood of the demonstrated effects.

4.4 The Chemicals Regulation Directorate's comments reported by Defra (Defra, 2012) suggest that control and treatment groups were fed different diets in the Whitehorn study, with control bees consuming nectar while treated bees had sugar water. This is wrong. Both control and treatment controls were fed sugar water during the two-week experimental phase, then both control and treatment colonies were allowed to forage freely outside.

5. *No published evidence on sublethal effects for other wild pollinators*

5.1 There is no published evidence about the sublethal effects of field-realistic levels of neonicotinoids on solitary bees or other wild flower-feeding insect groups such as butterflies, moths and hoverflies.

5.2 Emerging evidence from the STEP project (www.step-project.net), not yet published, is expected to show adverse reproductive impacts on the solitary bee species *Osmia bicornis*.

6. *Lack of transparency in the regulatory process*

6.1 There is a distinct lack of transparency about the methods used to make regulatory assessments for individual pesticides. The multi-year/multi-site field trials referred to for thiamethoxam in the Defra document on neonicotinoids (Defra, 2012) are unpublished and apparently not available for scrutiny. Given the challenges of such field scale assessments, due to the foraging range of bees (see point 3.3) and the spatial and temporal variability of landscapes, the methods used are highly pertinent to any assessment of whether or not there is a likely unacceptable influence on non-target species. Why can scientists outside the regulatory process not have access to these studies?

7. *Measures to enhance natural pest control*

7.1 Alternative non-chemical approaches to pest control in a commercial farming context have not been given enough attention in policy or research. Pest and disease regulation is identified as an ecosystem service, delivered mostly in enclosed farmland and continuing to be highly impacted by the conversion and intensification of natural habitats to farmland (UK NEA, 2011). As pest regulation is largely delivered by free-living predatory invertebrates, the service is likely to be adversely affected by the use of insecticides and conversely, is likely to be enhanced by reducing insecticide use.

7.2 In France, the primary agricultural producer in Europe, the Ministry of Agriculture and Forestry's ECOPHYTO2018 Programme aims at a progressive eradication of 53 of the most dangerous chemicals, and a decrease of 50% in the use of pesticides within 10 years (by 2018). By contrast, the UK has no coordinated national effort to reduce pesticide use. Data published by the Food and Environment Research Agency show that overall pesticide application rates rose 6.5% between 2005 and 2010 in the UK, due to greater intensity of treatment per ha on some crops (Breeze *et al.*, 2012).

7.3 My team at the University of Cambridge are synthesizing scientific evidence on enhancing natural pest control, as part of a Natural Environment Research Council Knowledge Exchange Programme on Sustainable Food Production (www.nercsustainablefood.com). We are working with an international group of advisors, including experts in insect ecology and agronomy.

7.4 So far we have identified 59 different measures that can enhance natural pest control in arable or livestock farming. This list is unpublished, but can be provided on request. We have carried out a literature search using a systematic search protocol (submitted to the journal *Environmental Evidence*), and so far identified over 4,000 individual studies that provide evidence for the effectiveness of one or more of the 59 measures. We will begin summarising these studies in plain English in a synopsis of evidence format (see www.conservationevidence.com) early next year, and evidence should be compiled and available for a selection of the measures by summer 2013.

References

Aizen, M A & Harder, L D (2009). The Global Stock of Domesticated Honey Bees Is Growing Slower Than Agricultural Demand for Pollination. *Current Biology*, **19**, 915–918.

Biesmeijer, J C, Roberts, S P M, Reemer, M, Ohlemuller, R, Edwards, M, Peeters, T, Schaffers, A P, Potts, S G, Kleukers, R, Thomas, C D, Settele, J, & Kunin, W E (2006). Parallel declines in pollinators and insect-pollinated plants in Britain and the Netherlands. *Science*, **313**, 351–354.

Blacquiere, T, Smagghe, G, Gestel, C A M v, & Mommaerts, V (2012). Neonicotinoids in bees: a review on concentrations, side-effects and risk assessment. *Ecotoxicology*. DOI 10.1007/s10,646–012–0863-x.

Bommarco, R, Lundin, O, Smith, H G, & Rundlöf, M (2012). Drastic historic shifts in bumble-bee community composition in Sweden. *Proceedings of the Royal Society B*, **279**, 309–315.

Breeze, T D, Bailey, A P, Balcombe, K G, & Potts, S G (2011). Pollination services in the UK: How important are honeybees? *Agriculture, Ecosystems & Environment*, **142**, 137–143.

Breeze, T D, Roberts, S P M, & Potts, S G (2012). *The Decline of England's Bees: Policy Review and Recommendations*. Friends of the Earth, London.

Brittain, C & Potts, S G (2011). The potential impacts of insecticides on the life-history traits of bees and the consequences for pollination. *Basic and Applied Ecology*, **12**, 321–331.

Brown, M J F & Paxton, R J (2009). The conservation of bees: a global perspective. *Apidologie*, **40**, 410–416.

Cameron, S A, Lozier, J D, Strange, J P, Koch, J B, Cordes, N, Solter, L F, & Griswold, T L (2011). Patterns of widespread decline in North American bumble bees. *Proceedings of the National Academy of Sciences of the United States of America*, **108**, 662–667.

Collins, G A & Roy, H E (2012). *Provisional Atlas of the Aculeate Hymenoptera of Britain and Ireland Part 8.* Centre for Ecology and Hydrology.

Conrad, K F, Warren, M S, Fox, R, Parsons, M S, & Woiwod, I P (2006). Rapid declines of common, widespread British moths provide evidence of an insect biodiversity crisis. *Biological Conservation*, **132**, 279–291.

Cresswell, J E (2011). A meta-analysis of experiments testing the effects of a neonicotinoid insecticide (imidacloprid) on honey bees. *Ecotoxicology*, **20**, 149–157.

Darvill, B, O'Connor, S, Lye, G C, Waters, J, Lepais, O, & Goulson, D (2010). Cryptic differences in dispersal lead to differential sensitivity to habitat fragmentation in two bumblebee species. *Molecular Ecology*, **19**, 53–63.

Defra (2012). *Neonictonioid insecticides and bees: the state of the science and the regulatory response* Defra.

Dramstad, W E, Fry, G L A, & Schaffer, M J (2003). Bumblebee foraging—is closer really better? *Agriculture Ecosystems & Environment*, **95**, 349–357.

Food and Environment Research Agency (2012) *Pesticide Usage Statistics* http://pusstats.csl.gov.uk/index.cfm

Fox, R, Brereton, T, Asher, J, Botham, M S, Middlebrook, I, Roy, D B, & Warren, M S (2011). *The State of the UK's Butterflies 2011*. W Butterfly Conservation and the Centre for Ecology and Hydrology, Dorset.

Gill, R J, Ramos-Rodriguez, O, & Raine, N E (2012). Combined pesticide exposure severely affects individual- and colony-level traits in bees. *Nature*, advance online publication. DOI 10.1038/nature11,585.

Hill, M O (2011). Local frequency as a key to interpreting species occurrence data when recording effort is not known. *Methods in Ecology and Evolution*, **3**, 195–205.

Morris, R (2010). Web-based natural history recording. *British Wildlife*, **21**, 313–317.

Potts, S G, Biesmeijer, J C, Kremen, C, Neumann, P, Schweiger, O, & Kunin, W E (2010). Global pollinator declines: trends, impacts and drivers. *Trends in Ecology & Evolution*, **25**, 345–353.

Smith, P, Ashmore, M, Black, H, Burgess, P, Evans, C, Hails, R, Simon G Potts, Quine, T, Thomson, A, Biesmeijer, K, Breeze, T, Broadmeadow, M, Ferrier, R, Freer, J, Hansom, J, Haygarth, P, Hesketh, H, Hicks, K, Johnson, A, Kay, D, Kunin, W, Lilly, A, May, L, Memmott, J, Orr, H, Pickup, R, Purse, B, & Squire, G (2011). Chapter 14: Regulating services. In *The UK National Ecosystem Assessment Technical Report*. UK National Ecosystem Assessment, UNEP-WCMC, Cambridge.

UK National Ecosystem Assessment (2011). *The UK National Ecosystem Assessment*. UNEP-WCMC, Cambridge.

Warren, M S, Hill, J K, Thomas, J A, Asher, J, Fox, R, Huntley, B, Roy, D B, Telfer, M G, Jeffcoate, S, Harding, P, Jeffcoate, G, Willis, S G, Greatorex-Davies, J N, Moss, D, & Thomas, C D (2001). Rapid responses of British butterflies to opposing forces of climate and habitat change. *Nature*, **414**, 65–69.

Whitehorn, P R, O'Connor, S, Wackers, F L, & Goulson, D (2012). Neonicotinoid Pesticide Reduces Bumble Bee Colony Growth and Queen Production. *Science*, **336**, 351–352.

9 November 2012

Written evidence submitted by the Royal Society for the Protection of Birds

Executive Summary

— The aim of pesticide policy decisions must be to improve the overall sustainability of pest control. Any actions taken to address current concerns over neonicotinoids must be set in this broader context.

— The RSPB is highly concerned by emerging evidence of the impacts of neonicotinoids on pollinating insects. We further believe that the possible environmental impacts of a ban on neonicotinoids must play a key part in any decision to suspend approvals. It is imperative that any regulatory action does not drive farmers to resort to pesticides that are more environmentally damaging overall.

— We therefore feel that Government and industry should place a high priority on developing and promoting environmentally-benign alternative means of pest control (both chemical and non-chemical) to replace the use of neonicotinoids. At the same time, research must continue to clarify the impacts on neonicotinoids on pollinators, and to understand how farmer practice might change if these chemicals were banned.

— Pesticide usage in the UK is monitored and reported in terms of weight of active substance applied. There is a clear need to develop more direct and realistic ways of assessing pesticide impacts in the field. Lack of evidence does not necessarily imply lack of impacts.

— The RSPB believes that the UK policy response to date has been inadequate to address the known environmental risks from pesticide use and does not follow the precautionary principle. The Sustainable Use Directive sets out a clear framework for Member States to reduce the risks of pesticide use by applying an Integrated Pest Management approach (IPM). However, the UK government has failed to take this opportunity to increase support for IPM approaches in the UK.

Introduction

1. The RSPB's agriculture vision is for sustainable systems of farming that produce adequate supplies of safe, healthy food; protect the natural resources of soil, air and water that farming depends on; help to protect and enhance wildlife and habitats; provide jobs in rural areas and contribute to a diverse rural economy. The RSPB strives to achieve this vision by engaging with agriculture in a variety of ways. Our long-standing science programme includes monitoring farmland bird populations, researching causes of declines and testing solutions. We work with farmers to develop and promote farm management that benefits biodiversity, and with government to develop agricultural policies that support more sustainable farming. We have first-hand experience of the challenges of farming through ownership and running of Hope Farm, a conventional arable farm in Cambridgeshire.

2. The RSPB recognises pesticides as one of a range of tools in both agriculture and conservation land management, but one which must be used appropriately and sparingly due to the associated risks and negative environmental impacts. RSPB believes that the aim of pesticides policy must to be to continually improve the sustainability of pest control. The approvals processes in place at EU and UK level must stringently assess the risks of active substances before allowing them to be used, applying the precautionary principle where data are lacking. Substances that are found to have negative impacts on non-target organisms must be actively phased out according to appropriate timescales, while less harmful alternatives are developed. Pesticides policies must also ensure responsible pesticide use. This includes protecting the most vulnerable sites and habitats (for example sensitive waterbodies, SSSIs) from negative effects of pesticides; and promoting an "Integrated Pest Management" approach in all sectors,[51] with reduced reliance on chemical control and incorporation of measures beneficial for biodiversity. We urge that any actions taken to address current concerns over neonicotinoids should be set in this broader context.

3. The RSPB has not undertaken an assessment of Defra's recent analysis and we are therefore not equipped to comment on the use of evidence in this particular case, for setting policy and regulations on pesticides. However, we would like to comment more generally on current policies on neonicotinoids, as well as the broader questions posed by the Committee on monitoring of pesticide use and alternative methods of pest control.

[51] As defined in Annex III of Directive 2009/128/EC on the sustainable use of pesticides

Policy on Neonicotinoids

4. The RSPB is highly concerned by emerging evidence of the impacts of neonicotinoids on pollinating insects. Such impacts include lethal effects; in particular direct poisoning during drilling of treated seeds;[52] and chronic effects of exposure via pollen and nectar of treated plants.[53] Researchers have also detected neonicotinoids in non-crop plants growing in the margins of treated fields at concentrations high enough to kill herbivorous insects.[54] However, the evidence for population-level impacts on pollinators is still equivocal.[55]

5. There is an urgent need to fill the gaps in scientific knowledge to understand the impacts of neonicotinoids on pollinators. Nevertheless, the RSPB believes that the current evidence is strong enough that the Government and industry should place a high priority on developing and promoting environmentally-benign alternative means of pest control (both chemical and non-chemical) to replace the use of neonicotinoids.

6. The RSPB believes that the possible environmental impacts of a ban on neonicotinoids must play a key part in any decision to suspend approvals. Current alternatives, such as broad spectrum insecticide sprays, may be equally or more harmful to non-target organisms. It is imperative that any regulatory action does not drive farmers to resort to pesticides that are more environmentally damaging overall. Before changing the rules on neonicotinoids, it is therefore necessary to a) understand how farmer practice would change if neonicotinoids were banned, and the environmental implications of this; and b) actively work towards replacing neonicotinoids with pest management strategies that are known to be less environmentally damaging.

7. The RSPB is supportive of the activities at UK and EU level to carry out further research on neonicotinoids and to review the risk assessment process for bees. We urge the authorities to push forward with these processes and to fully implement any recommendations that arise, as well as continuing to follow closely the research being produced by independent scientists. We suggest that the UK government should also review experiences in other EU countries (France, Germany, Italy and Slovenia) where regulatory action on neonicotinoids has already been taken.

Monitoring of actual levels of pesticide usage, and the extent to which that influences policy on pesticides

8. The Pesticide Forum annual reports[56] bring together monitoring information on pesticide use and impacts. Pesticide use is reported in terms of estimated annual usage in tonnes of active substance applied and average inputs per crop (again in kg active substance applied per hectare). The draft National Action Plan on pesticides published by Defra in July 2012[57] also includes data on the total area treated with pesticides in Great Britain (an indicator which is a multiple of the area of crop grown and the number of times it is treated). However, these metrics are of limited use in assessing the changes in environmental impact of pesticide use over time, because different active substances have different characteristics (for example toxicity to different taxa and persistence in the environment).[58]

9. There is a clear need to develop more direct and realistic ways of assessing pesticide impacts in the field. A promising new approach using ecological modelling is being pioneered by researchers at the University of Reading.[59]

10. The indicators of environmental impact reported by the Pesticides Forum include water quality monitoring and population trends in selected bird species. Monitoring shows that pesticides continue to be a major cause of water pollution, with implications for both the aquatic environment and the cost to water companies (and therefore to water customers) of supplying safe drinking water. Populations of birds that depend on farmland habitats continue to decline. Scientific evidence[60] implicates the indirect effects of pesticides in the declines of some farmland birds including yellowhammer and corn bunting which have declined by 55% and 89% respectively. However, it is difficult to quantify the link between bird declines and pesticide use, since birds are affected by many other factors as well as pesticides. Most pesticide impacts on birds are indirect, by altering food chains. It would be valuable to also consider data for other taxa (such as certain insect or plant groups) that are more directly affected by pesticide use.

11. The RSPB believes that the UK policy response to date has been inadequate to address the known environmental risks from pesticide use and does not follow the precautionary principle. The precautionary principle allows for a decisive policy response in situations where possible risks are high but evidence is lacking to quantify these risks. The RSPB believes that such evidence as is available on the impacts of

[52] Marzaro et al. (2011) Lethal aerial powdering of honey bees with neonicotinoids from fragments of maize seed coat. Bulletin of Insectology 64: 119–126

[53] See Pesticide Action Network UK factsheets for a summary of research on this issue: PAN (2012) Sub-lethal and chronic effects of neonicotinoids on bees and other pollinators. http:// bees.pan-uk.org/assets/downloads/Bee_factsheet2.pdf

[54] Krupke CH et al. 2012. *PLoS ONE* 7: e29268

[55] See for example Creswell, J E, Desneux, N & vanEngelsdorp, D (2012). Dietary traces of neonicotinoid pesticides as a cause of population declines in honey bees: an evaluation by Hill's epidemiological criteria. Pest Management Science 68: 819–827.

[56] http://www.pesticides.gov.uk/guidance/industries/pesticides/advisory-groups/pesticides-forum/pesticidesforum-annual-reports

[57] http://www.defra.gov.uk/consult/2012/07/30/uknap-pesticides/

[58] Reus, J. et al. (2002) Comparison and evaluation of eight pesticide environmental risk indicators developed in Europe and recommendations for future use. AGRICULTURE ECOSYSTEMS & ENVIRONMENT 90: 177–187

[59] http://cream-itn.eu/projects/wp-3/bird-1-modelling-the-importance-of-landscape-structure-and-life-history-traitsfor-the-risk-to-populations-of-skylarks-phd-university-of-reading-uk

[60] Boatman, N.D. et al. (2004) Evidence for the indirect effects of pesticides on farmland birds. Ibis 146: 131–143

pesticides on the environment points to a high level of risk. A lack of quantitative evidence on impacts may point to a lack of research rather than lack of a problem. Although it is vital for policy to be evidence-led, policy makers must be aware of situations where policy can be evidence-limited.

12. The government's insistence on "no gold plating"[61] in its implementation of the Sustainable Use Directive[62] has resulted in a missed opportunity to put pest control in the UK on a more sustainable footing. Government's draft National Action Plan on the sustainable use of pesticides does not propose any new measures nor set any targets or timetables to reduce the negative impacts of pesticides. The RSPB calls for a more proactive implementation of the Sustainable Use Directive that is in keeping with the intention of this Directive to promote a shift to more sustainable pest control practices in farming.

What alternative pest-control measures should be used?

13. The Sustainable Use Directive sets out a clear framework for Member States to reduce the risks of pesticide use by applying an Integrated Pest Management approach (IPM). IPM has the potential to simultaneously improve pest control while helping farming to become more sustainable and resilient overall. From the point of view of individual farmers, it may help them to reduce their costs and avoid or overcome problems of pesticide resistance.[63] Some IPM measures can also contribute to biodiversity objectives, for example providing habitat for beneficial insects.[64]

14. IPM describes an overall approach to pest control and cannot be achieved by implementation of one or two measures in isolation. However, one important set of measures that may be included in a successful IPM strategy is creating and managing habitat for the natural enemies of pest species. Evidence on the success of such approaches was reviewed by Natural England in their recent report on ecosystem services delivered by Environmental Stewardship.[65]

15. Organic farming aims to avoid the need for pesticides[66] through maintaining healthy crops and soil and promoting natural control of pests, and has clear benefits for biodiversity.[67] The RSPB wishes to see increased funding for organic farming and more research into organic techniques as part of the strategy for more sustainable farming in the UK. Techniques used in organic farming to minimise chemical use should be incorporated into the IPM toolkit used by conventional farmers.

16. The draft UK National Action Plan states that many users adopt practices that are in line with the principles of IPM. A 2009 report by the Rural Economy and Land Use Programme[68] supports the assertion that some measures are widely adopted, but also highlights a lack of uptake of a truly integrated approach making use of the full range of techniques. Effective IPM cannot be delivered by uptake of one or two techniques in isolation.

17. The RSPB calls on government to develop a clear definition of IPM that builds on the principles set out in the Sustainable Use Directive;[69] develop crop and sector-specific IPM protocols; and provide extension and outreach services to assist farmers in implementing IPM. The IPM plan currently under development represents an opportunity to achieve many of these outcomes. The plan should offer farmers a clear benchmark for their current performance, along with recommendations to improve and links to the resources available to help with this.

Hope Farm Example

18. The RSPB owns and manages a 181 hectare arable farm in Cambridgeshire,[70] known as Hope Farm. Our aim at Hope Farm is to develop, test and demonstrate farming techniques that produce food cost-effectively and benefit wildlife within a conventional arable system. Management of the farm is a continuous process of learning and improvement—we do not claim to have all the answers. We have taken some steps towards IPM on the farm and we intend to develop this approach further.

19. The RSPB has had significant success in increasing levels of biodiversity on the farm since we took over management in 1999. Farmland birds, the most systematically monitored group, have more than doubled

[61] http://www.defra.gov.uk/news/2010/12/15/pesticides/

[62] DIRECTIVE 2009/128/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides.

[63] Data on known resistance problems are available from the Resistance Action Groups: http://www.pesticides.gov.uk/guidance/industries/pesticides/advisory-groups/Resistance-Action-Groups.

[64] Food and Environment Research Agency. 2012. Ecosystem services from Environmental Stewardship that benefit agricultural production. Natural England Commissioned Reports, Number 102.

[65] Food and Environment Research Agency. 2012. Ecosystem services from Environmental Stewardship that benefit agricultural production. Natural England Commissioned Reports, Number 102.

[66] See the Soil Association's standards http://www.soilassociation.org/LinkClick.aspx?fileticket=l-LqUg6iIlo%3d&tabid=353 (section 4.11) and factsheet http://www.soilassociation.org/LinkClick.aspx?fileticket=XN06h4o5BOs%3D&tabid=143 for details of the use of pesticides in organic farming.

[67] Hole, D G et al. (2005). Does organic farming benefit biodiversity? Biological Conservation 122: 113–130

[68] Relu policy and practice note no. 10 (2009). Overcoming Market and Technical Obstacles to Alternative Pest Management in Arable Systems. ttp://www.relu.ac.uk/news/policy%20and%20practice%20notes/Bailey/Bailey%20PPN10.pdf

[69] Annex III of the Directive sets out the general principles of IPM.

[70] Further information available from the RSPB website: http://www.rspb.org.uk/ourwork/farming/hopefarm/

in number. Our focus has been on creating sufficient habitat to support sustainable bird populations within the farmed landscape. This includes refuges for insects—margins, hedgerows, beetle banks etc—which should mitigate the negative effects of pesticides and help improve natural pest control.

20. We employ an agronomist to help us decide on the most appropriate pesticides to use, we follow best practice in terms of when and how we apply chemicals, and we minimise our use of pesticides as far as possible within this conventional farming system. For example some years ago we changed our variety of wheat to one that is orange blossom midge resistant, considerably reducing the likelihood of needing to spray insecticides on our wheat crops within the bird breeding season.

21. Data from Hope Farm is being used to develop a model to assess the risks that pesticides pose to skylark populations[71] (see also paragraph 9 above). Skylark is a useful indicator species of the effects of pesticides because of it is field-dwelling and therefore vulnerable to agricultural practice such as pesticide application. This makes it a key species for regulatory risk assessments but at present there is no way to fully assess the risks that pesticides pose to skylark populations.

9 November 2012

Written Evidence submitted by Georgina Downs, UK Pesticides Campaign

Executive Summary

1.1 On the understanding[72] that the Environmental Audit Committee will be considering wider issues in its inquiry than just the impact of neonicotinoid pesticides on bees and other pollinators, then the UK Pesticides Campaign submits the following written evidence, which is primarily in relation to the exposures, risks and adverse health impacts of pesticides[73] *in general* (and not specifically neonicotinoids) on residents and the public.

1.2 A **short summary** of the UK Pesticides Campaign's written evidence is as follows:-

- All chemical pesticides are deliberately designed to be toxic, that is their purpose, and therefore all chemical pesticides have inherent hazards for human health.
- The dangers of pesticides can clearly be seen on the data sheet for each pesticide product that can carry various warnings such as *"Very toxic by inhalation," "Do not breathe spray; fumes; vapour," "Risk of serious damage to eyes," "Harmful, possible risk of irreversible effects through inhalation,"* and even *"May be fatal if inhaled."*
- It is now beyond dispute that pesticides can cause a wide range of both acute, and chronic, adverse effects on human health, including on the health of residents exposed to them. This includes irreversible and permanent chronic effects, illnesses and diseases.
- Approx. 80% of pesticides used in the UK each year are related to agricultural use.
- The majority of poisoning incidents and acute adverse health effects recorded annually in the Government's own monitoring system are from agricultural pesticides used on crops.
- The Government has **repeatedly failed to take action** when faced with, including in its own monitoring system, evidence of actual harm, as well as the risk of harm, to human health from crop-spraying under the current policy and approvals regime.
- Yet **EU law requires** that pesticides can only be authorised for use if it has been **established** that there will be ***no harmful effect*** **on human health**. It also **requires** a proactive approach to reviewing authorisations *after* approval, including that authorisations shall be cancelled and pesticides prohibited where there is a risk of harm.
- The Government's monitoring system currently only considers the acute effects of *individual* pesticides and therefore does not, in general, monitor or deal with either (i) chronic ill-health effects caused by pesticides or (ii) the effects of mixtures of pesticides. The fact that there has been, to date, no specific monitoring or collection of data in the Government's monitoring system in relation to the chronic effects, illnesses and diseases reported by people is a situation that has previously been criticized in a number of official reports dating back to 1987 and Government has *still* not changed its policy to rectify this.
- The **reality of crop spraying in the countryside** is not merely related to exposure to one individual pesticide or to one single group of pesticides, as agricultural pesticides are rarely used individually but commonly sprayed in mixtures (cocktails)—quite often a mixture will consist of 4 or 5 different products. Each product formulation in itself can contain a number of different active ingredients, as well as other chemicals, such as solvents, surfactants and co-formulants (some of which can have adverse effects in their own right, *before* considering any potential synergistic effects in a mixture(s)). Studies have shown mixtures of pesticides (and/or other chemicals) can have synergistic effects.

[71] http://cream-itn.eu/work-packages-and-projects/wp-3-vertebrates/bird-1-modelling-the-importance-oflandscape-structure-and-life-history-traits-for-the-risk-to-populations-of-skylarks-phd-university-of-reading-uk

[72] As indicated by the Committee Clerks of the Environmental Audit Committee.

[73] The main types of pesticides used in agriculture include insecticides, herbicides, and fungicides.

— Scientific papers have concluded that *"the total emissions of pesticides may range from several% up to almost all the applied quantities"* and in relation to vapour that, "*Volatilization may represent a major dissipation pathway for pesticides applied to soils or crops, accounting for up to 90% of the application dose in some cases"*, and that *"Volatilization may last for a period of several days to a few weeks (or sometimes even longer), and sometimes exhibits a diurnal cycle"*.

— Scientific studies have found pesticides **miles** away from where they were applied and have calculated health risks for residents and communities living within those distances.

— **The existing UK Government policy and approvals system fundamentally fails to protect people in the countryside from pesticides, particularly rural residents.**

— There are serious flaws in the approach to exposure and risk assessment for public health.

— The fact that, to date, there has never been ***any*** assessment in the UK of the risks to health for the long term exposure for those who live in the locality of pesticide sprayed fields, and/or who go to school in the locality of sprayed fields, means that under EU law **pesticides should never have been approved for use in the first place for spraying in the locality of residents' homes, schools, children's playgrounds, among other areas.**

— Children are particularly vulnerable to the effects of pesticide exposure because their bodies cannot efficiently detoxify chemicals, as their organs are still growing and developing. Also when children are exposed at such a young age they will obviously have a longer lifetime to develop long-term chronic effects after any exposure.

— The Government previously **failed to act** on its *own findings* of 82 exceedances of the EU limits set for exposure (the AOEL), in some cases the AOEL **was exceeded up to 20 to 30 times over**, which is an *order of magnitude higher,* when **any** exceedance, on the Government's *own previously stated case,* and most importantly **under EU law**, **would lead to immediate action of authorizations being refused (or trigger prohibition/revocation if the AOEL exceedance is discovered *after* approval).**

— The Government's previous estimated exceedances of the AOEL clearly demonstrated that products have been in use in the UK which resulted in residents (and others in the countryside) being exposed to levels greatly in excess of the AOEL, year after year.

— Yet the UK Government has **not, to date, taken any action** to prevent the exposure and risk of harm for residents in these circumstances, and has violated its obligation under EU law to prohibit the use of pesticides where the AOEL is known to be exceeded.

— The UK Government has continued to refuse to introduce **any** statutory conditions of use to protect residents and others from exposure. Such conditions of use would include, most importantly, the prohibition of the use of pesticides in the locality of residents' homes, as well as schools, children's playgrounds, nurseries, hospitals, amongst other areas. Yet such a measure is absolutely crucial for public health protection, especially that of vulnerable groups, including babies, children, pregnant women, and those already ill.

— Therefore, in relation to the health of rural residents and communities, the UK Government has, to date, knowingly failed to act, has continued to shift the goalposts, cherry picked the science to suit the desired outcome and has misled the public, especially residents, over the safety of agricultural pesticides sprayed on crop fields throughout the country. The Government's continued line that there is no evidence of harm from pesticides, as well as no risk of harm, is just untenable and inexcusable. The evidence is there and has been there for a considerable time, the Government is just determined not to act on it. The Government's response to this issue has been of the utmost complacency, is completely irresponsible and is definitely not *"evidence-based policy-making."*

— The failings in the UK Government's policy and approach to exposure and risk assessment regarding human health, and related and repeated inaction, is also comparable to the serious concerns that have been raised regarding the UK Government's policy and approach to exposure and risk assessment in relation to other species, such as bees.

— Bees and other species, just like residents and other humans, could be exposed to innumerable *mixtures* of pesticides, repeatedly, throughout every year, and for years.

— In relation to the risk of harm to bees from pesticide mixtures, a US study in 2010 highlighted the potential synergistic effects on bee health from mixtures and combinations of different pesticides as the researchers found 121 **different** pesticides and metabolites within 887 wax, pollen, bee and associated hive samples. Therefore aside from the individual products that carry warnings of a risk to bees on the product label and safety data sheet information (such as *"harmful", "dangerous", "extremely dangerous" or "high risk"* to bees), there will also be the risk of adverse impacts on bee health from the cumulative effects of multiple exposures to mixtures of different pesticides.

— The **reality of pesticide spraying in the countryside** is **not** reflected in any of the risk assessments under the UK Government's existing approach, whether for humans or bees.

— The principal aim of pesticide policy and regulation is supposed to be the protection of public health and the environment. Yet the Government, DEFRA, PSD (now CRD), and ACP, have all continued to base decisions in relation to pesticides on the protection of industry and business interests as opposed to what is absolutely required as the number one priority of pesticide policy and regulation—**to protect public health.**

— Sales of pesticides in the UK *alone* for 2011–12 was £627 million, and reports have put the value of the world pesticides industry at around a staggering $52 billion.

— There are clear conflicts of interests in relation to those advising DEFRA Ministers over the pesticides policy agenda, especially regarding the Chemicals Regulation Directorate (CRD) that receives approx. 60% of its funding from the agrochemical industry. This is broken down into the fees charged to companies for applications, and a charge on the UK turnover of pesticides companies. For a number of years now this has resulted in the CRD receiving around £7 million or more per year from the agro-chemical industry.

— A number of ACP members have links to the pesticides industry. For eg., some members may undertake consultancy work, have shares in and/or receive funding for research support. This has always been an inappropriate structure, as so-called *"independent"* advisors cannot possibly be classified as independent if they have financial or other links with the very industries they are overseeing in relation to the hazards to human health.

— Ministers have also been receiving advice from the Pesticides Forum for many years, and yet year after year the Forum has wrongly asserted in its annual reports that *"the use of pesticides is **not** adversely impacting on the health of UK citizens or the environment."* Considering the grossly inaccurate statements that the Pesticides Forum has continued to make, effectively denying the adverse health and environmental impacts of pesticide use, then it is also of serious concern that it is intended that the Forum be responsible for the monitoring and review of the UK's Action Plan on pesticides after it has been adopted.

— The UK's policy and approvals regime is based on a wholly inappropriate structure and it goes some way to explaining why the pesticide industry has, for many years, had such control over successive Governments' policy decisions on pesticides, particularly in relation to the use of pesticides in agriculture. Successive Governments have continued to reflect the position of the pesticides industry in **all policy decisions taken to date on pesticides**, (at least since the UK Pesticides Campaign has been in existence since 2001).

— The only real solution to **eliminate** the adverse health and environmental impacts of pesticides is to take a **preventative approach** and avoid exposure altogether with the widespread adoption of truly sustainable **non-chemical farming methods**. This would obviously be more in line with the objectives for sustainable crop production, as the reliance on complex chemicals designed to kill plants, insects or other forms of life, cannot be classified as sustainable. **Therefore it is a complete paradigm shift that is needed, as no toxic chemicals that have related risks and adverse effects for any species (whether humans, bees or other) should be used to grow food.**

1. Introduction

1.3 The UK Pesticides Campaign was founded in 2001 and is the only campaign, not only in the UK, but also across Europe, that specifically exists to highlight the risks and adverse health, environmental and financial impacts of pesticides on rural residents and communities, as well as on other members of the public exposed. I myself, as the Founder and Director of the UK Pesticides Campaign, have lived next to regularly sprayed fields for over 28 years, and I therefore have the direct experience of living in this situation.

1.4 Over the last 11 years the UK Pesticides Campaign has produced extensive written and visual materials, and has made a number of presentations across Europe, to highlight the UK Government's fundamental failure to protect public health, in particular rural residents and communities, from exposure to agricultural pesticides sprayed in the locality of residents' homes, schools, children's playgrounds, and public areas. The visual materials produced include two videos entitled *"Pesticide Exposures for People in Agricultural Areas—Part 1 Pesticides in the Air; Part 2 The Hidden Costs"* to illustrate chemical exposure and the acute and chronic adverse impacts on rural residents exposed.[74]

[74] The second video on the DVD entitled *"Pesticide Exposures for People in Agricultural Areas—Part 2 The Hidden Costs"* featured, just as an example, a few of the individuals and families from all over the country reporting acute and/or chronic adverse health effects in rural communities surrounded by sprayed fields.

1.5 The work of the UK Pesticides Campaign is widely recognised both nationally and internationally,[75] and has led to a considerable number of prestigious environmental awards and nominations.[76]

1.6 The position of the many residents and members of the public that have contacted the UK Pesticides Campaign (whether by email, phone, post, or other) is always very clear, in that they are fully supportive of, and sign up to, the aims and objectives of the campaign, (and are often very pleased to discover that there is a campaign specifically representing and fighting on residents' behalf). The emails the campaign has received, often detail the individual's own acute and/or chronic adverse health effects (or that of a family member(s) or other(s), or on their domesticated animals/pets etc.) as a result of exposure to agricultural pesticides from crop spraying in their locality. It is important to stress that the UK Pesticides Campaign does not just receive reports from residents, but also from farmers, operators, ex-farm managers and other workers exposed to pesticides. The UK Pesticides Campaign also receives reports from people who are exposed and suffer acute and/or chronic adverse effects from other pesticide sources, (eg such as amenity use) **however, agricultural exposure does make up the majority of the cases reported.**

1.7 The UK Pesticides Campaign has continued to campaign for the introduction of the following necessary **mandatory measures** for the protection of residents from pesticides:

- The **prohibition of pesticide use** in the locality of residents' homes, schools, children's playgrounds, hospitals, nurseries, and other buildings where people may be situated. Considering the distances that pesticides have been shown to travel then the distance where the use of pesticides is prohibited needs to be **substantial**.
- A new legal obligation to give rural residents **at least 48 hours' prior notification** before any pesticide spraying in their locality, including notification of the chemicals to be used.
- A new legal obligation for farmers and other pesticide users to provide information on the pesticides they use **directly** to residents (as third party access is inadequate, especially in the event of an acute poisoning when getting that information immediately is critical).

1.8 The UK Pesticides Campaign has continued to argue that the only real solution to eliminate the adverse health and environmental impacts of pesticides is through the widespread adoption of **non-chemical farming methods**. This would be more in line with the objectives for sustainable crop production, as the reliance on complex chemicals designed to kill plants, insects or other forms of life, cannot be classified as sustainable.

2. Adverse Impacts of Pesticides on Human Health

2.1 **All** chemical pesticides are deliberately designed to be toxic, that is their purpose, and **therefore all chemical pesticides have inherent hazards for human health.**

2.2 The dangers of pesticides can clearly be seen on the safety data sheet for each pesticide product that can carry various warnings such as "*Very toxic by inhalation,*" "*Do not breathe spray; fumes; vapour,*" "*Risk of serious damage to eyes,*" "*Harmful, possible risk of irreversible effects through inhalation,*" and even "***May be fatal if inhaled.***"

2.3 It is now beyond dispute that pesticides **can cause** a wide range of both acute, and chronic, adverse effects on human health. This includes irreversible and permanent chronic effects, illnesses and diseases. The European Commission (EC) clearly acknowledged when publishing the proposals for the new EU pesticides legislation (in July 2006) that pesticides can cause various adverse effects on human health, including on the health of rural residents who are exposed to them. For example, in the European Commission's July 2006 document entitled *"Questions and answers on the pesticides strategy"*[77] under the heading *"How do pesticides affect human health?"* the EC stated:

"Direct contact with the pesticide itself may occur during the time of application of the chemical but indirect exposure is the most common form of contamination. Residents and bystanders can be indirectly exposed to pesticides via spray drift. .. The effects of indirect exposure can be worse for especially vulnerable population groups such as children, the elderly or other particular risk groups (chronically sick people for instance).

[75] The work of the UK Pesticides Campaign has been featured in national and international media since 2002. Examples of national media coverage include: in the Times, Sunday Times, Financial Times, Guardian, Observer, Daily Telegraph, Sunday Telegraph, Daily Mail, Daily Express, Daily Mirror, Independent, Independent on Sunday, Metro; as well as on a number of BBC TV and radio programmes (including BBC News, Politics Show, Countryfile, The Food Police, Radio 4's: Today programme, Woman's Hour, You and Yours, PM, The World at One, Costing the Earth; BBC World Service, BBC Radio 5 Live); ITV and Channel 4 programmes (including ITV News, Channel 4 News,); and on Sky News. In relation to international media coverage, articles that have featured the work of the UK Pesticides Campaign have appeared in, amongst others, the US (including CNN), Canada, Australia, New Zealand, France, Germany, Portugal, India, and The Beijing News in China. In addition a diverse range of magazines have also featured the work of the campaign including: Cosmopolitan, Marie Clare, Grazia, Red, Vogue, Ecologist, Resurgence, Lifescape, Private Eye, Science in Parliament, Country Living, The Big Issue, New Consumer, Easy Living, Ethical Living, Spirit and Destiny, Landworker, Positive Health, amongst others. The work of the campaign has also been featured in a number of books including "*The Vitamin Murders*" by James Fergusson; "*Scared to Death*" by Christopher Booker/Richard North; "*Toxic Airlines*" by Tristan Loraine; "*People Power*" by Jon Robins and Paul Stookes.

[76] A list of awards and nominations can be seen at Wikipedia at:- http://en.wikipedia.org/wiki/Georgina_Downs

[77] Source: *"Questions and answers on the pesticides strategy"* published on 12th July 2006 and available at:- http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/06/278&format=HTML&aged=0&language=EN&guiLanguage=en

Long term exposure to pesticides can lead to serious disturbances to the immune system, sexual disorders, cancers, sterility, birth defects, damage to the nervous system and genetic damage.*"*

2.4 In the EC's July 2006 *"Impact Assessment of the Thematic Strategy on the Sustainable Use of Pesticides,"* that accompanied the proposal for a new Use Directive, the EC stated[78]

> *"**Acute impairment of health—**Short-time exposure to pesticides **can cause severe acute health effects**, including diarrhoea, nausea, vomiting, abdominal pain, profuse sweating, salivation, blurred vision, irritation of skin **and death** are examples that have been reported in various publications.*
>
> ***Chronic impairment of health—**Chronic health impairment results from a low but constant level and has a long-term character. Major incidents, in particular clear correlations between exposure and chronic effects, are not often recognised immediately since no obvious symptoms of poisoning exist.*
>
> *There are various sources for continuous exposure, like the consumption of polluted water, pesticide residues in food, regular application of PPP over many years, **or residential proximity to it and consequently direct exposure via air. People regularly or repeatedly exposed to or working with pesticides, may have a higher risk of incidence of cancer or other chronic diseases, birth defects, cancer in offspring, stillbirths and reproductive problems, skin rashes and disorders, disturbed enzyme and nervous system."***

2.5 The EC's July 2006 *"Impact Assessment of the Thematic Strategy on the Sustainable Use of Pesticides,"* that accompanied the proposal for a new Use Directive, went on to state: [79]

> *"Under real life conditions, **acute and chronic adverse effects associated with exposure to the common classes of pesticides** can vary a lot for a given substance or substance class. Conversely, different substances or substance classes **can cause** similar symptoms. For example, the following have been reported for certain classes of insecticides:*
>
> — *ORGANOPHOSPHATES **can cause** headaches, pain, weakness, numbness in extremities, dizziness, damage to memory, mood control, chest tightness, loss of coordination, uncontrolled urination, seizures, death due to respiratory failure;*
>
> — *CARBAMATES **can cause** headaches, genetic mutations, vomiting, birth defects, dizziness, reduced fertility, seizures, kidney damage, shortness of breath, nervous system damage;*
>
> — *PYRETHRINS and PYRETHROIDS **can cause** lack of coordination, deep lung allergy, convulsions, pneumonia, muscle paralysis, vomiting, asthma and death due to respiratory failure."*

2.6 These are just some of the acute and chronic adverse health effects that can result from exposure to a given substance or substance class. Residents can of course be exposed (unknowingly) to **all** these classes of pesticides, along with other classes, (as well as to innumerable *mixtures* of these and other classes), repeatedly, throughout every year, and in many cases, like my own situation, for decades, and currently under the UK policy and approach residents have **absolutely no protection at all** from the risks and related acute and chronic adverse health impacts. (See further paras 3.1—3.37 in the following section)

2.7 The EC Impact Assessment document goes on to again highlight the position of other vulnerable groups where any health risks may be increased, as it states:[80]

> *"Effects could be amplified for especially sensitive population groups, such as children (due to specific physiological and developmental factors), the elderly (due to their possibly compromised metabolic capacity), or other particular risk groups (immunologically compromised people, chronically sick, etc.)"*

2.8 In addition to the European Commission statements, Cornell University's teaching module *"Toxicity of Pesticides"* [81] clearly states that,

> ***"Pesticides can: cause deformities in unborn offspring (teratogenic effects), cause cancer (carcinogenic effects), cause mutations (mutagenic effects), poison the nervous system (neurotoxicity), or block the natural defenses of the immune system (immunotoxicity)." [82]***
>
> ***"Irreversible effects are permanent and cannot be changed once they have occurred. Injury to the nervous system is usually irreversible since its cells cannot divide and be replaced. Irreversible effects include birth defects, mutations, and cancer." [83]***

[78] Source: Page 23 of the *"Impact Assessment of the Thematic Strategy on the Sustainable Use of Pesticides"* published on 12th July 2006 and available at:- http://ec.europa.eu/environment/ppps/pdf/sec_2006_0894.pdf

[79] Ibid.

[80] Ibid.

[81] Cornell University's teaching module *"Toxicity of Pesticides"* can be seen at:-http://psep.cce.cornell.edu/Tutorials/core-tutorial/module04/index.aspx

[82] To see this quote in Cornell University's teaching module *"Toxicity of Pesticides"* click on *"Check Answer"* to the study question at:- http://psep.cce.cornell.edu/Tutorials/core-tutorial/xml/CoreTest.aspx?Q=4–19

[83] This quote can be seen in Cornell University's teaching module *"Toxicity of Pesticides"* at:-http://psep.cce.cornell.edu/Tutorials/core-tutorial/module04/index.aspx

2.9 There has been a significant increase in recent years of a number of these chronic health conditions. For example, according to cancer statistics, an estimated 12.7 million new cancer cases and 7.6 million deaths occurred worldwide in 2008.[84] There are around 309,500 new cases of cancer (excluding non-melanoma skin cancer) diagnosed each year in the UK alone, and more than one in three people will develop some form of cancer during their lifetime.[85] In 2009, there were more than 156,000 cancer deaths in the UK, and over one in four (28%) of all deaths in the UK were due to cancer.[86]

2.10 As recognised by the European Commission, pesticides can damage the brain and central nervous system of humans. This is not surprising considering that many pesticides are neurotoxic. Parkinson's Disease is a neurological disorder that has been repeatedly linked to pesticide exposure in numerous international studies. One reputable study published in March 2009 found that exposure to just two pesticides within 500 metres of residents' homes increased the risk of Parkinson's Disease by **75%**.[87] According to statistics from Parkinson's UK, 127,000 people live with Parkinson's in the UK, or 1 in 500 people.[88] One in 20 people who get Parkinson's is under 40 years of age.[89] There is currently no cure for Parkinson's.[90]

2.11 The cost to the UK economy of just a few of the chronic health conditions that pesticides can cause is massive. In the UK alone, in 2008, cancer cost £5.13 billion in terms of NHS costs alone, and the total costs to society in England was estimated to be a staggering £18.33 billion, with these costs predicted to increase to £24.72 billion by 2020.[91] It has been calculated that Parkinson's Disease costs the NHS £384 million per year with 78% of these costs being taken up by hospitalisations,[92] and the total cost in the UK of the disease is estimated to be between £449 million and £3.3 billion annually, depending on the cost model and prevalence rate used.[93]

2.12 **Although there are a number of different causes for these chronic conditions, even if pesticides are only causing a proportion, the costs would still be enormous, particularly when added up with all the health costs of other related conditions, along with all the environmental costs.** For example, the cost of removing pesticides from drinking water *alone* is estimated to be approx. £140 million per year.[94] It has been estimated to cost approx. a further £4.75 million to monitor pesticides at 2500 surface and groundwater sites.[95] It costs £2 million a year to check for pesticide residues in food[96] and an estimated £5.4 million for pesticide monitoring in both food and livestock together.[97,98]

2.13 It is therefore clear that chemical farming has enormous external costs in the UK every year. Obviously it goes without saying that the personal and human costs to those suffering chronic diseases and damage cannot be calculated in financial terms. The significance of these consequences requires the adoption of a **preventative approach** to make sure that the protection of human health *is* (which it currently is not, see further below) the overriding priority of the UK Government's pesticides policy and regulations.

2.14 Although UK citizens can be exposed to pesticides from a variety of agricultural and non-agricultural sources (including agricultural and horticultural uses; forestry; uses in the home and garden; and amenity uses) **the agricultural sector is the largest sector, as approximately 80% of pesticides used in the UK each year are related to agricultural use**[99] (and which is predominantly related to **ground spraying**, as there is only *limited* aerial spraying that still takes place in the UK). Therefore it is not surprising that the majority of poisoning incidents and acute adverse health effects that are recorded annually in the UK Government's own

84 Source: Worldwide cancer statistics from GLOBOCAN 2008 published in June 2010, which can be seen at:- http://info.cancerresearchuk.org/cancerstats/world/index.htm

85 UK statistics from Cancer Research UK published December 2011, which can be seen on the first page at: http://info.cancerresearchuk.org/prod_consump/groups/cr_common/@nre/@sta/documents/generalcontent/018070.pdf

86 UK statistics from Cancer Research UK published December 2011, which can be seen on the 2nd page at: http://info.cancerresearchuk.org/prod_consump/groups/cr_common/@nre/@sta/documents/generalcontent/018070.pdf

87 *"Parkinson's Disease and Residential Exposure to Maneb and Paraquat From Agricultural Applications in the Central Valley of California,"* by Sadie Costello, Myles Cockburn, Jeff Bronstein, Xinbo Zhang, Beate Ritz.

88 Source: Parkinson's statistics taken from the Parkinson's UK website at:- http://www.parkinsons.org.uk/about_parkinsons/what_is_parkinsons.aspx

89 Ibid.

90 Ibid.

91 Source: Policy Exchange, Research Note, Feb. 2010, entitled *"The cost of cancer,"* page 1, which can be seen at:- http://www.policyexchange.org.uk/images/publications/the%20cost%20of%20cancer%20-%20feb%2010.pdf

92 Source: Parkinson's statistics taken from the Parkinson's UK website in September 2010 in a section entitled *"The cost of Parkinson's to the NHS."* The website has been rejigged recently and the link for that page no longer works. However, the costs statistics were on there in September 2010 as I cited them in an article I wrote for the Ecologist published on 22nd October 2010 at:- http://www.theecologist.org/blogs_and_comments/commentators/other_comments/649883/the_pesticides_scandal_government_inaction_is_destroying_lives.html

93 Source: *"The economic impact of Parkinson's disease"* by Leslie J Findley, published in September 2007. Abstract can be seen at:- http://www.prd-journal.com/article/S1353–8020(07)00105–8/abstract

94 Source: Jules Pretty, Professor of Environment and Society in the Department of Biological Sciences at the University of Essex.

95 Source: *"An assessment of the total external costs of UK agriculture,"* Prof Jules Pretty et al, August 2000.

96 Source: Pesticide Residues Committee (PRC) secretariat, pers comm, September 2010.

97 Source: *"An assessment of the total external costs of UK agriculture,"* by Prof Jules Pretty et al, August 2000

98 These few examples given of some of the environmental costs are just in relation to the UK *alone* and before considering the equivalent costs across Europe.

99 Agricultural and horticultural uses account for approx. 80 per cent of the amount of pesticides used per year in the UK. Garden, home, forestry and amenity uses account for the balance per year in the UK. (NB. Amenity use only accounts for a mere 4% of pesticide use in the UK per year).

monitoring system are from agricultural pesticides that are used in crop spraying.[100] Further, it is also important to stress that the majority of these poisoning incidents and acute adverse health effects as a result of crop-spraying, are for **residents**, rather than operators, which is again not surprising considering operators generally have protection and residents do not.

2.15 For example, the acute adverse health effects recorded in the Government's own monitoring system[101] include, amongst other adverse health effects, the following:

— Chemical burns (including to the eyes and skin);

— Skin and eye irritancy (eg itching, stinging, burning sensations, rashes and blistering);

— Throat irritation (eg sore and painful throats); damaged vocal chords;

— Sinus pain; respiratory irritation; difficulty swallowing and chest discomfort; coughing; breathing problems; shortness of breath and asthma attacks;

— Headaches; dizziness; nausea; vomiting; stomach pains; flu-type illnesses; aching joints.

2.16 It is important to stress the fact that the Government's monitoring system currently only considers the acute effects of *individual* pesticides and therefore does not, in general, monitor or deal with either (i) chronic ill-health effects caused by pesticides or (ii) the effects of mixtures of pesticides. The fact that there has been, to date, no specific monitoring or collection of data in the Government's monitoring system in relation to the chronic effects, illnesses and diseases reported by people is a situation that has previously been criticized in a number of official reports[102] dating back to 1987 (which is now 25 years ago) and the Government has *still* not changed its policy to rectify this situation.

2.17 For the last 11 years the UK Pesticides Campaign has collected reports of both acute adverse health effects, as well as chronic long-term effects, illnesses and diseases, in rural communities where residents live in the locality of pesticide sprayed fields. The **acute effects** reported are the same types of acute effects recorded in the Government's very own monitoring system and include, sore throats, burning eyes, nose, skin, blisters, headaches, dizziness, nausea, stomach pains, burnt vocal chords and flu-type illnesses, amongst other things. The most common **chronic long-term illnesses and diseases** reported include various cancers, (especially breast cancer among rural women, as well as cancers of the prostate, stomach, bowel, brain, and skin), leukaemia, non-Hodgkins lymphoma, neurological conditions, (including Parkinson's disease, Multiple Sclerosis (MS) and Myalgic Encephalomyelitis (ME)), asthma, allergies, along with many other medical conditions. It is important to stress that there are a number of cases where the individuals involved **do have** confirmation from either their doctor (or other medical professional) that the acute and/or chronic effects **are caused** by pesticides. The reports cover all different age groups from the very young (including babies and young children) to the elderly. It is important to note that reports of this nature have gone on for decades.

2.18 **The UK Government has repeatedly failed to take action when faced with, including in its own monitoring system, evidence of actual harm, as well as the risk of harm, to human health caused by crop-spraying with pesticides under the current policy and approvals regime. Yet EU legislation requires that pesticides can only be authorised for use if it has been established that there will be *no immediate or delayed harmful effect* on human health.**[103] **It also requires a proactive approach to reviewing authorisations *after* approval, including that authorisations shall be cancelled and pesticides prohibited where there is a risk of harm to human health**.

2.19 It is important to stress the fact that the principal aim of any domestic pesticide policy, under then EU Directive 91/414/EEC, and now the new EU Regulation 1107–2009, [104] is based on the **risk of harm**, and ***not* that harm has to have already occurred**. Therefore as I have continued to argue both throughout my campaign, and the legal case proceedings, under EU legislation the UK Government is **not** supposed to be exposing residents (and others) to the ***risk* of harm** (whether it be acute or chronic adverse health effects) from exposure to pesticides. This was rightly recognized by Collins J in the High Court Judgment (eg see the final sentence of paragraph 23 of the High Court Judgment)[105]

[100] For example, the Pesticide Incidents ("PI") Reports, and the Field Operations Directorate ("FOD") Reports. For further information on these reports, and the Government's monitoring system in general, see paragraphs 72 to 118 of the second Witness Statement produced for the legal case *Georgina Downs v DEFRA,* available on the UK Pesticides Campaign website at:- http://www.pesticidescampaign.co.uk/documents/Downs%202.pdf

[101] Ibid.

[102] UK Agriculture Committee of the House of Commons, *The Effects of Pesticides on Human Health*, Second Special Report, Session 1986–87, London: HMSO 1987; the British Medical Association report, *The BMA Guide to Pesticides, Chemicals and Health,* BMA (Edward Arnold) 1990, 1992; the Royal Commission on Environmental Pollution 2005 report, *Crop Spraying and the Health of Residents and Bystanders*.

[103] Article 4(3)(b) and Article 4(2)(a) of the European Regulation 1107/2009 which can be seen at:- http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:309:0001:01:EN:HTML

[104] Available at:- http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:309:0001:01:EN:HTML

[105] http://www.bailii.org/cgi-bin/markup.cgi?doc=/ew/cases/EWHC/Admin/2008/2666.html&query=title+(+downs+)&method=boolean%20%3Chttp://www.bailii.org/cgi-bin/markup.cgi?doc=/ew/cases/EWHC/Admin/2008/2666.html&query=title+(+downs+)&method=boolean%3E

3. Failings of the Current UK Policy to Protect Residents (and the Public) from Pesticides

3.1 The existing UK Government policy and approvals system **fundamentally fails** to protect public health from pesticides, particularly in relation to rural residents and communities. Considering that the full policy failings are so extensive then, in addition to the summarised failings set out in the section above regarding the Government's repeated failure to take action when faced with, including in its own monitoring system, evidence of actual harm, as well as the risk of harm, to human health caused by crop-spraying, I will again only be able to summarise below the key points regarding the failings of the UK approach to exposure and risk assessment for human health. However, I can always provide further documentation if members of the Environmental Audit Committee want to see the **full detailed factual evidence** relating to the UK Government's policy failings regarding human health, and which is on the UK Pesticides Campaign website at:- http://www.pesticidescampaign.co.uk/witnessStatement_1.htm in particular the **second** Witness Statement that I produced for the legal case *Georgina Downs v DEFRA*.

3.2 It is important to note that, as will be seen from what is set out below, the failings in the Government's approach to exposure and risk assessment regarding **human health** is also comparable to the serious concerns that have been raised regarding the Government's approach to exposure and risk assessment in relation to other species, such as bees.

3.3 As said above, European legislation regarding the authorisation of pesticides (formerly EU Directive 91/414 and now EU Regulation 1107–2009[106]) **requires** that ***before*** pesticides can be approved for use, risk assessments **must** be undertaken **to establish** that there will be **no harmful effect** on human health. This must apply to **all** the necessary exposure groups, including operators, workers, **residents** living in the locality of pesticide sprayed fields, as well as other members of the public exposed (eg. such as bystanders).

3.4 In early 2001, I identified serious flaws in the Government's current policy and approvals system for protecting residents (and other members of the public) from pesticides and as a result I started to present a case to the Government (which was also highlighted to the EU). This case was in relation to both the serious flaws within the current UK exposure and risk assessment for *bystanders*, and the fact that, to date, **there has been no exposure and risk assessment for a residents specific exposure scenario** (as residents have a completely different exposure scenario to a mere *bystander* and therefore residents and bystanders are two separate exposure groups). The case presented also included the serious inadequacies in the UK monitoring system. *(For further information regarding the serious inadequacies in the UK monitoring system see paragraphs 64 to 152 of the second Witness Statement produced for the legal case).* The campaign I launched in early 2001, the UK Pesticides Campaign, has been calling for urgent changes to pesticides policies ever since to address the lack of **any** protection for residents that currently exists.

3.5 The risk assessment failings are important for me to briefly detail considering that the adverse health impacts that are reported by residents in the UK will be **as a direct result** of the flaws in the UK's approach to exposure and risk assessment for human health.

3.6 Therefore I have briefly detailed below at paras 3.7 to 3.37 some of the key points contained within the critical second Witness Statement that I produced for the legal case *Georgina Downs v DEFRA* regarding the current exposure and risk assessment failings, and which importantly, are based on the UK Government's **very own documents, findings and statements**. The second Witness Statement is available to see in full on the campaign website at:- http://www.pesticidescampaign.co.uk/documents/Downs%202.pdf

3.7 To date, the UK Government's only assessment of the exposure and risks of humans other than workers and operators is based on the *predictive* model of a *bystander* which assumes that there will only be occasional short-term exposure of transient *bystanders*. The *bystander* model estimates "*maximum daily exposure"* as equal to **five minutes'** exposure (or even less, as a previous paper by the Government regulators, the Pesticides Safety Directorate (PSD) now changed to the Chemicals Regulation Directorate (CRD))[107] in fact shows calculations based on just **one minute** exposure),[108] to the spray cloud at the time of the application only, **from a single pass of a sprayer**, **at eight metres** from the spray boom and based on exposure **to only one individual pesticide at any time**. The Government asserts that it then assumes this level of daily exposure (that is, exposure for five minutes (or less)) to occur once a day over a period of 30 days or at most three months.

3.8 My case has always been from the outset that it is impossible to justify taking this short-term *bystander* model (to spray drift (droplets) only, from a single pass of the sprayer, and via inhalation and dermal absorption only) in order to address the position of **residents** who are repeatedly exposed to mixtures (often referred to as *cocktails*) of pesticides from a multitude of exposure factors (see para 3.9 below) and via all exposure routes (ie. oral, dermal and inhalation, as well as via the eyes), throughout every year, and in many cases, like my own situation, for decades. Residents are therefore **not** the same as transient *bystanders*. In the words of a representative of a UK interdepartmental group:[109]

[106] Available at:- http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:309:0001:01:EN:HTML

[107] But referred to in these comments in some places as the Pesticides Safety Directorate (PSD), as that was the name of the regulators at the time the Witness Statement that is referred to in these comments was produced.

[108] See paragraphs 7 and 8(a) of the second Witness Statement.

[109] Statement by a representative of the Interdepartmental Group on the Health Risk of Chemicals (IGHRC) at the UK Advisory Committee on Pesticides open meeting held on 10th July 2002.

"..it's only when we bring together the information about the hazard (about whether the chemical is toxic and in what way it is toxic), its only when we bring that together with the exposure (the route of exposure, the frequency of exposure, the amount of exposure and the duration of exposure) that we can hope to assess what the risk to the health of the individual is."

3.9 The UK Government's transient *bystander* exposure assessment (exposure of an adult with 60kg bodyweight) for five minutes (or less), to spray drift *only* at the time of application, from a single pass of a sprayer, at eight metres, via dermal and inhalation routes only, and to just one pesticide only, rather than to a mixture) **fails entirely** to address the chronic, long-term, repeated and cumulative exposure of residents. As set out in meticulous detail at para 56 of the second Witness Statement produced for the legal case, the Government's current *bystander* risk assessment model **excludes** the following altogether (and which would **all** be relevant for the exposure scenario of **residents**):

(a) exposure at less than eight metres from the sprayer;[110]

(b) inhalation and dermal exposure outside the five minute (or one minute) time frame;[111]

(c) *any exposure from subsequent passes of the sprayer*: for example, the UK Government knows that dermal exposure will be increased threefold by subsequent passes of the sprayer, yet ignores this increase in its bystander exposure model;[112]

(d) any exposure through oral ingestion and via the eyes;[113]

(e) long-term exposure to pesticide particles, droplets and vapours in the air in the hours, days, weeks and months after application(s): see para 56(c) of the second Witness Statement. Also the paper by Bedos *et al*, entitled *"Occurrence of pesticides in the atmosphere in France,"* (referred to in the High Court Judgment at paragraph 33) states, *"Pesticides are present in the atmosphere in 3 forms: in liquid and solid phases—as aerosol particles or adsorbed on pre-existing aerosols, or incorporated in fog or rain droplets, or in gaseous phase"* and that, *"These three processes result in highly variable amounts of pesticides contaminating the atmosphere during the days or weeks following pesticide application. The total emissions of pesticides may range from several% **up to almost all the applied quantities**."* In relation to vapour, the paper by Bedos *et al*, entitled *"Mass transfer of pesticides into the atmosphere by volatilisation from soils and plants: overview"*, Agronomie 22 (2002) 21–33, concluded that, "*Volatilization may represent a major dissipation pathway for pesticides applied to soils or crops, **accounting for up to 90% of the application dose in some cases***", and that *"**Volatilization may last for a period of several days to a few weeks (or sometimes even longer), and sometimes exhibits a diurnal cycle**"*;

(f) exposure to pesticides in pollen, dust (including, but not limited to, harvest dust) and soil;[114]

(g) *exposure to pesticides transported from outdoor applications and redistributed into an indoor air environment*: see paragraph 56(d) of the second Witness Statement. Also, see Lu *et al*, "*Pesticide exposure of children in an agricultural community: evidence of household proximity to farmland and take home exposure pathways*";

(h) exposure to pesticides in precipitation and via reactivation;[115]

(i) *exposure to pesticides from long-range transportation*: studies have shown pesticides found **miles** away from where they were originally applied, eg a reputable study in California found pesticides located up to **3 miles away** from the treated areas, and calculated health risks for residents and communities living within those distances;[116]

(j) exposures to mixtures of pesticides (and other chemicals that may be in the formulation(s)) and any potential synergistic effects:[117] agricultural pesticides are rarely used individually, but are commonly sprayed in mixtures (cocktails)—quite often a mixture will consist of four or five different products mixed together. Each product formulation in itself can contain a number of different active ingredients, as well as other chemicals, such as solvents, surfactants and other co-formulants (some of which can have adverse effects in their own right, even before considering any potential synergistic effects in a mixture(s)). The existing *bystander* model does not factor in the additional exposures which someone will receive if exposed to a mixture of pesticides at the same time. Various studies have shown that mixtures of pesticides (and/or other chemicals) can have synergistic effects.[118] Further, as highlighted earlier at paragraph 2.10, the study published in March 2009 entitled, *"Parkinson's Disease and Residential*

[110] See paragraph 56(b) of the second Witness Statement.
[111] See paragraph 56(c) of the second Witness Statement.
[112] See paragraph 56(a) of the second Witness Statement.
[113] See paragraph 56(a) of the second Witness Statement.
[114] See paragraph 56(d) of the second Witness Statement.
[115] See paragraph 56(e) of the second Witness Statement.
[116] Lee *et al, "Community Exposures to Airborne Agricultural Pesticides in California: Ranking of Inhalation Risks"* (2002). See paragraph 56(f) of the second Witness Statement.
[117] See paragraph 56(g) of the second Witness Statement.
[118] For example, a study published in "*Toxicology*," in January 2002 entitled, *"Interactions between pesticides and components of pesticide formulations in an in vitro neurotoxicity test,"* by J.C. Axelrad, C.V. Howard, W.G. McLean. See further paragraph 56(g) of the second Witness Statement.

Exposure to Maneb and Paraquat From Agricultural Applications in the Central Valley of California," by Sadie Costello, Myles Cockburn, Jeff Bronstein, Xinbo Zhang, and Beate Ritz, **found exposure to just two pesticides within 500 metres of residents' homes increased Parkinson's Disease risk by 75%**;

(k) *exposures due to previous or subsequent spraying events (on the same or different days), and cumulative effects:*[119] I often receive reports from residents where their houses are surrounded on three or even on all four sides by sprayed fields, all of which may be sprayed on any given day, (whether it be the same day or on subsequent days), repeatedly, throughout every year. Therefore if a resident is surrounded on all sides by crop fields and is subjected to repeated exposures from all sides then this increases the exposure *even further*. Therefore again this scenario is the **reality** for residents living near sprayed fields, particularly those surrounded by sprayed fields on all sides;

(l) *any exposure of babies and children*: the current "*bystander*" model assumes a body weight of an adult weighing 60kg,which does not cover those of a lower bodyweight, eg. the bodyweight of a new-born baby (that could be present in a home or garden in the locality of pesticide sprayed fields) might be something like one-twentieth of this amount at 3kg (and have a higher breathing rate and smaller airways) and so can have very significantly higher total exposure per kg bodyweight per day than that of adults, or even toddlers. Babies may spend significant amounts of time out of doors, in prams or (for older babies) playing on the ground in gardens. The evidence in the second Witness Statement showed that again, astonishingly, to date, the UK Government has not made *any* exposure estimates for babies. (See 56(i)(k) of 2 Witness Statement);

(m) exposure of other vulnerable groups including pregnant women, the elderly, those who are already ill or disabled, and those taking medication (and where any interactions or synergistic effects between pesticides and the medication must be taken into account);[120]

(n) *multiple exposure scenarios*:[121] where one individual's exposure takes place not only at home but also elsewhere—eg at school, playground, office, or other buildings situated in the locality of pesticide sprayed fields. These are all **realistic** long-term multiple exposure scenarios that **have not been accounted for** in the UK Government's existing approach, which is again astonishing. It is not uncommon for a child to live near sprayed fields ***and*** attend school near sprayed fields as well, which obviously increases the level of exposure to an even higher level. Children are particularly vulnerable to the effects of pesticide exposure because their bodies cannot efficiently detoxify chemicals, as their organs are still growing and developing. Also when children are exposed at such a young age they will obviously have a longer lifetime to develop long-term chronic effects after any exposure.

3.10 In January and July 2003, an official from the PSD (now CRD) prepared two papers (that were submitted for the consideration of the UK Advisory Committee on Pesticides (ACP) at the January and July 2003 ACP meetings), that considered a *limited* number of additional exposure estimates other than that already relied upon (that is, the five minutes, at eight metres, spraydrift only *bystander* model etc.) It should also be noted though that the PSD's additional exposure estimates were for just a *limited* number of pesticides only, and **not** for ***all*** the pesticides authorized for use in the UK at that time (and nor has this been done subsequently). See for example paragraph 18 of the second Witness Statement.

3.11 **My second Witness Statement contained a detailed analysis (prepared specifically for the purposes of the UK legal proceedings) of the UK Government's very own figures and findings and showed how the PSD papers themselves flatly contradicted the UK Government's assertion that its existing *bystander* model protects residents.** For the detailed analysis of the January and July 2003 PSD papers, see paras 12 to 36 of the second Witness Statement. The following are some key points.

The January 2003 PSD Paper:

3.12 Exposure at less than eight metres: dermal exposure at one metre from the sprayer was found to be up to about eight times that expected at eight metres under the current model, and airborne levels were found to be similarly increased. PSD clearly acknowledged that those "*closer to the sprayer bystanders may experience higher exposures than currently predicted.*" Yet despite this, the UK Government did not modify its bystander exposure assessment to take this higher exposure into account. (See paragraph 14 of the second Witness Statement).

3.13 24-hour air exposure (inhalation only): both German and Californian data on 24-hour air levels that were considered in the January PSD paper (and which was to vapour *only* and excluded exposure to any droplets and particles in that time-frame) produced estimated 24 hour exposures in excess of the Government's current estimated systemic exposure (from exposure to spraydrift (droplets) *only* (ie. excluding any exposure to vapour and particles) at eight metres for five minutes). But again, no change was made to the UK exposure and risk assessment approach. (See para 15 of 2 Witness Statement).

[119] See paragraph 56(h) of the second Witness Statement.
[120] See paragraph 56(j) of the second Witness Statement.
[121] See paragraph 56(k) of the second Witness Statement.

3.14 Harvest dust (inhalation only): estimates in the PSD paper of exposure by inhalation of harvest dust showed that in just six and a half minutes of breathing such dust, a person would experience exposure equal to the UK Government's current *maximum daily exposure* estimate (on the five minutes (or less) at eight metres model). Someone breathing such dust for one hour would suffer exposure almost ***ten times*** that of the *maximum daily exposure* in the current bystander model. Yet the UK Government again did not alter its exposure model; nor did it ever give any further consideration to this specific exposure factor subsequently. (See paras 16 and 56(d) of 2nd Witness Statement).

3.15 The only suggested justification given in the Jan. 2003 PSD paper for the failure to protect people in relation to harvest dust is that "*bystanders are not likely to experience dust concentrations as high as this nor are they expected, due to the general nuisance of high dust concentrations, to be exposed for long*". Three points should be noted about this

(a) The justification put forward is not scientific in nature. Rather, it is a mere assertion about whether the assessed exposure scenario is or is not realistic.

(b) As to that assertion, while it may be that a transient bystander will, given the choice, limit his or her exposure to harvest dust, the same cannot be said of residents, who have no choice. For example, a resident living close to wheat fields which are harvested year after year may experience, as my family and I have experienced, high levels of harvest dust going over their whole property and land (as shown in my first video on the DVD that I produced to highlight pesticide exposure for rural residents).

(c) Despite this, and despite the results in the PSD paper, once again, no adjustment has been made to the current UK assessment in order to include in the exposure calculations exposure to pesticides in harvest dust, let alone in other sources, such as pesticides in pollen and topsoil carried by the wind, (eg. when it is eroded by, and then carried by, the wind). The UK Government has not even considered these additional potential exposure factors, let alone estimate what that exposure may be for residents (or even bystanders) in the locality. See paragraph 56(d) of the second Witness Statement. Also see Bedos et al, *Occurrence of pesticides in the atmosphere in France*, section 1, Introduction: "*..due to the wind erosion process, wind can remove soil particles with pesticide molecules fixed on them from the soil surface.*"

3.16 Exposure of children following drift into gardens: the January 2003 PSD paper estimated the systemic absorption (from dermal and oral exposure (excluding inhalation)) of a toddler (weighing 14.5kg) playing for two hours on surfaces adjacent to sprayed fields to be about **69 times higher** than the estimated systemic exposure using the current bystander assessment model (ie. from exposure to spraydrift for five minutes (or less) from the single pass of the sprayer at eight metres). But once again, despite this significant finding, of toddlers exposure from playing on surfaces adjacent to sprayed fields over just that *limited* two hour period *only* (and for oral and dermal absorption only, not inhalation) the UK Government did not, at that time, make any change to its exposure and risk assessment approach. (See paragraph 17 of the second Witness Statement).

The July 2003 PSD Paper:

3.17 Exposure at one metre: the July 2003 PSD paper (despite unwarrantedly discounting potential inhalation exposure[122]) showed estimates of exposure for someone at one metre from the sprayer which **exceeded the EU limits set for exposure, the so called Acceptable Operator Exposure Level (AOEL),** sometimes by **many times over at an *order of magnitude* higher**: for example, exceedances of up to twenty-two times above the AOEL at one metre for trifluralin[123] (in Hawk); and in relation to orchard spraying of Dithianon (in Dithianon Flowable) exposure at eight metres (ie. under the current UK bystander exposure assessment) exceeded the AOEL up to thirty-one and a half times over. (See paragraph 20 examples (a) to (j) of the second Witness Statement).

3.18 Yet again, despite this very significant finding, the Government did not modify its exposure and risk assessment approach, apparently on the unsupportable assumption in the July 2003 PSD paper that people were *"unlikely to stand much closer than eight metres,"* (and also that *"any person closer would be more likely to have some involvement in the pesticide application, and therefore be wearing at least overalls."*) [124] It is to be noted that again, that was a purported justification based not on science but upon an unsupported assertion about the presumed situation, and which, in relation to the situation of residents, is one that is very seriously and fundamentally incorrect, and is simply **not the reality**.

3.19 The **reality** is very different, as evidence before the courts, including visual materials showed that in many cases crop-spraying can take place (on a regular basis) within inches of a resident's home. For example, I had two photos sent to me which show a resident's home within approx. 12 inches of a regularly sprayed field, and also have additional photos of crop-spraying taking place right next to residents' homes and gardens.

[122] The July 2003 PSD paper adjusted the potential dermal exposure at one metre (compared with that at eight metres) but **did not** adjust the potential inhalation exposure, despite the January 2003 PSD paper's finding that at low wind speeds, inhalation exposure was **five times higher** at one metre than at five metres.

[123] Trifluralin was withdrawn in March 2008 in all Member States following a European Commission decision, (Member States had a grace period which expired on 20 March 2009), but this action was at the behest of the European Commission rather than the PSD, which took no action as a result of the July 2003 PSD paper.

[124] *"Exposure of bystanders to pesticides",* Matthews and Hamey, Pesticide Outlook October 2003.

Also the reality of crop spraying in the close proximity of residents homes, schools, children's playgrounds is clearly shown on the DVD, including footage showing a mannequin family (that I previously placed at the edge of our garden) made up of some of the most vulnerable groups including a pregnant woman, two babies, and a young child, that was to illustrate **a typical and realistic residential setting**, where people are out in their garden, and then with no warning, spraying takes place. **All these visual materials can all be made available to members of the Environmental Audit Committee on request.**

3.20 It is important to note that the Government's own Field Operations Directorate (FOD) reports *themselves* (which are part of the Government's *own monitoring system*) contain cases where crop-spraying has taken place within a metre or so of the boundary of a resident's property and therefore the Government is actually well aware that this is a very realistic and common situation for residents living in the locality of sprayed fields.[125]

3.21 It is important to note that even if there is a boundary structure, (eg a hedge, fence etc.) this will not make any difference when it comes to pesticide droplets, particles or vapours in the air, as farmers cannot control pesticides once they are airborne (either at the time of application or subsequently) and therefore pesticides can travel over and above (or even through) any structure of this nature. If a house or its garden, (or a school), is situated less than eight metres from where the sprayer passes, (and in some cases less than even a metre away) then a resident may be exposed at this distance at any time when spraying occurs. Also the spray can enter an open window or airvent and contaminate the inside of the house. Clearly a house (or children's school or other building) cannot be moved from its position and so the situation of people being a metre or less away from a sprayer is most definitely not rare. Speaking personally, for the first nine years that my family and I lived in our current home, we knew nothing about the pesticide spraying whatsoever (as no one had informed us about this hazardous practice) and thus we did not know they were being applied to the fields adjoining our home. Therefore often I would be playing in the garden as a young girl standing only inches away from a crop sprayer as it passed, without any knowledge that it was dispersing hazardous chemicals. Therefore to reiterate the situation of people being a metre or less away from a sprayer is the **reality** for many people living near sprayed fields, who of course will not be involved in the pesticide application, and thus who, unlike operators, will **not** be wearing any personal protective equipment (PPE), such as respirators, masks, *overalls* etc., on their own property and land, nor, unlike operators, will they be sitting in specifically filtered cabs.

3.22 Very importantly, as said at para 3.17 above, there were also a number of examples in the July 2003 PSD paper of high exceedances of the AOEL at *eight metres* from the sprayer (ie. under the current UK bystander exposure assessment). An example of this is in relation to the orchard spraying of Dithianon (in Dithianon Flowable) where exposure at 8 metres exceeded the AOEL up to thirty-one and a half times over. It is important to note that the January 2003 PSD paper found that based on drift fallout data from applications in orchards that the drift deposit at three metres (the closest distance at which measurements were taken) was *"about three times that expected at eight metres."* Therefore as I pointed out in para 20(e) of my second Witness Statement that if going by that finding then the exceedance of the AOEL for Dithianon of up to thirty-one and a half times over (at 3155% of the AOEL), if multiplied by three (to give an estimate for exposure at three metres) would be almost **95 times above the AOEL**. This exceedance could be increased further still if the exposure was at 1 metre away. **Yet any exceedance of the AOEL (even just by 1 time over) is supposed to lead to authorizations being refused, or trigger prohibition if already approved. Products containing Dithianon remain approved for use in the UK, including Dithianon Flowable.**

3.23 The exposure of residents and bystanders at a distance of one metre from the sprayer is, in these circumstances, **plainly realistic**—and the exceedances identified in the July 2003 PSD paper of the EU exposure limit (the AOEL) at a distance of one metre, as well as very importantly the considerable number of exceedances of the AOEL at eight metres (ie. under the current bystander exposure assessment that the UK Government has continued to stand by), sometimes by many times over at an *order of magnitude* higher[126] therefore give rise to an obligation on the UK Government to prohibit use, which obligation has not been fulfilled. In fact, as can be seen in the second Witness Statement, once all relevant exposure factors and exposure routes are taken into account and included in the exposure calculations, it becomes clear that separation distances of **miles, not metres,** would be needed in order to prevent any exceedance of the AOEL, and in order to protect residents from the risk of harm. For example, in the High Court Judgment in the case *Georgina Downs v DEFRA* at paragraph 28, the Judge referred to the UK Government's own data on air levels that had pointed out that *"high levels of a particular pesticide had been identified 300 metres from the sampling station"*; also as highlighted earlier there are international studies where pesticides have been found **miles** away from where they were originally applied and the documented risks for rural residents and communities of various adverse health effects from living within those distances; another study published in the Journal of the American Medical Association (JAMA) in 2005 that confirmed acute illnesses in children and employees from pesticides sprayed on farmland in the locality of schools, pointed out that, at the time the study was prepared that, a number of US states require **the prohibition of spraying in the locality of schools in an attempt to protect children from exposure**, including one state where the distance of the area where the use of pesticides is prohibited in the locality of schools is **2.5 miles**.[127]

[125] See footnote 74 of the second Witness Statement.
[126] See paragraphs 20 (d), (e), (f), (g), (i) and (j) of the second Witness Statement.
[127] Study by Alarcon et al, (2005), entitled, *"Acute Illnesses Associated with Pesticide Exposure at Schools."*

3.24 **24-hour inhalation exposure (excluding other routes such as dermal, oral and eyes):** the PSD's calculations in the July 2003 paper showed examples of cases where the 24-hour inhalation exposure to vapour *alone* (ie. ignoring all other exposure sources such as direct inhalation of spray droplets and particles) **substantially exceeded the AOEL**, either in children, or in both adults and children, with exposures for children of up to more than 27 times above the AOEL and even for adults more than twelve and a half times above the AOEL. It is important to note that there were also a number of examples of cases where the 24-hour inhalation exposure (which is to vapour *only* and excludes exposure to droplets and particles in that time-frame) was estimated, by itself, to be very near the AOEL in children (as much as 92% of AOEL) so that there would be a very serious risk of exceeding the AOEL once other exposure factors were taken into account and included in the exposure assessment calculations, and again in some cases the AOEL exceedances could be many times over. (See paras 22 and 23 of 2 Witness Statement).

3.25 **Children's dermal and hand-to-mouth and object-to-mouth exposure**: in the July 2003 paper the PSD exposure estimates through these routes *alone* (that excluded inhalation exposure altogether, and that were said to be estimated based on a toddler weighing 15kg playing on grass for two hours following drift into gardens) were found to **exceed the AOEL** by up to about four and a half times. But again, no conditions of use have, to date, been imposed to prevent such exposure (eg by prohibiting spraying and pesticide use in the locality of homes, schools, children's playgrounds, nurseries etc) And once again, the UK Government gave no consideration whatsoever to the exposure of **babies** having a lower bodyweight (and therefore higher total exposure per kg bodyweight per day) than toddlers. (See paragraph 24 of the second Witness Statement).

3.26 When questioned in 2005 about the cases in the July 2003 PSD paper where exposures for children exceeded the AOEL, a then Department of Health representative stated, *"We would not simply accept an AOEL being exceeded twice in children."* Despite this, (and despite the fact that there were cases where the exposure for children was estimated to exceed the AOEL many more times than two, eg child 24 hour inhalation where the exceedance was more than 27 times the AOEL) the Government made no adjustment at the time to its existing exposure assessment model (five minutes at eight metres from the sprayer for an adult weighing 60 kg).

3.27 **Combination of exposure estimates**: it is important to stress the fact that the AOEL exceedances were based on each exposure factor *individually,* as the PSD, as well as the Advisory Committee on Pesticides have, to date, **wrongly** calculated each factor in *isolation* and have failed to ***ever*** calculate exposure factors together in the exposure calculations, (which is obviously essential to do in relation to the overall exposure scenario in totality for residents). The estimates given in the July 2003 PSD paper clearly showed that if combining a number of the exposure factors together, the AOEL for a number of pesticides would be greatly exceeded for children, and adults, (and of course *even further exceeded* if already exceeded just from any one exposure factor *individually*)

3.28 Despite this, to date, the PSD and ACP have continued to knowingly fail to calculate exposure factors together.

3.29 As set out above (and in more detail in the second Witness Statement at paragraphs 27–55), the UK Government did not, as a result of either of the 2003 PSD papers, alter its bystander exposure assessment model (exposure at eight metres for five minutes (or less) to spraydrift only from a single pass of a sprayer) to include in the exposure calculations all other relevant exposure factors. No further estimates were carried out on all the other pesticides approved for use in the UK at that time, and nor has this been done subsequently. In fact despite the results obtained in the July 2003 PSD paper, astonishingly the stated conclusion of the PSD paper was that, *"For products applied as sprays, these examples demonstrate that the current approach is protective of longer-term bystander exposure"*. Therefore **no action** was taken by the UK Government to revoke the authorisations for pesticides where exposure (even on the *limited* number of additional exposure factors considered by the regulators in the 2003 PSD papers, and even when taken *alone* rather than in combination) exceeded the EU exposure limit, the AOEL. This is despite the requirements in the European legislation, (as EU law clearly specifies that the AOEL **must not be exceeded**, if it is, then authorizations **must be refused**, and if the AOEL exceedance is discovered *after* approval, **it must trigger prohibition/ revocation**), and further, it is despite the recognition in the UK Government's very own previously stated case that **any exceedance** of the AOEL would trigger prohibition/revocation.

3.30 **The PSD's previous estimated exceedances of the AOEL clearly demonstrated that products have been in use in the UK which would have led to residents being exposed to levels greatly in excess of the AOEL, on a regular basis, year after year.**

3.31 Further still, evidence in the second Witness Statement showed that DEFRA Ministers were not even informed by the PSD of these very serious AOEL exceedances. For example, in PSD's advice to Ministers, dated 24 March 2004, following the 2003 DEFRA Consultation on pesticides, in referring to the estimates of 24 hour air inhalation exposure in the July 2003 PSD paper, the PSD stated, *"Exposure assessments for a large number of pesticides using the worst case Californian value as surrogate data are within the AOELs* ***in all but a very few cases****…The ACP reviewed these assessments before they confirmed that the risk assessments applied* ***are robust****."* This failed to inform Ministers not only of the details regarding the exceedances of the AOEL for 24-hour inhalation exposure, but also the exceedances of the AOEL for children playing in the fallout area; in estimates of exposure at 1 metre, and even in some estimates relating to the current UK bystander exposure

model of five minutes exposure at eight metres, (any of which of course could be in relation to either adults, or babies, children or other vulnerable groups).[128]

3.32 To reiterate, the Government has previously assessed exposure in a number of **realistic scenarios** in which residents are regularly exposed, including (i) exposure at less than eight metres; (ii) 24 hour inhalation exposure (although to vapour *only* excluding spray droplets and particles) for both adults and children; (iii) the dermal, hand-to-mouth and object-to-mouth exposure of small children playing on grass for two hours (without any account being taken of any exposure from breathing ie. droplets, particles and vapours, during those two hours). As detailed earlier, it will be appreciated that these are by no means all the exposure factors/sources relevant to a residents overall realistic exposure scenario in totality. (See para 56 of the two Witness Statement and in summary above at para 3.9). The PSD's **own findings** found significant exceedances of the EU exposure limits, the AOEL (in some cases an *order of magnitude* higher), in relation to each of those exposure factors taken *alone*. Many more exceedances would be found if the exposures were totalled—as they plainly should be in order to allow for a **realistic worst-case scenario**, as required by the existing Annex VI to the EU legislation.[129] **Yet the Government has not, to date, taken any action to prevent the exposure and risk of harm for residents in these circumstances, and has violated its obligation under EU law to prohibit the use of pesticides where the AOEL is known to be exceeded.**

3.33 It is clear from what is set out in summary above that the current UK assessment model for *bystanders* is inadequate to assess even the exposure of such bystanders, and **fails entirely** to address the exposure of **residents**, as the overall exposure a resident receives cannot possibly be calculated if some of the exposure factors are ignored in the exposure calculations, which they currently are. See para 53 of the 2nd Witness Statement.

3.34 **The fact that, to date, there has never been *any* assessment in the UK of the risks to health for the long term exposure for those who live in the locality of pesticide sprayed fields, and/or who go to school in the locality of sprayed fields, means that under EU law pesticides should never have been approved for use in the first place for spraying in the locality of homes, schools, playgrounds, amongst other areas.**

3.35 Further, it is clear that if a proper and full assessment was undertaken to assess the exposure and risk for residents, that would have to include in the exposure calculations **all** the exposure factors and exposure routes, both higher and lower levels of exposure, **and then added together (summed) then the result would be that pesticides would simply not be allowed to be approved at all for use in the locality of residents' homes, as well as schools, children's playgrounds, nurseries, hospitals, amongst other areas**.

3.36 Therefore in summary, the factual evidence that I produced for the legal case, and which, as said earlier, is based on the UK Government's **very own documents, findings and statements**, (and thus **anyone** who analyses the same UK Government documents and materials as referred to in the second Witness Statement would obviously see the same results) clearly confirms that the UK Government has fundamentally failed to:

— protect public health from pesticides, particularly rural residents;

— undertake ***any*** exposure and risk assessment for the long-term exposure for those who live, work or go to school in the locality of pesticide sprayed fields (**which means that under EU and UK equivalent legislation pesticides should never have been approved for use in the first place for spraying in the locality of residents' homes, schools, etc., in the absence of any actual risk assessment for those exposed in such scenarios**);

— act on its *own findings* of 82 exceedances (in **realistic** exposure scenarios for residents) of the limits set for exposure (the AOEL), in some cases the AOEL **was exceeded up to 20 to 30 times over**, which is an *order of magnitude higher,* when **any** exceedance, on the UK Government's *own previously stated case,* and most importantly under EU law, **would lead to immediate action of authorizations being refused (or trigger prohibition/revocation if the AOEL exceedance is discovered *after* approval).** It is important to reiterate that these AOEL exceedances were based on each exposure factor *individually,* as the UK Government's advisors, the Advisory Committee on Pesticides (ACP), and the PSD (now CRD), **wrongly** calculated each factor in *isolation* and have failed to ***ever*** calculate (sum) exposure factors together in the exposure calculations, which is obviously essential to do in relation to the overall exposure scenario for residents. **Therefore on the results shown in PSD's (CRD's) own findings the AOEL would have been exceeded *even further* when calculating exposure factors together**;

— act on the evidence of the risk of harm to human health, and further than that, act on the evidence of **harm** that is occurring, including in the Government's *own monitoring system*. Yet EU legislation **requires** that pesticides can only be authorised for use if it has been **established** that there will be ***no harmful effect*** on human health. It also **requires** a proactive approach to reviewing authorisations *after* approval, including that authorisations shall be cancelled and pesticides prohibited where there is a risk of harm.

[128] See paragraphs 27 to 30 and 33 to 36 of the second Witness Statement.

[129] The European legislation regarding the authorisation of pesticides was formerly European Directive 91/414 and is now European Regulation 1107/2009.

3.37 The factual evidence clearly shows that the UK authorities have approved pesticides for use (a) without first assessing the exposure and risks for **residents living in the locality of pesticide sprayed fields**, (and which the UK Government is required to do under the relevant European and UK equivalent legislation); and (b) without imposing **any** statutory conditions of use to protect residents from exposure, including exposures which give rise to risks to health, as well as exposures in excess of the AOEL. Such conditions of use would include the prohibition of the use of pesticides in the locality of residents' homes, as well as schools, children's playgrounds, hospitals etc. As said, the full detailed evidence regarding the failings of the current UK policy and approach are contained in the 150 page second Witness Statement (available at: http://www.pesticidescampaign.co.uk/documents/Downs%202.pdf).

The Legal Case Georgina Downs v DEFRA

3.38 The aforementioned detailed factual evidence led to my landmark victory in the High Court in November 2008 that ruled that the UK Government's policy on pesticides was not in compliance with European legislation. My case was the first known legal case of its kind to reach the High Court to directly challenge the Government's pesticide policy and approach regarding crop-spraying in rural areas. The critical evidence contained in my second Witness Statement resulted in the High Court Judge, Mr. Justice Collins, concluding (at paragraph 39 of the High Court Judgment[130]) that, *"**The alleged inadequacies of the model and the approach to authorisation and conditions of use have been scientifically justified. The claimant has produced cogent arguments and evidence to indicate that the approach does not adequately protect residents and so is in breach of the** **[EU]** **Directive**"* [131] and at paragraph 70 of the High Court Judgment that DEFRA *"**must take steps to produce an adequate assessment of the risks to residents**"*[132]

3.39 **The Judge also concluded at paras 39 to 43 of the High Court Judgment that I had produced *"solid evidence"…that residents have suffered harm to their health"*.** [133]

3.40 The Order of Mr. Justice Collins issued on 15 December 2008 ordered that DEFRA must reconsider and as necessary amend its policy in accordance with the terms of the judgment. It should be noted that although Mr. Justice Collins granted DEFRA leave to appeal, **he made it clear that he did not think that an appeal had a real prospect of success**.[134] **This would have been based on the assumption that the Court of Appeal would form its Judgment on the very same evidence and arguments that he did.**

3.41 However, my critical evidence and arguments were then subsequently ignored by the Court of Appeal in its judgment of July 2009, as it was all bizarrely ***substituted*** with the conclusions of a UK Government requested and funded report from four years earlier in 2005. Therefore the Court of Appeal's judgment was **not** based on the same cogent case, detailed factual evidence and arguments that had led to the High Court ruling in my favour. A striking example of this is demonstrated by the fact that **there is absolutely no reference whatsoever** in the Court of Appeal's Judgment of the very serious exceedances of the EU exposure limit, the AOEL, in **realistic** exposure scenarios for residents (and that were in clear breach of the legislative requirements of the then EU Directive 91/414) and importantly, that had been based on the UK Government's *very own findings*.

3.42 Although Judicial Review is about points of law, any decisions on the legal points must be based on the correct factual evidence presented. The High Court Judge, Mr. Justice Collins, had **correctly** based his Judgment on the critical detailed factual evidence I had set forth, in a number of Witness Statements, and that I had produced specifically to support the legal arguments and Grounds for challenge raised in my case. By substituting my evidence, the Court of Appeal judges fundamentally misrepresented my case. The Court of Appeal's only explanation for ignoring my evidence was that I had "*no formal scientific or medical qualifications*." **Yet this is completely irrelevant, and it would effectively mean an end to any citizen taking a Judicial Review case in the UK if the courts will not take any notice of the evidence presented by that citizen because he/she is not a qualified scientist or doctor.** Also this is a highly prejudicial approach. Any legal judgment or decision is supposed to reflect the arguments and evidence set forth by the named parties involved in that case, irrespective of their professional background. Therefore the Court of Appeal judges were supposed to be basing their judgment as to whether to uphold or overturn the High Court Judgment based on the **exact same evidence** that led to that judgment in the first place, and which they did not.

3.43 Therefore the Court of Appeal overturned the High Court Judgment but **only** as a result of very wrongly (and possibly intentionally) **substituting** the cogently argued case I had presented with the findings of another party, thus resulting in the Court of Appeal judgment being formed on the wrong basis, and which did not in any way resemble the same case, arguments and evidence that Mr. Justice Collins based his Judgment on in the High Court, and which resoundingly found in my favour on all grounds, ruling that the UK Government was in breach of **both EU law and Article 8 of the European Convention of Human Rights**. Therefore the

[130] http://www.bailii.org/cgi-bin/markup.cgi?doc=/ew/cases/EWHC/Admin/2008/2666.html&query=title+(+downs+)&method=boolean%20%3Chttp://www.bailii.org/cgi-bin/markup.cgi?doc=/ew/cases/EWHC/Admin/2008/2666.html&query=title+(+downs+)&method=boolean%3E

[131] Ibid.

[132] Ibid.

[133] Ibid.

[134] In the High Court Order issued on 15th December 2008 Mr. Justice Collins stated that, *"While I recognise that the arguments raised by the defendant were and are by no means without substance, **I do not think that in all the circumstances an appeal has a real prospect of success**."*

Court of Appeal Judgment was a complete whitewash and there was not even a hint anywhere in the Judgment of any criticism of the Government at all. The Court of Appeal basically just passed the issue back to the Government to deal with and yet it was the Government I am challenging! I said at the time the Court of Appeal Judgment came out and will reiterate it again here, that the Government could not have wished for a better result than if it wrote the Judgment itself!

3.44 It is important to point out the fact that I actually had **5 legal decisions in my favour** between 2007 and 2009 in the legal case against the Government. These included: 1) the original permission granted by Mr. Justice Mitting in January 2007 for an application for Judicial Review; 2) the High Court ruling from Mr. Justice Collins in my favour in November 2008; 3) Mr. Justice Collins then refused in December 2008 the Government's first application for a "*stay*" of the High Court Judgment and Order; 4) the Court of Appeal Judge Lord Justice Laws then refused the Government's second application for a "*stay*" in February 2009; 5) the Court of Appeal Judge Lord Justice Sullivan then refused the Government's third application for a "*stay*" in March 2009 following an oral hearing and ordered that the Government should get on with its review as ordered by the High Court ruling in November 2008. In fact at that March 2009 oral hearing Lord Justice Sullivan criticized the Government for not having already initiated *any* action as a result of the High Court ruling. Yet just four months later it was the same Lord Justice Sullivan who wrote the lead Judgment for the Court of Appeal in July 2009 in which my evidence and arguments were ignored and bizarrely ***substituted*** with the findings of another party!

3.45 The only observational point I would make in relation to this (there are of course other points, but for the purposes of this submission I shall only highlight this one) is that Lord Justice Sullivan had announced at the oral hearing in March 2009 that he was most likely going to be a Judge involved in the main Court of Appeal hearing on the case (which subsequently took place in May 2009). Therefore the Government and other parties (such as the pesticides industry) would have known two months in advance who one of the Judges was most likely going to be. I of course do not know what went on behind the scenes, but I do know that it was clear to a number of those who attended the Court of Appeal hearing in May 2009 that the Judges came in with a pre-formed view and did not display any genuine interest in the case, evidence and arguments presented by my side.

3.46 It is also important to point out that the original High Court ruling in my favour was obviously a very significant and landmark ruling for the potentially millions of residents throughout the country who, like myself, live in the locality of pesticide sprayed fields. The High Court judgment was extremely damaging to the Government, all the Government departments, officials and scientific advisors, responsible for pesticides, as it clearly confirmed what I had always said from the outset of presenting my arguments since 2001, that the Government has fundamentally failed to protect people in the countryside from pesticides and has also knowingly allowed residents to continue to suffer from adverse health effects without taking any action to prevent the exposure, risks and adverse impacts occurring. Therefore the High Court ruling had massive legal and political implications on the Government involving issues of responsibility, accountability and liability. Further confirmation of this could be seen in a number of legal articles on the internet, at the time, that reported on the significance of the High Court ruling. For example, one article published in *Environmental Liability*[135] stated, *"This case is a landmark one because it is the first case in which a judge has pointed to solid evidence of residents suffering ill health caused by exposure to pesticides in nearby fields, and it will no doubt be referred to as a precedent in future cases brought by residents."* Thus the Government knew that, amongst other implications, the ruling by the High Court could have opened the floodgates to compensation claims against the UK Government from the many individuals and families who have suffered adverse health effects from exposure to pesticides sprayed in the locality of residents' homes.

3.47 There was also very heavy lobbying on the Government from the industry to ensure that the Government appealed the High Court Judgment (which I am in no doubt the Government would have appealed anyway with or without the industry lobbying) and it was reported in the press at the time that the Government maintained that if the High Court Judgment stood then the *"Government's pesticide policy would be fundamentally undermined"* and that the policy and approvals system *"might even grind to a halt."*[136] This would undoubtedly have cost the Government many millions not only in relation to lost income from the pesticide industry to the regulators, the CRD[137] (who were the acting defendants in the legal case on behalf of DEFRA/Government), but also in the threat of any potential legal action against the Government by the industry if new product approvals were no longer able to be granted, as well as any potential legal action if pesticides the Government had previously approved (and that were subject to long approvals, for example, many pesticides are approved for 10 years) were no longer able to be used. *(NB. Such legal cases have been taken previously in the EU by companies challenging the EU Commission for no longer including their pesticides in Annex 1).*

3.48 In fact, the Government's concern over the financial impacts on the industry was clear to see in the two Witness Statements submitted on behalf of DEFRA by the then PSD (now CRD) Chief Executive, Kerr Wilson, to the Court of Appeal, regarding DEFRA's renewed application for a stay of the High Court Judgment and

[135] *Environmental Liability* article in 2008 entitled *"Landmark judgment concerning pesticide crop-spraying"*.

[136] These quotes appeared in various articles in May 2009 including Farmers Weekly.

[137] The CRD receives approximately 60% of its funding from the agrochemical industry, which is broken down into the fees charged to companies for applications, and a charge on the UK turnover of pesticides companies, see further paras 5.4 to 5.10 below under the sub-heading *"Chemicals Regulation Directorate (CRD)."*

Order of Collins J. Both Mr. Wilson's Witness Statements cited various reasons for *preserving the status quo* that were **all** notably related to *alleged* financial and economic impacts on manufacturers, farmers and distributors, or the impact on agricultural productivity, if there were any changes to the current UK policy and approach for pesticides and the related approvals system. Therefore despite such a significant and landmark High Court ruling, that had found the Government failing in its legal obligation to protect human health, (particularly rural residents), the two Witness Statements submitted on behalf of DEFRA did not display ***any*** concern whatsoever in relation to the protection of public health, nor any genuine desire to rectify the policy and approach as had been ordered by the High Court, as the ***only*** concern displayed was with the protection of industry and business interests rather than the protection of the public.[138] For example, notable statements in the first Witness Statement of Kerr Wilson on behalf of DEFRA dated 9 January 2009 include,[139] amongst others, at paragraph 6: *"The annual market value of pesticide sales is approximately £490 million*[140] *which delivers benefits to farmers, significantly improving agricultural productivity";* at para 8: *"If, as a result of the Declaration, new approvals could not be granted, there would be important ramifications,"* (the paragraph then goes on to list at points a to e, a number of concerns relating to the impacts on pesticide approvals (including on evaluations of new products; re-registration of existing products etc.) and the *alleged* financial and economic disadvantages for UK industry and farmers as a result, eg. para 8e that states that, *"…due to the seasonal nature of the use of plant protection products, the coming months are critically important for approval holders and farmers, as not gaining approval before the growing season can result in a sales being lost for a whole year");* at para 10: *"Without a stay PSD will have no option but to suspend activity on new approval applications, which will have commensurate financial and significant agricultural impacts on approval holders, distributors and farmers."*

3.49 In paragraph 10 Kerr Wilson also stated, "*DEFRA and PSD have an* ***obligation*** *to consider the need for certainty amongst its stakeholders,* ***particularly applicants for approval*** *and the wider agricultural community, and wishes to continue to discharge its* ***duties*** *to* ***them*** *pending the outcome of the appeal."* [141] The PSD's concern regarding its "*obligation*" and "*duties*" to the industry yet again confirmed that its primary concern was for the protection of industry interests, particularly applicants for approval (ie. the manufacturers' of pesticides, such as the agro chemical companies). Notably, there was no mention anywhere in Mr. Wilson's Witness Statement of the PSD's **obligations** and **duties** to protect the health of those exposed to pesticides, particularly to that of residents.

3.50 Therefore for all the reasons set out in the above paras it is clear why the Government would have needed to get the landmark High Court ruling overturned no matter what.

The Government's Current Policy Review

3.51 Following Lord Justice Sullivan's refusal at the oral hearing in March 2009 of the Government's third application for a "*stay*" and his order that the Government should get on with its review as ordered by the High Court ruling in Nov. 2008, DEFRA Ministers requested the regulators initiate a review of the Government's policy and approach regarding human health, particularly re. residents and bystanders.[142] The Ministers request for a policy review was therefore taken **only** ***after***, and as a direct result of, that March 2009 Court of Appeal ruling, and which the Government **publicly committed** to continuing with irrespective of the subsequent Court of Appeal judgment in July 2009. [143]

3.52 As part of the Government's policy review there are 2 Working Group's co-ordinated by the Advisory Committee on Pesticides (ACP) that are reviewing the exposure, risks, and adverse health effects to residents and other members of the public exposed, (which is as a direct result of the evidence and arguments I presented in my legal challenge).

3.53 One of the Working Groups entitled *"Pesticides Adverse Health Effect Surveillance Scheme Working Group (PAHES)"* is in the process of finalising its report. Although I have not seen the final report, the *draft* PAHES report concluded that there are *"obvious problems"* with the current surveillance and monitoring systems in the UK and stressed the fact that systems are required that *"deal with both chronic and acute effects of pesticides"* (as, as detailed earlier, there is currently no specific monitoring or collection of data in the Government's existing monitoring system in relation to the chronic effects, illnesses and diseases reported by residents in rural areas, which is something that I have continued to point out when detailing the failings of the UK monitoring system, including in great detail in the second Witness Statement).

3.54 The other Working Group, which is a joint Working Group of the ACP and the Committee on Toxicity (COT), entitled *"Bystander Risk Assessment Working Group (BRAWG)"* is also in the process of finalising its

[138] This was pointed out in my fourth Witness Statement involved in the legal case *Georgina Downs v DEFRA* which is available at:- http://www.pesticidescampaign.co.uk/documents/Downs%204.pdf

[139] I am not sure whether I am allowed to publish any of DEFRA's Witness Statements from the legal case, but the quotes of Kerr Wilson's cited in paragraphs 3.48 and 3.49 above can all, in any event, be seen cited in my fourth Witness Statement involved in the legal case *Georgina Downs v DEFRA* available at:- http://www.pesticidescampaign.co.uk/documents/Downs%204.pdf

[140] This figure is now higher, see further paragraph 5.3 below.

[141] See footnote 68.

[142] Letter from Dave Bench (CRD) to the COT Chairman, Professor David Coggon, dated 11th March 2009, and which can be seen on pages 7 and 8 of the document at:- http://cot.food.gov.uk/pdfs/tox200909.pdf

[143] Letter from Dave Bench (CRD) to the COT Chairman, Professor David Coggon, dated 1st September 2009, and which can be seen in the document at:- http://cot.food.gov.uk/pdfs/tox200928addendum.pdf

report. Although BRAWG has *finally* acknowledged that the current approach for assessing the exposures and risks to public health (the so-called *bystander* risk assessment) is inadequate, and has thus *finally* agreed with a number of the critical arguments that I have been highlighting over the last 11 years, the BRAWG report does not address *the extent* of the *very serious flaws* in the Government's existing approach to exposure and risk assessment (as set out in full detail in my second Witness Statement and which I briefly summarised in earlier paras above).

3.55 The BRAWG report does now recommend that there should be separate exposure and risk assessments for residents and bystanders (which again is what I have been arguing for the last 11 years since the outset of the campaign). However, the approach proposed regarding residents still **excludes** many of the exposure factors and exposure routes summarized in para 3.9 above, and in full detail at para 56 of the second Witness Statement), and which are **all** relevant to include for the specific exposure scenario of residents.

3.56 The main changes in approach that are now recommended by BRAWG are as follows:

— Both acute (short-term) and longer-term exposure assessments are required for residents, (however, the way this has been proposed by BRAWG is still inadequate);

— That a two metre distance between the sprayer and a resident or bystander should be assumed in all the acute and chronic risk assessments, as BRAWG considered that the current distance assumed in the risk assessment of eight metres between the spray boom and an individual is inadequate, (however, although this is an improvement from the current eight metre approach, it is again still inadequate, as it should be closer);

— **Estimates of exposure through each pathway and route should be aggregated (combined)**, (again, the way this has been proposed by BRAWG is still inadequate, as firstly, as said above, the approach regarding residents still excludes many of the exposure factors and routes that need to be included; and secondly, for assessment of total potential systemic exposure, the group recommends that estimates of exposure from different sources and by different routes should *not* simply be summed as a matter of routine, and yet they would need to be, otherwise a complete and accurate assessment of the overall realistic exposure and risk for residents cannot be reached);

— **That separate risk assessments should be considered for children and adults exposed as residents and bystanders;** (although again, the way this has been proposed by BRAWG is still inadequate, and further, there will still be no consideration whatsoever to the exposure of babies and young children with a bodyweight lower than 15kg, and some parts of the assessments still based on 60kg).

3.57 An additional important recognition in the BRAWG report and which again would not have even been considered if it was not for the arguments and evidence presented in the campaign I run and related legal case, is that BRAWG "*notes a concern that some individuals may become sensitised to pesticides (or indeed other substances), possibly following apparently low exposures relative to the sensitising dose in animals,* ***and that risk factors for sensitisation are not well understood, either for pesticides or for other substances****. The group considers that it is important to identify the extent to which current or new formulations may change the ability of chemicals to act as sensitisers."*[144]

3.58 The BRAWG report also notes concern that sensitisation could have longer term consequences as the report states, *"An individual can become sensitised as a result of exposure to a substance that can induce a specific immunological reaction ("induction"), such that the individual then reacts to much lower concentrations on further exposure ("elicitation"). On initial contact with a skin sensitiser, the exposed person may experience no obvious symptoms, yet further contact with the same substance may result in clinical manifestations (either skin or respiratory)."*[145]

3.59 As a result BRAWG recommends that research be conducted on the extent to which current or new formulations may change the ability of chemicals to act as sensitisers. The reason why this is an important admittance is because of the continued assertions of Government advisors, such as the ACP, over many years that chemical sensitivity does not exist, and that pesticides will not result in pesticide (or other chemical) sensitivity in humans. Yet the UK Pesticides Campaign has continued to receive reports from people who not only have suffered acute and/or chronic health impacts as a result of exposure to pesticides, but a number of reports where people having developed chemical sensitivity.

3.60 The BRAWG report is due to be finalised and passed to Ministers shortly as the recommendations of both the Advisory Committee on Pesticides (ACP) and Committee on Toxicity (COT) on a revised policy approach to assessing the risk from pesticides to residents and bystanders. It is therefore not yet known at the time of writing this whether DEFRA Ministers will follow the advice recommended in the BRAWG report. However, the fact that BRAWG will now be advising Ministers for a few *limited* changes to the exposure and risk assessment approach (as a result of the evidence and arguments I have continued to present in relation to the residents and bystanders issue), and which is thus a sign of admittance from the Government's advisors of some of the inadequacies of the current approach, as said earlier, BRAWG still does not address *the extent* of the *very serious flaws* in the Government's existing approach to exposure and risk assessment. Therefore

[144] Taken from the latest published version of the *draft* BRAWG report which is available at:- http://cot.food.gov.uk/pdfs/tox201232.pdf

[145] Ibid.

BRAWG has not in any way recommended all the changes that are necessary, and most importantly, the ACP *still* has **not** recommended the introduction of any measures to be introduced into the statutory conditions of use for the necessary protection of the health of residents and others exposed, such as the prohibition of the use of pesticides in the locality of residents' homes, as well as schools, children's playgrounds, hospitals etc.

4. Related Questions Regarding the Government's Approach to Risk Assessment for Bees

4.1 As can be seen from what is set out above, the failings in the Government's approach to exposure and risk assessment regarding human health is also comparable to the serious concerns that have been raised regarding the Government's approach to exposure and risk assessment in relation to other species, such as bees. It is absolutely clear that if there are fundamental flaws in the exposure assessments for pesticides, whether it be for humans, bees or any other species, then there will inevitably be flaws in the risk assessments from the outset. Although I have not examined the exposure and risk assessments currently carried out by the UK Government for bees in the same way as I have for human health, it is highly like that there will be similar flaws in the way the Government carries out the assessments regarding the risks to bees. For example, is the Government including in the exposure assessment for bees all the different exposure factors that bees will be subjected to, such as exposure to pesticides via the air (including droplets, particles and vapours), exposure to pesticides in pollen, exposure to pesticide treated seeds? Does it consider the overall total exposure that bees will be getting both in the short term and the long term? Also the critical point about the mixtures of different pesticides that bees could come into direct contact with and the fact that if a bee is regularly situated in amongst pesticide sprayed fields then it could be coming into direct contact with mixtures of pesticides on a daily basis, including not only in any particular crop field itself, but also in flight when travelling from one field to the next as a result of exposure to mixtures of pesticides in air.

4.2 In relation to the risk of harm to bees from pesticide mixtures, a US study in 2010[146] highlighted the potential synergistic effects on bee health from mixtures and combinations of different pesticides as the researchers found 121 **different** pesticides and metabolites within 887 wax, pollen, bee and associated hive samples. Therefore aside from the **individual products** that carry warnings of a risk to bees on the product label and safety data sheet information (such as *"harmful", "dangerous", "extremely dangerous" or "high risk"* to bees), **there will also be the risk of adverse impacts on bee health from the cumulative effects of multiple exposures to mixtures of different pesticides**.

4.3 This point was further supported by the recent study in the journal *"Nature"* which was reported in the media[147] as being the first to look at the effect of a combination of chemicals and at the sort of levels typically seen in the countryside. It was reported that the *"worst effects were seen in the colonies **exposed to the combination of chemicals**."*[148]

4.4 Researcher Nigel Raine was quoted as pointing out that *"pesticide usage was currently approved on tests which examine **single pesticides over a period of days, rather than weeks**"* and that *"our evidence shows that the risk of **exposure to multiple pesticides** needs to be considered, as this can seriously affect colony success."*[149]

4.5 In the same media article Professor David Goulson of the University of Stirling, was quoted as saying that, *"This new study also highlights the threat posed by exposing beneficial insects **to mixtures of toxic chemicals**, something which all bees face in agricultural environments, but the effects of which are rather poorly understood."*[150]

4.6 In view of such studies, and considering the **reality of crop spraying in the countryside** is not merely related to exposure to one individual pesticide or to one single group of pesticides, as agricultural pesticides are commonly sprayed in mixtures (cocktails), then it would not be adequate to assess the impacts of pesticides on bees *solely* in relation to one group of pesticides such as the neonicotinoids. As said earlier, quite often one pesticide application will consist of four or five different products mixed together. Each product formulation in itself can contain a number of different active ingredients, as well as other chemicals, such as solvents, surfactants and other co-formulants (some of which could have adverse effects in their own right, whether to humans or bees, even before considering any potential synergistic effects in a mixture(s)). Therefore bees and other species, just like residents and other humans, could be exposed to innumerable *mixtures* of pesticides, repeatedly, throughout every year, and for years.

4.7 In relation to this it is important to stress the fact that farmers cannot control pesticides once they are airborne (either at the time of application or subsequently) and so the exposure that residents and other species receive is as a result of the authorised/permitted use of these substances under the Government's existing policy. (The pesticides used in the locality of resident's homes will contaminate both outdoor and indoor environment).

[146] *"High levels of miticides and agrochemicals in North American apiaries: implications for honey bee health,"* Abstract can be seen at:- http://www.ncbi.nlm.nih.gov/pubmed/20333298

[147] http://www.dailymail.co.uk/sciencetech/article-2221223/Is-cocktail-pesticides-wiping-bees-Insects-left-confused-chemicals.html?ito=feeds-newsxml

[148] Ibid.

[149] Ibid.

[150] Ibid.

4.8 It is therefore important that the Environmental Audit Committee enquiry is not limited to assessing the impacts of pesticides on bees and other insects *solely* in relation to one group of pesticides such as the neonicotinoids. Clearly that would miss the wider issue of pesticide spraying in the countryside *in general* and the impacts on bees, as well as importantly on humans, and the very serious failure of the current UK policy and approvals system to adequately assess the risks of such exposure (ie. to **mixtures** of pesticides regularly sprayed), as well as the Government's failure to act on known risks and adverse impacts. The **reality** of pesticide spraying in the countryside is not reflected in any of the risk assessments the Government does, whether it be for humans or bees!

5. Reasons Behind the Government's Complacency and Inaction on Pesticides

5.1 To reiterate, to date, the Government, its advisors, and regulators, have fundamentally failed to protect people in the countryside from pesticides, and have also knowingly allowed residents to continue to suffer from adverse health effects without taking any action to prevent the exposure, risks and adverse health impacts occurring. The evidence really is quite clear that, to date, the Government has knowingly failed to act, has continued to shift the goalposts, cherry picked the science to suit the desired outcome and has misled the public, especially rural residents, over the safety of agricultural pesticides sprayed on crop fields throughout the country. The Government's continued line that there is no evidence of harm from pesticides, as well as no risk of harm, is just untenable and inexcusable. The evidence is there and has been there for a considerable time, the Government is just determined not to act on it. The Government's response to this issue has been, to date, of the utmost complacency, is completely irresponsible and is definitely not *"evidence-based policy-making"*. As I have always maintained from the outset of my campaign this is definitely one of biggest public health scandals of our time.

5.2 The principal aim of pesticide policy is supposed to be the protection of public health and environment. This is meant to be the number one priority and take absolute precedence over any financial, economic or other considerations. However, the Government has been absolutely determined at all costs to maintain the status quo and to appease the interests of the industry (at least this has been the case re. human health), as the Government has continued to put chemical/industry interests over and above protecting public health. To highlight just a few further reasons (to those set out in paras 3.46 to 3.50) as to why successive Governments' have continued to allow industry to set the agenda on pesticides:

5.3 Considering that sales of pesticides in the UK *alone* for 2011–12 was £627 million[151] and reports have put the value of the world pesticides industry at around a staggering $52 billion[152] then this is obviously very big business indeed. However, there are also clear conflicts of interests at play in relation to those advising DEFRA Ministers over the pesticides policy agenda; especially in relation to the Chemicals Regulation Directorate.

i) The Chemicals Regulation Directorate (CRD)

5.4 The Chemicals Regulation Directorate (CRD), the delivery body for DEFRA's responsibility on pesticides and the key officials advising Ministers on the safety of pesticides, is also the evaluator/assessor in the UK for the authorization of pesticide products. The CRD receives approximately 60% of its funding from the agrochemical industry, which is broken down into the fees charged to companies for applications, and a charge on the UK turnover of pesticides companies.[153] For a number of years now this has resulted in the CRD receiving around £7 million or more per year from the agro-chemical industry.[154] In the CRD's annual reports and accounts in relation to the CRD's business operations, the CRD's reliance on full cost recovery from the industry for CRD's *"services"*,[155] including evaluating applications for product approvals is repeatedly stated. **This has always been a completely inappropriate structure, and it means that the CRD has a financial interest in any policy decisions under consideration.**

5.5 Further, by CRD carrying out all the Government Consultations' on pesticides, and also being the main Government agency that assesses the adequacy of the UK's policy and approach, is really effectively just asking the regulator to be judge and jury of itself, which further compounds the inappropriateness of the UK structure.

5.6 **As the UK Pesticides Campaign has continued to argue, even though CRD's main priority is supposed to be to protect public health and the environment from pesticides this obviously conflicts with the fact that the CRD's main customers/clients are its approval holders, (predominantly made up of the**

[151] Taken from an email from the CRD finance department on 25th September 2012 confirming this figure.

[152] Source:- http://www.thedailygreen.com/environmental-news/latest/pesticides-47120102

[153] Source para 3.1 of the 2011 DEFRA document at:- http://www.defra.gov.uk/consult/files/110210-pesticides2011-condoc.pdf

[154] For example, see para 3.1 of the 2011 DEFRA document at:- http://www.defra.gov.uk/consult/files/110210-pesticides2011-condoc-ia.pdf in relation to the figure for 2009/2010 which was **£7.4 million**, and in relation to examples for earlier years see page 16 of the CRD's "Annual Report and Accounts 2008/09" for the figures for 2007/08 and 2008/09 available at: http://www.pesticides.gov.uk/Resources/CRD/Migrated-Resources/Documents/A/Annual_report_and_accounts_final.pdf

[155] Also see for example, DEFRA's response to the consultation last year on the draft legislative text of two UK Regulations to support the European Regulation regarding the authorisation of pesticides (at:- http://www.defra.gov.uk/consult/files/plant-protection-products-consult-response.pdf) that states, *"The Department does not consider it reasonable for the Exchequer to fund the entire operation of this regulatory regime.* ***It is appropriate for the industry to continue to meet the costs of the services they receive."***

agro-chemical companies), and the fact that the CRD is required to meet full cost recovery for its operations, including from product applications and approvals. **The CRD's very structure seems to make health and environmental considerations subordinate to pest control.** (NB. As detailed earlier at paras 3.48 and 3.49 this conflict of interests was clearly apparent during the legal case). The CRD's (formerly PSD's) primary concern and focus on the protection of industry interests as opposed to people's health really has been very clear through all the 11 years that I have been campaigning.

5.7 Therefore, as detailed, the UK's pesticide policy and control regime is based on a wholly inappropriate structure and goes some way to explaining why the pesticide industry has for many years (decades even) had such control over successive Governments' policy decisions on pesticides, particularly in relation to the use of pesticides in agriculture. If the pesticide industry is effectively the ones who are *"paying"* for what controls are or are not in place for the protection of public health and the environment then the industry will of course only be willing to pay the minimum amount possible **for the least controls possible**, **and will preferably want to just continue relying on voluntary measures only. Successive Governments' have continued to reflect the position of the pesticides industry in all policy decisions taken to date on pesticides, (at least since the UK Pesticides Campaign has been in existence since early 2001) and it is quite clear that part of the reason for this can be explained by the fact that the industry are the ones who provide the majority of the funds to finance the control regime. As the UK Pesticides Campaign has pointed out previously, this would appear to be a case of *"whoever pays the piper calls the tune."***

5.8 Therefore as long as the Government's control regime is being funded by (and thus relies upon) the pesticides industry with the majority percentage then there will inherently continue to be reluctance on the part of the industry and the Government to introduce mandatory measures/statutory controls for the protection of public health and safety. The current approach clearly creates an inherent conflict of interests with, in particular, the CRD, having a financial interest in any policy decisions under consideration, and would appear to be one of the reasons why there is this current perverse system of placing the interests of business and industry over and above that of the protection of public health.

5.9 It is clear from the text of both the former EU Directive 91/414 and the new EU legislation consisting of the PPP Regulation, and Sustainable Use Directive (SUD), **that there should be no balancing of interests when it comes to public health protection**.

5.10 **Therefore the primary concern of Government and CRD should definitely not be on ensuring the *minimum cost* to the industry and business, it should be on ensuring the maximum protection for human and animal health and the environment**.

ii) The Advisory Committee on Pesticides (ACP)

5.11 The Government, DEFRA, PSD (now CRD), have always stated that the ACP is *"independent"* of Government. However, the UK Pesticides Campaign would argue that whilst this may have been the aim in theory, it is not necessarily borne out in practice. For example, the ACP Secretariat is made up of PSD/CRD employees. Also, the ACP bases its decisions on summary information that is provided by PSD/CRD employees and to my knowledge the ACP does not go through the full dossiers of information that are provided by applicants. Thus, as said, the ACP's decisions are predominantly based on the summary information and advice and recommendations that are provided by the PSD/CRD. The ACP will then often just concur with the PSD's/CRD's position and does not very often make contrary conclusions to those of the PSD/CRD. Further, the ACP's *"Advice to Ministers"* has not always been passed on by the regulators (then PSD now CRD) to Ministers'[156] which again undermines the ACP's so-called *"independent"* status if the regulators (PSD/CRD) have been able to seemingly deliberately prevent the ACP's *"Advice to Ministers"* from being passed on to the very Ministers it is intended for.

5.12 In relation to the ACP it is important to note the following.

5.13 Paragraph 1.2 of the 2012 DEFRA consultation letter regarding the consultation on the options for the future of the Advisory Committee on Pesticides[157] stated,

> *"The ACP was established under Section 16(7) of the Food and Environment Protection Act 1985 (FEPA). The Advisory Committee on Pesticides was established by the Control of Pesticides (Advisory Committee on Pesticides) Order 1985 and the Advisory Committee on Pesticides for Northern Ireland by the Control of Pesticides (Advisory Committee) Order (Northern Ireland) 1987. The terms of reference are to provide Ministers with advice, either when requested to do so or otherwise, on any matters relating to the control of pests in furthering the general purposes of Part III of the Act.*
>
> *The general purposes of Part III of FEPA are that the provisions of that part of the Act shall have effect:*
>
> — *With a view to the continuous development of means;*
>
> — *to protect the health of human beings, creatures and plants;*

[156] It came to light in 2005 that the then PSD had not passed on to DEFRA Ministers the ACP's formal written advice regarding the residents and bystander issue, (advice nos. 297 and 301) labelled as *"Advice to Ministers."*

[157] Available at:- http://www.defra.gov.uk/consult/files/pesticides-condoc-120308.pdf

— *to safeguard the environment;*

— *to secure safe, efficient and humane methods of controlling pests; and*

— *With a view to making information about pesticides available to the public."*

5.14 The 2012 DEFRA consultation letter regarding the consultation on the options for the future of the ACP[158] went on to state,

"Under Section 16(9), Ministers are required to consult the Advisory Committee:

— *as to regulations which they contemplate making;*

— ***as to approvals of pesticides which they contemplate giving, revoking or suspending; and***

— ***as to conditions to which they contemplate making approvals subject.**"*

5.15 In a conversation with a representative of DEFRA (David Williams) in May 2012, I asked whether **all** products that are considered for approval in the UK go before the (so-called *"independent"*) ACP. He said that he did not think they did, as it would be too much work for the ACP, and therefore that some are just considered by the CRD. In a subsequent email on 14 May 2012 to David Williams and copied to Dave Bench of CRD I requested further information on this, as considering Section 16(9) of FEPA clearly states that *"Ministers **are required to consult the Advisory Committee** *as to approvals of pesticides which they contemplate giving, revoking or suspending; and *as to conditions to which they contemplate making approvals subject"* then to not actually do so when it is **required** would appear to not be in compliance with FEPA Section 16(9)

5.16 The specific questions I asked in my email of 14 May were: 1) How many product applications have not been before the ACP? 2) Whether this has always been the situation since the outset of Section 16(9) being in place? 3) Or whether it started off as every product applications but then subsequently changed thereafter to not being all product applications? 4) Also what else does not go before the ACP but is dealt with by CRD? And I requested examples as to any other instances in which the ACP is not consulted *"as to approvals of pesticides which Ministers contemplate giving, revoking or suspending"*, and *"as to conditions to which Ministers contemplate making approvals subject."*

5.17 Despite repeated reminder emails over the subsequent weeks and months and assurances from DEFRA officials that a *"substantive response"* was coming, I did not actually receive any response to these questions until 19th October 2012 in an email from David Williams of DEFRA that stated that, *"CRD currently receive on average 1,300 plant protection product applications per year. This figure covers the range of applications from new active substances to changes of approval to reflect a change of company name. **Only a small minority are directly put before the ACP. We do not hold the statistical information that you requested.**"*

5.18 I am currently awaiting a response to some further questions I have sent DEFRA and CRD in relation to this to establish exactly how many new product applications, as well as any new active substances, may not have been before the ACP **at all** in relation to each year since FEPA (and most importantly Section 16(9)) has been in existence since 1985.

5.19 This is important information to obtain considering the specific requirements in FEPA Section 16(9), and in order to establish any non-compliance, and breach, of Section 16(9).

5.20 As said earlier at para 3.60, the ACP *still* has **not** recommended to Ministers any measures to be introduced into the statutory conditions of use for the necessary protection of the health of residents and others exposed from agricultural spraying, such as advising Ministers to prohibit of the use of pesticides in the locality of residents' homes, as well as schools, children's playgrounds, hospitals etc. This is despite the evidence that the ACP has received over the last 11 years, since early 2001, regarding the fundamental failings of the existing policy and approvals system in protecting residents' health. There are many examples of the ACP's inaction when faced with evidence of actual harm, as well as the risk of harm, to human health, as a result of pesticide exposure (see for example the many examples included in the second Witness Statement produced for the legal case).

5.21 Therefore, the ACP has, to date, failed to act over the adverse health impacts of pesticides in exactly the same way as DEFRA and CRD (formerly PSD). Further, when PSD found in 2003, on its own estimates, 82 examples of exceedances of the AOEL, in some cases an *order of magnitude higher*, the ACP **did not** advise Ministers for action.

5.22 Furthermore, it is important to point out that a number of members of the ACP have links to the pesticides industry. For example, some members may undertake consultancy work, have shares in and/or receive funding for research support. This has always been an inappropriate structure, as so-called *"independent"* Government advisors cannot possibly be classified as independent if they have financial or other links with the very industries they are overseeing in relation to the hazards to human health. (NB. The declarations of interest of ACP members in the latest ACP report published (2011) is available at:- http://www.pesticides.gov.uk/Resources/CRD/ACP/Annual_Report_2011.pdf, see Annex 3 entitled *"Independent members declaration of interest in the pesticides industry 2011"*).

[158] Ibid.

(iii) *The Pesticides Forum*

5.23 There are a number of very important points to make regarding the Pesticides Forum.

5.24 The *draft* UK pesticides National Action Plan (NAP), that was recently subject to a Government Consultation, in Annex 2[159] entitled *"The Pesticides Forum—brief description and role"* it states, *"The Pesticides Forum has the following terms of reference: To bring together the views of those concerned with the use and effects of pesticides; To identify their common interests; To assist the effective dissemination of best practice, advances in technology, and research and development results.* ***To advise Government on the development, promotion and implementation of its policy relating to the responsible use of pesticides****."* [160] Thus one of its remits is to advise Ministers on pesticides policy and use.

5.25 Paras 6.1 and 6.2 of the *draft* UK National Action Plan (NAP) pointed out that the Government/ DEFRA/CRD intends to rely on the Pesticides Forum for the monitoring and review of the UK National Action Plan.[161] This can also be seen in other paras of the *draft* UK NAP such as at para 7.1 which refers to the Pesticides Forum's *"suite of indicators to monitor how pesticides are being used* ***and the impact they are having****"*,[162] para 8.3, and para 8.4 that states, *"Progress in the priority areas will be looked for over the five years of the Plan. Indicators will be examined annually in the Pesticides Forum report to provide the quantitative measure of this progress,"*[163] as well as in various other places.

5.26 Firstly, it is important to stress the fact that the Pesticides Forum does **not** involve ***all*** stakeholders, as there is **no** representative on the Pesticides Forum on behalf of those directly affected and adversely impacted from exposure to pesticides and this is something that has always been of great concern to the UK Pesticides Campaign.

5.27 Secondly, as can be seen from the letter I sent to the Chairman of the Pesticides Forum on 18 June 2012 (and which I have previously provided to the clerks of the Environmental Audit Committee and which is available at:-
http://www.pesticidescampaign.co.uk/documents/
Letter%20to%20the%20Pesticides%20Forum%2018th%20June%202,012.pdf)
there are some serious issues with the Pesticides Forum annual reports, including the inclusion of a number of grossly inaccurate statements within the annual reports. These include such statements as that in the Executive Summary of the current 2011 report that states, *"The work of the UK Pesticides Forum in 2011 confirms that the use of pesticides is* ***not*** *adversely impacting on the health of UK citizens or the environment."* **This is simply not factually correct, and in fact even just going by the UK Government's *own monitoring system* it shows cases of acute effects recorded in members of the public each year**. As said this inaccurate statement is just one of a number of inaccurate statements contained within the Pesticides Forum annual reports each year.

5.28 Having recently investigated this issue it was confirmed by the Pesticides Forum Secretariat (which is provided by the CRD) that **no** Pesticides Forum member had dissented, or objected, to such statements prior to the publication of the 2011 annual report, and this included organisations that are supposed to be on the Pesticides Forum as organisations concerned about the adverse impacts of pesticides on human health and the environment (eg. the Pesticide Action Network UK (PAN UK), the Wildlife and Countryside Link and Sustain). The various members of the Pesticides Forum had plenty of time to raise any concerns seeing as the 2011 *draft* report was circulated to the Pesticides Forum members in February and yet was not actually published until May.

5.29 Further, the current 2011 report is not an isolated case, as this non-dissenting, and thus agreeing with and signing up to, the contents and inaccurate statements in the Pesticides Forum annual reports has actually been going on **for years,** as according to conversations that I have had with the Pesticides Forum Secretariat there was **no** dissenting to any of the same sort of statements from any of the Pesticides Forum members in relation to the 2008, 2009 and 2010 reports either. This means that UK Ministers are highly likely to have been informed by the regulators, the CRD, when highlighting the various Forum reports to those Ministers, that the reports had been agreed by **all members** of the Forum, including the various NGOs and purported and supposed environmental and consumer organisations that are members of the Forum.

5.30 It is of course absolutely imperative that any organisation that is involved in a Forum that provides advice to Ministers, (which is one of the main objectives of the Pesticides Forum as stated in each one of the Pesticides Forum annual reports), must know what it is signing up to and agreeing with, especially when that organisation purports to be representing a *link* of other organisations as well, as it could then look as if all those other organisations are also agreeing with the content of the Pesticides Forum reports.

[159] The *draft* UK National Action Plan (NAP) consultation document is available at:- http://www.defra.gov.uk/consult/files/consult-nap-pesticides-document-20120730.pdf

[160] Para 13 of the Impact Assessment for the *"The Plant Protection Products (Sustainable Use) Regulations 2012"* also points out the Pesticides Forum is a body "**which advises Ministers generally on the use of PPPs."**

[161] The *draft* UK National Action Plan (NAP) consultation document is available at:- http://www.defra.gov.uk/consult/files/consult-nap-pesticides-document-20120730.pdf

[162] Ibid.

[163] Ibid.

5.31 It is, as said above, most certainly **not** correct for the Pesticides Forum reports to have maintained, since at least 2008, that *"the use of pesticides is **not** adversely impacting on the health of UK citizens or the environment"* and if I had not spotted this then who knows how many more years all the members of the Forum would have carried on non-dissenting, and thus agreeing with and signing up to, the same and/or similar grossly inaccurate statements within the contents of the subsequent Pesticides Forum reports.

5.32 It is also important to point out that the Pesticides Forum has always been dominated by industry based organisations. Therefore there is simply no proper, robust, **independent** consideration and evaluation in the UK of the various indicators and schemes that are in place regarding the health and environmental impacts of pesticides.

5.33 **Therefore, as said, there is serious concern regarding the Pesticides Forum as DEFRA Ministers have been receiving advice from the Pesticides Forum for many years, and yet year after year the Forum has wrongly asserted that, *"the use of pesticides is not adversely impacting on the health of UK citizens or the environment."* Considering the grossly inaccurate statements that the Pesticides Forum has continued to make year after year, effectively denying the adverse health and environmental impacts of pesticide use, then it is of *further* serious concern that it is intended that the Pesticides Forum be responsible for the monitoring and review of the UK's National Action Plan (NAP) on pesticides after it has been adopted.**

6. Conclusion

6.1 As pointed out earlier, the evidence I produced for the legal case clearly showed that the Government, DEFRA, PSD (now CRD), and ACP, have all continued to base decisions in relation to pesticides on the protection of industry interests as opposed to what is absolutely required as the number one priority of pesticide policy and regulation—**to protect public health**. Yet in the UK, DEFRA has previously stated[164] that there is not supposed to be a trade off when it comes to the risks to health from pesticides with the benefits and that if there is scientific evidence that use of a pesticide *may* harm human health that is to be considered unacceptable, and that approval for use would be refused, whatever the benefits. However, paragraphs 195 to 206 of my second Witness Statement from the legal case detailed the evidence to show that the Government has continued to adopt the improper approach of *balancing* harm to human health against the (supposed) benefits of pesticide use, in which the Government is accepting a degree of damage to human health on the basis that *it believes* it is outweighed by other benefits (eg cost/economic benefits for farmers and the industry), rather than adopting the absolute protective approach that is required under EU law for the protection of human health.

6.2 As said earlier, it is absolutely clear from the text of both the former EU Directive 91/414, and the new EU legislation consisting of the PPP Regulation, and the SUD, **that there should be no balancing of interests when it comes to public health protection**.

6.3 It is important that the Environmental Audit Committee enquiry also looks into what is going on behind the scenes and the inappropriateness of the UK structure and regime for assessing the safety of pesticides, as it does not matter how much unarguable and indisputable evidence exists regarding the adverse impacts of pesticides, successive Governments have been absolutely determined at all costs to maintain the status quo and to appease the interests of the industry, at least this has been the case re. human health.

7. Recommendations for Action

Options for the protection of residents in the EU legislation (PPP Regulation and SUD)

7.1 As a direct result of the work of the campaign I run, the UK Pesticides Campaign, the new EU legislation consisting of the PPP Regulation, and the Sustainable Use Directive, contains a number of critical measures for the protection of residents, including a new legal obligation for farmers and other pesticide users to provide information to residents and others on the pesticides they use (Article 67 of the PPP Regulation); [165] and the option for a new legal requirement in the statutory conditions of use for residents to be provided with prior notification before spraying (Article 31 para 4(b) of the PPP Regulation).[166]

7.2 However, most importantly, Article 12 of the Sustainable Use Directive (SUD) includes the option for the prohibition of pesticide use in areas used by the general public, or by *"vulnerable groups"*, a term which is clearly defined in Article 3, paragraph 14 of the new EU PPP Regulation as including **residents *"subject to high pesticide exposure over the long term"*** as a result of living in the locality of pesticide sprayed fields.[167] Article 12 is a vital clause. Considering that the majority of poisoning incidents and acute adverse health effects that are recorded annually in the UK Government's *own monitoring system* are from crop-spraying, then as said earlier, the prohibition of the use of pesticides in the locality of residents' homes, as well as schools, children's playgrounds, hospitals, and public areas is absolutely crucial for public health protection,

[164] Joint Memorandum *"Progress on Pesticides"* submitted by DEFRA and HM Treasury to enquiry by the Environment, Food and Rural Affairs Committee (20.10.2004).

[165] Article 67 of the European PPP Regulation 1107/2009 can be seen at:- http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:309:0001:01:EN:HTML

[166] Article 31 para 4(b) of the European PPP Regulation 1107/2009 can be seen at:- http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:309:0001:01:EN:HTML

[167] The new definition for *"vulnerable groups"* in Article 3, para 14 of the European PPP Regulation 1107/2009 can be seen at:- http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:309:0001:01:EN:HTML

especially that of vulnerable groups, as pesticides should never have been approved for use in the first place for spraying in the locality of any of these areas. Considering the risks, and acute and chronic adverse health impacts of pesticide use, then a preventative approach must be utilized, especially in relation to the protection of vulnerable groups including residents, babies, children, pregnant women, and those already ill. As said earlier, considering that studies have shown that pesticides can travel in the air for **miles** then the distance of the area where the use of pesticides is prohibited needs to be **substantial**. The areas where the use of pesticides is prohibited can of course still be managed/farmed using non-chemical farming methods. This would include rotation, physical and mechanical control and natural predator management. See below *"The Prioritisation of Non-Chemical Methods."*

7.3 These aforementioned measures are all measures that the UK Pesticides Campaign has been calling for since the outset of the campaign at the beginning of 2001 and it is critical that all these measures are **mandatory** and must be introduced into the statutory conditions of use for the authorization/approval of *any* pesticide to *finally* protect the health of residents and other members of the public from exposure to pesticides.

7.4 Article 31 of the European PPP Regulation under *"Contents of authorisations"* states at para 4(a) that *"The requirements referred to in paragraph 2 may include the following: (a)* ***a restriction*** *with respect to the distribution and use of the plant protection product* ***in order to protect the health of*** *the distributors, users, bystanders,* ***residents****, consumers or workers concerned or the environment, taking into consideration requirements imposed by other Community provisions; such restriction shall be indicated on the label."* [168]

7.5 Therefore the EU legislation includes provisions that Member States can adopt regarding requirements for specific restrictions of use for the protection of residents' health.

7.6 It is of great concern among residents in the UK that certain measures within the EU SUD and EU PPP Regulation are not currently being implemented correctly by the Government, as DEFRA's response has been to, as ever, effectively maintain the status quo and not to bring in any mandatory measures to protect rural residents from exposure to pesticides, and to just continue to rely on industry-led voluntary measures only. Yet reliance on existing or enhanced voluntary approaches will not change anything and thus will not provide any public health protection, as voluntary measures have existed for decades, have not worked, however many times they are repackaged, and are completely unacceptable in this situation. Most importantly of all, DEFRA officials previously advised DEFRA Ministers in June 2006 that, ***"…voluntary measures can only be used where there is no health risk to residents and bystanders…"*** [169] Therefore DEFRA Ministers and officials are well aware that in the situation where the health risks and adverse effects are already accepted, (including in the Government's own monitoring system), then **voluntary measures are not an option and thus should never have been relied upon in the first place in a situation where public health is at stake**.

7.7 Members of the public have continued to raise their concerns and/or report adverse health impacts to decision makers, Ministers, MPs, other politicians, over the use of pesticides, particularly in relation to agricultural pesticide spraying, and the lack of any measures in the Government's existing policy to protect public health, especially rural residents and communities exposed to pesticides from living in the locality of pesticide sprayed fields.

7.8 The factual evidence clearly confirms the fact that in relation to the exposure of residents **more than enough evidence already exists** (evidence of AOEL exceedances; harm to the health of residents and others exposed, including in the UK Government's *own monitoring system* etc.) **for action to be taken now** with the introduction of mandatory measures for the protection of residents health, and that are very long overdue.

7.9 Therefore DEFRA needs to urgently amend its policy and approach regarding pesticides, and must urgently implement all the aforementioned specific requirements for the protection of residents (at paras 7.1 to 7.5). Ministers must finally put the protection of the health of UK citizens first and foremost in its policy.

The Prioritisation of Non-chemical Methods

7.10 There is no doubt that the widespread use of pesticides in farming is causing serious damage to the environment, wildlife and, above all, human health. A long-term approach is needed, rather than inadequate measures aimed at addressing problems only in the short-term. This problem is not going to be solved by simply *papering over the cracks* as the whole core foundations and structure on which the current UK policy and approvals system operates is inherently flawed. For example, it would **not** solve the very deep seated and fundamental problems that exist by merely ***reducing*** the use of pesticides **as just one single exposure could lead to damage to the health of humans, bees or other species**; nor will the problems be solved by merely substituting one pesticide for another.

7.11 The only real solution to **eliminate** the adverse health and environmental impacts of pesticides is to take a **preventative approach** and avoid exposure altogether with the widespread adoption of truly sustainable **non-chemical farming methods**. This would obviously be more in line with the objectives for sustainable

[168] Article 31 para 4(a) of the European PPP Regulation 1107/2009 can be seen at:- http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:309:0001:01:EN:HTML

[169] Taken from paragraph 94 of a document formulated for Ministers consideration by DEFRA's *Chemicals and Nanotechnology Division"* in June 2006.

crop production, as the reliance on complex chemicals designed to kill plants, insects or other forms of life, cannot be classified as sustainable.

7.12 Considering the health and environmental costs of using pesticides it makes clear economic sense to switch to non-chemical farming methods. **It is a complete paradigm shift that is needed, as no toxic chemicals that have related risks and adverse effects for any species (whether humans, bees or other) should be used to grow food.**

7.13 In 2003 the then DEFRA Minister for Food and Farming, Lord Whitty, stated that, ***"Reducing reliance on pesticides is a priority, and we want to find alternative, more environment-friendly pest controls for farmers and growers."*** However, this statement has never been backed up by **any real action** by either the previous Government, or the current coalition, to move away from chemical dependency and the strong ties with the agro-chemical industry to the development of sustainable non-chemical farming methods.

7.14 One of the main objectives/aims of the new EU legislation is to shift policy towards the utilisation of **non-chemical farming methods** in order to reduce dependency on pesticides. **Therefore the Government needs to prioritise as a matter of urgency the promotion and encouragement of the use of non-chemical methods in the UK.**

7.15 Incidentally, it is important to stress the fact that the system called **Integrated Pest Management (IPM)** is **not** the same as non-chemical methods. IPM is a system **that still uses pesticides to some degree** (whichever definition one goes by). To give an example of my own experiences of IPM in the UK, the farmers that were farming the fields next to our property insisted they used IPM, and yet they were known to spray 30 times in 6 months with mixtures of different pesticides! Therefore in *reality* and in practice, IPM does not necessarily involve lower pesticide use. IPM is a weaker and a far more compromised system compared to utilising complete **non-chemical farming systems**.

7.16 To give a further example of the differences between IPM and non-chemical methods see the article at:-
http://www.enewspf.com/latest-news/science-a-environmental/31,034-connecticuts-historic-pesticide-legislation-threatened-by-ipm-bill.html.
Although the article is largely related to the use of pesticides on lawns (and in Connecticut) note it says,

> *"In the years since the original bill was introduced by state senator Ed Meyer, a robust natural lawn industry has sprung forth in an around Connecticut. Numerous groundskeepers have adapted practices that allow for the maintenance of excellent playing fields—**yet the synthetic chemical industry has never stopped lobbying the legislature to roll back the protection to include "integrated pest management." IPM allows for synthetic chemical pesticides at the discretion of the licensed applicators."***
>
> ***"The pro-pesticide strategy is to call the elimination of the pesticide ban "Integrated Pest Management,' but what it really stands for is business as usual,"** said Dr. Jerome Silbert, a pathologist from Connecticut. **"If this bill (5155) passes it will be a major setback for the protection of young children from involuntary exposure to toxic lawn pesticides."***
>
> *"This was well thought out and well explored law by all parties," said Alderman. **"The state should not roll this law back because industry and SOME grounds keepers would like to use pesticides again under the guise of Integrated Pest Management. When IPM has been mandated in other states it has proven to be unenforceable—because it allows pesticides—and once pesticides are allowed one cannot tell how much or how many times they are used. IPM has not proven to be a workable method when mandated for schools."***

7.17 Therefore, as said above, IPM is **not** the same as non-chemical methods. The problems with pesticides will not be solved by IPM. As said, it is a complete paradigm shift that is needed to shift policy away from the dependence on pesticides altogether.

7.18 The adoption of the new European legislation, with the key objective and aim of utilizing non-chemical methods to reduce dependency on pesticides, gives the coalition Government the chance to overhaul the existing policy and approach in order to make the protection of public health the number one priority of the UK Government's policy and regulations. A different approach is urgently needed and is very, very long overdue.

7.19 Please note that any comments made by me are, of course, **Without Prejudice** to the position taken by me, and the evidence and arguments advanced by me, in my legal case, both through the domestic courts, and before the European Court of Human Rights.

9 November 2012

Written evidence submitted by Professor Graham Stone, University of Edinburgh

SUMMARY POINTS

(1) The value of the pollination ecosystem service to UK agriculture and biodiversity is enormous.

(2) Pollination services require healthy pollinator populations of suitable species that are both growing (or at least stable), and functioning efficiently.

(3) Pesticides, including neonicotinoids, have been designed to target fundamental insect systems. Our default expectation must be that, even at sub-lethal doses, their impacts on beneficial insects will never be good.

(4) Impacts on pollinators can be complex and delayed.

(5) There is reason to expect that combinations of pesticides could have synergistic effects on insect health.

(6) We know neonicotinoids reduce UK bee performance, but we don't really know why.

(7) Impacts of pesticides are very likely to vary among pollinator groups.

CONCLUSIONS.

1. We know too little about non-target impacts of neonicotinoids to assume that there is little or no risk to UK pollinators under current application regimes.
2. Given the value of pollination services, there is an urgent need to invest in the research necessary to address the "known unknowns".
3. It would probably be unwise to extrapolate from research on bees to behavioural and population effects on non-bee pollinators.

EACH SUMMARY POINT, EXPANDED.

1. The value of the pollination ecosystem service to UK agriculture and biodiversity is enormous, and could not be achieved without insect pollinators (POST 2010; Breeze et al 2012). It is prudent therefore to know about non-target effects before deploying any pesticides. **History shows** that failure to understand impacts of toxins on non-target species and natural communities only ever has an unhappy ending.

2. Pollination services require healthy pollinator populations of suitable species that are both growing (or at least stable), and functioning efficiently (healthy). (Breeze et al 2012).

3. Pesticides, including neonicotinoids, have been designed to target fundamental insect systems (Nauen and Denholm 2005; Aliouane et al 2009).

Our default expectation for such toxins must be that, even at sub-lethal doses, their impacts on beneficial insects will never be good (Desneux et al 2007). That they do not cause harm should be based on evidence, rather than absence of evidence—and there are a lot of important things we don't know very much about.

4. Impacts on pollinators can be complex and delayed. Beyond rapid killing of insects, neonicotinoids are known to have complex and longer-term effects on individual and colony performance. In social bees, exposure to neonicotinoids reduces pollen collecting ability and ability to return safely to the nest from foraging trips (Gill et al 2012; Henry et al 2012). Reduced pollen-collecting ability may explain why neonicotinoid-exposed bumblebee colonies are less able to invest resources in queens for the next generation (Whitehorn et al 2012). While argument continues over the magnitude of these effects in fully natural situations, these effects can only ever have negative impacts on the quality of pollination service delivered, and the status of bee (and other pollinator) populations.

5. There is reason to expect that combinations of pesticides could have synergistic effects on insect health because different pesticide groups target different fundamental systems. Neonicotinoids target systems using one type of nerve transmission (cholinergic), while phenylpyrazoles such as Fipronil target another (glutamergic) (Pfluger and Duch 2011). These nervous systems fulfil different roles in the body: for example, cholinergic nerves are involved in collection of information and processing by the insect brain (Pfluger and Duch 2011), while glutamergic nerves are involved in operation of the main flight muscles (which in social bees are also associated with generation of heat for nest incubation, and in solitary bees, large hoverflies and some butterflies are required for essential pre-flight warm-up) (Heinrich 1993). Because foraging and other pollinator behaviours often involve both information processing and flight, we should explore the extent to which different pesticide combinations interfere with them.

Recommendation: impacts of combined pesticide exposure should be studied as a matter of urgency.

6. We know neonicotinoids reduce UK bee performance, but we don't really know why. Though some of the impacts of neonicotinoid pesticides on insect physiology are known, we still cannot explain the observed effects on honeybee and bumblebee behaviour.

We know which physiological systems are most likely to be targeted by neonicotinoids (see evidence submission from Dr. Chris Connolly, Dundee University; Desneux et al 2007), and we also know about some

impacts on individual bee behaviour (eg Gill et al 2012). Neonicotinoid exposure is associated with longer foraging trips, lower rates of pollen harvesting, and higher forager mortality through non-return to the nest (Henry et al. 2012). These changes reduce the resources flowing into a bee colony, and result in reduced queen production in bumblebees (Whitehorn et al 2012).

The decline in foraging success could be attributable to collapse of a key metabolic system (such as the flight muscles, whose ability to generate internal heat is essential for flight and warming of the nest) or to neural processing of information (ability to recognise flowers and rewards, ability to communicate information to nest mates, and to navigate home safely) (Desneux et al 2007; Henry et al 2012), or any combination of these and other systems. We urgently need more research on the organ-system and whole animal level impacts of pesticides on bees and other pollinators.

Recommendation: System-level effects of neonicotinoids singly and in combination with other pesticides should be explicitly studied.

7. Impacts of pesticides are very likely to vary among pollinator groups. We should not extrapolate to other groups from known impacts on social bees.

Pollinator groups (eg social bees, solitary bees, hoverflies, butterflies) differ in how individual foraging success is linked to reproductive success, and face different routes of pesticide exposure.

(a) Social bees versus solitary bees. To date, almost all work on the effects of neonicotinoids has been carried out on honeybees and bumblebees (see DEFRA research programs at http://randd.defra.gov.uk/). These social species can respond to challenging conditions by altering the proportion of workers doing different jobs, and how much resource they invest in making workers versus making reproductive adults (eg Whitehorn et al 2012 and Gill et al 2012 for bumblebees). However, solitary bee females are required to carry out all of these roles, building and stocking each cell with collected provisions before laying their egg (Stone 1994). They cannot make the same resource allocation decisions as social bees, or benefit from warmth/nectar gathered by nestmates, and may be more vulnerable to non-lethal pesticide effects. We also need to know how neonicotinoids impact on the courtship and mating behaviours of male solitary bees, which are far more diverse than those seen in social species, and directly linked to successful reproduction.

Recommendation: neonicotinoid impacts on solitary bees should be explicitly investigated using model systems such as the red mason bee, *Osmia bicornis* (= *O. rufa*).

(b) Bees versus other pollinators. Bees differ from other pollinators in that their reproductive output depends directly on how much pollen the adult females can collect. Any factor that reduces a bee's ability to recognise, harvest or carry pollen back to its nest will influence its reproductive rate. Exposure to pesticides through food is via nectar (adults) and pollen (larvae).

Other pollinators have different links between the food they harvest from flowers and their reproductive rate. For example, adult female hoverflies feed on pollen and/or to mature their eggs (and so are exposed to systemic pesticides in pollen/nectar) (Gilbert 1981), but this is not directly linked to how many offspring they have. The larvae of many hoverflies feed on other insects, and have additional potential routes of pesticide intake (for example, from aphids feeding on a sprayed or seed-dressed plant). Butterflies are different again, and do not need the nectar they feed on to mature their eggs. They are exposed as adults to pesticides in nectar, and as larvae to any pesticides in their food plant.

Recommendation: this simple overview suggests that it would be unwise to extrapolate from research on bees to behavioural and population effects on non-bee pollinators.

Literature cited

Aliouane Y et al. (2009). Subchronic exposure of honeybees to sublethal doses of pesticides: effects on behaviour. Environmental Toxicology and Chemistry 28, 113–122.

Breeze TD, Roberts SPM and Potts SG (2012). The Decline of England's Bees

Policy Review and Recommendations. Friends of the Earth/Reading University.

Desneux N et al (2007). The sublethal effects of pesticides on beneficial arthropods. Annual review of Entomology 52, 81–106.

Gilbert FS (1981). Foraging ecology of hoverflies: morphology of the mouthparts in relation to feeding on nectar and pollen in some common urban species. Ecological Entomology 6, 245–262.

Gill RJ et al (2012). Combined pesticide exposure severely affects individual- and colony-level traits

Heinrich BE (1993). The Hot-blooded Insects. Springer.

Henry M. *et al.* (2012). A common pesticide decreases foraging success and survival in honeybees. Science 336, 348–350.

Nauen R and Denholm I (2005). Resistance of insect pests to neonicotinoid insecticides: current status and future prospects. Archives of insect Biochemistry and Physiology 58, 200–215.

Parliamentary Office of Science and Technology (2010) Insect Pollination. January 2010 Number 348.

Pfluger HJ and Duch C (2011). Dynamic neural control of insect muscle metabolism related to motor behavior. Physiology 26, 293–303.

Stone GN (1994). Activity patterns of females of the solitary bee *Anthophora plumipes* in relation to temperature, nectar supplies and body size. Ecological Entomology 19, 177–189.

Whitehorn PR et al (2012) Neonicotinoid pesticide reduces bumble bee colony growth and queen production. Science 336, 351–352.

20 November 2012

Written evidence submitted by the Department for Environment, Food and Rural Affairs

SUMMARY

- Defra is pleased to have the opportunity to present its thoughts on this issue and to set out some of the work we are doing.
- Bees and other insect species are an essential facet of the natural world and play a very important economic role as pollinators. We therefore carry out a considerable amount of work to conserve important insect groups and some of that work is outlined in this memorandum.
- Some insects, however, are a problem for economic activity in several areas, including agricultural production and food hygiene. Insecticides are therefore valuable tools and farmers and others should be able to use them when this can be done without putting people or the environment at risk. Defra therefore supports and maintains strict regulation of insecticides and other pesticides. The basis of the regulatory system is the assessment and management of risks to human health and the environment.
- Published studies have indicated that neonicotinoid insecticides could have sub-lethal effects on bees which are sufficiently disruptive of their normal functions to have adverse consequences for populations. Some stakeholders have pressed us to respond to this by banning neonicotinoids, others have argued against such a course. Defra's role in this case is to assemble all the evidence, consider it carefully and fully and to reach a decision on the best course. We have consistently made it clear that we will restrict or withdraw authorisations of pesticides containing neonicotinoids if the evidence calls for this.
- We therefore ensure that new research is assessed alongside the existing evidence. The most recent such assessment was completed in September, under the direction of Defra's former Chief Scientific Adviser, Professor Sir Bob Watson. The work was carried out by Government scientists and independent experts, taking full account of parallel work by the European Food Safety Authority. Their findings were considered by Professor Watson. His successor, Professor Ian Boyd, was sighted on this final stage and was content with the approach taken and overall conclusions drawn. Following Professor Watson's recommendations, the Government drew three key conclusions.
- First, it was time to update the process for assessing the risks of pesticides to bees in the light of developments in the science—including the latest research. This exercise should include the development of a new risk assessment for bumble bees and solitary bees, alongside an updated risk assessment for honey bees. This work is being taken forward in Europe and UK experts are active in this. The aim is to complete this highly complex task by the end of 2012.
- Second, further research was needed to fill identified evidence gaps, including the questions raised about the relevance of the recent studies to field conditions. The Government had already put new research in place to explore further the impacts of neonicotinoids on bumble bees in field conditions and to understand what levels of pesticide residues and disease in bees are normal.
- Third, the studies considered did not justify changing existing regulation. However, the research that we had put in hand and the on-going work in Europe to develop the risk assessment could change the picture and it would always be possible that further new evidence may emerge. As our knowledge developed, we would continue to consider the need for further research and for any changes to the regulation of pesticides containing neonicotinoids.
- Contrary to some reports, the action we have taken to date and the conclusions we drew from the September review are in step with most of the other regulatory bodies in Europe.
- Further research under the Insect Pollinators Initiative, which is part-funded by Defra, was published online on 21 October (Gill et al, Combined pesticide exposure severely affects individual- and colony- level traits in bees, doi:10.1038/nature11,585). Defra has taken the views of the independent Advisory Committee on Pesticides on this study. The Committee advises that the study reinforces existing knowledge that sub-lethal effects with potential implications for colony survival are found in the conditions applied in laboratory studies. However, it does not fill gaps in knowledge about exposure in the field and about evidence of actual damage in the field.

— Defra has work in place to address these points. We have asked the researchers to complete their work as quickly as possible without jeopardising its quality. We expect this to be done by the turn of the year. In the meantime, we are examining the human health, environmental and economic consequences of possible options for regulatory action.

— This issue is not closed and we do not regard all the questions as answered. We recognise that there are real concerns which need to be addressed as fully and rapidly as possible. We are bringing forward our own research and will consider its results and implications for the assessment of risk as soon as they are available. We are also ensuring we have clear view of which options for regulatory action might prove effective and proportionate.

Introduction

1. In announcing its Inquiry into the impact of insecticides on bees and other insects, the Committee said that it would examine the analysis published by Defra on 18 September on the effects of neonicotinoid insecticides on bees. Under this heading, the Committee highlighted several issues: the basis on which Defra decided not to change existing regulations at this stage, whether this decision is justified by the available evidence, and why the Government decided not to follow other European countries in temporarily suspending the use of insecticides linked to bee decline. The Committee also identified other specific issues for particular examination:

— The application of real-world—"field"—data. What monitoring there is of actual—rather than recommended—levels of pesticide usage, and the extent to which that influences policy on pesticides.

— Any potential impacts of systemic neonicotinoid insecticides on human health.

— What alternative pest-control measures should be used, such as natural predators and plant breeding for insect-resistance, in a bid to make UK farming more insect- and bee-friendly.

2. This Memorandum sets out:

(a) relevant background information on the regulatory system for pesticides;

(b) the current regulation of neonicotinoids in the EU, UK and other Member States;

(c) the Defra review published in September;

(d) the further work we have carried out since September, including examination of the Gill *et al* paper in Nature, and our future plans;

(e) the use of real-world monitoring data;

(f) potential impacts of neonicotinoids on human health; and

(g) the scope for making UK farming more insect-friendly, including the use of alternative pest-control methods.

A. The Regulatory System for Pesticides

3. Pesticides have been regulated in the UK for 25 years, regulation replacing an earlier non-statutory scheme. Over the past 20 years, they have increasingly been subject to EU rules. These rules distinguish between two types of pesticides: plant protection products (PPPs, which include most pesticides used in agriculture and horticulture) and biocidal products (intended to destroy or control organisms in a range of non-agricultural situations). Some insecticides are biocides, for example products for controlling house flies or ants. However, the main concerns related to exposure of bees have been in relation to plant protection products and so this is the system described in this memorandum.

4. Under Regulation (EC) No 1107–2009, plant protection product active substances are approved at EU level. Active substance approvals are normally for ten years and are then subject to complete reassessment according to current standards. Both the EU and individual Member States are able to carry out an earlier reassessment if new information of concern comes to light.

5. If an active substance meets EU safety requirements, products containing that active substance can be authorised at Member State level. This authorisation is carried out according to common rules set by EU regulation, but there is a degree of discretion to take account of national circumstances.

6. Regulation 1107–2009 sets out the circumstances in which Member States may review authorisations and may withdraw or amend authorisations. The Regulation also sets out the circumstances in which it is possible to prohibit the use of treated seeds.

(a) *Risk assessment*

7. Authorisation or approval is only granted following assessment of scientific data on risks. This risk assessment covers:

— risks to human health through all routes of exposure, including air, water and food;

— risks to the environment—taking account of the pesticide's fate and distribution in the environment (including water, air and soil), its impact on non-target species and its impact on biodiversity and the ecosystem; and

— the efficacy of the product. This part of the assessment considers whether the product is effective in controlling agronomically significant pests. Approval will be refused if the product is not sufficiently effective or if the target pest is not a significant economic threat.

8. The human health assessment is outlined at paragraphs 59 to 64 below. The environmental risk assessment evaluates risks to honey bees and to two other non-target arthropods as representative species (this part of the risk assessment is outlined in **Annex 1**) but not, separately or specifically, risks to other bee species.

9. It is recognised that risk assessment cannot fully reflect what will happen in real life situations. For example, it is not considered appropriate to carry out tests of the toxicity of pesticides on people and so careful use is made of animal tests with an additional factor built in to take account of inter-species variation. In the case of environmental risk assessment, it is clearly not possible to take full account of every variable. Uncertainty factors and conservative assumptions are therefore used with the aim of achieving a high degree of confidence that decisions are sufficiently protective.

(b) *The approvals procedure for active substances*

10. It is the job of the company which wishes to gain approval to put together the necessary scientific data to support its application. To this end, companies commission and fund the studies that are submitted to the pesticides regulatory authorities. The studies must be conducted to internationally recognised guidelines and have verified Good Laboratory Practice and quality assurance certification.

11. The studies commissioned in support of an approval application are sometimes described as secret, but that is not an accurate portrayal. These studies carry data protection rights under EU legislation, which means that they cannot be used by other companies to gain authorisation. However the data is accessible through access to information arrangements such as those under the Freedom of Information Act and Environmental Information Regulations. These access rights to the regulatory studies have been used in respect of neonicotinoids.

12. In addition the Government recognises the value of having the data more readily available for wider review and has suggested to the pesticide manufacturers that it would be a good idea to publish their studies. Syngenta tell us that their long-term over-wintering bee field trial data has been submitted for publication to a scientific journal and is currently going through the peer review process.

13. The applicant submits all of the information including study methodology and data generated, together with their own conclusions, in the form of a Dossier. The Dossier need not consist only of studies commissioned by the applicant for regulatory purposes. It will also include published data, including academic studies where these exist and are relevant. There is a specific requirement for this in article 8(5) of Regulation 1107–2009, which states:

> "Scientific peer-reviewed open literature, as determined by the Authority [meaning the European Food Safety Authority], on the active substance and its relevant metabolites dealing with side-effects on health, the environment and non-target species and published within the last 10 years before the date of submission of the dossier shall be added by the applicant to the dossier."

14. The Dossier is scrutinised and assessed by a regulatory authority's experts in all of the various scientific disciplines involved. The regulatory authority's opinion—which may or may not coincide with that of the company—is set out in a Draft Assessment Report (DAR). The DAR produced by the regulatory authority of a Member State is then submitted to the European Food Safety Authority (EFSA), which organises a further scrutiny (known as peer review) by experts from all of the EU Member States. Following this peer review, EFSA sends its conclusions to the Commission. This is used as the basis for a proposal from the Commission for approval or not of the substance and any associated conditions. This proposal is adopted (or not) by qualified majority vote of Member States. The DARs and EFSA conclusions are published on the EFSA website (http://www.efsa.europa.eu). Commission decisions are published in the Official Journal of the European Union and on their website.

(c) *The role of EFSA*

15. EFSA was set up in January 2002, as an independent source of scientific advice and communication on risks associated with the food chain. For pesticides work, EFSA deals with risk assessment issues, including for the environment, and the European Commission is responsible for the risk management decision. EFSA is responsible for the peer review of active substances used in pesticides. It also gives scientific advice on broader issues that cannot be resolved within the peer review of active substances and provides scientific guidance on more generic issues, commonly in the fields of toxicology, eco-toxicology or the fate and behaviour of pesticides. The EU rules for the authorisation of pesticides allow the Commission to seek EFSA's views on new evidence on the safety of a pesticide or active substance; it is this provision that the Commission used in asking EFSA to review the recent studies on neonicotinoids and bees.

(d) *The overall picture on approvals*

16. Since the European system came into force in the early 1990s, the number of active substances approved for use in PPPs has reduced from over 900 to around 400. Some new active substances have been approved, but many more existing active substances have had their approvals withdrawn. In some cases this was because concerns were identified. In others, companies have taken the view that the costs of taking a substance through review are not justified by the likely future income from sales.

17. The picture is similar for product authorisations. In particular, the costs of authorisation have seen a steady reduction in the range of products available to tackle pests, weeds and diseases in the horticulture sector. This has implications for the ability of growers to produce crops and there are ongoing initiatives (both nationally and at EU level) to tackle the issue.

(e) *PPP authorisations in the UK*

18. In the UK, Defra has lead responsibility for plant protection products. The regulatory system is run, under our direction, by the Chemicals Regulation Directorate of the Health and Safety Executive (CRD). Plant protection products can only be sold or used if they are authorised and conditions are routinely attached to authorisation (for example specifying crops, dose rates, timing and protective equipment) to ensure protection of human health and the environment (including wildlife). The Advisory Committee on Pesticides (ACP) provides independent, impartial and expert advice on pesticides and the control of pests.

B. The Regulation of Neonicotinoids

(a) *EU approvals for neonicotinoids*

19. Five neonicotinoids have been approved by the EU according to the process set out in section A above. EU legislation agreed in 2010 sets specific provisions relating to the use as seed treatments of three neonicotinoids (clothianidin, imidacloprid and thiamethoxam) and a non-neonicotinoid pesticide called fipronil which has some similar properties. These provisions relate to labelling of pesticide-treated seed, a requirement for professional application of seed treatments to seed, and monitoring for possible impacts on bees. These requirements were not applied to acetamiprid and thiacloprid, which are little used as seed treatments (and not at all in the UK) and show acute toxicity to bees several orders of magnitude less than the other three neonicotinoids (acetamiprid and thiacloprid are cyano-substituted neonicotinoids while the others are nitroguanidine-substituted).

(b) *Authorisations of neonicotinoids in the UK and other individual EU countries*

20. The UK has authorised products containing each of the five neonicotinoid active substances approved by the EU. It is often reported that neonicotinoids have been banned in a number of EU countries and that the UK is thus out of line. The facts are rather different. All 27 EU member states allow the use of neonicotinoids. Four of these countries currently restrict particular uses and our understanding of their position is as follows:

- France. Imidacloprid suspended for seed treatments on sunflower (since 1999) and maize (since 2004). One seed treatment for oilseed rape (Cruiser OSR, containing thiamethoxam) was banned earlier this year.
- Germany. Clothianidin, imidacloprid and thiamethoxam suspended as seed treatments for maize since 2008. Some emergency authorisations (allowing short term use to address particular pest pressures) have since been granted for this use.
- Italy. Clothianidin, imidacloprid and thiamethoxam suspended as seed treatments for maize since 2008. Suspensions reviewed annually.
- Slovenia. Clothianidin and thiamethoxam suspended as seed treatments for maize.

21. The suspensions in Germany, Italy and Slovenia followed particular incidents in which poor practice in treating and sowing seed led to bee kills due to the creation of excessive dust contaminated with neonicotinoids. Our assessment is that the risk of similar incidents in the UK is negligible. There are several reasons for that conclusion. First, the dose rates used in the seed treatment in Germany were almost double those which would be used in the UK. Second, the problems related to maize and drilling was taking place at an unusual time of year when adjacent crops were in flower. Third, seed treatments in the UK are carried out by professional contractors, which minimises the risk of a sticker not being applied (stickers help the pesticide adhere to the treated surface). Fourth, drilling equipment in the UK is either built differently or has been adapted so that it directs dust towards the ground, thus minimising the risk of drift.

22. The issues raised by the German, Italian and Slovenian incidents have been addressed by the additional controls set out in the EU legislation outlined at paragraph 19 above).

23. The basis for the recent French action is not entirely clear. The statement made cites a review by the French agency ANSES. However, ANSES did not call for a ban and its review (which covers similar ground to our work and that of EFSA) does not appear to justify the action. France asked the Commission to take action to apply across the EU (this being a necessary step before national action can be taken). The Commission and most Member States were not in favour of EU wide action at this time. They noted that EFSA were

carrying out the urgent consideration of the bee risk assessment process and were revisiting the current risk assessments for neonicotinoids.

24. Restrictions on neonicotinoids in other EU countries could provide an opportunity to study the benefits for pollinators (although any improvement in bee health could not simply be read across to the UK situation since the actions taken were in the most part related to problems that do not apply here). Italy has collected information through the APENET monitoring and research project. This was reviewed by EFSA (their statement is at http://www.efsa.europa.eu/en/efsajournal/pub/2792.htm). EFSA concluded that there were deficiencies in the study designs, weakness in the statistical analysis and incompleteness in the reporting of results. It was therefore not possible to draw a definitive conclusion. However, potential concerns were identified (including effects from dust exposure, sub-lethal effects and interactions with pathogens). These are being carried forward into the updating of the risk assessment procedure for bees.

C. The Government's Analysis of the Evidence and the Conclusions Drawn in September 2012

(a) *The evidence considered*

25. Insecticides by their nature are toxic to insects. The regulatory process seeks to establish whether the likely exposure of key species to insecticides is less than the amount that will cause harm. Over recent years, a number of academic studies have been published that suggest that neonicotinoids may have adverse effects on bees and—by implication—on other pollinator species. The suggestion is that these effects are sub-lethal but cause sufficient disruption to the normal functioning of bees to be a threat at the colony level.

26. Most of the studies have looked at the effect of a specific neonicotinoid on a specific species, normally honey bees or the buff-tailed bumblebee, Bombus terrestris. However, some have looked at combinations of pesticides or at the possible interaction of pesticides and diseases of bees.

27. A number of the studies were summarised in the Defra document published online on 18 September. These studies—which are not all of those that have been considered—are listed at **Annex 2**. The two most widely publicised studies, both published in Sciencexpress on 29 March 2012, are:

— Henry *et al* "A common pesticide decreases foraging success and survival in honey bees"

— Whitehorn *et al* "Neonicotinoid pesticide reduces bumble bee colony growth and queen production"

(b) *Defra's use of the evidence*

28. The regulatory controls on pesticides, explained in section A above are strong. However, the Government is not complacent and takes very seriously any threat to bees and other pollinators. Defra therefore looked very closely at the developing evidence with the aim of:

(a) identifying what is known about the various risks identified and their implications;

(b) what is not known and requires further investigation. Defra has funded a range of research on these issues in recent years; and

(c) whether regulatory action is required. This could include restricting or withdrawing product authorisations; such measures have been taken in previous cases when found to be necessary.

29. Accordingly, the recent studies were assessed, along with the existing evidence (including Defra-funded research and the regulatory studies), by: the Chemicals Regulation Directorate (CRD) of HSE; bee experts in Defra's Food and Environment Research Agency (Fera); and the independent expert Advisory Committee on Pesticides (ACP). The ACP drew on the advice of CRD and Fera. Defra's Science Advisory Council (SAC) also reviewed ACP's use of some of the evidence; whilst SAC did not seek to reach conclusions on the evidence, it did identify a number of issues which the ACP took into account in drawing its own conclusions. The outcomes of the ACP's work are reported at paragraphs 30 to 33 below. UK experts have also been involved in work carried out by the European Food Safety Authority (EFSA) (paragraph 40 below) and drew on this in their own consideration. Alongside the consideration of the new studies, work has also been put in hand (see paragraphs 37 to 39) to fill several evidence gaps that have been identified.

The ACP's assessment

30. The ACP considered the issue at its meetings on 15 May and 3 July. The recommendations agreed following the 3 July meeting are set out in full at **Annex 3**. In summary, the ACP concluded that the current UK risk assessments are secure and recommended that there is no justification for regulatory action at present. Furthermore, there is no evidence as yet of neonicotinoid impacts on bees in the UK. However, the ACP will consider any new information as it arises and keep the situation under close review. The Committee supports the evidence gathering and development of the risk assessment that is in hand here and in Europe.

31. The ACP's conclusion was based on reconsideration of studies supporting the current authorisations for thiamethoxam products and on detailed examination of the recent publications in the scientific literature, with one of the ACP's environmental experts carrying out a careful examination of the raw data.

32. The regulatory field studies comply fully with current rules and also cover some additional aspects, such as over-wintering. The power of the studies to detect statistically significant changes is not established and

they would not specifically detect all of the individual sub-lethal effects suggested by academic studies. However, hives exposed to treated crops did not show any gross effects on a wide range of important endpoints when compared to control hives exposed to untreated crops.

33. While noting questions concerning aspects of the published studies by Henry et al and Whitehorn et al, the ACP does not discount their findings. The Committee believe these studies should be considered in the development of future regulatory guidance. Further research is merited to clarify the findings and their relevance to the UK field situation. The ACP noted that relevant work is already being taken forward with urgency. The Committee will keep this research, and its potential implications for authorisations, under review.

Defra's conclusions

34. Defra's conclusions, as set out in the 18 September published document, were:

> "The new research has been considered alongside existing knowledge, including the studies submitted to support current regulatory approvals for the neonicotinoids. This work has been carried out by Government and independent experts, taking account of parallel work in Europe. The broad conclusions of this work are as follows:
>
> — Some of the new studies provide evidence of sub-lethal effects of neonicotinoids in the conditions applied in the research.
>
> — However, none of the studies gives unequivocal evidence that sub-lethal effects with serious implications for colonies are likely to arise from current uses of neonicotinoids.
>
> — Existing studies submitted in support of the present regulatory approvals fully meet current standards. They do not explicitly address all the sub-lethal effects suggested by the academic research. However, they do cover a wide range of important endpoints and, in these studies, hives exposed to treated crops did not show any gross effects when compared to control hives exposed to untreated crops.

"Based on these findings, Defra has concluded that:

— It is appropriate to update the process for assessing the risks of pesticides to bees in the light of developments in the science—including the latest research. This exercise should include the development of a new risk assessment for bumble bees and solitary bees, alongside an updated risk assessment for honey bees. This work is being taken forward in Europe and UK experts are active in this. The aim is to complete this highly complex task by the end of 2012.

— Further research will be carried out to fill identified evidence gaps, including the questions raised about the relevance of the recent studies to field conditions. The Government has already put new research in place to explore further the impacts of neonicotinoids on bumble bees in field conditions and to understand what levels of pesticide residues and disease in bees are normal.

— The recent studies do not justify changing existing regulation. However, the research that we have put in hand and the on-going work in Europe to develop the risk assessment could change the picture and it is always possible that further new evidence may emerge. As our knowledge develops, we will continue to consider the need for further research and for any changes to the regulation of neonicotinoids."

The precautionary principle

35. The precautionary principle is normally taken from the text of the Rio Declaration on Environment and Development 1992. Principle 15 of the Declaration states "Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."

36. Defra fully accepts that the precautionary principle is applicable to considering the appropriate response to the potential effects of pesticides. In the present instance, it has a clear bearing on the issue of neonicotinoids and bees. Defra does not accept the suggestion that has been made that the application of the precautionary principle must lead inevitably to a decision to ban neonicotinoids. The precautionary principle guides decision-making when a serious potential risk has been identified and where, following the best possible risk assessment, there remains scientific uncertainty. It does not dictate the appropriate decision.

(c) *Continuing to fill the evidence gaps*

37. Defra has carried out research and development (R&D) around these issues over a number of years. The most recent completed projects include:

— PS2366 "Assessing the impact of guttation on non-target arthropods, design of extended lab and field studies". The aim of this project was determine whether the current methodology for risk assessment for sprayed applications can be adapted to include the residues present on the surface of leaves following systemic pesticide applications. Previous research indicated that the exposure of honey bees to pesticide residues in guttation fluid was unlikely to be a problem but it may be a problem to other non-target arthropods.

— PS2367 "Assessing the impact of pesticides on honeybee brood—evaluation of effects" was a literature review undertaken to identify the potential effects of pesticides on honeybee brood, for example mortality, reduced lifespan and their implications at the colony level. The report makes some recommendations for changes in the honeybee brood study design and concluded that the greatest determinant of over-winter survival is the health/age of the queen. The findings of this research were incorporated into the EFSA scientific opinion and will be used in designing future honey bee brood studies.

— PS2368 "Potential impacts of synergism between systemic seed treatments and sprayed fungicides in crops". This found, in certain cases, a degree of synergy between an insecticide and a fungicide in terms of acute lethal effects.

38. All these reports have been sent to EFSA. Two further projects have been commissioned from Defra's Food and Environment Research Agency (Fera), both due to be completed and published by March 2013. Fuller project details can be found on the Defra website. In brief:

— PS2370 is focusing on the interpretation of pesticide residues and disease in honey bees. Dead bees are sometimes submitted under the Wildlife Incident Investigation Scheme. These are routinely screened for pesticides and low levels of pesticides are often found (an outline of recent data is at **Annex 4**). These residues are unlikely to have been the cause of death, but there is little scientific information on their significance. This new research will help us interpret the wildlife incident results by obtaining some apparently "healthy" bee samples from the bee inspectors own bee hives in both urban and rural environments and analysing them for pesticide residues and for disease levels. The hives will be inspected in summer, autumn and again early in 2013 to ensure that the bees survived the winter. For the major pesticide classes detected, the half life of the parent pesticides in live bees will be assessed to assist in interpretation of residues in live bees.

— PS2371 is designed to explore the findings of the Whitehorn *et al* study, using more realistic conditions. It is looking at real life edge-of-field exposure of bumble bees to neonicotinoid treated flowering oilseed rape (both spring sown and winter sown). The key objectives are:

  — To assess exposure of bumble bee colonies in clothianidin and imidacloprid treated oilseed rape.

  — To assess the effects of exposure on colony development and production of drones and queens.

  — To determine whether the effects reported following laboratory exposure of bumble bee colonies to neonicotinoid treated sucrose and pollen are observed following field exposure to flowering oilseed rape grown from neonicotinoid treated seed.

39. We have just commissioned some new research from Professor Goulson's team at Stirling University. PS2372 "Quantifying exposure of bumblebees to neonicotinoids and mixtures of agrochemicals" is due to start in February 2013 and will run for three years. The aim of this research is to quantify the actual exposure of wild bumblebees to sub-lethal doses of neonicotinoid insecticides in UK landscapes. Specifically the objectives are to:

(a) determine levels of neonicotinoids in the nectar and pollen of the main UK flowering crops and in a selection of field margin/hedgerow wildflowers favoured by bumble bees (information on this is currently limited and this has been an issue in interpreting the findings of some of the recent academic research);

(b) quantify the doses of neonicotinoids to which bumblebee colonies are exposed when naturally foraging in UK farmland; and

(c) quantify and compare exposure of wild bumblebee species.

(d) *Developments in Europe*

40. As pesticide regulation is harmonised across Europe, the EU dimension to consideration of this issue is important. The European Food Safety Authority (EFSA) is carrying out a number of pieces of work (in which UK experts are involved) including:

— EFSA's Panel on Plant Protection Products and their Residues published a Scientific Opinion on the science behind the development of a pesticide risk assessment for honey bees, bumble bees and solitary bees on 23 May. This is available at http://www.efsa.europa.eu/en/efsajournal/doc/2668.pdf and is a very substantial and significant review and analysis of the state of the science.

— The Opinion will be the basis for a Guidance Document for applicant companies and regulatory authorities in the context of the review of Plant Protection Products (PPPs) and their active substances under EU law. This guidance is due to be drawn up by the end of December and the draft issued for public consultation on 20 September is at http://www.efsa.europa.eu/en/consultations/call/120,920.htm

— EFSA published a Statement on 1 June addressing the significance of the Henry *et al* and Whitehorn *et al* studies. This Statement is available at: http://www.efsa.europa.eu/en/efsajournal/doc/2752.pdf. In brief, their findings were:

Comparing the Henry *et al* study with possible real life exposures, EFSA conclude that sub-lethal effects cannot be fully excluded in worst case situations. However, they note several uncertainties regarding the results.

In particular, in the study, bees consumed the total amount of active substance within a relatively short period rather than during the course of a day. Depending on the substance properties and how fast the substance can be metabolised by the bees, this method of exposure could lead to more severe effects than may occur when bees are foraging.

The concentrations tested on bumblebees by Whitehorn *et al*. were in the range of the maximum plausible exposure levels from imidacloprid in pollen and nectar. However, it is uncertain as to what extent the exposure situation in the study is representative of field conditions since bumblebees would need to forage for two weeks exclusively on imidacloprid-treated crops in order to be exposed to the same extent as in the study. Further consideration would be necessary to understand whether this situation may occur in intensive monoculture landscapes.

The Defra research project PS2371, referred to in paragraph 39 above, will help to address the issues raised by EFSA on the Henry et al and Whitehorn et al studies.

— EFSA are reviewing the bees risk assessment for the three neonicotinoid active substances that have high acute toxicity to bees; this work is due to be completed by the end of 2012.

— A scientific report on "Interaction between pesticides and other factors in effects on bees" was published on the EFSA website in September. The report (by Fera) is at: http://www.efsa.europa.eu/en/supporting/pub/340e.htm

D. Defra's Further Work Following the Publication of the Gill Et Al Paper in Nature in October 2012

(a) *The Nature paper*

41. A paper by Gill et al "Combined pesticides exposure severely impacts individual- and colony-level traits in bees" was published in Nature on 21 October (doi:10.1038/nature11.585). The study reported in the paper was funded under the Insect Pollinators Initiative (IPI), which was set up in 2009 to help to identify the main threats to bees and other insect pollinators. Defra provides about 25% of the funding for the IPI. The study is part of an IPI project looking at the impact of sub-lethal exposure to chemicals on the learning capacity and performance of bees.

42. The study considered the potential effects of exposing bumble bees (*Bombus terrestris*) to lambda-cyhalothrin (a pyrethroid insecticide) and to imidacloprid (a neonicotinoid insecticide). Early stage bumble bee colonies received long-term (four—week) exposure to imidacloprid and lambda-cyhalothrin, both individually and in combination. There were ten control colonies, ten colonies exposed to imidacloprid only, 10 to lambda-cyhalothrin only and 10 to a combination of imidacloprid and lambda-cyhalothrin. Bees from all colonies were able to forage outdoors. Foraging behaviour of individual workers was recorded using radio frequency identification tags (RFID).

43. The authors report that effects were seen on the behaviour of individual bees in the colonies treated with imidacloprid (either alone or in combination with lambda cyhalothrin). Effects at the colony level were seen in all the treated colonies (including those treated only with lambda-cyhalothrin) and these were most pronounced for the colonies treated with both pesticides. The observed effects for each treatment group are summarised in the table below.

Effect level	*Effect type*	*Imidacloprid*	*Lambda Cyhalothrin*	*Mixture*
Effects on individual behaviour	Number of foragers	+	ND	+
	Foraging bout frequency	ND	ND	-
	Amount of pollen collected	-	ND	-
	Duration of pollen foraging bouts	+	ND	+
Effects at colony level	Worker production	-	ND	-
	Brood number	-	ND	-
	Nest structure mass	ND	ND	ND
	Worker mortality	ND	+	+
	Worker loss	+	-	+
	Worker mortality and loss	ND	+	+
	Colony loss (n lost/n survived)	0/10	0/10	2/8

Significant increase (+) significant decrease (-) and no detected effect (ND) at the 5% significance level

(b) *The issues raised by the study*

44. Dr Raine, one of the study authors, commented in the press release accompanying its publication:

"Policymakers need to consider the evidence and work together with regulatory bodies to minimize the risk to all bees caused by pesticides, not just honeybees. Currently pesticide usage is approved based on tests looking at single pesticides. However, our evidence shows that the risk of exposure to multiple pesticides needs to be considered, as this can seriously affect colony success".

45. This raises three issues:

(a) policy makers need to consider the evidence and work together with regulatory bodies. Defra completely agrees and this is very much our approach, as outlined in paragraphs 28 and 29 above;

(b) addressing the risk to all bees, not just honey bees. Again, Defra agrees that this is important. The fact that the current pesticides risk assessment only explicitly addresses the risks to honey bees and not to other types of bees is being addressed by the review being carried out by EFSA (see paragraphs 34 and 40);

(c) exposure of bees to multiple pesticides. Foraging bees may indeed be exposed to crops treated with different pesticides. The regulatory system does not look at every possible combination effect of multiple active substances—which would clearly be impractical with several hundred active substances and many more products. Risks are considered when multiple active substances are combined in the same product. The regulatory risk assessment builds in uncertainty factors and conservative assumptions, with the aim of ensuring that individual pesticides carry a very low risk of adverse effects.

(c) *Defra's consideration of the Nature paper*

46. The research which Defra has put in hand will produce results early in 2013 and should give greater clarity about the effects of neonicotinoids on bumble bees in field conditions. However, we have made it very clear that we will continue to assess any new substantial evidence that emerges. We have therefore carried out an urgent assessment of the Gill *et al* paper, informed by the views of CRD and the advice of the Advisory Committee on Pesticides.

47. The advice of the ACP is as follows:

> "Recent research published in Nature by Gill et al was agreed to be well conducted. It adds additional information in suggesting a possible mechanism by which neonicotinoids may have an effect at population level. As such it reinforces the concerns already identified on the basis of the previously considered evidence.
>
> "However it does not change the balance of evidence sufficiently to lead the ACP to recommend regulatory action on neonicotinoids in the absence of the additional work identified by the committee in July. The Committee advises that there are three key "tests" required to assess the balance of evidence; toxicity, exposure, and evidence of effects occurring in the field.
>
> "There is now a good body of evidence that enables an understanding of the toxicity of the neonicotinoids to bees. Critically, there is still a need to address the current gaps in knowledge about the extent to which the laboratory exposures in the current published data reflect the exposures experienced in the field. Ideally there is also a need to establish whether there have been any impacts on UK bee populations. The field work undertaken earlier this year and data on the health of UK bee colonies over the period during which the neonicotinoids have been used in UK agriculture will help to address these knowledge gaps. Results are awaited in early January.
>
> "The Committee expects to be in a position to consider these data in January, and have noted that this short delay would not prevent effective regulatory action if the data indicate that this is required. The ACP noted that treated seed had already been sown this autumn, and that the much smaller proportion of spring sown seed would already be in the supply chain for the 2013 harvest. Any regulatory action on treated seed would thus mainly impact from the 2013 autumn sowings onwards.
>
> "The ACP also considered a range of possible approaches that could be applied if restrictions on neonicotinoid use are required. The Committee asked the Chemicals Regulation Directorate to develop some more detailed scenarios taking into account a range of relevant factors."

(d) *The next steps*

48. There is good evidence of potentially serious sub-lethal effects on bees in the conditions applied in several studies. However, there still remains very little evidence in two crucial areas:

— First, the likelihood that effects seen in the laboratory would be seen in the field. Further information on this crucial issue will be provided by the Fera study PS2371 outlined at paragraph 38 above and the researchers are pulling out all the stops to get this completed quickly. There is still a degree of uncertainty as to how rapidly some of the analytical work can be completed, but the aim is to have a complete set of results for consideration at the turn of the year.

— Second, there is a lack of evidence of actual damage caused to bees by neonicotinoids in UK field conditions. This is also being tackled through Fera work to examine historic trends in neonicotinoid usage and honey bee health. This work will be carried through on the same timescale as the bumble bee study.

49. We have consistently said that we are fully prepared to act if the evidence on neonicotinoids shows a need. However, it currently remains the case that the main field data we have available for honey bees suggests an absence of effects, while field data on bumble bees is lacking. This is why PS2371 is important.

50. If and when the evidence indicates that action was needed, it would be important that careful consideration is given to several issues. It would clearly be necessary to ensure that any action taken was likely to be effective in removing unacceptable risks to bees from neonicotinoids. It would also be important to ensure that action did not have undesirable consequences for the environment or human health. Further, it should be proportionate. For example a blanket ban should not be imposed if more limited and targeted action would be effective. Defra has instructed CRD to put work in hand to enable us to understand better the likely consequences of possible regulatory options including the implications of alternative pesticides or pest control measures being taken. This work will be completed by the end of the year, so that the results are available for consideration alongside the results of the Fera bumble bee study.

51. The ACP has considered CRD's initial analysis of relevant issues when considering potential restrictions on the use of neonicotinoids. The Committee offered views on the further work needed. As part of the exercise, CRD are approaching several parties who may have useful information about the agronomic and economic implications. In doing so, CRD are making it clear that no decision has been taken and that their approach is not about the merits of taking regulatory action but about understanding its consequences.

52. We will move quickly to consider the new scientific and technical information when it is available. The Fera data is designed to address the absence of field evidence and, in line with our consistent stance, we will be ready to act if this research gives cause.

E. The Use of Real-World Data and Monitoring of Actual Levels of Pesticide Usage

53. There is a considerable body of monitoring work carried out. This looks at the quantities of pesticides used, how they are used, where they are found and the effects they have on people, wildlife and the wider environment. The main elements of this monitoring (the key schemes are described in more detail at **Annex 5**) include:

- Monitoring of pesticides residues in food.
- Pesticides Usage Surveys.
- Wildlife Incident Investigation Scheme.
- A variety of schemes monitoring human health, including the National Poisons Information Scheme (NPIS), Human Health Enquiry & Incident Survey (HHEIS) and Pesticides Incidents Appraisal Panel (PIAP).
- Tests of pesticide formulations—to see whether the pesticide products being sold are formulated in accordance with their authorisations.
- Monitoring of pesticides in surface and ground water undertaken by the Environment Agency for England and Wales and equivalent bodies in Scotland and Northern Ireland.
- Cross-compliance checks. Pesticides rules are covered in one of the Statutory Management Requirements which farmers need to meet in order to qualify for the full single payment and other direct payments.

54. The various current schemes for human health monitoring are being reviewed by the Pesticides Adverse Health Effect Surveillance Scheme Working Group (PAHES), a sub-group of the ACP. PAHES aims to define the strengths and weaknesses of existing systems for reporting of adverse health effects related to pesticides exposure and to assess the feasibility of developing an integrated system for the reporting, investigation and evaluation of exposure to pesticides in relation to human health. The PAHES report is currently being finalised.

55. The current suite of monitoring serves several purposes. The most important are:

- To allow the Government to verify that pesticides are being used according to their approvals; and
- To provide a check on the effectiveness of the regulatory risk assessment. When a pesticide is used in accordance with the terms of its approval, are the consequences as expected?

56. Information on usage is particularly valuable as a trigger for consideration of the reasons for change. Increases and decreases in use can result from changing pest pressures, the development of pest resistance or changes in user preferences between types of product and classes of chemicals.

57. Monitoring results are considered by CRD, the ACP and the Pesticides Forum. The Forum brings together a wide range of organisations representing those who make, use or advise on pesticides as well as environmental, conservation and consumer interests. It provides a mechanism for exchanging ideas and for encouraging joint initiatives to address particular issues. It also provides advice to Government on pesticide usage matters. In particular, it advises Ministers and others on how best to monitor the impacts arising from the use of pesticides (including the use of indicators).

58. Two examples of changes of approach to particular pesticides arising from monitoring are:

- the revocation of herbicides containing isoproturon (IPU) which was highlighted as a problem in water through monitoring as well as through risk assessment. In this case there was clear evidence on the effects of IPU on aquatic organisms, the standard risk assessment identified an unacceptable risk and water monitoring data indicated that IPU was found in UK waters at levels that would be expected to impact on aquatic organisms.

— stewardship measures introduced by industry for the potato sprout suppressant chloropropham following residues monitoring findings.

F. Potential Impacts of Systemic Neonicotinoid Insecticides on Human Health

59. Before any pesticides are authorised there is an extensive range of safety tests including investigations of acute toxicity, long term toxicity, carcinogenicity, reproductive toxicity, genotoxicity and neurotoxicity (most insecticides are neurotoxins). Safe exposures for people are usually determined using a 100 fold factor on no effect doses in experimental animals. In some specific cases higher factors are used. These factors are to take account of inter-species variation and variation in the response of different individuals (intra-species variation). Products are not authorised if the exposure estimates are above the safe levels.

60. There are two very broad circumstances in which people may be exposed to pesticides. First, they may be in or close to the treated area—as the person applying the pesticide, as a farm worker harvesting or handling a treated crop, as a bystander or as a local resident. Second, they may eat treated food. The pesticides risk assessment for human health considers the risks in these two main parts.

61. For "occupational" exposures, no observed adverse effect levels derived from appropriate in vitro and in vivo animal studies are compared with estimates of exposure for users, bystanders and other workers, derived from models, or in some cases, from exposure studies.

62. The consumer risk assessment is based on exposure estimates developed from an understanding of the residues of the active substance and relevant metabolites that might occur in foodstuffs (including those of animal origin) that are derived from treated crops. This draws on data on actual/worst case residue samples, and from surveys of the national diet. The resultant estimates are compared to relevant no effect levels from animal studies. Both acute and chronic dietary risk assessments are carried out.

63. The impacts of neonicotinoids on insects are largely the result of strong binding of the compounds to nicotinic receptors. The available data strongly suggests that the binding of neonicotinoids to mammalian nicotinic receptors is much weaker than to insect receptors. In addition, scientific studies show that neonicotinoids are not as potent in vertebrates (including humans) as they are in insects. Although this does not mean there are no effects in mammals, there is a higher margin between doses required to kill insects and doses of potential concern for people than is the case for some of the older insecticide active substances such as organophosphate compounds.

64. For each of the neonicotinoids clothianidin, imidacloprid and thiamethoxam, the table below illustrates the following three human health exposure scenarios:

(a) ADI—Acceptable Daily Intake. The ADI is the amount of a substance which can be ingested every day of an individual's entire lifetime without harm. The ADI is expressed as milligrams (mg) of chemical per kg body weight of the consumer. The ADI is derived from the most appropriate No Observed Adverse Effect Level (NOAEL) by applying an assessment factor, normally 100.

(b) ARfD—Acute Reference Dose. This is the quantity of a substance in food or water, expressed on a bodyweight basis, that can be ingested over a short period of time (usually one meal or one day) without appreciable health risk to the consumer.

(c) AOEL—Acceptable Operator Exposure Limit. This is the maximum amount of active substance to which the operator may be exposed without any adverse health effects. The AOEL is expressed in mg of the chemical per kg body weight of the operator per day. The AOEL is usually derived in terms of a systemic dose and is based on the most appropriate NOAEL by applying an assessment factor, normally 100, and any necessary correction for the extent of oral absorption.

		ADI (lifetime dietary)	*ARfD (acute dietary)*	*AOEL (Operator or Bystander)*
Clothianidin	mg/kg bodyweight	0.097	0.1	0.1
	% used *	<1	1.0	<1
Imidacloprid	mg/kg bodyweight	0.06	0.08	0.08
	% used *	10	20	6
	% used #	0.5	32	-
Thiamethoxam	mg/kg bodyweight	0.026	0.5	0.08
	% used *	5.0	'no risk'	<1

** based on exposure estimates made as part of the regulatory risk assessment*

 # EFSA monitoring of pesticide residues in food for 2009 (only imidacloprid cited)

G. Scope for Using Alternative Pest-Control Methods to Make UK Farming More Insect-Friendly

65. Insects face a number of threats. These include the loss, fragmentation and degradation of habitats, pressures from non-native species and diseases, climate change and pollution. Defra has a number of activities that aim to counter some of these threats. Some of these are outlined in **Annex 6**.

66. There is a need to control insect damage to agricultural crops. The significant role currently played by neonicotinoids in this is summarised in **Annex 7**.

67. The UK has a longstanding policy of minimising the impacts of pesticide use. This begins with the regulatory system but also includes a number of additional non-regulatory actions to develop and encourage best practice. This work is drawn together in the UK Pesticides Strategy. The Voluntary Initiative (VI) has played a significant role in this work. It was set up in 2001 to promote and ensure best practice in the use of pesticides, with a focus on benefits for water protection and biodiversity. Working in collaboration with crop assurance schemes and wider stakeholders, the VI has achieved a number of successes, in particular the establishment of training systems for users and testing programmes for pesticide application equipment.

68. The EU has now set out a similar approach in Directive 2009–128/EC on the sustainable use of pesticides. It includes a number of the measures that already feature in the UK Strategy. The Directive requires the UK and other Member States to draw up and publish a National Action Plan setting out our proposals to reduce risks and impacts of pesticide use on human health and the environment. A public consultation on the draft plan has just closed and the plan will be published in late November.

69. The Directive includes provisions on Integrated Pest Management (IPM). IPM sets a framework to minimise the use of pesticides and encourage the use of alternatives. Our approach to IPM and to the development of alternatives is set out below.

(a) *Integrated Pest Management*

70. Integrated Pest Management (IPM) describes a broad approach to plant protection that discourages the development of populations of harmful organisms, keeps the use of pesticides other forms of intervention to levels that are economically and ecologically justified and reduces or minimises risks to human health and the environment. IPM emphasises the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms;

71. IPM is well established in the UK and many farmers and growers adopt practices which are in line with IPM principles, particularly due to the requirements of farm assurance schemes, retailer requirements or other national or international production standards. The promotion of IPM principles is a key feature of the EU Directive on the sustainable use of pesticides and the summary of IPM principles set out in the Directive is at **Annex 8**. Member States are required to implement the provisions on IPM by 1 January 2014.

72. National legislation (The Plant Protection Products (Sustainable Use) Regulations 2012) requires all users to be trained. Only courses for users and advisors which provide training on integrated approaches will receive accreditation.

73. Non-regulatory schemes such as Assured Food Standards Schemes require growers to adopt practices consistent with the general principles of IPM. Specific standards are set for individual crops. Work is underway with the key industry stakeholders to develop an IPM self-assessment tool for farmers (an IPM Plan) to encourage the use of IPM tools and techniques such as decision support systems and pest and disease monitoring systems.

74. In woodland, initiatives such as the UK Woodland Assurance Scheme and the Forestry Commission's practical Guide to Reducing Pesticide Use in Forestry promote practices consistent with the aims of the Directive and national policy, but specifically require owners/managers to implement effective IPM strategies.

75. Government also provides support to farmers wishing to convert to organic methods of production under the Organic Entry Level Scheme. The production of organic food must be done in accordance with Council Regulation 834/2007 and enforced under national legislation (the Organic Products Regulations 2009). Growers are inspected by private Defra-licensed Organic Inspection Bodies each year.

76. There is also extensive research into alternative methods of pest, weed and disease control, outlined at paragraphs 81 to 91 below. Government-funded pesticides work includes a significant programme of work to reduce reliance on chemical pesticides by developing novel alternative technologies that do not pose unacceptable risks to human health, non-target organisms, and the environment. This provides the scientific basis to enable companies to develop further measures for integrated or biological control in arable and horticultural commodities, thereby encouraging sustainable crop protection and potentially also benefitting other production systems such as organic production.

IPM and seed treatments

77. Treated seeds are sown before the onset and extent of the developing pest population can be known. In other words, the treated seed is sown in anticipation of a problem. It is sometimes suggested that the use of

seed treatments is prophylactic and often unnecessary and that it is therefore inconsistent with Integrated Pest Management.

78. The regulatory system does consider whether a seed treatment is appropriate and consistent with the principle of minimising pesticide use. Proposed seed treatment uses are refused if the pest does not occur frequently enough to warrant it, and where a foliar spray would be more appropriate. Assessment is based on:

- whether the target consistently occurs each season or is only a sporadic pest.
- whether the target is highly localised or is wide ranging on the particular crop.
- whether the target, if present, causes economic damage that would warrant treatment.
- where the target requires early/immediate measures—controlling aphids which are virus vectors is one example because of the speed with which viruses can be transmitted.

79. Current uses of the neonicotinoid seed treatments (and indeed other insecticide seed treatments) are considered appropriate. The principal uses are for autumn control of cereal aphids (vectors of BYDV), aphids on sugar beet or OSR (vectors of virus yellows), and assisting crop establishment at sowing by controlling/reducing soil pests. The degree of protection afforded by seed treatments also means that the number of subsequent foliar sprays required is reduced.

80. Due to the long established problems of *Myzus persicae* resistance to pirimicarb, growers rely completely on neonicotinoid seed treatments in sugar beet to prevent virus infection. There is also the developing new situation of pyrethroid resistance in cereal aphids which means, again, that autumn sown cereals will rely heavily on neonicotinoid seed treatments for BYDV control.

(b) *Development of alternatives to chemical insecticides*

81. Defra funds research to develop alternative approaches to reduce reliance on chemical pesticides. There is close collaboration with industry and other stakeholders in carrying out the research and in carrying through the subsequent knowledge transfer. For those insect pests against which neonicotinoids are currently used in the UK (principally aphids, beetles and moths), the main approaches can be summarised as follows:

Biopesticides

82. The three main groups of biopesticide products are semiochemicals, microorganisms/fungi, and natural chemicals, such as plant extracts. Semiochemicals include biologically active compounds produced by pests to communicate with each other, such as sex or aggregation pheromones. Synthetic versions disrupt pest feeding and other behaviours in the case of aphids, and also attract their natural enemies. Aphid pests in arable crops (cereals, oil seed rape and beans) have been the main targets of Defra research, but the more promising outcomes have yet to be translated into commercial practice.

83. In terms of microorganisms and fungi, entomopathogenic fungi have shown the best prospects for aphids, and also some beetle pests including vine weevil against which neonicotinoids are used. Defra is currently supporting work to help bring this work to commercialisation. Specific promising examples include using artificial vine weevil refugia to spread a highly effective fungal disease of the beetle, and enhancing biopesticide usage for the control of aphids—especially in horticultural crops, through better understanding of combinations of biopesticides and chemical pesticides, including neonicotinoids.

Enhancing natural plant defences

84. Crop plants produce compounds to defend themselves against pests. This process can be enhanced by treating crops with synthetic versions of these compounds. These same chemicals often also attract natural enemies of the pests. The alternatives programme has funded research on jasmonic acid and related compounds. The main targets to date have been aphids and to a lesser extent beetle pests in cereals (winter wheat), summer beans and oilseed rape. Some work has also been done in intensive horticulture, mostly with aphids. This work has led to jasmonic acid seed treatments being commercialised, and this could provide an alternative to neonicotinoid seed treatments.

Development of new modes of action for insecticides

85. Most of the major insecticides used worldwide, including neonicotinoids, are neurotoxins, and the number available for use in agriculture is decreasing with stricter regulation. The Defra-funded work is still at the development stage but offers promise of insect pest control that will provide alternatives and thereby help reduce reliance on neurotoxins.

86. One element of this work has been particularly promising is to disrupt the immune system of insects, thereby reducing their resistance to diseases, including the world's most widely used biopesticide, *Bacillus thuringiensis (Bt)*, and insect pathogenic fungi. In other research, fusion proteins as carriers for biologically derived toxins are being developed as delivery systems to target key pests; commercial partners have already been involved in this work.

87. A second major part of this research on new insecticides has been to develop options that interfere with the pests' internal systems that regulate feeding, moulting, reproduction and other biological processes. Insect feeding is of obvious interest, given that it is feeding by a pest that causes the damage to crop plants. Advanced molecular biology (genomics) has permitted greater understanding of the processes involved in feeding, thereby exposing weak-spots where these processes might be disrupted. The compounds involved have been characterized with support from the Defra alternatives programme, and preliminary work has yielded promising results. Target pests include aphids and beetles, again from pest groups against which neonicotinoids are used.

88. Lastly, Defra is supporting new research to help address the issue of insect pest resistance to neonicotinoids which is increasing in the UK and elsewhere in Europe. Examples include several major UK aphid pests. A pilot trial will evaluate certain naturally-derived compounds that may prevent resistance mechanisms in the pests from operating, and therefore when used in combination with neonicotinoids will permit lower levels of the latter being used.

(c) *Bringing alternative products to the market*

89. Bio-pesticides cover a range of products. It is generally the case that they offer various benefits over conventional chemical pesticides such as reduced environmental impact, shorter harvest intervals, minimal residues. However, they also tend to be fairly narrow in their spectrum of activity, are slower to act and may have limited shelf life and specific storage requirements. They therefore require much more knowledge and management input to work effectively and, as a result, they tend to be most used in higher value horticultural crops.

90. Biopesticides and other alternative products may be developed for relatively niche purposes, may be produced by companies that do not deal frequently with pesticide regulation, and may make different demands of the regulatory risk assessment. To tackle these issues, CRD has for several years run a scheme to help biopesticide producers gain approvals for their products. The scheme includes:

- A "Biopesticide Champion" to provide initial contact for product innovators or manufacturers, and help them through the approval process.
- Provision of specific guidance to applicants (via free pre-submission meetings) identifying the best way forward. Potential applicants are encouraged to make contact at the earliest possible stages of product development.
- Reduced costs for evaluations.

91. Since the biopesticides scheme was introduced the number of authorisations for these products has increased significantly. Numbers now compare favourably with other EU countries, given the size of the horticulture sector in the UK. The scheme is currently being reviewed to make the approach simpler, although the EU regulatory requirements cannot be avoided.

Annex 1

HONEY BEE RISK ASSESSMENT UNDER EU PESTICIDE REGULATIONS

For pesticides that are applied as a spray

1. Data on the acute oral and contact toxicity of the pesticide is always submitted when foraging honey bees are likely to be exposed. Exposure could result from honey bees foraging the crop that is being sprayed or foraging weeds in the crop.

2. These data are generated via the use of internationally agreed test guidelines.[170] The endpoints from these studies are LD50, ie the median lethal dose that results in 50% mortality of the test population. Two separate studies are conducted: acute contact toxicity is determined by placing a dose of the pesticide on to the thorax of the bee;—acute oral toxicity is determined by feeding bees treated sucrose. These are laboratory based studies that are carried out under controlled conditions and use either the active substance or the formulated pesticide product.

3. The LD50 is then used to derive a "hazard quotient"—the application rate of the pesticide in g/ha divided by the LD50 in µg/bee. If the resulting ratio is less than a trigger value of 50,[171] it is considered that an unacceptable level of mortalities are unlikely to occur and the pesticide can be authorised without any restrictions regarding the risk to honey bees. If the ratio is greater than 50 then the product is either restricted to a time when honey bees are not foraging or further data are requested to enable a decision to be made on authorisation.

4. If a restriction is imposed, the UK product label will state:

> *Dangerous to bees. To protect bees and pollinating insects do not apply to crop plants when in flower. Do not use where bees are actively foraging. Do not apply when flowering weeds are present.*

[170] See Organisation for Economic Cooperation and Development guideline for the testing of Chemicals—honey bees, acute oral toxicity test (OECD 213) and acute contact test (OECD 214).

[171] This value of 50 has been validated see Aldridge, C. A., and A.D.M. Hart. 1993. Validation of the EPPO/CoE risk assessment scheme for honeybees, Appendix 5. Proceedings of the 5th International Symposium on the Hazard of Pesticides to Bees, 26Ð28 October 1993, Plant Protection Service, Wageningen, The Netherlands.

5. If further data are requested, these take the form of either semi-field studies (sometimes referred to as cage studies) or field studies. Semi-field studies use a small colony of about 5,000 bees, which is placed inside the enclosure a few days before the crop is sprayed. The crop is sprayed once the bees have become accustomed to the enclosure and are actively foraging the crop. The following endpoints are considered—mortality, foraging activity and survival of the colony. Semi-field studies usually last only a few days. There is always a control enclosure and there should be sufficient replication to permit statistical analysis.

6. Field studies are large scale and involve an unenclosed crop where honey bee colonies are placed adjacent to the crop. If a study was being conducted on oilseed rape then a plot of approximately 1 ha would be used. Colonies are used that contain at least 10,000 bees and each colony should cover at least 10–12 frames, including at least 5–6 brood frames. The crop is sprayed once the bees have become accustomed to the crop and are actively foraging. The major effects that are monitored as part of a field study are effects on mortality, foraging activity and survival of the colony. Further details regarding how these studies are carried out is provided in internationally developed guidance.[172]

7. The effects observed in the semi-field or field study will determine whether the pesticide is authorised and whether restrictions are applied.

For pesticides that are applied as seed treatments *or as a* solid formulation

8. Some pesticides are applied directly to seed prior to drilling in order to protect them from soil pests and soil borne diseases. If the pesticide is systemic (ie it can move into the plant and hence occur in the flower) then honey bees may be exposed to it. If this is considered likely, then a risk assessment is carried out. The above "hazard quotient" approach is not appropriate for assessing this risk and so reliance is currently placed on semi-field and field studies, similar design in design to those outlined above. A similar approach is used for pesticides formulated as granules or pellets. The effects observed in the semi-field or field study will determine whether the pesticide is authorised and whether restrictions are applied.

Development of the risk assessment

9. The risk assessment continues to be developed. Applicant's will in future need to submit additional data covering: effects on honey bee brood development and other honey bee life stages (this information will enable an assessment of any effects on the development of the brood); and potential chronic effects on adult bees.

10. An EFSA review (http://www.efsa.europa.eu/en/efsajournal/pub/2668.htm) examines the science behind the development of a risk assessment of plant protection products on bees (honey bees, bumble bees and solitary bees). Following the review, EFSA, the Commission and Member States have been developing guidance to be used in the authorisation process. UK experts are actively involved in this work. A draft guidance document was put to public consultation on 20 September (http://www.efsa.europa.eu/en/consultations/call/120,920.htm) and is due to be revised and completed by the end of 2012.

Risk Assessment for Other Non-Target Arthropods

11. The risk to non-target arthropods is assessed using laboratory data on two standard species—*Aphidius rhopalosiphi* and *Typhlodromus pyri*. The endpoints from these studies (expressed as g/ha) are compared to exposure data (also expressed as g/ha). The risk assessment covers both in and off-field assessments and, depending on the results, data on additional species may be requested. These additional data may be in the form of extended laboratory, semi-field and/or field studies. In addition to data on additional species, risk mitigation may be used to enable the population to recover from within the crop itself as well as protecting off-crop species. This risk assessment, as set out in the Terrestrial Guidance Document, is being revised following the ESCORT 3 workshop, in which UK regulatory scientists participated.

Annex 2

RECENTLY PUBLISHED RESEARCH LISTED IN THE DEFRA DOCUMENT "NEONICOTINOID INSECTICIDES AND BEES: THE STATE OF THE SCIENCE AND THE REGULATORY RESPONSE"

1. Mickaël Henry, Maxime Beguin, Fabrice Requier, Orianne Rollin, Jean François Odoux, Pierrick Aupinel, Jean Aptel, Sylvie Tchamitchian and Axel Decourtye (2012). A common pesticide decreases foraging success and survival in honey bees. Sciencexpress/29 March 2012/Page 10.1126/science.1,215,039

2. Penelope R Whitehorn, Stephanie O'Connor, Felix L Wackers, Dave Goulson (2012). Neonicotinoid pesticide reduces bumble bee colony growth and queen production. Sciencexpress/29 March 2012/Page1/ 10.1126/science.1,215,025

3. Pettis J S, van Engelsdorp D, John J and Dively G Pesticide exposure in honey bees results in increased levels of the gut pathogen *Nosema* (2012). Naturwissenschaften, 2012 Feb; 99(2): 153–8 Epub 2012 Jan 13.

4. Lu C, Warchol K M and Callahan R A (2012). In situ replication of honey bee colony collapse disorder. Bulletin of Insectology 65 (1): 99–106, 2012 ISSN 1721–8861.

[172] See European and Mediterranean Plant Protection Organisation (EPPO) Side effects on honey bees PP 1/170(4).

5. Vidau C, Diogon M, Aufauvre J, Fontbonne R, Vigues B, Brunet J-L, Texier C, Biron D G, Blot N, El Alaoui H, Belzunces L P, Delbac F (2011). Exposure to sub-lethal doses of fipronil and thiacloprid highly increases mortality of honey bees previously infected by *Nosema ceranae*. PloS ONE 6(6): e21,550. Doi 10.1371/journal.pone.0,021,550.

6. Cresswell J E, Desneux N and van Engelsdorp (2012). Dietary traces of neonicotinoid pesticides as a cause of population declines in honey bees: an evaluation by Hill's epidemiological criteria. Pest Management Science (2012), Vol. 68, Issue 6, pp 819–827.

7. Wu J Y, Smart M D, Anelli C M, Sheppard W S (2012). Honey bees *(Apis mellifera)* reared in brood combs containing high levels of pesticide residues exhibit increased susceptibility to Nosema (Microsporidia) infection. Journal of Invertebrate Pathology 109 (2012) 326–329.

8. Mommaerts V, Reynders S, Boulet J, Besard L, Sterk and Smagghe G (2010). Risk assessment for side-effects of neonicotinoids against bumblebees with and without impairing foraging behaviour. Ecotoxicology (2010) 19:207–215 Doi 10.1007/s10,646–009–0406–2

9. Tapparo A, Marton D, Gioio C, Zanella A, Solda L, Marzaro M, Vivan L and Girolami V (2012). Assessment of the environmental exposure of honey bees to particulate matter containing neonicotinoid insecticides coming from corn coated seeds. Environmental science and technology ACS dx.doi.org/10.1021/es2,035,152 Envion Sci Technol.

10. Johnson R M, Mao W, Pollock H S, Guodong N, Schuler M A, Bernbaum M R (2012). Ecological appropriate xenobiotics induce cytochrome P450s in *Apis mellifera*. PLoS ONE 7(2): e31,051. Doi:10.1371/journal.pone.0,031,051.

11. Schneider C W, Tautz J, Grunewald B, Fuchs S (2012). RFID Tracking of Sub-lethal Effects of Two Neonicotinoid Insecticides on the Foraging Behavior of *Apis mellifera*. PLoS ONE 7(1): e30,023. Doi:10.1371/journal.pone.0,030,023.

12. Brittain C, and Potts S G (2011). The potential impacts of insecticides on the life history traits of bees and the consequences for pollination. Basic and applied ecology 12 (2011) 321–331

13. Teeters B S, Johnson R M, Ellis M D and Siegfried B D (2012). Using video-tracking to assess sub-lethal effects of pesticides on honey bees (Apis mellifera L.) Environmental Toxicology and Chemistry, Vol. 31, Issue 6, pp 1349–54.

14. Aufauvre J, Biron D G, Vidau C, Fontbonne R, Roudel M, Diogon M, Vigues B, Belzunces L P, Delbac F, & Blot N (2012). Parasite-insecticide interactions: a case study of *Nosema ceranae* and fipronil synergy on honey bee. Sci. Rep. 2, 326; DOI:10.1038/srep00,326 (2012).

15. Blacquiere T, Smagghe G, van Gestel C A M and Mommaerts V (2012). Neonicotinoids in bees: a review on concentrations, side-effects and risk assessment. Ecotoxicology (2012) 21:973–992 DOI 10.1007/s10,646–012–0863-x

Annex 3

ACP ADVICE ON NEONICOTINOIDS AND BEES ISSUED JULY 2012

Overall, the ACP were agreed that the current risk assessments are secure and have concluded that there is no justification to take regulatory action at present. Furthermore, there is no evidence as yet of neonicotinoid impacts on bees in the UK. However, the ACP will consider any new information as it arises and keep the situation under close review. An explanation of the work leading to this advice is set out below.

1. The ACP has examined in detail the recent publications in the scientific literature. They identified a number of points at a first discussion of this topic at the May 2012 meeting which have now been followed up.

2. Members have carefully reconsidered the data (including an examination of the raw data) supporting the current authorisations for thiamethoxam products in the light of findings from recent published data (specifically the paper by Henry et al) and EFSA discussions. The field studies submitted by the applicants are fully compliant with current regulatory guidance and additionally cover some aspects not required by the current guidance (eg over-wintering). In line with current guidance the regulatory studies were not designed with detailed statistical analysis in mind, and their power to detect statistically significant changes is not established. Also, they would not show some of the specific sub-lethal effects suggested by academic studies, such as disorientation over distances. However hives exposed to treated crops did not show any gross effects on a wide range of important endpoints when compared to control hives exposed to untreated crops.

3. While noting there were some questions concerning aspects of the two published studies (by Henry et al and Whitehorn et al), the ACP cannot discount their findings. The Committee believe these studies provide interesting information that should be considered in the development of future regulatory guidance. Some further research is merited in the light of these papers and others to clarify the findings and their relevance to the UK field situation. The ACP is pleased to note that relevant work is already underway.

4. This further work will need time to be completed. In particular the ACP is aware that the study on bumble bees (Defra project PS 2371) is currently in its field phase and it is expected results will be reported in March 2013. The ACP has asked for preliminary information to be made available as soon as possible following the field phase this autumn/winter. The study examining residues in honey bees (Defra project PS2370) to assist in the interpretation of the relationship between pesticides residues and disease in bees is also expected to report in March 2013. A preliminary examination of bee health statistics following the introduction of the neonicotinoids is expected to become available later this summer. Finally the EFSA work re-evaluating all of the neonicotinoid insecticides in the light of the latest research and the development of the revised guidance on assessing risk to bees are both due by the end of this year. The ACP will keep this work and its potential impact on authorisations under review

5. The ACP also identified a number of other possible areas for research into the possible impacts of neonicotinoid insecticides. These include some work on bee toxicokinetics to examine factors related to dose and exposure period, a true field study looking at disorientation (while recognising the very real practical difficulties might make this impossible to do). The ACP also asked their Environmental Panel to look at work on guttation as a potential source of exposure to other non-target arthropods.

6. Although the ACP has considered thiamethoxam in detail, the Committee agreed that the conclusions reached can be applied broadly to the authorisations of other neonicotinoid insecticides because:

- The acute toxicity of thiamethoxam, clothianidin and imidacloprid are all of a similar order of magnitude, with similar extent of use. Acetamiprid and thiacloprid are significantly less acutely toxic and are used on a significantly smaller area.
- The chemical properties of all of the neonicotinoid insecticides are very similar and the mode of insecticidal action is identical for them all.

Annex 4

PESTICIDE DETECTION IN DEAD BEES SUBMITTED UNDER THE WILDLIFE INCIDENT INVESTIGATION SCHEME

1. The Wildlife Incident Investigation Scheme (WIIS) examines incidents in which it is suspected that animals may have been poisoned by pesticides. Carcases submitted are routinely analysed for a range of pesticides. A total of 51 cases involving bees have been reported in the past four years (out of an overall total of 745 cases). Of these, two cases appeared to have been a result of the use of a pesticide in accordance with its approval; neither of these involved neonicotinoids. There were two instances of abuse (use of pesticides to deliberately poison bees) and three of misuse (careless/incorrect use leading to poisoning). One of the misuse cases involved a neonicotinoid (imidacloprid) along with three other pesticides.

2. Analysis of dead bees submitted in WIIS cases has brought 100 detections of pesticides (and the full list is in the table below). Of these, 10 are neonicotinoids (7 detections of thiacloprid and 3 of imidacloprid). It is notable that many of the pesticides detected most frequently are biocidal products (for example, products authorised for control of feral bees) rather than plant protection products used in agriculture and horticulture. In the majority of cases, the pesticides detected were not clearly the cause of death.

Active substance	*Number of detections*
Bendiocarb	14
Propiconazole	12
Permethrin	9
Chlorpyrifos, fluvalinate and thiacloprid	7
Tebuconazole	5
Boscalid	4
Dieldrin, dimethoate, imidacloprid	3
Azoxystrobin, carbendazim, diazinon, fipronil, gamma-HCH, lambda-cyhalothrin	2
Bifenthrin, cypermethrin, DDE, DDT-pp, deltamethrin, glyphosate, MCPA, mecoprop-p, methomyl, myclobutanil, penconazole, pirimicarb, pirimiphos-methyl, prothioconazole	1

Annex 5

MONITORING SCHEMES FOR PESTICIDES

Pesticide Residues In Food

1. Responsibility for monitoring residues in food rests with the Committee on Pesticide Residues in Food (PRiF). Its terms of reference are to:

- provide independent advice to the Health and Safety Executive and the Food Standards Agency (FSA), and UK Ministers on:
  - the planning of surveillance programmes for pesticide residues in the UK food supply;
  - the evaluation of the results; and

— procedures for sampling, sample processing and new methods of analysis.

— make its findings and recommendations available to Government, consumers and the food and farming industries in a way which aims to be comprehensive, understandable and timely.

2. The full 2012 monitoring programme can be found at: http://www.pesticides.gov.uk/guidance/industries/pesticides/advisory-groups/PRiF/PRiF-archive/2012–2012_programme.htm

3. Monitoring results are compared against Maximum Residue Levels (MRLs). MRLs are the maximum concentration of plant protection product residues legally permitted in food and animal feeds. The prescribed levels are based on good agricultural practice (GAP); if the user follows the GAP the level of plant protection product in the crop at harvest should not exceed the MRLs. MRL exceedances are followed up with the suppliers.

4. MRLs are intended primarily as a check that the GAP is being followed and to assist international trade in treated produce. The GAP (and hence the MRL) are always set in such a way that adherence to the GAP will not lead to dangerous residue levels. But MRLs are not safety limits in themselves and are usually set well below what would be a "safe" level. It thus follows that residues in excess of an MRL are not necessarily a risk to health, and the Acceptable Daily Intake (ADI) and Acute Reference Dose (ARfD) are used to assess in a precautionary manner appropriate long and short term exposure to residues in foodstuffs.

5. MRLs are set through a long-term EC programme establishing individual limits for different active substance/food commodity combinations. The aim is to establish an MRL reflecting all the authorised uses of pesticides within the Community as well as MRLs that are required to take account of imports into the Community. If a specific MRL is not established then a default level of residue (which is effectively zero) is the statutory maximum permitted.

Wildlife Incident Investigation Scheme

6. The Wildlife Incident Investigation Scheme (WIIS) makes enquiries into the death or illness of wildlife, pets and beneficial invertebrates that may have resulted from pesticide poisoning. The scheme has two objectives:

— To provide information to the regulator on hazards to wildlife and companion animals and beneficial invertebrates from pesticides; and

— To enforce the correct use of pesticides, identifying and penalising those who deliberately or recklessly misuse and abuse pesticides.

7. In practice "companion animals" usually refers to cats and dogs, and "beneficial invertebrates" refers to honeybees, bumble bees and earthworms. Also included in the Scheme are suspect baits, where it is thought that pesticides have been inappropriately applied or used, and spillages of pesticides where this poses a risk to wildlife or companion animals.

8. WIIS monitors the unwanted effects on wildlife through misuse, abuse or approved use of pesticides. The scheme helps monitor the way pesticides are used and their effect. It allows us to assess how people use pesticides and how well they understand the laws relating to these chemicals and protecting wildlife. WIIS also helps us assess whether pesticides are behaving as predicted once released into the environment. So it shows how well the risk assessment and approval process is working.

9. The Scheme is essentially a monitoring tool to inform the pesticide approval process. However, where there is clear evidence of a breach of pesticide law enforcement action may be taken.

10. If the information collected on an incident indicates that pesticide laws may have been broken, a range of regulatory action is considered. If there seems to be enough evidence of illegal activity, cases are referred to be investigated and court action may be taken. Any fines and costs that have to be paid, together with the publicity such cases attract, encourage others to use pesticides safely.

11. Even if there is not enough evidence for a formal investigation or prosecution, other action (for example, using enforcement notices or sending out warning letters) may be taken. Also, it may sometimes be appropriate to refer an incident to another authority, such as the police. In these circumstances, Defra will offer help and advice to that authority.

12. Where suspected pesticide poisoning is reported, a combination of field work, veterinary examination and chemical analysis is used to try to determine the cause of death. Cases accepted for further investigation usually fall into one of the following categories:

— **Approved use**—a pesticide is used in accordance with its conditions of authorisation.

— **Misuse**—the product has not been used according to the conditions of its authorisation, but the breach is careless or accidental, without the intention of harming animals.

— **Abuse**—a pesticide has been deliberately used in an illegal manner to poison, or to try to poison animals.

13. In some cases pesticides may be found but the origin of the substance is unclear and the cause of death will be unknown or unspecified.

14. WIIS is supported by targeted publicity that aims to reach countryside users and influencers, for example veterinary practitioners. The campaign explains how to identify and report potential incidents. It also makes clear that those who deliberately abuse or misuse pesticides in a way which could harm birds, mammals and bees will be prosecuted.

Pesticides Usage Survey

15. The Pesticide Usage Survey (PUS) collects quantitative and qualitative data on pesticides used in agriculture, horticulture and food storage. This data has been collected in the UK for the last 40 years. Since the entry into force of the EU Statistics Regulation (1185–2009/EC), PUS data are now collected as part of the requirement for the collection of data on sales and usage of pesticides. The sampling and data gathering approaches uses fully meet the requirements of the UKSA Code of Practice for Official Statistics.

16. Surveys currently collect data on pesticides used on arable crops, vegetables, glasshouse crops, soft fruit, top fruit, fodder and forage, stored top fruit and potatoes. The surveys provide accurate information concerning regional and national pesticide usage including: the range of chemicals used, the amount of active ingredients applied, the total treated area, the proportion of crops treated, and the methods and timing of application.

17. The data collected provide essential information for a number of purposes including:

- Informing the pesticide risk assessment (approval) process, including the UK and EU review programmes of older pesticide active substances.
- Policy, including assessing the economic and/or environmental implications of introduction of new active substances and the withdrawal/non-approval of pesticide products (the data reported to organisations such as the OECD and EU enabling the UK to honour international agreements); evaluating changes in growing methods and Integrated Pest Management where this has an impact on pesticide usage.
- Informing the targeting of monitoring programmes for residues in food and the environment.
- Contributing to assessing the impact of pesticide use, principally as part of the Pesticide Forum's Annual Report.
- Providing information to assist research projects which can support all of the above activities.
- Training/teaching programmes which are designed to improve practice in the use of pesticides by the farming/training industries.
- Informing the Wildlife Incident Investigation Scheme (WIIS) programme to help identify potential misuse of pesticides.

18. Surveys in England and Wales are carried out by the Food and Environment Research Agency (Fera) and GfK Kynetec, with parallel surveys being carried out in Scotland by the Science and Advice for Scottish Agriculture (SASA) and in Northern Ireland by the Agri-Food & Biosciences Institute (AFBI). Since 2011, published reports cover usage throughout the United Kingdom.

National Poisons Information Service (NPIS)

19. The primary function of the NPIS is to give information to enquiries from health professionals. All health care providers have free access to the UK on-line poisons database TOXBASE and the number of TOXBASE accesses can be counted. Should this not be immediately available (eg unregistered NHS user) or be insufficient for their needs enquirers will ring the NPIS help line. All telephone enquiry data are entered into a confidential national database collection system, the UK Poisons Inquiry Database (UKPID). This includes agent, patient demographics, symptoms, where available clinical laboratory results, treatment advice and, generally in more severe cases, follow up (although follow up of cases is not funded routinely).

20. The NPIS also is associated with the UK Teratology Information Service (UK TIS) and this service will receive specific enquiries about exposures in pregnancy, either directly or be referred them by the NPIS. Data on these cases are also collected in a dedicated database. In the case of pregnancy enquiries the NPIS follows up all pregnancies where it is possible to ascertain the pregnancy outcome but these are few in number for data protection reasons.

21. Regular reports are produced which provide an overview of accidental and deliberate exposures, the agents involved, and outcomes. Severity gradings are consistent with standardised international criteria, the WHO Poisoning Severity Score and symptom details are also collected. These datasets thus allow analysis of the symptoms and severity of accidental and deliberate exposures to individual agents and comparative toxicity to be assessed between agents of the same type, for example herbicides or insecticides. In 2010–11, NPIS systems collected information on approximately 1,300 pesticide and biocide exposures out of a total of 500,000 enquiries for all poisonings.

22. NPIS primarily answers questions on acute exposure, but will collect information on chronic effects of poisoning when enquiries are received from concerned medical practitioners wishing to ascertain whether or not a patient's symptoms may be related to previous pesticide exposures.

Human Health Enquiry & Incident Survey (HHEIS)

23. This system was initiated in 2002. It is largely the work of pesticide approval holders. The approval holders keep records of contacts and enquiries they receive usually from users following product label contact advice. These records are required to be submitted annually to CRD. It has several positive features but reports on only a fairly small number of incidents each year.

Pesticides Incidents Appraisal Panel (PIAP)

24. Post-approval surveillance of pesticide products is essential to detect any health effects that may not have been identified by the initial screening process. PIAP forms part of the post-approval surveillance of pesticide products. It is set up within the HSE and collects information mostly from the public and occasionally employees as they occur continuously through the year. Information is assessed by a committee consisting of experts in this area from both within and without the HSE. Data are analysed and published as an annual report.

25. PIAP considers all incidents of ill health reported to the HSE which are alleged to have been caused by exposure to pesticides used at work/in a work activity. Each report is assessed by a suitably trained member of HSE staff who will investigate each report where appropriate and if necessary seek extra information about the event, especially details of exposure and short and medium term follow up. The PIAP committee is informed of these incidents only when the investigation has been completed, at which time it is supplied with copies of the investigation/follow up reports.

26. PIAP itself does not carry out any further enquiries or investigation and relies entirely on the information collected by HSE staff. PIAP considers each incident report, not to establish causation or blame, but to judge the strength of association between the alleged exposure and alleged ill health. The final decision is based on the balance of probabilities. This enables PIAP to detect any patterns or trends of ill health associated with either individual pesticides or particular groups of pesticides and to assess the reliability of such trends. PIAP reports its findings to the ACP.

Annex 6

WHAT DEFRA IS DOING TO PROTECT INSECTS

Honey Bees

1. Honey bees differ from other insects in that they are essentially a managed species. Defra has a role in helping bee keepers to succeed. The Healthy Bees Plan was launched in March 2009 by Defra and the Welsh Government following publication of the National Audit Office's report on "The Health of Livestock and Honeybees in England". The overall aim of the Plan is to achieve a sustainable and healthy population of honey bees for pollination and honey production in England and Wales. It provides a fresh impetus for government, beekeepers and other stakeholders to work together to respond effectively to pest and disease threats and to sustain honey bees and beekeeping for the future. Defra funding (£4.6 million since 2009) currently runs until 2015.

2. A key priority of the Healthy Bees Plan is to deliver an enhanced training and education programme for beekeepers, driving up husbandry standards and the management of pests and diseases. Defra (Fera) has so far co-funded education and training initiatives with beekeeping associations eg, 400 new beekeeper trainers and a suite of new training materials and courses. Jointly funded programmes will be a key feature of the work going forward.

3. Defra also provides £1.3 million each year to Fera's National Bee Unit's (NBU) to deliver its bee health programme. The programme includes the provision of a free apiary inspection and diagnostic service for statutory diseases and pests, and a free training and education programme to enable beekeepers to become more self-reliant in combating disease through improved bee husbandry. The programme aims to control the spread of endemic notifiable diseases of honey bees and to identify and manage the risk associated with new exotic pests and diseases that may be introduced. The NBU manages BeeBase (www.nationalbeeunit.com), the voluntary national database of beekeepers which also serves as a management tool for planning and executing the inspection programme.

4. There are approx. 28,300 beekeepers currently registered on BeeBase. Increasing the number of beekeepers registered is a key objective of the Healthy Bees Plan. The Plan includes a number of actions to increase registrations including enhanced communications activities and collaboration with beekeeping associations to encourage their members to register. So far this year, there have been 4,081 new registrations of which 1989 have self-registered.

Bumble Bees and other Pollinators

5. Bees and other pollinators are an essential part of our natural ecosystems, and their conservation has become part of biodiversity conservation efforts. Declines in pollinator numbers have significant economic impact, estimated of the order of £500 million, as the crops they pollinate—such as oilseed rape, orchard fruit and beans—support our agricultural systems.

6. Since 1900, the UK has lost 20 species of bee, 62 species of moth, and several butterflies including the mazarine blue and the black-veined white. A further 35 bee species (out of 251) are considered to be under threat of extinction. There has been a severe decline in the diversity of wild bees in the countryside.

7. Wild pollinators require a range of habitats and food sources throughout the year—not just flowers. They need places to nest, feed and forage during the various stages of their life cycle. Over the last 50 years there have been dramatic changes in our countryside due to agricultural intensification, commercial forestry and urban development. These have caused widespread habitat losses. Flowers planted in high streets, parks, gardens, etc are often selected to be low maintenance, long-lasting and pest and disease free. They are also devoid of nectar and pollen which creates extensive areas where wild pollinators cannot survive.

8. Defra is working to protect pollinators and wildlife in general through *Biodioversity 2020: A strategy for England's wildlife and ecosystem services.* In particular, Outcome 3 of the strategy states that "by 2020 we will see an overall improvement in the status of our wildlife and will have prevented further human induced extinctions of known threatened species". The species of principal conservation importance (listed on s41 of the NERC Act 2006) currently includes 17 species of bee, of which 16 species currently occur in England, as well as many other wild pollinators.

9. Natural England promotes the conservation of wild pollinators though Environmental Stewardship, which advises and supports farmers to provide the habitats these animals need, for example flower-rich meadows and buffer strips. It runs conservation projects to support *Biodiversity 2020* and other priority species, including pollinators such as bumble bees. For example the short haired bumble bee, extinct in the UK, was recently reintroduced from New Zealand.

Pollinating Insects and Environmental Stewardship

10. The need to address declines in pollinating insect populations was recognised when Environmental Stewardship was designed. There are relatively few opportunities to do this within modern, intensive arable and grassland management systems, so attention turned to providing habitat for these insects around the margins of fields.

11. Entry Level Stewardship (ELS) therefore pays for the establishment of nectar flower mix in blocks or strips. The design is intended to provide a large quantity of nectar from a small area, to mimic some of the nectar-bearing crops that were once a feature of more traditional agricultural systems and to limit the genetic impact on native wild flower species of the widespread sowing of commercial seed. The sown mixes should be actively managed and re-established as necessary to maintain the nectar supply over the five years of the ELS agreement. Within Higher Level Stewardship, a wider range of options is available, including floristically enhanced grass margins and conservation headlands.

12. ELS nectar flower strips or blocks provide additional nectar sources, particularly for long-tongued species of bumblebees. However, retaining healthy populations of pollinating insects requires a variety of habitats across the farm. For example, tall grass buffer strips provide protection for over-wintering insects.

13. Uptake of ELS nectar flower strips or blocks has been lower than expected. Natural England and the Campaign for the Farmed Environment have therefore been specifically promoting the selection of options of benefit for pollinating insects.

14. Within livestock farming, a new ES option for legume- and herb-rich swards will be available from 1 January 2013. The new option is intended to provide habitat and food for invertebrates including crop pollinators, benefit soil structure, mitigate climate change by reducing nitrogen fertiliser use and provide productive high quality forage for livestock. It is one of a number of changes to ES to improve its delivery and to better meet its environmental objectives.

Campaign for the Farmed Environment

15. The Campaign for the Farmed Environment is an industry-led voluntary approach. It encourages arable farmers to take up key in-field Environmental Stewardship (ES) options and deliver voluntary environmental action. The key objective of the Campaign is to retain and exceed the environmental benefits that were provided by the previous set-aside scheme. The Campaign was proposed by farming organisations as an industry-level alternative to regulation. The Campaign was launched in November 2009 and is currently funded until the end of 2012.

16. The Campaign promotes a range of in-field ES options. It also encourages farmers to leave 3–4% of their least productive land uncropped and provides a range of voluntary environmental management measures which can deliver similar benefits to ES on this land. The options and measures aim to deliver benefits in line with the three campaign themes of farmland birds, farm wildlife and resource protection. Among the many options that contribute to wider biodiversity and farm wildlife (which includes insects) are grass buffers, managed field corners, pollen and nectar flower mixes, sown wildflower headlands and beetle banks.

17. There is general agreement that, while environmental benefits are not being maximised, farmers participating in the Campaign are delivering benefits for the environment. Discussions are taking place on whether and how the Campaign might evolve beyond the current delivery approach to continue the good work

by the industry, extend to link with other industry-led initiatives (such as the Voluntary Initiative for pesticides) and provide a transition period until CAP reform. Defra will take a view on these questions shortly.

The Review Of Advice, Incentives And Voluntary Initiatives

18. Farmers need clear advice to help them improve farm practices, get the most from their land and understand environmental issues. Following a commitment made in the Natural Environment White Paper, Defra is undertaking a review to understand best practice in relation to advice provision and voluntary initiatives. The aim is to publish, by March 2013, plans for a streamlined framework of advice, incentives and voluntary initiatives to enable farmers and land managers to be more competitive and yield better environmental results.

Annex 7

THE ROLE OF NEONICOTINOIDS IN CONTROLLING CROP DAMAGE BY INSECTS

1. Neonicotinoids are widely used in UK agricultural and horticultural crops, with seed treatments, soil treatments and foliar treatments available. They prevent damage and yield losses by controlling a range of pests, such as aphids. When aphids feed on the crop they transmit viruses which cause diseases such as barley yellow dwarf virus (affecting cereals) and beet yellow virus (affecting sugar beet). These diseases can have serious effects on crop yields and quality.

2. Neonicotinoid seed treatments are used extensively in cereals, oilseed rape, and sugar beet where they provide protection against a range of foliar and soil dwelling pests, assisting crop establishment at the time of sowing. Where seed treatments have been used they generally reduce the need for subsequent insecticide foliar treatments. They are also very targeted. Neonicotinoids are also important because they provide an alternative mode of action in the overall insecticide treatment programme, particularly to the pyrethroid and organophosphate insecticides. They therefore play a key role helping to prevent the build up of resistance in the pests concerned.

3. The last decade has seen a significant reduction in the number of available insecticide active substances with different modes of action, particularly those with very broad activity controlling a wide range of insect species. There are a variety of factors behind this but principal ones are the impact of the EU programme for regular review of pesticides approvals and the development of resistance in some key insect pests to the older established chemistry, including pyrethroids, organophosphates and carbamates. (The approval of new active substances has provided replacements for some uses, but they tend to be more specialised with a narrower range of activity). In many situations insect control is reliant on one or two modes of action, with neonicotinoids being a key component in the overall treatment programme.

4. As an example, widespread pyrethroid resistance in pollen beetle has emerged across Europe leading to wide scale significant economic losses. In the UK there has been a slower, but continuing, shift in sensitivity and the development of fully resistant populations. The first populations were identified in small pockets of Eastern England but have now been recorded in the Midlands and Scotland, and neonicotinoids have played a major role in for containing resistant communities.

5. Proactive resistance management strategies have been put in place, including restrictions on use in certain crops, to promote the sustainable use of neonicotinoids. These have been developed in close partnership between CRD and the other members of the Insecticides Resistance Action Group (IRAG), which includes industry, growers and independent academic researchers.

Annex 8

GENERAL PRINCIPLES OF INTEGRATED PEST MANAGEMENT

(AS SET OUT IN THE EU DIRECTIVE ON THE SUSTAINABLE USE OF PESTICIDES)

1. The prevention and/or suppression of harmful organisms should be achieved or supported among other options especially by:

- crop rotation;
- use of adequate cultivation techniques (eg stale seedbed technique, sowing dates and densities, under-sowing, conservation tillage, pruning and direct sowing);
- use, where appropriate, of resistant/tolerant cultivars and standard/certified seed and planting material;
- use of balanced fertilisation, liming and irrigation/drainage practices;
- preventing the spreading of harmful organisms by hygiene measures (eg by regular cleansing of machinery and equipment); and
- protection and enhancement of important beneficial organisms, eg by adequate plant protection measures or the utilisation of ecological infrastructures inside and outside production sites.

2. Harmful organisms must be monitored by adequate methods and tools, where available. Such adequate tools should include observations in the field as well as scientifically sound warning, forecasting and early diagnosis systems, where feasible, as well as the use of advice from professionally qualified advisors.

3. Based on the results of the monitoring the professional user has to decide whether and when to apply plant protection measures. Robust and scientifically sound threshold values are essential components for decision making. For harmful organisms threshold levels defined for the region, specific areas, crops and particular climatic conditions must be taken into account before treatments, where feasible.

4. Sustainable biological, physical and other non-chemical methods must be preferred to chemical methods if they provide satisfactory pest control.

5. The pesticides applied shall be as specific as possible for the target and shall have the least side effects on human health, non-target organisms and the environment.

6. The professional user should keep the use of pesticides and other forms of intervention to levels that are necessary, eg by reduced doses, reduced application frequency or partial applications, considering that the level of risk in vegetation is acceptable and they do not increase the risk for development of resistance in populations of harmful organisms.

7. Where the risk of resistance against a plant protection measure is known and where the level of harmful organisms requires repeated application of pesticides to the crops, available anti-resistance strategies should be applied to maintain the effectiveness of the products. This may include the use of multiple pesticides with different modes of action.

7. Based on the records on the use of pesticides and on the monitoring of harmful organisms the professional user should check the success of the applied plant protection measures.

22 November 2012

Written evidence submitted by the Advisory Committee on Pesticides

Executive Summary

— The Advisory Committee on Pesticides (ACP) is a statutory independent scientific advisory committee. Members are appointed following open competition and advise Ministers on matters relating to the control of pests and particularly on the approvals of pesticides in the UK. There are clear arrangements in place to manage any potential conflicts of interest to ensure that the advice we provide is independent.

— Effective risk management for pesticides is dependent upon a good understanding of a number of important factors including; the properties of the substance, the way it is applied, the type of exposure experienced in practice, and the dose actually received.

— Risk assessments supporting current UK approvals for neonicotinoids are based on a standard regulatory package defined at EU level. These assessments have proved to be acceptable in relation to the authorised uses of these products in line with the standard requirements. We recognise that the standard requirements do not include some of the specific sub-lethal effects suggested by recent academic studies. However, satisfactory data have been supplied for neonicotinoids based on field studies in honey bees, which indicate that in practice there is no difference between colonies foraging in treated and untreated crops over several years of exposure and considering a number of important end points associated with bee colony sustainability. In addition, surveillance data have not highlighted specific problems occurring in the UK. This is why at present we have not advised any regulatory action.

— Recent academic research, which is being closely monitored by the ACP, has suggested possible effects on bee behaviour which are outwith those measured by the defined regulatory package. Also, behavioural effects have been detected in bumble bees, although risks to bumble bees are not currently assessed by regulatory studies and few data on them are available.

— However, such studies have not established convincingly that the exposures employed experimentally are likely to occur in nature.

— Further field-based work has been commissioned by Defra. Findings are expected early in the New Year and will provide better information on what exposures are actually occurring, and what the effects are in practice on bumble bees. Bumble bees are not currently routinely tested in regulatory studies.

— Should the field data on bumble bees indicate a significant risk that requires managing, we will consider carefully what the appropriate steps should be, and will provide advice to government that is supported by a more secure weight of evidence than exists at present. If use of neonicotinoids were to be restricted, this could result in greater usage of other insecticides known also to be hazardous to bees. Advice will therefore need to reflect risks to bees that could arise from the available alternatives.

— There is currently no evidence of harm to human health in either UK surveillance or the published literature following use of neonicotinoid insecticides in accordance with UK approvals.

— It is clear to us that appropriate risk management based on good scientific data is the way forward in this very complex situation and that important information is expected shortly.

— The ACP is not complacent about the current situation. We will consider any new information as it arises and are keeping the situation under close review.

1. The Advisory Committee on Pesticides (ACP)

1.1 At the outset it might be helpful to provide a little background about the ACP and its work. The ACP is a statutory independent advisory committee. Membership is drawn largely (but not entirely) from academia and members' skills reflect the range of expertise necessary to consider the scientific evaluation of studies supporting applications for approval of pesticides. We also have two lay members. Current membership is listed on our website and is attached as Annex 1.

1.2 Appointments are made following open competition and follow the requirements of the Office of the Commissioner for Public Appointments (OCPA). All of our members are independent and are required to declare any interests they might have in the pesticides industry, both on an annual basis and ahead of discussion of each issue we consider. As you are probably aware, university departments are required to seek funding from a variety of sources for their research programmes. Typically some funding comes from government, research councils, non-governmental organisations and industry. All members of the committee comply with the Nolan rules and all declare any interests they may have. The ACP has rules that govern how members might participate in discussion if they have interests to declare. These rules are published on our website here:

1.3 Members interests are recorded annually in our annual report and are also recorded in the minutes and detailed record where interests are declared on specific items discussed at our meetings. Indeed, one member, Dr Harris, has declared a personal interest during our discussions on neonicotinoids and bees as she has worked on clothianidin residues in food in the past, and consequently has played no part in the formulation of advice and has left the room for the duration of our discussions on the topic.

1.4 We have provided a short outline of our role and a summary of the approvals process in our annual report and this is attached at annex 2. Our annual reports are on our website here: http://www.pesticides.gov.uk/guidance/industries/pesticides/advisory-groups/acp/acp-annual-reports .

1.5 A key consideration in evaluating all of the data submitted in support of applications for approval of pesticide active substances and their products is to determine what dose of a substance causes toxic effects, what these are and what dose causes no observed adverse effects. This "hazard identification" stage of an evaluation identifies what *potential* effects a substance could cause. The "risk assessment" stage of the evaluation calculates the exposures (doses) that are *likely to occur* as a result of the proposed use and then assesses the possibility of the potential effects being *realised in practice* (ie whether a dose that causes effects may be experienced when the plant protection product is actually applied to crops). The approval of plant protection products requires there to be an acceptable risk assessment as defined by the current EU legislation (Regulation 1107–2009 of the European Parliament and of the Council). The data requirements for active substances are defined in Commission Regulation 544/2011 and those for products in Commission Regulation 545/2011. Furthermore the requirements for evaluation and authorisation of plant protection products which Member States are required to follow are set out in Commission Regulation 546/2011- the "Uniform Principles".

1.6 It is essential when considering information about pesticides to be aware of the material difference between *hazard* (the potential for harm) and *risk* (its likelihood), as outlined above.

1.7 It is fully accepted that the neonicotinoid insecticides (and indeed most other insecticides) are a hazard and are toxic to bees in laboratory studies at identified doses. Whether such toxicity is likely or not to arise in practice, however, will be determined by uses made of these pesticides and the extent of exposure in bees. (ie to what dose, if any, are they actually exposed).

2. Neonicotinoids

2.1 Imidacloprid was first authorised for use as an insecticide in the UK in 1993. Since then there have been a number of authorisations for use of insecticides containing neonicotinoids in the UK as follows:

2.2 Plant protection products:

Acetamiprid, clothianidin, imidacloprid, thiacloprid and thiamethoxam are authorised in products for use in plant protection on a wide range of agricultural and horticultural crops in a number of formulations including seed treatments, granules, sprays etc. Products containing neonicotinoids are also available for use in the home garden.

Table 1

INITIAL UK APPROVALS FOR THE NEONICOTINOID INSECTICIDES IN PLANT PROTECTION PRODUCTS WERE AS FOLLOWS

Substance	*ACP consideration*	*Initial approval date*	*First Use*
Acetamiprid	(EU annex I listing 2004) ACP 14 (319/2006))	2006	Home garden soil drench based on the EU evaluation
Clothianidin	ACP 6 (293/02) ACP 7(311/05)	2002 beet 2005 cereal	Seed treatment for sugar/ fodder beet
Imidacloprid	ACP 67 (226/93) published evaluation doc 73, ACP 18 (257/98) ACP 237 (276/00) ACP 66(283/01)	1993 for sugar beet, for cereals 1998, for oilseed rape 2001	Seed treatments for sugar beet, winter wheat and winter barley, oilseed rape
Thiacloprid	ACP 300 (278/00))	2000	Foliar spray on apples
Thiamethoxam	ACP 6 (319/2006))	2006	Seed treatment on sugar beet

2.3 *Biocidal products:*

Imidacloprid products have been approved for control of ants, cockroaches and flies; thiacloprid wood preservatives have been authorised. Applications for use of clothianidin, thiamethoxam, acetamiprid and dinotefuran are all under consideration through the EU regulatory system for biocidal products.

2.4 There are also known to be veterinary medicine uses. Veterinary medicines are the responsibility of the Veterinary Products Committee.

2.5 This paper considers the plant protection product uses of the neonicotinoids, as these uses are more likely to result in exposure for bees.

3. The European Food Safety Authority (EFSA)

3.1 EFSA play an important role in Europe as "guardians" of risk assessment for plant protection products. In addition to their important programme of peer review (of evaluation and risk assessment of all Member States' work as "Rapporteurs" evaluating data submitted in support of active substances for use in plant protection products), they also draw advice from a number of expert advisory panels with membership of experts drawn from across the EU.

3.2 Members of the Environmental Audit Committee will probably already be aware that EFSA is also currently undertaking a number of specific activities associated with the assessment of risk to bees.

The Specific Questions to be Addressed by the Inquiry.

4. *The use (or abuse) of evidence in this particular case, for setting policy and regulations on pesticides*

4.1 We should stress that the ACP takes its responsibilities in providing independent advice to Ministers based on sound science very seriously. It considers the potential risks to bees and other non-target insects from the use of insecticides to be an extremely important issue. These potential risks were considered prior to all approvals for use in the UK. Furthermore, *all* approvals undergo regular routine review, but are also subject to review *at any time* should emerging data indicate a need to reconsider the risk assessment.

4.2 In this respect, potential harm to pollinating insects from neonicotinoid insecticides is an area of public and scientific concern and of intense research activity. Recent published literature indicates the possibility that there may be toxicity to honey bees and also to bumble bees considering outcomes such as bee behaviour, which are not required by the current EU regulatory assessments. The ACP has recognised the importance (and urgency) of keeping a close watching brief on this emerging science and its possible impact on current approvals for use, and has devoted considerable attention to developing concerns about risks from neonicotinoid insecticides to bees and other pollinators. Since 2008 the issue has featured in many of its meetings. Annex 3 provides a short summary of our discussions and links to the relevant parts of our website providing records of those discussions. Note that discussions were also held with the public at our open meeting in November 2011, resulting in the views from that meeting being passed to EFSA for further consideration as they develop revised guidance for regulatory testing in this area. Relevant correspondence is in Enclosure 3.

4.3 Our advice to Ministers in July 2012 (at annex 4) was based on a careful review of all of the studies available to us. These included the studies originally submitted by applicants for approval of products as well as studies in the published literature. (We understand Defra has provided detailed information on the regulatory requirements for plant protection products). We re-visited the regulatory studies on bees for thiamethoxam this year, particularly in the light of the studies by Henry *et al* and Whitehorn *et al* in 2012, which we also reviewed

in detail, before providing our advice. We had previously re-considered imidacloprid bee studies in developing our advice on the "buglife" report.

4.4 The regulatory data supplied by the applicants are unpublished. Regulatory data are of considerable commercial value and complex "data protection" rules in the legislation govern how the data can be used in ways that protect their value. This is why the actual studies are not attached as a part of this evidence. However, the evidence can be made available to the Environmental Audit Committee on request to CRD.

4.5 In the interests of efficiency we have not included all of the work done by ACP and CRD on the neonicotinoids since the early 1990's as the sheer volume is huge. However, if the Environmental Audit Committee wishes to see any more detail of our work we would be happy to provide it. The Environmental Audit Committee should be aware that a dossier supporting a single active substance is very extensive and in hard copy probably amounts to a stack about 1.5–2 metres high of A4 paper printed double sided.[Not published here. Deposited in the Parliamentary Archives].

4.6 As an *example* of an early evaluation of a neonicotinoid (1993) the published evaluation document for imidacloprid is provided as Enclosure 1. .[Not published here. Deposited in the Parliamentary Archives]. It is important to note that this was the evaluation that supported the first approval of imidacloprid in the UK. Subsequent approvals and further considerations in accordance with the EU legislation leading to EU annex I inclusion will have involved the evaluation of additional studies. (We can supply further details if required).

4.7 Our work also takes account of concerns raised by stakeholders. Our response to the "buglife report" is provided as Enclosure 2, .[Not published here. Deposited in the Parliamentary Archives]. together with the paper we considered in formulating our response, and the further consideration by our Environmental Panel. We also include in Enclosure 3 an example of a response provided to a letter received directly from a stakeholder (ACP 9 (354/2012)).

4.8 The various papers we have considered at our meetings since May 2012 are at Enclosures 3 to 6 .[Not published here. Deposited in the Parliamentary Archives].—together with the detailed record of our discussion of the papers.

4.9 We did not recommend regulatory action on neonicotinoid insecticides in July 2012 because there remained considerable uncertainty as to whether the adverse effects on bees (both bumble bees and honey bees) reported in the investigative research studies actually occur in real life field conditions. Indeed, the regulatory data made available to us included a well conducted field study using thiamethoxam indicating no difference in a range of relevant endpoints over a period of several years between honey bee hives in both treated and untreated crops. We are aware that EFSA have taken a similar stance to the ACP with respect to the current knowledge of bee safety and neonicotinoids.

4.10 We are also aware that other insecticides that could be used as alternatives to using neonicotinoids themselves pose some risks to bees, and loss of the use of neonicotinoids would be likely to result in an increase in the extent of use of some of these alternative insecticides (see below).

4.11 The ACP is not complacent about the current situation. An important part of our advice to ministers was that "the ACP will consider any new information as it arises and keep the situation under close review." We were aware in July 2012, when providing that advice, that key research likely to shed light on some of the uncertainties was expected to be reported early in 2013.

4.12 Since July, the ACP has become aware of a new report by Gill *et al*, published in the journal Nature on 1/11/12, which has been reviewed at the ACP's November meeting for its potential to alter the regulatory climate. This most recent study provides additional information in suggesting a possible mechanism by which neonicotinoids may have an effect at population level. As such it reinforces the concerns already identified on the basis of the previously considered evidence, but still does not provide the clear evidence about field exposure in bumble bees from the UK situation that the Defra study (Defra project PS 2371) is designed to address. We anticipate considering initial results from this work at our January meeting and concluded that this short delay would not prevent effective regulatory action if the data indicate this is required. We noted that seed treated with neonicotinoids had already been sown this autumn, and that the much smaller proportion of spring-sown seed would already be in the supply chain for the 2013 harvest. Any regulatory action on seed treatments would thus mainly impact from the 2013 autumn sowings onwards.

4.13 In addition to considering applications for approval of active substances and plant protection products the ACP also plays an important role in developing regulatory science. For example there is considerable interest in assessing risks to both people and wildlife from mixtures of pesticides. The ACP has on several occasions discussed the issues associated with exposure to mixtures, and has concluded that joint effects are rarely more than additive in nature. For that reason, we have concluded that assessment factors routinely applied in risk assessments should generally be sufficient to account for potential mixture effects, although we do require some more specific consideration (particularly in human risk assessments) where a single product contains more than one active substance with clear potential to interact. There is also a considerable amount of development work in this area looking at the possibilities that might be afforded by probabilistic risk assessment.

5. *The application of real-world—'field'—data. What monitoring is there of actual—rather than recommended—levels of pesticide usage, and the extent to which that influences policy on pesticides.*

5.1 There is a framework of monitoring schemes considering actual pesticide usage and its consequences for both human and environmental health. We understand that Defra has provided detailed information about the schemes.

5.2 Information from the Wildlife Incident Investigation scheme (WIIS) on bee incidents is perhaps of particular relevance to this Inquiry. Information from WIIS is included in enclosure 2 in ACP 6 (341/2010), and despite specific screening being in place, there had not been any positive detections of neonicotinoids in bees at that time.

5.3 To date we have not seen any data to suggest that UK bee populations have been in decline due to the use of insecticides, or that Colony Collapse Disorder is occurring in the UK. We are also aware that bee diseases such as varroa might be weakening bees to the point where insecticides are able to have a greater effect, but again, we have not seen any data to suggest that this is actually happening.

5.4 The various monitoring schemes feed back information to the regulatory process, often via the ACP. Where findings of monitoring suggest there is a need, these inform further action, whether that is further research to clarify mechanisms of activity recorded, or further regulatory activity.

5.6 One example of such activity is the current stewardship programme for products containing chlorpropham to identify the mechanism leading to occasional peak residues above the Maximum Residue Level (MRL)[173] in order to rectify the position. The ACP is actively monitoring this scheme involving chlorpropham, and has written to the relevant stakeholders indicating that it will take action if the current situation is not resolved to its satisfaction.

6. *Any Potential Impacts of Systemic Neonicotinoid Insecticides on Human Health.*

6.1 Human risk assessment for plant protection products is completed in accordance with the Uniform Principles set out in EU legislation.

6.2 We understand that Defra has provided detailed information about the regulatory risk assessment for humans.

6.3 Given the very large margins of safety required in human risk assessment before an authorisation can be recommended, it is unlikely that use in accordance with the UK conditions of authorisation will result in any impacts on human health. However, as no experimental data are available on humans, in addition to the detailed risk assessment, the ACP also considers reports of suspected ill-health associated with pesticide exposure in the UK, and screens the published literature for reports of adverse health impacts that might be of relevance to UK pesticide use. Enclosure 7 [Not published here. Deposited in the Parliamentary Archives].provides relevant abstracts from the published literature. None relate to approved use in the UK. Most seem to be reports of attempted suicide, mostly in developing nations. It is notable that the recovery from these events was generally within a matter of days with a relatively low level of mortality being reported. This contrasts to literature reports for some other insecticide classes which might be considered alternatives to neonicotinoids.

6.4 The three UK schemes reporting information on human health effects of pesticide exposure, National Poisons Information Service, (NPIS), Pesticides Incidents Appraisal Panel (PIAP) and Human Health Enquiry and Incidents report (HHEIS) have recorded very few reports involving a neonicotinoid insecticide. Details of the incidents reported are not included with this evidence to maintain patient confidentiality. Symptomatic reports were associated with not using the product in accordance with its authorisation. Symptoms reported as being associated with exposure to neonicotinoid insecticides were transient and relatively minor, such as skin rashes and eye irritation.

6.5 Overall, therefore, monitoring has not identified reports of ill health in the UK associated with use of the neonicotinoid insecticides in accordance with their authorisations. We recognise that while each of the surveillance schemes has its own strengths and weaknesses, overall these schemes focus on acute ill-health and are not designed to identify long term consequences of pesticide exposure. A recent ACP working group has examined these schemes and made recommendations for future surveillance.

6.6 As with all pesticides, this position is kept under continuous review, and we expect to consider the next reports from the monitoring schemes in January 2013.

7. *What alternative pest-control measures should be used, such as natural predators and plant breeding for insect-resistance, in a bid to make UK farming more insect- and bee-friendly?*

7.1 The ACP is keen to see the development of sustainable approaches to pest management. This is often referred to as "Integrated pest management" (IPM).

[173] **Maximum Residue Level (MRL):** The maximum concentration of a pesticide residue (expressed as mg/kg) legally permitted in or on food commodities and animal feeds. MRLs are based on good agricultural practice data and residues in foods derived from commodities that comply with the respective MRLs are intended to be toxicologically acceptable.

7.2 Nearly 10 years ago we published the report of a sub-group of the ACP that considered the alternatives to conventional pest control techniques in the UK. This report is on our website here. http://www.pesticides.gov.uk/Resources/CRD/Migrated-Resources/Documents/A/ACP_alternatives_web_subgrp_report.pdf It is also available as Enclosure 8.

7.3 Since that report was produced, there have been a number of important initiatives aimed at supporting the development of sustainable agriculture in the UK. Some examples include:

— Introduction of the various levels of environmental stewardship agreements.

— Two projects considering regulatory approaches for biological pesticides (RELU and REBECCA) and an on-going review in association with the Pesticides Forum.

— The UK biopesticides scheme.

— A draft National Action Plan prepared for consultation (consultation closed on 22 October 2012) setting out many of the ways in which the UK supports development of sustainable approaches to the use of Plant Protection Products.

7.4 Despite these considerable efforts and developments, and the authorisation of more biological pesticides, it remains the case that effective control of important insect pests particularly in arable and some horticultural crops in the UK will continue to rely heavily upon the relatively few authorised insecticidal products for the foreseeable future. Maintaining a crop protection "armoury" that includes insecticides with different modes of action is also important to minimise the risk of insecticide resistance developing in key pests.

7.7 Specialist growing techniques such as those required in organic production systems currently play an important but "niche market" role in the overall agricultural production within the UK, and there are significant costs associated with these methods of production—often including lower yield. The latter is clearly of increasing importance when considering wider food security issues.

7.8 Thus, the main alternatives to use of neonicotinoids currently available to most farmers and growers are other insecticides. Annex 5 provides a short summary of acute toxicity data on honey bees for insecticides currently authorised for use on oilseed rape (OSR) as an example crop that is very attractive to bees. The data demonstrate that most of these insecticides present a potential hazard to bees. Risk management for all of these substances is therefore primarily about management of exposure, so that the risk of actual harm is limited. It is important to note that not all insecticides control the same pests, so the insecticides included in this list would not necessarily be interchangeable alternatives. Recent usage data for the neonicotinoids in the UK is at annex 6 to give a clear context to the Inquiry considerations. We understand that more detailed examination of alternatives has been provided by Defra.

7.9 It is very important that the careful scientific examination of possible impacts of the neonicotinoids is completed to ensure that an appropriate regulatory response is made to manage risk. Action on the neonicotinoids could result in greater usage of other insecticides. Both the neonicotinoids and most other insecticides have fairly low LD50[174] values for honey bees (ie are toxic at low concentrations) and it would be quite difficult to identify from these data that there is a class difference in toxicity between the neonicotinoids and other classes of insecticides. We currently have virtually no data on bumble bees for other insecticides as it is not a standard regulatory requirement. The limited data we have seen eg in Gill *et al* (2012) indicate that under those experimental conditions exposure to lambda cyhalothrin alone (at a dose which is higher than is used in practice), also resulted in some significant effects on bumble bees.

Enclosures .[Not published here. Deposited in the Parliamentary Archives].

1. Published evaluation document 73—imidacloprid

2. ACP 6 (341/2010) and ACP 6/1 (341/2010) initial consideration of the "buglife" report and ACP response. Our environmental panel's consideration of the additional points is ACP 12 (350/2012).

3. ACP 9 (354/2012) response to a stakeholder; ACP 7, 7/1, 7/2, 7/3, 7/4, 7/5, 7/6 (355/2012) papers on bees considered at meeting 355 plus the detailed record of discussion of that item at the May 2012 meeting.

4. ACP 6, 6/1, 6/2, 6/3, 6/4, 6/5, 6/6 (356/2012) and ACP 11 (356/2012) papers on bees considered at meeting 356 plus the detailed record of discussion of those items at the July 2012 meeting.

5. ACP 20, 20/1 (357/2012) additional studies on bees and detailed record of discussion at the September 2012 meeting.

6. ACP 12, 12/1, 12/2, (358/2012) additional studies on bees discussed at the November 2012 meeting and the advice just sent to Ministers.

7. Abstracts from the published literature on reported human health effects of neonicotinoids

8. ACP Report on alternatives to conventional pest control techniques in the UK

[174] LD50 the theoretical lethal dose for 50 per cent of a group of animals

Annex 1

CURRENT ACP MEMBERSHIP (AS AT 16 NOVEMBER 2012)

CHAIR

Sadly, our current Chair**, Professor Gabrielle Hawksworth** passed away on 30 July 2012. She will be greatly missed by all her friends and colleagues.

DEPUTY CHAIRMAN

Dr Andrew Povey is Reader in molecular epidemiology at the University of Manchester. He was first appointed to the Committee in 2008 to advise on epidemiology and toxicology issues.

MEMBERS

Professor Colin Brown is Professor in Environmental Science at the Environment Department of the University of York. This is his sixth year on the Committee.

Dr John Cocker is a Biochemist and Head of Biological Monitoring at the Health and Safety Laboratory, Buxton, Derbyshire. This is his fourth year on the Committee.

Mr Richard Davis is a retired Director of the Chemicals Regulation Directorate, who graduated in plant pathology and followed with a successful career in research in the use of pesticides in horticultural and agricultural crops and in pesticide regulation. He joined the ACP in Autumn 2011.

Ms Jennifer Dean is a Barrister, and is the ACP Committee Lay Member for consumer affairs. This is her third year on the committee

Mr Derek Finnegan is a regulatory compliance and safety specialist with expertise in delivering technical and regulatory solutions to the food industry. He was appointed to the Committee in January 2012.

Dr Caroline Harris is Principal Scientist and Co-Director of the Centre for Chemical Regulation and Food Safety, Exponent International Ltd, Harrogate, North Yorkshire. This is her fourth year on the Committee.

Dr Martin Hare is Principal Lecturer at Harper Adams University College and Chair of its Research Degrees Standards Committee. He is an active researcher in pesticide efficacy, and joined the Committee in Autumn 2011.

Mr Philip Jackson is a self employed Health and Safety Consultant, and is the ACP Lay Member for Environmental Issues. This is his third year on the Committee

Professor Ted Lock is Industrial Professor of Toxicology at the School of Pharmacy and Biomolecular Sciences, Liverpool John Moores University. He was appointed to the Committee in January 2012.

Dr Peter Matthiessen is an independent environmental consultant in ecotoxicology, and is a former member of the Centre for Ecology and Hydrology, Lancaster Environment Centre. This is his sixth year as a Member of the Committee.

Dr Chris Morris is a Senior Lecturer in neurotoxicology at the Medical Toxicology Centre, University of Newcastle. He was appointed to the Committee in January 2012.

Professor Colin Ockleford is Professor in the Department of Medicine at Lancaster University and Visiting Professor in the Laboratory for Developmental Cell Sciences in The Department of Infection, Immunity and Inflammation at Leicester University Medical School. This is his sixth year on the Committee.

Professor Keith Palmer is Professor of Occupational Medicine at the University of Southampton, and Clinical Scientist at the MRC Lifecourse Epidemiology Unit. He is Honorary Consultant Occupational Physician at the Southampton University Hospitals NHS Trust. This is his first year on the Committee.

Dr William Parker is Director of the Horticulture Sector of the Agriculture and Horticulture Development Board. This is his fifth year as a Member of the ACP.

Professor Richard Shore is a vertebrate ecotoxicologist and Head of Site at the Centre for Ecology & Hydrology (CEH) at Lancaster. He is a senior researcher investigating the environmental impacts of contaminants, and has an Honorary Chair at Lancaster University. He joined the ACP in Autumn 2011.

Dr Andrew Smith is Director of the MRC Integrative Toxicology Training Partnership (ITTP), based at the MRC Toxicology Unit, University of Leicester. He joined the ACP in January 2012.

Dr Stephen Waring is Consultant in Acute Medicine and Toxicology, York Hospitals NHS Trust, and Honorary Senior Lecturer in Clinical Pharmacology, Hull/York Medical School. This is his fourth year on the Committee

Dr Simon Wilkinson is a staff scientist at the Medical Toxicology Centre, University of Newcastle Upon Tyne. He researches into routes of exposure to harmful chemicals, concentrating on dermal absorption and cutaneous metabolism. He joined the Committee in Autumn 2011.

Annex 2

THE REGULATORY SYSTEM

Most people agree that it is very important to control the pests, diseases and weeds that threaten our food supplies. There are a number of techniques to do this which are used by both professional farmers and growers and by home gardeners. These include techniques such as crop rotation, digging or ploughing, weeding and the introduction of predatory insects or mites, nematodes and parasitoids as part of integrated pest management (IPM) approaches.

Pesticides are included in these techniques for both professional farmers and growers and home gardeners. Pesticides are substances, preparations or organisms used to control specific pests, pathogens or diseases or weeds. They include a wide range of different substances, both naturally occurring and synthesised and a range of bacteria, fungi or viruses that can be used in biological control.

Because these are products that are specifically designed to have an effect on a living thing, pesticides, like medicines, are subject to an extensive regulatory system and must demonstrate that they can be used without unacceptable risks before they are allowed to be sold.

This is a short explanation of the regulatory system currently in place for pesticides, specifically designed for the general reader. More detailed technical information (suitable for those seeking to make an application for approval of a pesticide for example) is available on the CRD website [http://www.pesticides.gov.uk/guidance/industries/pesticides].

There is a large volume of work to do in assessing pesticides to ensure they meet the requirements of the regulatory system. Much of this work is now shared between the member states of the EU, with one member state, known as the Rapporteur Member State taking the lead responsibility for assessing the active substances used as pesticides in the EU. An active substance can only be used in a pesticide product anywhere in the EU if it meets the regulatory requirements and has been approved by the member states.

The active substance in a pesticide product is the part of the product that provides the pest control. Most products also include a range of other substances that help to make the product suitable to apply to protect the crops, for example the bait that will attract slugs to eat slug pellets. These other substances are called co-formulants.

Each member state remains responsible for authorising all pesticide products to be used within their member state. This is so that each member state can make a specific assessment of each product taking account of differences in conditions that occur across Europe that will affect how a pesticide can be used.

A number of government departments in the UK have a specific interest in the authorisation of pesticides. The Department for Environment, Food and Rural Affairs (Defra) takes the lead, with important involvement from the Department of Health, the Food Standards Agency, the HSE (HSE), and the devolved authorities in Scotland, Wales and Northern Ireland.

The Chemicals Regulation Directorate (CRD) of the Health and Safety Executive (HSE) prepares a scientific evaluation of applications for pesticide product authorisation in the UK on behalf of all of the departments. They also prepare evaluations of active substances where the UK has been asked to be the Rapporteur Member State for the EU.

The independent Advisory Committee on Pesticides provides expert advice both to CRD and to the responsible ministers and departments on all major issues relating to pesticides in the UK.

The Scientific Evaluation Of A Pesticide

This is a complex process involving the detailed consideration of a huge database of scientific studies for each active substance and pesticide product.

For the purposes of this document it is perhaps most straightforward to outline the data that are considered and the way in which information is used to complete the risk assessment needed to meet the regulatory requirements for a new active substance. Such applications must be accompanied by data for a pesticide product as well. Details of data requirements and evaluation times are given on the CRD website for different types of applications for approval [http://www.pesticides.gov.uk/guidance/industries/pesticides/user-areas/applicant-advice].

The main components of the data package that typically would be required for a new pesticide fall into the following seven areas.

1. Physico-Chemical Properties

The applicant is required to specify the chemical composition of the product, its active substance, and any significant impurities that it may contain. Information must also be supplied on the physicochemical properties of the active substance, for example how soluble it is in water or other solvents, what is its vapour pressure etc and on methods by which it can be detected and measured, for example in foodstuffs and water.

2. Potential toxicity in humans

Data on potential toxicity are required for the active substance, the product as a whole, and also any important metabolites of the active substance to which humans might be exposed. An important objective of the toxicological assessment is to establish "no adverse effect levels" (NOAELs) for any ill-effects that might occur. A NOAEL is the highest dose in an investigation that does not cause ill-effects. Specific data on effects in humans is not usually available, particularly for new active substances. However data are considered on a range of mammalian species in studies that consider effects that might occur over an entire lifetime and over several generations.

On the basis of these data, a decision is made as to whether the product requires labelling as a hazard (eg irritant, harmful, toxic) in accordance with standard international requirements.

Reference doses are also defined for use in the risk assessments. These reference doses are carefully derived from the NOAELs of studies relevant to the type of exposure expected, and always include an assessment factor to take account of the fact the studies are in animals and not in humans. Internationally these are usually set to provide a margin of at least 100 on the key NOAEL, assuming that average humans are at least 10 times more sensitive than animals and that particularly sensitive humans are up to 10 times more sensitive still. Data available from medicines where there are comparable data available on both humans and other mammals suggests that this is more than adequate to take account of these uncertainties as differences in sensitivity are more usually less than 10 in reality. The size of the assessment factor can be increased if considered necessary due to either greater than usual uncertainty in the data package or specific critical irreversible effects seen in the studies.

The reference doses set are:

Acceptable daily intake (ADI)

This is the amount of a chemical which can be consumed every day for a lifetime in the practical certainty, on the basis of all known facts, that no harm will result. It is expressed in milligrams of the chemical per kilogram bodyweight of the consumer.

Acute reference dose (ARfD)

The definition of the ARfD is similar to that of the ADI, but it relates to the amount of a chemical that can be taken in at one meal or on one day.

Acceptable operator exposure level (AOEL)

This is intended to define a level of daily exposure that would not cause adverse effects in operators who work with a pesticide regularly over a period of days, weeks or months.

3 Dietary Intake

One of the ways humans might be exposed to a pesticide is through its presence as a residue in food. An obvious route of exposure is residues in food from the treated crop, but residues may also occur in other foods by indirect routes. For example, they might arise in the meat, milk or eggs of animals that have been fed on a treated crop, or from crops grown subsequently to a treated crop if the pesticide is particularly long-lasting in the environment.

Furthermore, the particular product that is being evaluated may not be the only source of the pesticide in the diet. The same chemical may also be a constituent of other products that are already on the market in the UK or in other countries from which we import food.

In assessing the risks from residues of a pesticide in foods, therefore, it is necessary to identify and take account of all

foodstuffs in which significant residues might occur, including those resulting from the use of other products that contain the same active substance.

To check whether the proposed use of a pesticide might cause unacceptable long-term dietary exposures, an estimate is made of the maximum intake that an individual would be expected to incur over a prolonged period. This is based on the distribution of measured residues of the pesticide in foods derived (directly or indirectly) from treated crops, and data on the national patterns of consumption for different foods from official surveys, as now commissioned by the Food Standards Agency. These surveys provide specific data on both special diets and variations in diet with age.

The long-term dietary exposure to a pesticide, calculated in this way, is compared with the acceptable daily intake (ADI). If the ADI is exceeded, the proposed use of the pesticide will not be acceptable. The effect of any over-estimation of potential dietary intakes is to err on the side of safety.

Separate calculations are carried out for dietary exposures in infants and children, and other consumer groups, to check that the exposure will be acceptable. Also, if the pesticide has toxic effects that could arise

from a single dose, an estimate is made of the maximum dietary exposure that could occur in a single day or from a large portion of that food and this is compared with the acute reference dose (ARfD). If the ARfD is exceeded, again the proposed use will be unacceptable.

Finally, if the use of a pesticide produces significant concentrations of toxic metabolites in food (ie substances formed by its chemical degradation in plants or animals), the acceptability of exposure to each of these metabolites is also assessed.

4 Exposures to Operators, Other Workers, Bystanders and Residents

The other circumstance in which human exposure to pesticides commonly occurs is in the course of their application or through contact with crops or other materials that have been treated with them. For example, an operator might be exposed when mixing or applying a pesticide; a passer-by or neighbour might be exposed inadvertently to droplets that drift when a pesticide is being sprayed; and a worker harvesting a crop that has been treated might handle foliage that is coated with residues of a pesticide.

Estimating the profile of exposure in operators, other workers and bystanders is complex and must take into account many factors. These include:

- the physical form of the pesticide (eg liquid or granules);
- the way in which it is used (eg sprayed with a vehicle-mounted
- boom sprayer or painted with a brush);
- the circumstances in which exposure occurs (eg during mixing
- and application or through contact with a treated surface);
- the use of any personal protective equipment such as gloves or
- a face mask;
- the extent to which the pesticide penetrates the skin; and
- patterns of use (including frequency and duration).

The highest exposures in this group are experienced by operators (people actually applying the pesticide). Sometimes, acceptable operator exposure (ie exposure at or below the AOEL) can only be achieved through the use of personal protective equipment such as gloves, coveralls and face-masks. This may be satisfactory for professional operators but amateurs cannot always be expected to have the knowledge that is required to select and use the appropriate forms of protective equipment. Therefore, amateur uses of pesticides are not generally authorised where exposures would be acceptable only with the use of specialised personal protective equipment.

It is important to note, however, that exposure can be controlled by means other than protective clothing; for example, use of suitable packaging for products can reduce the exposure of users.

Authorisations are not allowed if estimated exposure of bystanders, neighbours or workers handling the treated crop is above the AOEL (and of course it is always assumed these people do not use protective equipment).

5 Environmental Fate and Behaviour

In order to assess the potential impact of a pesticide on the environment, it is necessary to establish what happens to it once it has been applied—where it gets to; how fast it is degraded and by what mechanisms; and whether any of its degradation products might occur at levels sufficient to pose a risk. In particular, information is needed about the concentrations of the pesticide and any relevant breakdown products that will occur in soil, water and air, and the persistence of such pollution.

Predicted environmental concentrations (PECs) are derived, and are used to assess:

- exposure of non-target species in soil and water;
- possible contamination of groundwater; and
- the potential for effects on, or residues in, following crops.

The distribution and breakdown of pesticides in the environment depends on many factors including the physical and chemical properties of the pesticide, the climatic conditions following use and the pattern of usage.

The rate of breakdown of a pesticide is usually summarised by a half-life value, which represents the time it takes for half of the pesticide to degrade. The ease with which a pesticide can be washed out of the soil is usually termed its mobility and a general impression of this can be gained from a Koc value (organic carbon sorption coefficient), which gives a measure of how well the pesticide adsorbs (sticks) to soil.

The mobility and degradation of a specific pesticide can vary in different soils and can also be influenced by rainfall and temperature. The application rate, frequency of application and overall pattern of usage can all affect the concentrations of the pesticide present in the environment, and must be taken into account.

6 Ecotoxicology

The other major determinant of a pesticide's environmental impact is its toxicity to wildlife. The environmental risk assessment focuses upon possible effects of the pesticide on a range of non-target organisms including: birds, wild mammals, fish, aquatic invertebrates and plants, insects (including bees) and other non-target arthropods, earthworms and soil micro-organisms and non-target plant species.

Acceptable exposure is determined in line with the relevant EU guidance. For many species this involves comparison of the dose causing no effects in experiments with the relevant predicted environmental concentration to form a toxicity:exposure ratio. If the risk assessment suggests the exposure will cause an unacceptable risk, a range of possible measures can be considered to reduce the exposure. One example of such a "risk mitigation measure" is a no-spray buffer zone around water courses to reduce the amount of spray that might drift onto surface water. If practical risk mitigation measures cannot be devised, the product will not be authorised.

7 Efficacy and Risk to Following Crops

Consideration of product efficacy is an integral part of the risk assessment process. Authorisation of a pesticide is only recommended if there are discernible benefits from the application of that pesticide. Data must be available to demonstrate the efficacy of the pesticide against target organisms when it is used in accordance with the label instructions. Data are also required to demonstrate that the dose recommended is the minimum necessary to achieve the desired effect.

In addition, the application of pesticides (especially herbicides) to a crop may pose a risk to the crop itself or to immediately adjacent or following crops. Studies are required to examine this.

Like resistance to medicines, resistance to pesticides is also a widespread problem that limits the effectiveness of many pesticides and reduces the options for controlling a range of target organisms. The risk of resistance development is considered for each pesticide. Where there is evidence or information to suggest that the development of resistance is likely, a management strategy designed to minimise the likelihood of resistance or cross resistance developing in target species is required.

The Role of the ACP

A draft evaluation covering all of these aspects is prepared by CRD. They then pass this to other government departments and to the ACP for specific advice on the evaluation and whether a product containing the new active substance can be considered for authorisation in the UK. The ACP consider these evaluations in great detail, and often require further studies to clarify aspects of the evaluation. Some examples of this work are outlined in the ACP's annual reports. Only when the ACP are content the product can be used without unacceptable risks do they advise ministers an authorisation can be granted. Ministers take note of the ACP's advice, and only once all government departments are in agreement that authorisation is acceptable can an authorisation be issued for the agreed use in the UK.

Subsequent requests for authorisations of products containing an approved active substance might require new data in only some of the seven areas above, but all changes, including administrative changes such as a change in the name of the company holding the authorisation, or additions to the crops treated must be specifically authorised.

How are Authorisations Kept up to Date?

All pesticides are subject to review at any time if data come to light that suggest that the risk assessments need significant revision, and there is a regular review programme in Europe to ensure that all data are kept up to date and that information is generated to meet new requirements that apply as scientific knowledge and understanding increases.

Changes to data requirements occur as scientific knowledge and understanding develops. These are usually updated at the routine review rather than each new data requirement being applied straight away across all currently authorised products. This helps to ensure the work load is more evenly spread, both in the laboratories generating the data, and in the regulatory processes.

Impact of Changing EU Legislation

During 2009 new EU legislation on pesticides was agreed. The Sustainable Use Directive (2009–128/EC) sets out a number of ways in which aspects of pesticide use may be managed in future. A new Plant Protection Products Regulation (EC 1107–2009) was also agreed. This has replaced Directive 91/414/EEC. The Regulation introduces some new aspects to pesticide regulation in the UK. Examples of these include additional restrictions relating to 'hazardous' substances, requirements to consider the substitution of more hazardous products with less hazardous ones, and a more collaborative approach to pesticide regulation by introducing the idea of "zonal" approvals involving groups of member states.

Annex 3

The ACP and its environmental panel has reviewed both the risk assessment approach and the emerging data regularly since 2008 as follows:

Environmental Panel Reports.

1. Environmental panel 103 (Oct 2008) notified of "restrictions on the use of neonicotinoids pesticides in Germany, Italy and Slovenia" http://www.pesticides.gov.uk/guidance/industries/pesticides/advisory-groups/acp/acp-environmental-panel/environmental-panel-103rd-meeting-notes

2. Environmental panel 104 (April 2009) a general update on honeybees outlined R&D responses to concerns about neonicotinoids and possible exposure via guttation and dust created at seed drilling. A new EPPO risk assessment scheme for systemic pesticides was considered. http://www.pesticides.gov.uk/guidance/industries/pesticides/advisory-groups/acp/acp-environmental-panel/environmental-panel-104th-meeting-notes

3. Environmental panel 105 (Oct 2009) update on general EU view on risk to bees from guttation. CRD indicated it was reviewing the Buglife report. http://www.pesticides.gov.uk/guidance/industries/pesticides/advisory-groups/acp/acp-environmental-panel/environmental-panel-105th-meeting-notes.htm

4. Environmental Panel 106 (March 2010) ACP had referred specific questions on the buglife report http://www.pesticides.gov.uk/guidance/industries/pesticides/advisory-groups/acp/acp-environmental-panel/environmental-panel-106th-meeting-notes.htm

5. Environmental Panel 107 (Oct 2010) consideration of issues raised by ACP from the buglife report; new EPPO risk assessment scheme for systemic pesticide; R&D on Guttation; WIIS data on bees; USA data on pesticide residues in beehives. http://www.pesticides.gov.uk/guidance/industries/pesticides/advisory-groups/acp/acp-environmental-panel/environmental-panel-107th-meeting-notes.htm

6. Environmental panel 108 (Feb 2011) panel views on the buglife report to go to ACP; SETAC workshop and OECD bees initiative;

7. Environmental panel 111 (Oct 2012) bees update and papers to consider.

(Notes from these meetings not yet on the web because minutes for 108 were only agreed at the Oct 2012 meeting due to a special meeting focusing on aquatic mesocosms that not all members attended and cancellation of a panel meeting. However the buglife report and papers were also considered at the ACP, so the overall view of the ACP is already published.)

ACP

Environmental panel activity is reported back to the ACP. Specific links given here are to additional discussion at the ACP only rather than to each report from the panel.

ACP Links given for individual meetings are to detailed records but shorter minutes drafted to be more accessible to lay readers in line with the Code of Practice for Scientific Advisory Committees are also available here: http://www.pesticides.gov.uk/guidance/industries/pesticides/advisory-groups/acp/acp-minutes

1. Meeting 337 (May 2009) Section 16.1 The investigation of the German incident; guttation droplets as a route of exposure for other non-target arthropods; tiered approach to risk assessment for bees; decline in pollinating insects and R&D commissioned.

http://www.pesticides.gov.uk/guidance/industries/pesticides/advisory-groups/acp/acp-detailed-record-of-discussion/acp-337–12-may-2009-detailed-record-of-discussion.htm

2. Meeting 340: ACP notified that research on guttation as a potential route of exposure had been commissioned section 9.2 http://www.pesticides.gov.uk/guidance/industries/pesticides/advisory-groups/acp/acp-detailed-record-of-discussion/acp-340–10-november-2009-detailed-record-of-discussion.htm

3. Meeting 341 (January 2010) section14. The ACP written response to the buglife report that had been delivered between meetings was referred to the environmental panel for consideration of the additional points raised by the ACP response.

http://www.pesticides.gov.uk/guidance/industries/pesticides/advisory-groups/acp/acp-detailed-record-of-discussion/acp-341–26-january-2010-detailed-record-of-discussion.htm

4. Meeting 350 (July 2011) section 10 report from the environmental panel on the further work on non-target arthropods they had taken forward following the buglife report

http://www.pesticides.gov.uk/guidance/industries/pesticides/advisory-groups/acp/acp-detailed-record-of-discussion/ACP-350–5-July-2011-Detailed-Record-of-Discussion.htm

5. Annual open meeting 2011 discussion on bees formed one of the workshop streams. Conclusions were sent to EFSA. http://www.pesticides.gov.uk/guidance/industries/pesticides/advisory-groups/acp/acp-open-meetings/Open-ACP-2011–12th-Annual-Open-Meeting-of-the-ACP-Park-Inn-York-Monday-14-November-2011.htm

6. Meeting 355 (May 2012) section 6 discussion of the current concerns about potential risk to bees and consideration of published research.

http://www.pesticides.gov.uk/guidance/industries/pesticides/advisory-groups/acp/acp-detailed-record-of-discussion/ACP-355–15-May-2012-Detailed-Record-of-Discussion.htm

7. Meeting 356 (July 2012) section 6 Further consideration of data, questions raised by Defra SAC and work underway in the UK and by EFSA. Advice provided for Ministers following this meeting.

http://www.pesticides.gov.uk/guidance/industries/pesticides/advisory-groups/acp/acp-detailed-record-of-discussion/ACP_356_3_July_2012_Detailed_Record_of_Discussion.htm

8. Meeting 357 (Sept 2012) record not yet published as confirmed at the November meeting. Latest published studies provided.

9. Meeting 358 (November 2012) record not yet drafted. Further published research considered and further advice provided.

Annex 4

ADVICE TO MINISTERS

Overall, the ACP were agreed that the current risk assessments are secure and have concluded that there is no justification to take regulatory action at present. Furthermore, there is no evidence as yet of neonicotinoid impacts on bees in the UK. However, the ACP will consider any new information as it arises and keep the situation under close review. An explanation of the work leading to this advice is set out below.

1. The ACP has examined in detail the recent publications in the scientific literature. They identified a number of points at a first discussion of this topic at the May 2012 meeting which have now been followed up.

2. Members have carefully reconsidered the data (including an examination of the raw data) supporting the current authorisations for thiomethoxam products in the light of findings from recent published data (specifically the paper by Henry et al) and EFSA discussions. The field studies submitted by the applicants are fully compliant with current regulatory guidance and additionally cover some aspects not required by the current guidance (eg over-wintering). In line with current guidance the regulatory studies were not designed with detailed statistical analysis in mind, and their power to detect statistically significant changes is not established. Also, they would not show some of the specific sub-lethal effects suggested by academic studies, such as disorientation over distances. However hives exposed to treated crops did not show any gross effects on a wide range of important endpoints when compared to control hives exposed to untreated crops.

3. While noting there were some questions concerning aspects of the two published studies (by Henry et al and Whitehorn et al), the ACP cannot discount their findings. The Committee believe these studies provide interesting information that should be considered in the development of future regulatory guidance. Some further research is merited in the light of these papers and others to clarify the findings and their relevance to the UK field situation. The ACP is pleased to note that relevant work is already underway.

4. This further work will need time to be completed. In particular the ACP is aware that the study on bumble bees (Defra project PS 2371) is currently in its field phase and it is expected results will be reported in March 2013. The ACP has asked for preliminary information to be made available as soon as possible following the field phase this autumn/winter. The study examining residues in honey bees (Defra project PS2370) to assist in the interpretation of the relationship between pesticides residues and disease in bees is also expected to report in March 2013. A preliminary examination of bee health statistics following the introduction of the neonicotinoids is expected to become available later this summer. Finally the EFSA work re-evaluating all of the neonicotinoid insecticides in the light of the latest research and the development of the revised guidance on assessing risk to bees are both due by the end of this year. The ACP will keep this work and its potential impact on authorisations under review

5. The ACP also identified a number of other possible areas for research into the possible impacts of neonicotinoid insecticides. These include some work on bee toxicokinetics to examine factors related to dose and exposure period, a true field study looking at disorientation (while recognising the very real practical difficulties might make this impossible to do). The ACP also asked their Environmental Panel to look at work on guttation as a potential source of exposure to other non-target arthropods.

6. Although the ACP has considered thiamethoxam in detail, the Committee agreed that the conclusions reached can be applied broadly to the authorisations of other neonicotinoid insecticides because:

- The acute toxicity of thiamethoxam, clothianidin and imidacloprid are all of a similar order of magnitude, with similar extent of use. Acetamiprid and thiacloprid are significantly less acutely toxic and are used on a significantly smaller area.
- The chemical properties of all of the neonicotinoid insecticides are very similar and the mode of insecticidal action is identical for them all.

Insecticide active substances: Bee toxicity data
Non-neonicotinoids on Oilseed Rape (OSR)

	acute oral µg/bee	*acute contact µg/bee*	*other data*
Pyrethroids			
Alpha-cypermethrin	0.059	0.033	tunnel and field
Beta-cyfluthrin	0.051	0.0098	cage and field test
Cypermethrin	0.035	0.02	NTA field study considering recovery from effects
Deltamethrin	0.079	0.0015	field tunnel and cage studies. Repellent effect
Lambda cyhalothrin	0.483	0.098	field study repellent effect. Short term foraging suppressant
Taufluvalinate	12.6	12	tent and tunnel tests. Formulated product lower tox
Zeta-cypermethrin	0.044	0.002	cage field and tunnel; repellent, early mortality and no accumulation of reserves but not impact on brood
Carbamates			
Pirimicarb	4	53.1	field studies
Oxadiazines			
Indoxacarb	0.26	0.094	cage test
Azomethines			
Pymetrozine	>117	>200	
Neonicotinoids on OSR			
Acetamiprid	14.53	8.09	tunnel and extended lab
Clothianidin*	0.00,379	0.04,426	field studies
Imidacloprid	0.0037	0.081	cage tests and field tests
Thiacloprid	17.32	38.82	tent and tunnel tests
Thiamethoxam	0.005	0.024	semi-field and field tests

**Clothianidin data presented here are taken from the EU evaluation and there is a slight difference in values compared to the values originally considered by the ACP in the UK evaluation. UK values were acute oral 24 hour LD50 0.00,394 µg/bee and acute contact 24hour LD50 0.04,697µg/bee*

N.B. the higher the toxicity to bees, the lower the "µg/bee" figure

"Oral" is toxicity that occurs following ingestion of the pesticide and is particularly relevant when considering potential exposures via food and drink for example.

"Contact" is measured following application directly to the back of a bee and is particularly relevant when considering potential exposures such as from spray drift for example.

Annex 6

DETAILED NEONICOTINOID USAGE INFORMATION

1. Arable Crops

Around five million hectares of crops received a seed treatment overall, which is similar to the foliar insecticide treatment area. All figures used are area grown and area treated as a percentage of the area grown. Information on the potential yield losses for cereals and OSR have been taken from HGCA fact sheet "Pest management in cereals and oilseed rape", and "Controlling aphids and virus diseases in cereals and oilseed rape". Supplementary information was also taken from the HGCA research review "Pesticide availability for cereals and oilseed rape following revision of Directive 91/414: effects of losses and new research priorities".

1.1 *Wheat—approximately two million ha grown*

Approximately two million ha of wheat is grown, 96% of which received a seed treatment, with 4% remaining untreated. (The usage data does not separate spring wheat from winter wheat). Approximately 36% of the crop grown from home-saved seed. The most common seed treatments highlighted in the usage survey report are:

24% received prothioconazole (fungicide)

22% received a neonic/fungicide mix treatment (Clothianidin/prothioconazole)

13% prochloraz (fungicide)

12% silthiofam (fungicide)

8% Fluoxastrobin/prothioconazole (fungicides)

5% clothianidin

3.4% of seed was treated with imidacloprid (2008 data)

30% of the crop was grown from seed treated with a neonicotinoid. Neonicotinoid seed treatments are used to:

(a) Control pests such as wireworm and slugs, to assist crop establishment and

(b) for the control of aphids in autumn sowings, to reduce/control the potential spread of BYDV (grain aphid and bird cherry-oat aphid). Losses from BYDV may be up to 2.5 t/ha when conditions favour aphid population development. The use of seed treatments provides around six weeks protection and reduces the subsequent number (or need) for follow up foliar sprays (currently only pyrethroids available). The number of foliar sprays will depend on how mild the autumn/winter conditions are. NB the pyrethroid tefluthrin is also approved for this use, but was not used in sufficient numbers to be reported in the usage survey. (Treatment for spring sown crops is ineffective because the crop is growing quickly at this point). Cultural control methods are important to reduce the ability for "green bridge" transmission (aphid movement) through the crop.

Neonicotinoid foliar sprays did not appear to be a major component of foliar insecticides used in wheat in the 2010 report. Although some crops received a treatment with acetamiprid or thiacloprid it is not possible to report the area treated. In 2008, 0.1% of wheat received a foliar treatment of thiacloprid. NB the foliar approved use is for a "reduction in orange blossom midge". Neonicotinoids would not be the product of choice as, for example, chlorpyrifos is more effective

1.2 Barley—winter (382,531 ha grown) and spring (538,632 ha grown) ***Total—921,163 ha***

As described above, seed treatments are used for BYDV control, which is particularly important in barley where it is considered the major disease. Evidence suggests yield losses in winter barley could be 2% (HGCA review).

No neonicotinoid seed treatments listed is listed in the main body of the 2010 survey report, however more complete data available in the report shows 7.4% of winter barley receiving a seed treatment of Clothianidin (either as a straight or in mixture with a fungicide) and less than 1% for spring barley.

Other survey data from 2008 shows 4.8% of winter barley receiving a seed treatment of Clothianidin and 3.7% of winter barley receiving a seed treatment of imidacloprid.

Neonicotinoid sprays do not appear to be a major component of foliar insecticides according to the survey data. (Again they may not be the product of choice).

1.3 *Oats—228,730 ha grown*

36% received prothioconazole fungicide

26%—prochloraz/triticonazole fungicide

14%—Clothianidin/prothioconazole neonic insecticide/fungicide

8% fludioxonil

4%—Clothianidin neonic insecticide

A total of 18% of oats received a neonic seed treatment.

1.4 *Oilseed Rape—641, 562 ha grown (97% of which is winter sown)*

Less than 1% untreated

22% grown from home-saved seed

Seed treatments

37% received fludioxonil/metalaxyl-M/thiamethoxam

21%—Beta-cyfluthrin/imidacloprid

18%—Beta-cyfluthrin/Clothianidin

16%—prochloraz/thiram

8%—thiram

A total of 76% of oilseed rape received a neonicotinoid seed treatment

Neonicotinoid seed treatments are used to assist in crop establishment and again for the control of Myzus persicae. Seed treatments provide protection for four—six weeks, follow up foliar (pyrethroid) sprays may be necessary. The main impact is again as a virus vector of turnip yellows virus in autumn, with yield decreases of 30% in the most susceptible autumn sown seedlings.

Neonicotinoid sprays were not listed in the 2010 report and the 2008 data showed 1% of the OSR area receiving treatment with thiacloprid. However, the approveduse is against pollen beetle—where pyrethroids are also approved and would be product of choice because cheaper. Where pyrethroid resistance has developed then thiacloprid or acetamiprid may be used. More recently flonicamid and pymetrozine have also been approved to give other MOA options where pyrethroid resistance is prevalent. As part of resistance management and to slow down its occurrence, there has been various research refining the pollen beetle thresholds and providing advice emphasising the need only to spray when the threshold is reached. There was evidence that a significant amount of pyrethroid use occurred even in years when the thresholds weren't reached.

More recently, thiacloprid has also been approved as a foliar spray against Myzus, so use may increase in future years. This is seen as in response to an increasing problem of Myzus, which historically has not reached levels justifying treatment.

For any foliar use, the UK has implemented a statutory restriction of only 1 foliar spray of any neonicotinoid containing product per crop, so usage will always be limited.

HGCA review notes that pests of OSR can have a greater impact on yields than cereal pests. Actual figures on yield losses (rather than from experimental work) were stated to be limited, but levels around 1–6% losses were estimated.

1.5 *Linseed—43, 838 ha grown*

8% grown from home-saved seed

50%—prochloraz

50%—Beta-cyfluthrin/imidacloprid

A total of 50% of linseed received a neonic seed treatment according to the 2010 report.

In 2008, 77% of linseed received a seed treatment of imidacloprid.

1.6 *Seed Potato—17, 440 ha grown*

It is considered that this should be more accurately defined as potatoes grown for seed as opposed to a seed treatment for potato tubers.

5% of the crop was grown from home-saved seed.

According to the main body of the 2010 report, 41% of the seed potato area received a neonic foliar spray (thiacloprid).

In 2008, 3% of the potato seed crop received a foliar treatment with acetamiprid and 96% with thiacloprid and 13.4% with thiamethoxam.

Foliar sprays are a critical use for potatoes grown for seed because of the need to keep the seed potatoes free of virus—the main transmitter again being Myzus persicae. Multiple foliar applications will be made over the course of the season. There are four MOA available as foliar sprays: pyrethroids, neoncotinoids, pymetrozine and flonicamid. However, producers of seed potatoes use pyrethroids as the product of choice because of its perceived repellent effects. Virus transmission can take place within minutes of aphids starting to feed, so this is seen as a valuable trait. There is significant widespread resistance to pyrethroids, so alternation

with other MOA is essential. From the usage data, neonicotinoids are the other principle foliar spray that will be used as part of the overall treatment programme. CRD imposed a maximum of two foliar applications on potato grown for seed,

Foliar applications are also made on ware potatoes, although aphid populations rarely reach significantly damaging levels through direct feeding. Typically only two applications may be required, and for this reason CRD imposed a restriction of 1 foliar application on ware potatoes.

Figures taken from the British Potato Council Research report (2009) "Pesticide availability for potatoes following revision of Directive 91/414/EEC: Impact assessments and identification of research priorities" estimated losses (£Million) of 3.2–7.9 for fresh and processed potatoes, and 16.6 for seed potatoes if Myzus persicae was untreated.

1.7 *Sugar beet—118,494 ha grown*

No home-saved seed due to the structure of the sugar beet market.

33% received hymexazol

33% thiram

13% thiamethoxam

12% Tefluthrin

7% Beta-cyfluthrin/Clothianidin

A total of 20% of sugar beet seed received a neonicotinoid seed treatment according to the 2010 report.

According to the 2008 data, 53% of the sugar beet received a seed treatment of Clothianidin, 7% with a seed treatment of imidacloprid and 11 % with a seed treatment of thiamethoxam.. This makes a total of 71% of sugar beet seed received a neonicotinoid seed treatment according to the 2008 data.

(According to BBRO Brooms barn, over 70% seed was neonic treated in 2012).

Neonicotinoids are particularly important for crop establishment, by controlling a range of soil pests, and then providing protection against aphids—particularly again Myzus, because it transmits virus yellows. There is no viable foliar option—the only approved product is pirimicarb and resistance to this is widespread (to the point where approval holder no longer recommends it). No neonicotinoid foliar sprays are approved on sugar beet—however twice in the last four years CRD has issued an emergency approval for the foliar use of thiacloprid to control aphids where (for various environmental reasons) the neonicotinoid seed treatments did not provide the usual length of control. There are pyrethroid-only seed treatments, but these do not include a claim for aphid control (only soil pests), and it would appear from the usage data to not be widely used.

The British Beet Research Organisation (BBRO) website puts usage of neonicotinoid seed treatments at over 90%, and notes that their effectiveness has reduced the need for further treatments. However, it was also noted that reliance on neonicotinoids alone, combined with the exposure Myzus receives on other crops, means that resistance risk is developing.

1.8 *Maize*

Used as a seed treatment for soil pests to aid crop establishment and subsequent frit fly infestations. Data from 2009 PUS survey indicate 5% was treated with clothianidin, 2% with imidacloprid, and 0.3% with thiamethoxam—a total of 7.3% ha. Around 160,360 ha were grown.

2. Horticultural uses

Neonicotinoids are also authorised in a wide range of horticultural crops either through on-label uses or off-label (EAMU/SOLA), across vegetable, fruit and ornamental uses. They are used as foliar sprays predominantly, although there are soil incorporation treatments (ornamentals). Whilst the ha treated is small compared to arable crops, they can still represent very important chemical control options, particularly in niche crops. Data from the PUS (2011) and more detailed information on uses and alternatives is available from the ADAS report (funded by DEFRA) on "Impact of changing pesticide availability on horticulture" have been used to illustrate some key uses:

114% (i.e > 1 spray) of protected chrysanthemums (2007) and 61% of iceberg lettuce (2007) being treated with acetamiprid;

96% of mustard (2007) receiving a seed treatment of imidacloprid;

94% of nut trees (2008) receiving a foliar application of thiacloprid

Brassicas are also a major use—for aphid control—only 2007 data available for thiacloprid, but for some of these crops around 50% will have been treated. (around 26,000 ha Brassicas in 2008). This figure is likely to

have risen since then, again due to resistance issues with pyrethroids and pirimicarb. Alternatives on Brassicas are pymetrozine, spirotetremat, and indoxacarb.

Carrots: around 12,000 ha grown, and 1/3 treated with thiacloprid for aphids (willow-carrot). Pirimicarb is available as an alternative.

Lettuce: 5877 ha grown, around 1200 treated with thiamethoxam, thiacloprid or acetamiprid for aphid control, including the currant-lettuce aphid. Alternatives to which there is no resistance are spirotetremat and pymetrozine.

Apple, plum: thiacloprid and flonicamid are used for aphid control.

Blackcurrant: sawfly—thiacloprid or chlorpyrifos

Raspberry—raspberry beetle, capsids, sawfly—thiacloprid and a range of other actives

Strawberry—capsids are controlled by thiacloprid or bifenthrin, biological control agents are an important component of IPM.

Hardy nursery stock—thiacloprid can be used for aphid control, but where IPM practised other actives are used with a shorter persistence to avoid impacts on predators eg pirimicarb, pymetrozine, permethrins. It is more widely used for thrips control (larvae), particularly because of resistance in alternatives such as pyrethroids, abamectin and spinosad.

Protected ornamentals—thiacloprid is used for control of aphids, with pymetrozine and pyrethroids as alternatives. It is also used for thrip control, along with spinosad and abamectin.

21 November 2012

Written evidence submitted by Professor Simon Potts

1. Executive Summary

1.1 Wild pollinators (bumblebees, solitary bees, hoverflies and other insects), not managed honeybees, are the main pollinators of crops and wild flowers in the UK.

1.2 Both wild pollinators and managed honeybees are in decline in the UK and the drivers of pollinator loss are likely to be multi-factorial.

1.3 About 20% of cropped area in the UK needs insect pollination and demand for pollination services is increasing.

1.4 The total value of pollination services to UK agriculture was £603 million in 2010.

1.5 The cost of replacing insect pollination with artificial means would be ~£1.9 billion and therefore does not present a viable alternative.

1.6 The public would be willing to pay between £1.3–1.8 billion per year to conserve pollinators.

1.7 Pollination of wild plants underpins a suite of other ecosystem services (eg carbon sequestration, soil and water quality, and biodiversity) which is likely to have a very high, but currently unknown, value.

1.8 Multiple mitigation options are available to minimise the impacts of pesticides on pollinators. These include reducing overall application, improving application technologies, replacing pesticides with biocontrol and other IPM strategies, and landscape management to provide additional pollinator habitats.

1.9 It is recommend that Defra undertakes or funds research to conduct cost benefitsanalyses and multi-stakeholder risk assessments of the various mitigation scenarios to understand the impactson farmer livelihoods, food security, pollinator conservationandpublic opinion.

2. Introduction

2.1 I am Professor of Biodiversity and Ecosystem Services at the School of Agriculture, Policy and Development, reading University, with more than 20 years' experience working on pollinators and pollinationservices. I was the lead author for the Chapter on Pollination in the UK National Ecosystem Assessment (Smith et al. 2011).

2.2 I have a number of professional roles advising or providing evidenceto national and international organisations including: UK Parliamentary Office of Science and Technology; Defra; Natural England; UK Science and Innovation network (FCO); UK Office of Government Commerce—Starting Gate review "Healthy Bees Implementation"; European Environment Agency; European Commission DG Agriculture and DG Environment; Food and Agricultural Organisation of the United Nations; International Commission of Plant-Pollinator Relationships; and IUCN Task force on declining pollinator services.

3. Background

3.1 Pollination is a critical ecosystem service for agricultural crop production and the maintenance of wild flower diversity. Pollination levels depend both on the supply of pollinators (ie the availability of sufficient numbers of the right sort of pollinators in the right place at the right time) and the demand from plants (ie the area and type of crops needing pollination).

3.2 The main pollinators of crops and wild flowers in the UK are bees (honeybees, bumblebees, solitary bees) and hoverflies, and to a lesser extent other flies, wasps, beetles and butterflies.

4. Supply of Pollinators

4.1 Wild pollinators, not managed honeybees, are the main pollinators in the UK. In 2007, UK populations of honeybees were only capable of supplying a maximum of 34% of pollination service demands of crops even under favourable assumptions; dropping from 79% in 1984 (Breeze et al. 2011). The actual current contribution is expected to be closer to 15%.

4.2 Wild pollinators, including bumble bees, solitary bees and hoverflies and other insects are therefore estimated to be responsible for ~85% of crop pollination services (Breeze et al. 2011).

4.3 While yet to be fully assessed, wild pollinators, rather than managed honeybees, are likely to be the main pollinators of wild flowers.

4.4 Wild pollinators are in severe decline in the UK. More than half of British landscapes, where sufficient data was available, have shown significant declines in wild bee diversity since 1980 (Biesmeijer et al. 2006). Some areas have also seen significant declines in hoverfly diversity, while other have shown no change or increases.

4.5 Honeybees are in severe decline in the UK. Almost all honeybees are managed, and feral colonies are extremely rare in the UK. The number of honeybee colonies has dropped significantly between 1985 and 2005: England 54% loss, Wales 23% loss, and Scotland 14% loss (Potts et al. 2010a). There has been a modest increase in the number of colonies in some areas very recently.

4.6 Drivers of pollinator loss in the UK are likely to be multi-factorial and include: loss and fragmentation of habitat, environmental chemicals including pesticides and herbicides, pests and pathogens, climate change and invasive species (Potts et al. 2010b). However, the relative contribution of each driver and their synergistic effects are largely unknown.

5. Demand for Pollination Services

5.1 Most crops and wild flowers need insect pollination. Approximately 84% of European crops depend at least in part on insect pollination services (Williams 1994). About 78% of temperate wild flowers need insect pollination (Ollerton et al. 2011).

5.2 About 20% of the area of UK crops are comprised those which are pollinator dependent; this is a 38% increase since 1989 (Breeze et al. 2011). This trend of increasing area is expected to continue with growing demands for: biofuel crops (eg oilseed rape which is insect dependent), locally grown fruits and vegetables, and the uptake of new crops (eg blueberries).

5.3 The UK produces only a small proportion of pollinator dependent products and imports the rest from overseas (eg 30% apples and 57% of strawberries are UK grown) (Smith et al. 2011).

6. Value of Pollinators to UK Agriculture

6.1 Total pollinator loss for UK agriculture would translate into an annual loss of £603million in 2010 (updated for 2010, from Smith et al. 2011); equivalent to about 13% of total farmgate crop value. However, this estimate fails to take into account the contribution of pollinators to: forage crops, such as clover, which support livestock; small-scale agriculture, such as allotments and gardens; ornamental flower production; and seed production for agricultural crop planting.

6.2 The value of pollinators to UK agriculture is increasing year on year as the area of pollinator dependent crops increases in response to increasing demands biofuels (eg oilseed rape), locally grown fruits and vegetables and novel crops (eg blueberries) (Breeze et al. 2011).

6.3 The cost of replacing the service provided by insect pollinators with hand pollination is £1.9 billion, and therefore does not present an economically viable option in the UK (Breeze et al. 2012).

7. Other Values of Pollinators

7.1 In addition to crop pollination, the public values pollinators for aesthetic, cultural, and recreational reasons in terms of their inherent conservation worth and that of wild and garden flowers they pollinate, and florally rich landscapes. The public would be willing to pay between £1.3 billion (Breeze 2012) and £1.8 billion (Mwebaze et al. 2010) per year to conserve pollinators.

7.2 Healthy and diverse plant communities rely on insect pollination, and these communities provide a wide range of other ecosystem services. These include the support of wider biodiversity through the provision of food (eg seeds and fruit) and shelter for other species including birds, mammals, reptiles and insects. Plants also contribute, to varying degrees, to carbon sequestration, the maintenance soil fertility and structure, flood protection, clean drinking water, and noise regulation (Smith et al. 2011). The contribution of pollinators to these services is indirect, but as the services themselves are likely to be valued at many billions of pounds, the value of pollinators is non-trivial.

8. Mitigation of Insecticide Impacts on Pollinators

8.1 There are a number of options available to mitigate against the impacts of pesticides on pollinators. These fall in to three broad categories: (i) reduction of use of pesticides; (ii) reduction in risk of exposure at point of application; and (iii) landscape management approaches. It is likely that a combination of these would be the most effective approach to safeguarding UK pollinators and pollination services.

8.2 Reduce pesticide applications. Pesticide application rates rose by 6.5% between 2005 and 2010 due to increasing treatment intensity per ha on a number of crops (FERA, 2012). A phased reduction in the application of all pesticides, including neonicotinoids, would be likely to benefit pollinators. In parallel, the adoption of other pest control methods such as supplementing with biocontrol agents or the management of uncultivated areas of farmland to enhance natural enemy populations, would help maintain overall pest control.

8.3 Improved application technologies. Adopting more stringent requirements for famers to use the best available application technologies, such as those reducing the loss of seed coating dust and the latest spray nozzle designs, would help minimise exposure risks.

8.4 Landscape management approaches, using instruments such as Agri-Environment Schemes, could be used to provide four sorts of benefits to pollinators. First, adding non-sprayed elements to the landscape would result in an overall dilution of the total amount of pesticide per unit area; secondly, if these areas were floristically rich then they could provide additional forage resources for both wild and managed pollinators; thirdly, these areas could provide "safe heavens" to effectively reduce exposure of pollinators to sprayed crops; and finally, modifying cropping patterns and rotations so that flowering times were synchronised across a landscape could reduce overall exposure.

8.5 Based on expert opinion, it is estimated that the cost of using current agri-environment scheme options for conserving wild pollinators would be in the region of £40–79 million for five years (Breeze 2012). This was based on mitigating against multiple pressures on pollinators not just pesticides.

9. Recommendations

9.1 Defra to fund research (directly or through Research Councils) to address key knowledge gaps focussed on the costs and benefits of implementing different mitigation actions; this would need to take into account multi-stakeholder risks assessments for farmer livelihoods, food security (including farm productivity, food prices for consumers and reliance on imports), environmental quality (pollution and harm to wildlife), pollinator conservation and public opinion. These should include cost:benefit analysis and risk assessment of the following scenarios:

9.2 Business as usual with no change in current policy or practice.

9.3 The potential loss in food production following a phased reduction in overall pesticide use: (i) without any substitute pest control methods; (ii) with replacement of neonicotinoids with other available pesticides; (iii) with the use of current biocontrol technologies.

9.4 Adoption of state of the art application technologies.

9.5 Adoption of landscape management practices to protect pollinators using current Agri-Environment Scheme instruments and/or using novel instruments, such as those that may arise under the CAP reform or payment for ecosystem service tools.

9.6 Developing a "polluter pays model" where the estimated negative impacts of pesticide applications carry a cost which is then used to pay for biodiversity offset to provide habitat elsewhere to protect pollinators.

9.7 Combinations of 9.3 to 9.6.

References

Biesmeijer, J C, Roberts, S P M, Reemer, M, Ohlemuller, R, Edwards, M, Peeters, T, Schaffers, A P, Potts, S G, Kleukers, R, Thomas, C D, Settele, J, & Kunin, W E (2006). Parallel declines in pollinators and insect-pollinated plants in Britain and the Netherlands. **Science** 313: 351–354

Breeze, T D, Bailey, A P, Balcombe, K G, & Potts, S G (2011). Pollination services in the UK: How important are honeybees? **Agriculture, Ecosystems & Environment** 142: 137–143

Breeze, T D, Roberts, S P M, & Potts, S G (2012). **The Decline of England's Bees: Policy Review and Recommendations**. Friends of the Earth, London.

Breeze T D (2012). Valuing UK Pollination Services; PhD Thesis, University of Reading

Food and Environment Research Agency (2012) **Pesticide Usage Statistics** http://pusstats.csl.gov.uk/index.cfm

Mwebaze P, Marris G C, Budge G E, Brown M, Potts S G, Breeze T D and MacLeod A (2010). Quantifying the Value of Ecosystem Services: A Case Study of Honeybee Pollination in the UK; Contributed Paper for the **12 Annual BIOECON Conference**

Ollerton, J, R Winfree, and S Tarrant(2011). How many flowering plants are pollinated by animals? **Oikos** 120: 321–326

Potts S G, Roberts S P M, Dean R, Marris G, Brown M, Jones R, Settele J (2010b). Declines of managed honeybees and beekeepers in Europe. **Journal of Apicultural Research** 49: 15–22

Potts, S G, Biesmeijer, J C, Kremen, C, Neumann, P, Schweiger, O, & Kunin, W E (2010a). Global pollinator declines: trends, impacts and drivers. **Trends in Ecology & Evolution** 25: 345–353

Smith, P, Ashmore, M, Black, H, Burgess, P, Evans, C, Hails, R, Potts S G, Quine, T, Thomson, A, Biesmeijer, K, Breeze, T, Broadmeadow, M, Ferrier, R, Freer, J, Hansom, J, Haygarth, P, Hesketh, H, Hicks, K, Johnson, A, Kay, D, Kunin, W, Lilly, A, May, L, Memmott, J, Orr, H, Pickup, R, Purse, B, & Squire, G (2011). Chapter 14: Regulating services. In The UK National Ecosystem Assessment Technical Report. **UK National Ecosystem Assessment**, UNEP-WCMC, Cambridge

Williams, I H (1994). The dependence of crop production within the European Union on pollination by honeybees. **Agricultural Zoology Reviews** 6: 229–257

2 December 2012

Further written evidence submitted by Bayer CropScience

On 30 November, the Environmental Audit Committee forwarded this question to Dr Julian Little of Bayer CropScience:

> I wonder whether you can comment on the attached EFSA document. The attached PDF, which I obtained on behalf of the Committee from the European Food Safety Agency, is taken from the Public Draft Assessment Report by the Rapporteur Member State (Germany) for Imidacloprid as part of the review programme referred to in Article 8(2) of the Council Directive 91/414/EEC. The document is dated February 2006. The passage is taken from Volume 3, Annex B, B.8 on Environmental Fate and Behaviour. At page 637, there are details of a study conducted by Bayer on Imidacloprid in relation to winter barley in Bury St Edmunds and Wellesbourne in the 1990s. Tables B.8.1–60 and B.8.1–61 on pages 639 and 640 appear to show a build-up of neonicotinoid residues in soil over time, but the report concludes that "the compound has no potential for accumulation in soil", which appears anomalous. Were you aware of this EFSA document? Is there a simple explanation that I'm missing why the residues build-up over time rather than dissipating, as you suggested in Committee at Q187? Do you agree with the conclusions drawn by the EFSA that those trials show that "the compound has no potential for accumulation in soil" and that the trial showed a "plateau level"? *[All quotes pages 639/640]* To the untrained eye, the results of the Bayer field trials appear rather striking, which is why I have brought it to your attention and would be grateful if you could comment on it at the first available opportunity.

Dr Little replied on 11 December 2012:

> As promised, our view on your "question 2" on the soil persistence of imidacloprid. This is an extremely complicated area of the regulatory process but hopefully, I can shed some light upon it.
>
> In the DAR there have been a number of studies carried out on the accumulation of imidacloprid, including three in Germany and two in the UK. The main difference between the UK and the German studies was the study designs used to estimate the half-life of the product in the soil. These studies are notoriously difficult to do, especially in terms of understanding the dose rate applied to the soil, sampling and the frequent issue of hot-spots—normally where treated seed arises in the core samples taken, which tend to skew the results. Hence why there is extensive use of modelling using field derived data.
>
> The UK study used relatively high levels of treatment and involved six successive years of barley growing; something that is not by any means considered "normal" in the UK. Indeed, data derived would be expected to be right at the extreme end of the spectrum of possibilities of what would be seen in normal agronomic practice. Also worth noting that in the UK study, attempts were made to estimate half-lives in soil using a single data point, again something that makes the validity of any conclusions difficult to assess.
>
> The German study essentially removed some of these issues, including that of hot spots and more data points would have been collected, although the variability remains high. Although the German

studies suggested a DT50 of 182 days, overall, the results suggest that in "worse-case scenarios", the half-life of imidacloprid in normal soils would be variable but around 288 days, and would be expected to plateau upon repeated doses after three years.

Just a quick comment on the word "persistence" which seems to have gained a negative connotation when associated with pesticides. Prior to the arrival of modern insecticides such as the neonicotinoids, insecticides tended to have very low half-lives, sometimes in hours, but as a result, were applied at very high dose rates, normally in kilograms per hectare. The move to lower dose products, frequently in the range of ten's of grams per hectare, which have been so welcomed by everyone involved in agriculture, has been facilitated by having slightly longer persistency levels.

11 December 2012

Supplementary written evidence submitted by Lord de Mauley, Parliamentary Under Secretary of State, Department for Environment, Food and Rural Affairs

At the Committee's evidence session on 12 December I undertook to write on three points.

THE SOIL ACCUMULATION TESTS FOR IMIDACLOPRID AND THE ROBUSTNESS OF THE EU PESTICIDE REGIME

The Committee asked a number of questions about the assessment of imidacloprid. There are two distinct issues to consider. One is the detail of the study and its interpretation and the other is the working of the system.

Having revisited these questions, Defra has concluded that in this case the EU regime has been correctly applied and that the relevant appropriate checks and balances have been applied. The key points underlying this conclusion are:

- No upper limit for persistence is set out in the legislation. Instead, evidence of persistence triggers further testing to establish whether accumulation occurs, the level at which a plateau is reached and, most importantly, whether that plateau level will have unacceptable effects on wildlife. This part of the procedure is described at paragraphs 7 and 8 of Annex 1 to this letter.
- It was suggested during the oral evidence session on 12 December that Regulation 1107/2009 requires that any plant protection substance approved for use in the EU must have a half-life in soil of less than 120 days. The situation is actually more complicated than this. Annex II of EU Regulation 1107/2009 sets criteria for "persistence", one of which is a half-life in soil of more than 120 days. However, active substances which are deemed to be persistent are not excluded from approval unless they are also bioaccumulative and toxic (so-called PBT substances). Imidacloprid does not meet the bioaccumulative criteria and so is not a PBT substance.
- Furthermore, these criteria clearly did not exist at the time the decision on imidacloprid was made under the previous Directive 91/414/EEC. They do not apply until a substance is reviewed under Regulation 1107/2009.
- The fact that the European Food Safety Authority (EFSA) reached a different conclusion from the rapporteur Member State (Germany) is evidence that the system is working properly. Consideration by EFSA is one of a number of checks and balances that are built into the system.
- The proposal by the European Commission was made with full knowledge of the EFSA conclusion. In accordance with the legislation, this was based on a specific supported use of a product that had met all of the criteria. The Commission decision identified a number of areas where further information was required, based on the advice from EFSA, for the evaluation of other uses and products and set a deadline for Member States to complete this re-registration work or withdraw these products. This work is ongoing as explained in the annexes to this letter.
- Regulation 1107/2009 does not require that EFSA finalises the risk assessment for all supported uses in every area before the European Commission can make a risk management proposal for approval of the substance. The approach to active substance approval, set out in the legislation, is to establish that there is at least one acceptable representative use in at least one Member State. It then falls to Member States to authorise individual products containing approved active substances. Member States do this on the basis of a full safety assessment, carried out according to common EU rules, using agreed EU end points and taking account of their own national circumstances.
- When products were considered for UK authorisation for cereals, the issue of persistence and accumulation were considered carefully and the conclusion reached was that the resultant risks to soil-dwelling organisms were acceptable. This evaluation will be revisited when imidacloprid is considered for re-registration in the UK before 31 January 2014. The UK regulatory authorities have been fully aware of the discussion in relation to soil accumulation throughout the process.

Further details on these points are set out in the three Annexes to this letter, which cover respectively the EU legislative framework, the EU procedures and the specifics of the imidacloprid assessment.

Requests for Substance Reviews

The Committee asked whether Defra has ever requested a review of a substance approval under the provisions of Regulation 1107/2009. I can confirm that we have made no such requests of the European Commission since that Regulation applied in June 2011. There is an ongoing programme of approval reviews, outlined in Annex 1 to this letter.

National Action Plan

The National Action Plan is on schedule to be submitted to the European Commission by the end of January. This is a little behind the due date but taking the extra time will allow us to give full consideration to the points raised in the public consultation on the draft plan.

Finally, I noted the comments of one Committee member on the Today Programme on Radio 4 on 13 December. On a specific point, I hope I made it sufficiently clear during the evidence session that Defra is not seeking "unequivocal" evidence and that the use of that word in our September statement was inappropriate. More generally, I hope that this letter provides a helpful account of how the complex regulatory process works and how the particular study highlighted by the Committee was handled.

Annex 1

THE EU LEGISLATIVE FRAMEWORK

Basic Principle: A Two Tier Approach

1. Regulation (EC) 1107/2009 applies from June 2011. Before that date, the EU plant protection product regime was governed by Council Directive 91/414/EEC. This set out a two tier procedure whereby active substances which met the relevant safety criteria were included in Annex I to the Directive. If an active substance was included in Annex I, Member States were then permitted to authorise individual products following a set of Uniform Principles. An Annex I inclusion was therefore not in itself an authorisation and further assessments of individual products were required before they could be authorised by Member States.

Re-evaluation programme under Directive 91/414/EEC

2. Recognising that many products were already authorised by Member States prior to entry into force of the Directive, a re-evaluation programme was established. This programme first evaluated the active substance for inclusion in Annex I. Representative products and uses were assessed and, if one of these uses met the conditions for inclusion, then the substance was included in Annex I. At the point of Annex I inclusion an extensive set of common "end-points" was established for Member States to use as the basis for their product authorisations. (End-points are values to be used in the risk assessment. For example, the Acceptable Daily Intake is the amount of a pesticide that can be ingested on a daily basis over a lifetime without an appreciable health risk.)

3. It is therefore fundamental to the system that the decision taken at EU level is limited to whether a given active substance has at least one use that may meet the criteria for authorisation. Member States then make decisions on authorisation; in doing so they apply common rules to their own national circumstances. This two tier process recognises that it would be impractical for an EU process to consider the full range of products and conditions for all Member States.

Regulation 1107/2009 Follows the Same Approach but Adds Hazard Criteria

4. Regulation 1107/2009 replaced Directive 91/414/EEC in 2011. A number of new elements were introduced but the basic two tier approach remains and active substance decisions (now termed approvals) remain based on the expectation that products containing the active substances meet the criteria. Annex II, paragraph 2.1, of the Regulation further specifies this by requiring "Authorisation to be expected to be possible in at least one Member State, for at least one plant protection product for at least one representative use".

5. Additional criteria for active substance approval were added including so called "hazard triggers". These triggers prohibit the approval of active substances on the basis of intrinsic properties, taking no account of the way in which a product might be used. One trigger is for active substances classed as PBT (Persistent, Bioaccumulative and Toxic). Annex II to the Regulation makes it clear that for a substance to be considered PBT it has to meet P, B and T criteria.

A Further Re-Evaluation programme under Regulation 1107/2009

6. All substances included in Annex I of Directive 91/414/EEC were approved under Regulation 1107/2009 as part of the transitional measures. A similar re-evaluation programme for these active substances is underway to address the requirement for a periodic reassessment. Recital 10 of Regulation 1107/2009 makes clear that the new criteria should be applied at the time of renewal or review of their approval.

7. The legislation also specifies the data requirements for active substances and for products. With respect to soil accumulation the requirements for active substances are set out in Commission Regulation 544/2011,

point 7.1.1.2.2. Soil accumulation tests are to be carried out where the DT90 (the time taken for 90% of the applied dose to disappear) in the field is greater than one year and where repeated application is envisaged. The tests must investigate the possibility of accumulation of residues and the level at which a plateau concentration is achieved. Tests need not be conducted where reliable information can be provided by a model calculation or another appropriate assessment.

8. For products, the Uniform Principles are now set out in Commission Regulation 546/2011. Section C, point 2.5.1.1, states:

> "No authorisation shall be granted if the active substance and, where they are of significance from the toxicological, ecotoxicological or environmental point of view, metabolites and breakdown or reaction products, after use of the plant protection product under the proposed conditions of use:
>
> — during tests in the field, persist in soil for more than 1 year (ie DT90 > one year and DT50 > three months), or
>
> — during laboratory tests, form non-extractable residues in amounts exceeding 70% of the initial dose after 100 days with a mineralisation rate of less than 5% in 100 days,
>
> **Unless** (emphasis added) it is scientifically demonstrated that under field conditions there is no accumulation in soil at such levels that unacceptable residues in succeeding crops occur and/or that unacceptable phytotoxic effects on succeeding crops occur and/or that there is an unacceptable impact on the environment, in accordance with the relevant requirements provided for in points 2.5.1.2, 2.5.1.3, 2.5.1.4 and 2.5.2."

Annex 2

THE EU PROCEDURES

The basic EU evaluation procedure under both Directive 91/414/EEC and Regulation 1107/2009 is as follows:

— A dossier is provided by the company wishing to gain approval for an active substance. This dossier includes information to address all the data requirements for the active substance. It must also address the data requirements for products in respect of at least one product containing the substance and one or more representative uses. The process for considering the Dossier and ensuring its validity is described in more detail at paragraphs 10 to 14 of Defra's original written evidence to the Committee.

— The Member State identified as the rapporteur prepares an extensive evaluation, the Draft Assessment Report, to a format dictated by EFSA.

— Since its establishment in 2001, EFSA has been responsible for giving the European Commission a conclusion on the risk assessment. EFSA's process for this includes a peer review by experts from Member States. However, the conclusions drawn are EFSA's own.

— On receipt of EFSA's conclusion, the European Commission make a legislative proposal for the granting or refusal of a substance approval. They use the risk assessment carried out by EFSA to make this risk management decision and prepare a review report that explains the basis for the decision. Proposals for approval include conditions that must be applied by Member States when authorising products and set out the issues identified in the peer review to which particular attention must be paid.

— Annex I inclusion decisions under Directive 91/414 would set deadlines for Member States to re-evaluate products in accordance with the Uniform Principles and taking account of the end-points derived during the EU procedure. Regulation 1107/2009 has generic provisions for this rather than setting deadlines for each decision.

— The Commission's legislative proposal is presented to the Standing Committee on the Food Chain and Animal Health. The Standing Committee is made up of representatives of the Member States and delivers an opinion on the proposal through qualified majority voting. Those proposals which receive a positive opinion are adopted by the Commission. Those that do not are referred through an additional procedure to reach a conclusion.

— Once an active substance is approved, Member States re-evaluate authorised products containing that active substance against the Uniform Principles and using the agreed end-points. The extent of this evaluation varies depending on how close the products and uses being considered are to those that were considered during the EU procedure. The relatively long period provided for the process reflects the extent and detail of the work that can be required to achieve this.

Annex 3

THE SPECIFIC CASE OF IMIDACLOPRID

The EU review

1. Imidacloprid was authorised in some Member States before Directive 91/414 came into force. It was therefore included in the substance re-evaluation programme.

2. The dossier was submitted by Bayer Crop Science. The representative uses supported for Annex I inclusion were as a seed treatment on sugar beet and as a foliar spray for apples and tomatoes (the latter including glasshouse use).

3. The EU rapporteur, Germany (specified in the Commission Regulation laying out the procedure for the specific phase of the re-evaluation programme), evaluated the dossier and prepared a Draft Assessment Report which was submitted to EFSA.

4. As part of an extensive data package on the fate and behaviour of imidacloprid in the environment, the rapporteur evaluated two soil accumulation studies, one from the use of imidacloprid as a foliar spray in orchards in Germany, and one as a seed treatment in barley in the UK.

5. Taking into account the submitted data, the rapporteur modelled the Predicted Environmental Concentration (PEC) for the representative uses (pages 680 to 685 of the DAR the Committee have been examining) and used these figures to complete the ecotoxicology risk assessment.

6. EFSA carried out a peer review and reported its conclusion to the European Commission (*EFSA Scientific Report* (2008) 148, 1–120, Conclusion on the peer review of imidacloprid, published on the EFSA website). They agreed with the rapporteur's conclusion that soil residue levels clearly plateaued in the German study. However, they found that the reasons for the different behaviour seen in the UK study were not fully explained. Further modelling was identified as a requirement "so the degradation pattern from these sites (both German and UK sites) can be more accurately incorporated into future exposure assessments, should imidacloprid be included in annex 1." This will be part of the application required for product re-registration by Member States, which is to be completed by 31 January 2014.

7. The "soil accumulation factor" is a factor applied to the application rate to give the likely maximum soil concentration following repeated use of an active substance. EFSA proposed that a soil accumulation factor of 1.713 might be appropriate for all the uses in situations where significant amounts of treated plant material are not incorporated into soil after the crop is harvested each year. They also proposed a realistic worst case soil accumulation factor of 5.275 which would also be applicable for all uses, but might be overly conservative for uses where large amounts of treated plant material with high cellulose/lignin content (ie straw) are not incorporated into the soil. The first soil accumulation factor was calculated using the longest single first order field dissipation trial DT50 of 288 days. The second was calculated using the longest single first order field accumulation trial DT50 of 1,333 days. (First order means that the rate of reaction is directly proportional to the concentration).

8. EFSA noted that the incorporation of treated plant material was the one major difference between the experimental design of the UK and German studies and might be an explanation why very long DT50 of 1,333 and 1,268 days were estimated at the two UK experimental sites and a plateau in soil residues had not occurred after 6 years of experimentation. EFSA noted the additional information provided by the rapporteur after the peer review (addendum 6 to the DAR) but did not believe this was reported in sufficient detail for them to reach a conclusion. Overall EFSA concluded that the risk assessment to soil dwelling organisms could not be finalised because the assessment of soil accumulation was not finalised, as outlined above. It is routine for EFSA to identify a range of issues in their conclusions, ranging from major concerns to minor readily resolvable issues. EFSA make no judgement about the impact of these issues on the decision to be taken, which is a matter for the European Commission.

9. In line with the normal procedure, the European Commission received and examined the EFSA conclusion. They concluded in this case that at least one use (glasshouse use on tomatoes, a use for which the issue of impacts on soil dwelling organisms is not key) met the requirements of the Directive. They decided that issues relating to other uses, including that of soil accumulation, were of the order that should be dealt with when Member States considered other individual product authorisations. Accordingly, "The impact on earthworms and other soil macro-organisms" was one of a number of points identified for particular consideration by Member States. The Commission also noted that conditions of authorisation should include risk mitigation measures, where appropriate.

10. The review report also noted that some endpoints might require additional studies to be submitted to the Member States in order to ensure authorisations for use under certain conditions.

11. The deadline for Member States to conclude their re-registration of products was set at 31 January 2014.

12. The Commission subsequently amended the Annex I inclusion to add additional requirements for the protection of bees.

UK Assessment

13. Imidacloprid was first authorised in the UK in 1998 following a consideration by the Advisory Committee on Pesticides (ACP). This assessment pre-dates the modern approach to modelling of soil behaviour. The UK field accumulation study considered by EFSA was a specific data requirement from the ACP and was designed to provide a worst case assessment, hence the incorporation of the entire straw rather than stubble only. At the time of the ACP assessment, the accumulation experiments were continuing. However, preliminary results were available.

14. By consideration of the kinetics of degradation, the ACP concluded it could be expected that these carry-over levels would be close to a plateau after the three years of data considered. Assuming a DT50 of 433 days (and 1st order kinetics) residues were predicted to plateau at approximately two times the initial concentration. This level was evaluated for risk to soil dwelling organisms which were concluded to be acceptable. This assessment will be reconsidered during the re-registration of the relevant products using the latest guidelines and the end points from the EU evaluation.

16 January 2013

Further written evidence submitted by Dr James Cresswell, University of Exeter

Response to Submission From Graham White, Friends of the Bees [published in Written Evidence Volume II]

Mr White states: *"Cresswell said the problem is far greater than [the lack of] a single study:*

There is a dearth of fundamental knowledge. Strong lab knowledge can inform, but we don't even have that. There is a virtual total lack of data on neonicotinoid residues in pollen and nectar."

Any neutral surveyor of peer-reviewed papers on this topic, from 1998 to the present day, would conclude that there are in fact dozens of studies and vast amounts of data ... [including] 16 peer-reviewed studies [listed in the EFSA report].

I respond as follows.

In my answer to Q121, I clearly did not intend to be understood as saying that there was no quantitative evidence about neonicotinoid residues in pollen and nectar. Indeed, my meta-analysis (Cresswell, J.E. 2011. Ecotoxicology, 20: 149–57) reviews the evidence and defines a "field realistic" range as up to 10 ppb.

The transcript of previous questions, Q119 and Q120, shows that I was addressing whether it was possible to "to recreate a field-scale trial in a laboratory" and the discussion in Q121 continues in relation to whether residues levels used in laboratory trials "... are representative of the broad range of what goes on in the UK, for example ..." Specifically, I intended to be understood as complaining that there was not enough data to specify the residue range in the UK.

Ie, as Mr White notes, the literature clearly provides some land mark point measurements but I was correct in stating that I was unable to find data describing spatial and temporal variation in residue concentrations in UK crops, such as oilseed rape.

31 January 2013

Supplementary written evidence submitted by Georgina Downs, UK Pesticides Campaign

1.1 During the Committee's oral evidence sessions on 28 November 2012 and 6 February 2013 there were a few things that I undertook to send in subsequently in writing.

(i) Confirmation of the two chemicals involved in the 2009 Parkinson's study.

(ii) Studies related to pesticide exposure and adverse health impacts on farmers.

(iii) Studies related to pesticide exposure and Motor Neurone Disease (MND).

1.2 In addition, I will also include in this further written evidence information regarding a very important review that is currently being published in *Toxicology and Applied Pharmacology* in relation to pesticide exposure and human chronic diseases.

(i) Confirmation of the Two Chemicals Involved in the 2009 Parkinson's Study

1.3 During the oral evidence session on 28 November 2012 I referred to a reputable study published in March 2009 that found that exposure to just two pesticides within 500 metres of residents' homes increased the risk of Parkinson's disease by 75%. Zac Goldsmith MP then asked me which were the chemicals involved in the study. I said Paraquat and Maneb, but undertook to check this and let members know subsequently in writing.

1.4 Having checked this I can confirm that the two chemicals involved in the study were indeed Paraquat and Maneb. For members information the abstract of this study entitled *"Parkinson's Disease and Residential Exposure to Maneb and Paraquat From Agricultural Applications in the Central Valley of California,"* by Sadie Costello, Myles Cockburn, Jeff Bronstein, Xinbo Zhang, and Beate Ritz, can be seen at: http://www.ncbi.nlm.nih.gov/pubmed/19270050.

(ii) Studies Related to Pesticide Exposure and Adverse Health Impacts on Farmers

1.5 During the oral evidence session on 28 November. 2012 when I was referring to the adverse health impacts of pesticides, Mark Spencer MP and Zac Goldsmith MP enquired about whether there were any studies regarding pesticides impacting on the health of farmers.

1.6 I pointed out that the British Medical Association (BMA) report in 1990 had highlighted quite a number of different studies that had been carried out up to that time (ie. 1990) regarding different cancers, lymphomas and leukaemia in farmers and operators. (For reference the BMA report was entitled *"The BMA Guide to Pesticides, Chemicals and Health",* BMA (Edward Arnold) 1990, 1992). However, I stressed the fact that the British Medical Association's report was 20 years ago and that there have been a considerable number of other studies since then, and I therefore undertook to provide Committee members subsequently in writing with information on examples of other such studies.

1.7 The important review that I referred to at paragraph 1.2 above, and that is included in further detail in section iv) below, that is currently being published in *Toxicology and Applied Pharmacology* in relation to pesticide exposure and human chronic diseases, includes references to a large number of studies of adverse health impacts of pesticides on farmers and others occupationally exposed. Members will be able to see the considerable number of studies included in the references section regarding the adverse health impacts of pesticides on farmers and others occupationally exposed. Also, just to highlight that the main text of the review points out that the first reports on the association of pesticides with cancer were presented around 50 years ago regarding higher prevalence of lung and skin cancer in the farmers using insecticides in grape fields (Jungmann, 1966; Roth, 1958; Thiers et al., 1967). It also points out that there have been several reports on increased rate of asthma in people occupationally exposed to pesticides (Hernandez et al., 2011), and that moreover, the result of an agricultural health study indicated that exposure to some pesticides may increase the risk of chronic obstructive pulmonary disease (COPD) in farmers (Hoppin et al., 2007). For further detail of the review being published in *Toxicology and Applied Pharmacology* in relation to pesticide exposure and human chronic diseases see section (iv) below.

1.8 I also pointed out during the oral evidence session on 28 November 2012 that the campaign I run does not just receive reports of adverse health effects from residents and other members of the public, but also from farmers, sprayers, ex-sprayers, ex-farm managers etc., particularly in relation to chronic effects such as neurological conditions and cancers. I would also point out to Committee members that I have sent the Committee a copy of the DVD containing the two videos that the campaign I run produced entitled *"Pesticide Exposures for People in Agricultural Areas – Part 1 Pesticides in the Air; Part 2 The Hidden Costs."* I referred to this DVD in paragraphs 1.4, 3.15(b), 3.19, and in footnote 3, of the written evidence to the Committee, dated 9th November 2012. The second video on the DVD featured, just as an example, a few of the individuals and families from all over the country reporting acute and/or chronic adverse health effects in rural communities surrounded by sprayed fields, and although those featured were predominantly residents reporting adverse health impacts, just over half way through there is a former farm manager and sprayer operator who has long term chronic health damage (particularly neurological damage) pointing out his experiences with pesticides. It is important to reiterate that the former farm manager/sprayer operator on the DVD is just one of a number of farmers that have contacted the campaign I run over the years to report acute and/or chronic adverse health impacts as a result of their pesticide exposure.

(iii) Studies Related to Pesticide Exposure and Motor Neurone Disease (MND)

1.9 During the oral evidence session on 6 February 2013 Chris Evans MP expressed specific interest in any studies related to pesticide exposure and Motor Neurone Disease (MND) and I therefore undertook to provide members with examples of such studies in writing.

1.10 The important review that I referred to at paragraph 1.2 above, and that is included in further detail in section iv) below, that is currently being published in *Toxicology and Applied Pharmacology* in relation to pesticide exposure and human chronic diseases, includes references to a number of studies related to pesticide exposure and Motor Neurone Disease (MND). These include, amongst others,

— Doi, H, Kikuchi, H, Murai, H, Kawano, Y, Shigeto, H, Ohyagi, Y, Kira, J, 2006. Motor neuron disorder simulating ALS induced by chronic inhalation of pyrethroid insecticides. Neurology 67 (10), 1894–1895;

— K, Tzatzarakis, MN, Mastorodemos, V, Plaitakis, A, Tsatsakis, AM, 2011. A case report of motor neuron disease in a patient showing significant level of DDTs, HCHs and organophosphate metabolites in hair as well as levels of hexane and toluene in blood. Toxicol. Appl. Pharmacol. 256 (3), 399–404;

— Pamphlett, R, 2012. Exposure to environmental toxins and the risk of sporadic motor neuron disease: an expanded Australian case–control study. Eur. J. Neurol.

1.11 As said earlier, a full copy of the aforementioned important review lists such studies included in the references section. Also, the main text of the review points out under the heading "Amyotrophic lateral sclerosis (ALS)" that,

> "Amyotrophic lateral sclerosis (ALS) is the nearly all common form of the motor neuron diseases characterized by degeneration of both upper and lower motor neurons. The symptoms include rapidly progressive weakness, muscle atrophy and fasciculations, muscle spasticity, dysarthria (difficulty speaking), dysphagia (difficulty swallowing), and a decline in breathing ability. Irrespective of familial ALS which can be easily ruled out, there is no known cause for this disease but many evidence-based potential risk factors have been proposed for its development where chemical exposures have been bolded (Morahan and Pamphlett, 2006; Sutedja et al., 2009). A population based case–control study conducted by McGuire and colleagues in 1997 was almost the starting point of pesticide-focused investigations in association with ALS. In that study, occupational exposure to three groups of chemicals, including solvents, metals, and pesticides in relation to the incidence of ALS was evaluated and the results showed the role of agrochemicals in most of the cases (McGuire et al., 1997). During the past decade, several reports indicated the association of ALS development with exposure to pesticides (Bonvicini et al., 2010; Doi et al., 2006; Freedman, 2001). Pesticides have reserved the most prominent role in the most of the surveys focusing on the association of environmental and occupational exposures with ALS, which have been carried out up to now, and it would not be unlikely to consider them as a risk factor for developing this neurological disorder (Johnson and Atchison, 2009; Kamel et al., 2012; Vinceti et al., 2012)."

1.12 The review also includes references to a considerable number of studies that have found associations between exposure to pesticides and a number of other neurodegenerative diseases including Parkinson's disease, Alzheimers, and multiple sclerosis. In relation to such neurodegenerative diseases the text of the review points out,

> "It can be said that Parkinson and other neurodegenerative disorders have been most studied in cases of exposure to neurotoxic pesticides such as organophosphates, carbamates, organochlorines, pyrethroids and some other insecticides since they interfere with neurotransmission and function of ion channels in the nervous system (Costa et al., 2008)."
>
> "Other than cancer, epigenetic alterations have increasingly been detected and investigated in neurodegenerative diseases, including Parkinson (Habibi et al., 2011), Alzheimer (Kwok, 2010), ALS (Oates and Pamphlett, 2007), and multiple sclerosis (Burrell et al., 2011). On the role of epigenetic changes in pesticide-induced neurodegenerative disorder, recently neurotoxic insecticides were found to promote apoptosis in dopaminergic neurons through hyper-acetylation of core histones H3 and H4 (Song et al., 2010)."
>
> "Furthermore, in an ecologic study, Parron et al. (2011) showed that people living in areas with high level of pesticides usage had an elevated risk of Alzheimer's disease."

1.13 For further detail of the review published in Toxicology and Applied Pharmacology on pesticide exposure and human chronic diseases see next section iv).

1.14 I would also point out to Committee members that following the oral evidence session on the 28th November 2012, I sent the Committee a link to another recent study regarding the association between pesticides and Parkinson's disease.[175] This study was in addition to the other study regarding pesticides and Parkinson's disease that I highlighted to members during the oral evidence session on 28th Nov. 2012, and in the previous written evidence at paras 2.10, 3.9(j) and footnote 16.

(iv) *The important review published in* Toxicology and Applied Pharmacology *on pesticide exposure and human chronic diseases*

1.15 Further to all that was set out regarding the adverse impacts of pesticides on human health in paras 2.1 to 2.19 of the UK Pesticides Campaign's written evidence to the Committee, dated 9 November 2012, and also further to the comments I made during the two oral evidence sessions to the Committee on 28 November 2012 and 6 February 2013, I am drawing members attention to the important review just published in *Toxicology and Applied Pharmacology* regarding the chronic health impacts of pesticides.

1.16 The review is entitled *"Pesticides and Human Chronic Diseases; Evidences, Mechanisms, and Perspectives"* by Sara Mostafalou and Mohammad Abdollahi at the Department of Toxicology and Pharmacology, Faculty of Pharmacy and Pharmaceutical, Sciences Research Center, Tehran University of Medical Sciences, Tehran, Iran.

1.17 The abstract for the review states, "Along with the wide use of pesticides in the world, the concerns over their health impacts are rapidly growing. There is a huge body of evidence on the relation between

[175] http://www.sciencecodex.com/pesticides_and_parkinsons_ucla_researchers_uncover_further_proof_of_a_link-104622 and information about the same study can also be seen at:- http://www.eurekalert.org/pub_releases/2013–01/uoc—pap010313.php

exposure to pesticides and elevated rate of chronic diseases such as different types of cancers, diabetes, neurodegenerative disorders like Parkinson, Alzheimer, and amyotrophic lateral sclerosis (ALS), birth defects, and reproductive disorders. There is also circumstantial evidence on the association of exposure to pesticides with some other chronic diseases like respiratory problems, particularly asthma and chronic obstructive pulmonary disease (COPD), cardiovascular disease such as atherosclerosis and coronary artery disease, chronic nephropathies, autoimmune diseases like systemic lupus erythematous and rheumatoid arthritis, chronic fatigue syndrome, and aging. The common feature of chronic disorders is a disturbance in cellular homeostasis, which can be induced via pesticides' primary action like perturbation of ion channels, enzymes, receptors, etc., or can as well be mediated via pathways other than the main mechanism. In this review, we present the highlighted evidence on the association of pesticide's exposure with the incidence of chronic diseases and introduce genetic damages, epigenetic modifications, endocrine disruption, mitochondrial dysfunction, oxidative stress, endoplasmic reticulum stress and unfolded protein response (UPR), impairment of ubiquitin proteasome system, and defective autophagy as the effective mechanisms of action."

1.18 The review points out that long-term contact to pesticides can harm human life and can disturb the function of different organs in the body, including nervous, endocrine, immune, reproductive, renal, cardiovascular, and respiratory systems, and that in this regard, "there is mounting evidence on the link of pesticides exposure with the incidence of human chronic diseases, including cancer, Parkinson, Alzheimer, multiple sclerosis, diabetes, aging, cardiovascular and chronic kidney disease (Abdollahi et al. 2004c; De Souza et al. 2011; Mostafalou and Abdollahi 2012a)."

1.19 The review discusses the association of pesticides exposure with the incidence of different types of human chronic diseases as well as general mechanisms of disease's process, which can be involved in pesticides-induced toxicities.

1.20 There are a vast number of references contained within this review to studies that found associations of exposure to pesticides with a wide range of chronic diseases, and this includes numerous studies relating to residents living in the locality of pesticide sprayed fields. There are also a number of accompanying Tables in the review including Table 1 that details pesticides associated with elevated incidence of cancer in epidemiological studies, and Table 2, the list of studies whose results implicate on the association of exposure to pesticides with incidence of chronic diseases and these include, breast cancer, prostate cancer, lung cancer, brain cancer (including childhood brain cancer), kidney cancer, colorectal cancer, testicular cancer, pancreatic cancer, esophageal cancer, stomach cancer, bladder cancer, bone cancer, non-Hodgkin's lymphoma, multiple myeloma, soft tissue sarcoma, leukaemia, and childhood leukaemia, birth defects, reproductive disorders, neuro degenerative diseases (including Parkinson's, Alzheimer's, Amyotrophic lateral sclerosis (ALS)), cardio-vascular diseases, respiratory diseases, diabetes (Type 1, 2 and gestational), chronic renal diseases, and autoimmune diseases (such as rheumatoid arthritis, and systemic lupus erythematous).

1.21 The review concludes that, taken together, the chronic diseases discussed within the review "are considered as the major disorders affecting public health in the 21st century" and that "the relationship between these diseases and environmental exposures, particularly pesticides, increasingly continues to strengthen." The review points out that "Near to all studies carried out in the area of pesticides, and chronic diseases are categorized in the field of epidemiologic evidence or experimental investigation with mechanistic insight into the disease process." It points out that "Some epidemiologic studies have been debated on their uncertainty in elicitation of a definite conclusion because of some restrictions." However, the review points out that "existence of more than a few dozen reports on the association of one case like brain cancer with exposure to pesticide is enough to create concern even without finding a direct link."

1.22 The review points out that "[a]bundance of evidence in this regard has promoted scientists to evaluate the mechanisms by which pesticides develop chronic diseases," and that "several mechanisms and pathways have been clarified for pesticide-induced chronic diseases." The review concludes that "the body of studies in this respect has become massive enough to consider pesticide exposure as a potential risk factor for developing chronic diseases," and that "[c]onsidering chronic diseases as the most important global health problems it is time to find a preventive approach in association with agrochemicals by logical reducing pesticide use or pesticide dependency and find efficient alternatives."

1.23 The content and conclusions of this important review adds even further support to the evidence that the campaign I run has given to the Environmental Audit Committee members, both in the written evidence and the two oral evidence sessions, regarding the chronic adverse health impacts of pesticides. Also, the statement in the review that "existence of more than a few dozen reports on the association of one case like brain cancer with exposure to pesticide is enough to create concern even without finding a direct link" is notably the same point that I made during the oral evidence session on the 6th February 2013 where I pointed out that "this is meant to be based on the risk of harm, not that harm has to have already occurred. Therefore, even if there was just one or two studies or suggestions in relation to a link with pesticides, which it is much further than that, there is confirmation that pesticides can cause a number of acute and chronic health effects, but even if it was just based on the suggestion-"Could they be causing…?" "Could they be…?"-action should be taken, because it is meant to be based on the risk of harm."

1.24 Obviously the conclusions of the aforementioned important review are in addition to the conclusions of the previous 2004 pesticides literature review that I highlighted to members during the oral evidence sessions

on 28 November 2012 and 6 February 2013 (that pesticides literature review had found consistent evidence linking pesticide exposure to brain, kidney, prostate and pancreatic cancer, as well as leukaemia, non-Hodgkin's lymphoma, neurological damage, Parkinson's disease and other serious illnesses and diseases), in which the authors concluded that they did not support the idea that some pesticides are safer than others, as they found that there are different health effects for different classes of pesticides and therefore their overall message to people was to avoid exposure to all pesticides whenever and wherever possible.

1.25 As I correctly highlighted at paragraphs 2.1 to 2.19 of the UK Pesticides Campaign's written evidence to the Environmental Audit Committee, dated 9 November 2012, based on the existing evidence it is now beyond dispute that pesticides can cause a wide range of both acute, and chronic, adverse effects on human health. This includes irreversible and permanent chronic effects, illnesses and diseases. As I previously pointed out, both in the written evidence and the oral evidence, the European Commission (EC) clearly acknowledged when publishing the proposals for the new European pesticides legislation (in July 2006) that pesticides can cause various adverse effects on human health, including on the health of rural residents who are exposed to them. For example, in the EC's July 2006 document entitled "Questions and answers on the pesticides strategy" under the heading "How do pesticides affect human health?" the EC stated:

> "Long term exposure to pesticides can lead to serious disturbances to the immune system, sexual disorders, cancers, sterility, birth defects, damage to the nervous system and genetic damage."

1.26 As highlighted at paragraphs 2.1 to 2.19 of the UK Pesticides Campaign's previous written evidence to the Environmental Audit Committee, the use of pesticides in agriculture has enormous external health and environmental costs in the UK every year.

1.27 The cost to the UK economy of just a few of the chronic health conditions that pesticides can cause is massive. Obviously it goes without saying that the personal and human costs to those suffering chronic diseases and damage cannot be calculated in financial terms. The significance of these consequences requires the adoption of a preventative approach to make sure that the protection of human health is (which it currently is not) the overriding priority of the UK Government's policy and regulations.

1.28 The UK Pesticides Campaign has always argued from the outset of the campaign that the existing substantial health and environmental costs in relation to the use of pesticides far outweighs the cost of switching to non-chemical forms of agricultural production that do not depend on pesticides. The Government is not factoring in this fundamental point in its policy decisions on pesticides.

(v) Additional Comments on Specific Points

1.29 I would like to take the opportunity in this further written evidence to provide additional comments on a number of specific points.

1. *Reports of acute and chronic adverse health impacts*

1.30 Firstly, as I pointed out in both the written evidence dated 9th November 2012, and during the oral evidence sessions on 28th November 2012 and 6th February 2013, for the last 11 years the UK Pesticides Campaign has received reports of both acute adverse health effects, as well as chronic long-term effects, illnesses and diseases, in rural communities where residents live in the locality of pesticide sprayed fields. The acute effects reported are the same types of acute effects recorded in the Government's very own monitoring system and include, sore throats, burning eyes, nose, skin, blisters, headaches, dizziness, nausea, stomach pains, burnt vocal chords and flu-type illnesses, amongst other things. The most common chronic long-term illnesses and diseases reported include various cancers, (especially breast cancer among rural women, as well as cancers of the prostate, stomach, bowel, brain, and skin), leukaemia, non-Hodgkins lymphoma, neurological conditions, (including Parkinson's disease, Multiple Sclerosis (MS) and Myalgic Encephalomyelitis (ME)), asthma, allergies, along with many other medical conditions. The reports of adverse health effects cover all different age groups from the very young (including babies and young children) to the elderly.

1.31 It is important that I stress again the critical fact that there are a number of cases where the individuals involved do have confirmation from either their doctor (or other medical professional) that the acute and/or chronic effects are caused by pesticides. This is especially the case when the chronic effects are related to irreversible neurological damage and injury.

1.32 As I pointed out during the oral evidence session on 6th February 2013 the reports of adverse health impacts that the campaign I run has received from residents all over the UK over the last 11 years are all medically diagnosed confirmed physical conditions, and therefore it would not only be seriously erroneous and clearly wholly inappropriate for anyone to try to suggest that such conditions are "psychosomatic" or "imagined" or "all in the mind," but any suggestions of this nature would be quite frankly grossly insulting, disrespectful, and patronizing to anyone who has suffered acute and/or chronic adverse health impacts as a result of exposure to pesticides sprayed in their localities.

1.33 As I said during the oral evidence session on 6th February 2013, the conditions that are being reported by residents living in the locality of pesticide sprayed fields are the same conditions as those that the European

Commission has previously acknowledged in its statements in 2006 can be caused as a result of exposure to pesticides, especially exposure over the long term, such as is the case for residents and rural communities.

1.34 Therefore as said during the oral evidence session on 6th February 2013, those suffering such health conditions have every right to know if pesticides have been the cause of their health problems, and also those that may not yet have suffered any health problems, have every right to know the information necessary to make informed and knowledgeable decisions to be able to try and protect their health and the health of their family from any harm. However, obviously the fundamental point is that people should have the right not to be exposed to these chemicals at all in the first place.

1.35 I would stress again the fact that European legislation requires that pesticides can only be authorised for use in the first place if it has been established (under Article 4 duty) that there will be no harmful effect on human health. That applies to both acute and chronic adverse health effects. Thus the principle aim of pesticide policy and legislation under the European legislation is supposed to be based on the risk of harm and not that harm has to have already occurred. Therefore the UK Government should not be exposing people to any risk of either acute or chronic harm to health.

1.36 Yet, as I have continued to point out since the outset of the campaign, considering the serious failings of the current UK policy and approvals system for protecting residents from pesticides, (including in relation to the fact that, to date, there has never been any assessment of the risks to health for the long term exposure of residents; as well as the serious inadequacies of the UK Government's existing monitoring system, including that it does not even deal with chronic effects at all), then I reiterate the critical fact that under European legislation pesticides should never have been approved for use in the first place for spraying in the locality of residents' homes, schools, children's playgrounds, and other areas where members of the public may be present.

1.37 I would also point out that there is also a clear case of double standards here. For example, the Government's response to the threat of a chemical terrorist attack would be first and foremost to protect its citizens. However, the spraying of toxic pesticides all over the countryside and the poisoning of the public is directly under Government sanction.

1.38 As pointed out at paragraph 7.8 of the previous written evidence to the Committee, the factual evidence clearly confirms the fact that in relation to the exposure of residents more than enough evidence already exists (evidence of AOEL exceedances; harm to the health of residents and others exposed, including in the UK Government's own monitoring system etc.) for action to be taken now with the introduction of mandatory measures for the protection of residents health, and that are very, very long overdue.

2. *UK National Action Plan for Pesticides*

1.39 During the oral evidence session on 27th February 2013 with DEFRA Minister Lord de Mauley, DEFRA Chief Scientific Advisor Professor Ian Boyd, and Dave Bench from CRD, there was some discussion of the UK Government's National Action Plan (NAP) on pesticides which had been published the day before on 26th February 2013.

1.40 In relation to this I would make the following few points regarding the UK's NAP.

1.41 I noted that the Committee members sought clarification from the aforementioned witnesses as to what exactly had changed between the previous draft of the NAP and the version published on 26th February 2013. Dave Bench confirmed that nothing substantial had changed. Having checked the two versions, there is certainly no noticeable changes in any of the substance of the final version of the Government's NAP with the previous draft.

1.42 Therefore, as per with previous Government consultations on pesticides, the Government "consults," but then just goes and does what it fully intended to do in the first place. This is not particularly surprising, as it has happened in every single Government "consultation" on pesticides over the last 10 years.

1.43 As I pointed out at paragraph 5.5 of the previous written evidence to the Committee, dated 9th November 2012, by CRD carrying out all the Government Consultations' on pesticides, and also being the main Government agency that assesses the adequacy of the UK's policy and approach, is really effectively just asking the regulator to be judge and jury of itself, which further compounds the inappropriateness of the UK structure.

1.44 Regulation 4 of the UK *"Plant Protection Products (Sustainable Use) Regulations 2012"* requires the Secretary of State, the Scottish Ministers and the Department to jointly adopt a National Action Plan in accordance with Article 4 (of the EU Sustainable Use Directive (SUD)) and to revise it as necessary. The NAP is supposed to include the provisions listed from Article 5 to Article 15 of the European Sustainable Use Directive. (See paragraph 2 of the Impact Assessment that accompanied *"The Plant Protection Products (Sustainable Use) Regulations 2012"* that states, "Article 4 states that the Member States' National Action Plans shall describe how they will implement the measures necessary to implement the Directive's requirements/aims.")

1.45 The UK NAP is mainly based on voluntary measures only and does not currently contain anything that would actually result in reducing the risks and adverse impacts of pesticide use on human health, especially

not in relation to agricultural pesticide use. This is despite the fact that the main purpose of the EU SUD is for reducing the risks and impacts of pesticide use on human health and the environment! For example, paragraph 14.2 of the NAP refers to "a range of industry initiatives to protect health and the environment." Such industry initiatives are voluntary based only, for example the Voluntary Imitative (VI). Further, the VI is only related to the environment[176] and does not focus on health. Considering the Government has not, to date, properly recognised the risks and adverse impacts on human health from exposure to agricultural pesticides from crop spraying (especially in relation to residents) then there is no real surprise that the Government has not proposed any mandatory measures to reduce the risks and adverse health impacts from the use of pesticides in agriculture. (For example, the NAP merely maintains, as ever, (at paragraph 7.1) that "The regulatory risk assessment and risk management process is very effective at identifying and mitigating risk").

1.46 As I detailed in the previous written evidence to the Committee, dated 9th November 2012, the reliance on existing or enhanced voluntary approaches will not change anything, and thus will not provide any public health protection, as voluntary measures have existed for decades, have not worked, however many times they are repackaged, and are completely unacceptable in this situation.

1.47 There are further examples in the UK NAP where the focus and concern is on reducing the alleged burdens on farmers, industry and other related business. (For example, amongst others, paragraph 5.2 that states, "The Government is keen to ensure that regulatory burdens on businesses are kept to a minimum and reduced/removed wherever possible. For pesticides, this means that the Plan aims for non-regulatory approaches to be adopted as much as possible, and looks to stakeholder partners to deliver these. Of particular relevance in delivering the non-regulatory measures in the Plan are the two key stakeholder organisations, the Voluntary Initiative for pesticides for agriculture and horticulture, and the Amenity Forum.")

1.48 Other examples of this can also be seen in other recent Government documentation relating to the EU SUD, for example in paragraph 11.2 of the Explanatory Memorandum that accompanied the *"The Plant Protection Products (Sustainable Use) Regulations 2012"* it states that, "All decisions have been taken with a view to minimising the effect on these businesses, including approaches such as;—adopting a "business as usual" policy where possible taking into account the requirements of the Directive, and attempting to replicate the existing regime as far as possible;—including a requirement that people take "reasonable precautions" rather than introducing certain prescriptive new measures, allowing businesses the flexibility to decide what measures are necessary based on individual circumstances, rather than a need for familiarisation with a raft of complex requirements;—using all available derogations;—deeming existing UK requirements as satisfying equivalent or related requirements under the Directive wherever possible, so that businesses do not have to implement unnecessary changes (for example, existing training certificates will be deemed to meet the minimum requirements of those introduced under the Directive)."

1.49 The Government's position is, as ever, mainly concerned with the alleged impacts and burdens, (including costs) that the obligations of the new EU legislation may have on farmers, industry and other related business. Yet the Government's policy on pesticides is supposed to protect human health first and foremost. Business and industry interests must not come before public health and safety. What about the real-life adverse impacts and burdens on rural residents and communities (and other members of the public) from crop-spraying activities, which includes impacts not only on their health, but also on their environment, as well as related costs and other financial implications for residents etc.

1.50 It is noticeable that there is no reference anywhere in the UK NAP to the existing real-life adverse health and environmental impacts and burdens on residents and communities (and the public in general) from crop-spraying activities, which again, means that there is also no recognition or inclusion of the related costs and other financial implications for residents from not introducing the necessary mandatory measures for the protection of residents. The protection of human health is of far greater value and importance than the protection of industry finances and, as pointed out previously, public health protection is supposed to be the Government's main priority and concern in its pesticides policy and approach, and which, to date, it clearly has not been.

1.51 I would also add at this juncture that the Government's response in the National Action Plan regarding Article 12 of the EU Sustainable Use Directive is factually and legally incorrect. I have repeatedly previously pointed this out to CRD and DEFRA in previous DEFRA consultations and yet officials continue to seemingly intentionally misinterpret the requirements of Article 12 of the SUD. Further, it is completely inaccurate for DEFRA/CRD to state in the Summary of NAP Consultation Responses that "residents who live adjacent to agricultural areas are not subject to high pesticide exposure" as Article 3 paragraph 14 of the EU PPP Regulation specifically defines residents living in the locality of pesticide sprayed fields as being "subject to high pesticide exposure over the long term." The recognition of the high level of exposure to pesticides for residents can also be seen elsewhere in the EU SUD such as in Article 7(2) that puts residents alongside operators and agricultural workers in terms of the high level of exposure to pesticides of the three exposure groups. However, it should be reiterated again that unlike operators, residents will not be expected to have any protective clothing and/or use any mitigating measures to prevent exposure to pesticides used/sprayed on crop fields in their localities. This is why, as said previously, the UK Pesticides Campaign has continued to correctly point out that residents are a group with one of the highest levels of exposure to pesticides. Therefore the

[176] For example, the VI website states, "*In 2001 the Government accepted proposals put forward by the farming and crop protection industry to minimise the **environmental** impacts from pesticides."*

blatant denial by DEFRA/CRD in the Summary of NAP Consultation Responses of the factual and realistic exposure scenario for residents (ie. that the exposure is high) is outrageous.

1.52 If members require any further information regarding Article 12 of the European Sustainable Use Directive and the Government's misinterpretation of the requirements of Article 12, then the UK Pesticides Campaign's submission to the DEFRA Consultation on the UK National Action Plan can be provided to Committee members on request.

3. *No balancing of interests when it comes to public health protection*

1.53 During the oral evidence session on 27th February 2013 with DEFRA Minister Lord de Mauley, DEFRA Chief Scientific Advisor Professor Ian Boyd, and Dave Bench from CRD, from my recollection Martin Caton MP questioned whether the Government was in fact supposed to be considering the impact on agro-chemical companies when making decisions on pesticides and cited statements from the European pesticides legislation.

1.54 In relation to this I would make the following few points.

1.55 The fundamental concern of the former European Directive 91/414 regarding the authorization of pesticides was that human health must not be at risk of harm. Recital 9 of Directive 91/414 stated, "Whereas the provisions governing authorization must ensure a high standard of protection, which, in particular, must prevent the authorization of plant protection products whose risks to health, groundwater and the environment and human and animal health should take priority over the objective of improving plant production."

1.56 This is also reflected in the new PPP Regulation that has replaced 91/414, as there are a number of places within the text of the new PPP Regulation that explicitly state that the overriding primary objective of the PPP Regulation is the high level of protection of human health and the environment. For example, recital 24 states, "The provisions governing authorisation must ensure a high standard of protection. In particular, when granting authorisations of plant protection products, the objective of protecting human and animal health and the environment should take priority over the objective of improving plant production. Therefore, it should be demonstrated, before plant protection products are placed on the market, that they present a clear benefit for plant production and do not have any harmful effect on human or animal health, including that of vulnerable groups, or any unacceptable effects on the environment." Article 1, paragraph 4 of the PPP Regulation states, "The provisions of this Regulation are underpinned by the precautionary principle in order to ensure that active substances or products placed on the market do not adversely affect human or animal health or the environment. In particular, Member States shall not be prevented from applying the precautionary principle where there is scientific uncertainty as to the risks with regard to human or animal health or the environment posed by the plant protection products to be authorised in their territory."

1.57 The EU SUD is also clear that the protection of human health and the environment is the priority. For example, Recital 22 states, "the objective of this Directive" is "namely to protect human health and the environment from possible risks associated with the use of pesticides." Recital 1 requires account to be taken of both precautionary and preventive approaches. Article 2, paragraph 3 of the SUD states that, "The provisions of this Directive shall not prevent Member States from applying the precautionary principle in restricting or prohibiting the use of pesticides in specific circumstances or areas."

1.58 It is therefore clear from the text of both the former European Directive 91/414 and the new European legislation consisting of the PPP Regulation and the SUD that the overriding primary objective of the EU pesticides legislation is the high level of protection of human health and the environment. It is also therefore clear that under European legislation there should be no balancing of interests as the protection of human health and the environment is supposed to be paramount.

1.59 Yet the Government has for many years now based its policy decisions regarding pesticides on the alleged financial and economic impacts on manufacturers, farmers and distributors, or the impact on agricultural productivity, if there were any changes to the current UK policy and approach for pesticides and the related approvals system.

1.60 The Government has continued to adopt the improper approach of balancing harm from pesticides against the (supposed) benefits of pesticide use, in which the Government is accepting a degree of damage on the basis that it believes it is outweighed by other benefits (eg. cost/economic benefits for farmers and the industry), rather than on the absolute protective approach that is required for health and environmental protection.

1.61 As detailed above, it is clear there can no balancing approach in a legal framework such as this, as the protection of human health and the environment must be paramount.

1.62 I would also point out that there is currently a clear mismatch and inconsistency between the Government's longstanding failure to protect people from passive exposure to pesticides and the Government's approach in other comparable policy areas that ended in a ban for public health protection. For example, the smoking ban in public places; BSE; asbestos and straw-burning, to name but a few. The latter, straw-burning, is a very good example of: a) the vociferous objection from the industry of any legislature measures being introduced, (which has always been the same sort of industry objection in relation to any measures being

introduced regarding pesticides); and b) how inadequate measures, such as small buffer zones, as well as voluntary approaches, (however many times they are repackaged) failed to protect residents and communities. The industry (led by the NFU) claimed that it would damage farming if a ban on straw-burning came in, yet there was no apparent harm to the industry following the introduction of the legislation.

1.63 As said at paragraphs 7.10 to 7.18 of the UK Pesticides Campaign's previous written evidence to the Committee, the only real solution to eliminate the adverse health and environmental impacts of pesticides is to take a preventative approach and avoid exposure altogether with the widespread adoption of truly sustainable non-chemical farming methods. This would obviously be more in line with the objectives for sustainable crop production, as the reliance on complex chemicals designed to kill plants, insects or other forms of life, cannot be classified as sustainable. Therefore it is a complete paradigm shift that is needed, as no toxic chemicals that have related risks and adverse effects for any species (whether humans, bees or other) should be used to grow food.

1.64 During the oral evidence session on 27th February 2013 with DEFRA Minister Lord de Mauley, DEFRA Chief Scientific Advisor Professor Ian Boyd, and Dave Bench from CRD, I noted there was some discussion regarding Integrated Pest Management (IPM).

1.65 I would therefore reiterate the points made at paragraphs 7.15 to 7.17 of the UK Pesticides Campaign's previous written evidence to the Committee, in that Integrated Pest Management (IPM) is obviously not the same as non-chemical methods, as IPM is a system that still uses pesticides to some degree (whichever definition one goes by). Therefore in reality, and in practice, IPM does not necessarily involve lower pesticide use, and thus the IPM system is not going to fundamentally change anything as it is not a move away from the use of pesticides in agriculture. IPM is a red herring and is a weaker, far more compromised system than utilising complete non-chemical farming systems.

1.66 According to Peter Melchett, Policy Director of the Soil Association, in a previous exchange I had with him regarding IPM, IPM is really current conventional farming, as many conventional farmers insist they already use IPM. I note that the Minister, Lord De Mauley, also pointed this out during the oral evidence session on the 27th February 2013.

1.67 Therefore the problems with pesticides will not be solved by IPM. As said, it is a complete paradigm shift that is needed to shift policy away from the dependence on pesticides altogether.

1.68 In objection to the widespread adoption of non-chemical methods the UK Government and the chemical and farming industries have repeatedly argued over the years that there would be a vast reduction in yield if pesticides were not used. Yet there are various international studies that have shown that this would not necessarily be the case and a few examples of these include:

- One review of over 200 food production projects involving simple, organic type techniques in different countries found that they resulted in major yield increases, ranging from 46–150%.[177]
- Other case studies in the Philippines have demonstrated that sustainable agriculture can be practised in large scale; where yields do not necessarily drop without the use of chemical fertilisers and pesticides; and that a rapid (even immediate) transition from chemical farming to sustainable agriculture is possible if correct technical principles are followed.
- One 15-year study comparing non-chemical farming methods to conventional methods concluded that yields from non-chemical farming equal conventional yields after four years. And that's with no detriment to soil, water or human health.[178]
- A previous study published results of 205 comparisons made of yields from organic and conventional farming systems in north America and Europe. The major finding of the study was, on average, and for a wide range of crops, yields within 10 percent (90 percent) of those obtained in conventional agriculture were achieved without use of agro-chemicals.[179]
- Ethiopia has also been turning away from high-input, intensive agriculture to develop farming systems based on traditional and organic farming methods. It has been reported that the results have been impressive, with yields doubling, in some cases more, following the use of compost—yields of the common Faba bean increased five-fold from 500 kg/ha to 2,500 kg/ha. The practical evidence of Project Tigray's increased yields has convinced the Ethiopian Government to abandon agrochemical-reliant agriculture and reorient national food and farming policy towards organic farming.
- Another report found that organic and agro-ecological farming in the Southern hemisphere produces dramatic yield increases, as well as greater crop diversity and greater nutritional content. For example: Tigray, Ethiopia (composted plots yield 3–5 times more than chemically treated plots), Brazil (maize yields increased 20–250%); and Peru (increases of 150% for a range of upland crops).[180]

[177] Source: *"Reducing Food Poverty with sustainable agriculture: A Summary of New Evidence," 'SAFE-World' Research Project.* J.N. Pretty and Rachel Hine, 2000.

[178] Source: Rodale Institute of Kutztown, Pennsylvania, 1998.

[179] Source: G. Stanhill, 1989.

[180] Source: *"The Real Green Revolution—Organic and agro-ecological farming in the South,"* N. Parrott and T. Marsden, Greenpeace, 2002.

— A study in Africa also showed an increase in yields from using organic and non-chemical methods. The article stated, "The research conducted by the UN Environment Programme suggests that organic, small-scale farming can deliver the increased yields which were thought to be the preserve of industrial farming, without the environmental and social damage which that form of agriculture brings with it. An analysis of 114 projects in 24 African countries found that yields had more than doubled where organic, or near-organic practices had been used. That increase in yield jumped to 128% in east Africa."[181]

— Researchers in Denmark found that a large-scale shift to organic agriculture could actually help fight world hunger while improving the environment.[182]

1.69 These examples undermine the suggestion that non-chemical methods would necessarily result in a decrease in yields, and in fact a number of the aforementioned studies actually found a significant increase in yield. What such methods would do is to eliminate the very significant health and environmental costs that currently exist in relation to the use of pesticides, (as well as eliminating the financial costs of the farmer or pesticide user having to buy the chemicals in the first place). This would result in significant economic and financial benefits and it is the only real solution to protect public health and prevent any illnesses and diseases associated with pesticides, for now and for future generations, especially in relation to residents (who, as detailed earlier, are one of the highest exposure groups when it comes to agricultural pesticide spraying).

1.70 Considering the risks, and acute and chronic adverse health impacts of pesticide use, then a preventative approach must be utilized, especially in relation to the protection of vulnerable groups including residents, babies, children, the elderly, and those already ill.

1.71 It is important to point out that there does not appear to be anything in particular in the UK NAP regarding the use of non-chemical alternatives, particularly not in relation to agriculture. This is despite the fact that one of the main objectives/aims of the new EU legislation from the outset under the Thematic Strategy is to shift policy towards the utilisation of non-chemical farming methods by promoting and encouraging use of non-chemical methods in order to reduce dependency on pesticides.

1.72 Therefore the Government needs to prioritise non-chemical methods in the UK's NAP, as there should be a section specifically within the NAP to take forward the objective/aim within the EU legislation of promoting and encouraging the utilisation of non-chemical methods in order to reduce dependency on the use of pesticides in the UK.

4 March 2013

Further supplementary written evidence submitted by Lord de Mauley, Parliamentary Under Secretary of State, Department for Environment, Food and Rural Affairs

OUTLINE DESCRIPTION OF DEFRA PROJECT PS2371

EFFECTS OF NEONICOTINOID SEED TREATMENTS ON BUMBLE BEE COLONIES UNDER FIELD CONDITIONS

PROJECT SET-UP

— The project was carried out by the Food and Environment Research Agency;

— Experiments were carried out on bumble bees at three sites (A, B and C) in Northern England;

— 20 bumble bee colonies were established at each site;

— The end points of the experiments were (1) mass of colonies after a set period of time; and (2) number of queens produced;

— Pollen samples were taken from bumblebee foragers. Pollen and nectar were collected using a honey bee colony at each site.

RESULTS

— The neonicotinoid thiamethoxam was the most abundant residue in pollen and nectar from colonies at sites A and B. This neonicotinoid was not part of the experiment at all. It would therefore appear either that some of the seed at the "control" site had been treated with this, or that the bees had been foraging on fields (other than the experimental sites) which had this treatment;

— Bumble bee colonies at all three sites survived, grew and produced queens;

— There was no significant difference in the number of queens produced between the sites;

— There was no significant difference between the terminal mass of colonies at sites A and B. The colonies at site C had a significantly lower terminal mass than the other two sites;

— Mean residue levels of neonicotinoids in pollen at site A were less than 1 ug/kg which, if comparable, indicates a dose rate of around 1/2th to 1/100th of the dose rate in laboratory experiments;

[181] Source: http://www.independent.co.uk/news/world/africa/organic-farming-could-feed-africa-968641.html

[182] Source: *"Organic agriculture and food security,"* Mark W. Rosegrant, Timothy B. Sulser, and Niels Halberg, 2007.

- Residue levels of neonicotinoids in pollen and nectar collected by honey bees were of a similar magnitude at site B to the levels at site A. Residue levels were lower at site C (the site where growth was lowest);
- Environmental temperature was generally lower at sites B and C than at site A;
- The variety of pollen taken by bumble bees was similar between sites A and B, but was much greater at site C;
- Monitoring of bee activity showed that there was no difference between sites A and B but there was comparatively reduced activity at site C early in the experiment, but not towards the end.

INTERPRETATION OF THE RESULTS

- The only significant difference in any of the end points between sites was the terminal mass of colonies at site C, the site with lowest neonicotinoid residues, as compared with colonies at the other two sites.
- There are several possible reasons for this difference:
  - Site C was treated differently from the other sites because that part of the project began two weeks later and the starting mass of colonies at this site were significantly lower than at the other sites:
    - This means they could have been exposed to different seasonal effects;
    - Because colony growth is exponential, the difference in starting mass could have a disproportionate influence on the final mass and this is difficult to address in a control.
  - The temperature at Site C , especially at site A:
    - In animals like bees, which are cold-blooded, temperature can have a strong effect upon metabolic rate;
    - This could be a significant factor in the lower growth in the colonies at this site;
    - The period of reduced activity also was related to the periods of greatest temperature difference.
  - The pollen data suggest that the bumble bees at site C foraged on a wider spectrum of pollen compared with bumble bees at the other sites. This could reflect a preference for pollen not contaminated with neonicotinoids or the diversity of pollen sources in the three areas.
- Consequently, it would not be safe to conclude that the mass of colonies at Site C is an effect of neonicotinoid exposure. Indeed given all the other information, it seems unlikely that it is an effect of the pesticide and is more likely to be related to environmental differences at this site.
- There is great variability in bumble bee colony performance and a paucity of scientific knowledge about the growth and queen production of normal bumble bee colonies. That said, the colonies in this study, including those at Site C, seem not to differ in their performance from the control and unexposed colonies in published academic work.

CONCLUSION

There is no statistically significant evidence of effects of these pesticides on bumble bees. .

13 March 2013

Further supplementary written evidence submitted by Lord de Mauley, Parliamentary Under Secretary of State, Department for Environment, Food and Rural Affairs

ADVICE RECEIVED FROM ACP AFTER THEIR 29 JANUARY MEETING

A. THE BALANCE OF EVIDENCE

Ministers will recall that earlier advice from the ACP in November 2012 had concluded that there was, at that time, insufficient evidence to associate neonicotinoid insecticide usage with impacts on bees (including honey bees and other important bee species). The ACP has now discussed a number of reports of further research with invited experts on bumble bees at its January 2013 meeting. These studies included the results of the bumble bee field study conducted by FERA during summer 2012 and initial findings of a comparison of English and Welsh honey bee colony loss and pesticide usage information during the period from 2000–10. As a note of caution, the results of these two studies are still provisional and the reports have not yet been peer reviewed. Interpretation of these findings was not straight forward and the need for further detailed analysis was identified in order to assist interpretation of the results.

Nevertheless members advise Ministers that the balance of the weight of evidence is changing in the light of these additional FERA studies, together with other university research findings. Whilst there is no single piece of evidence clearly identifying a significant adverse effect of neonicotinoid insecticides on bee species in the UK, the accumulation of information does not rule out the possibility that there might be effects occurring

to bees in the field in the UK, and much of this new information points in the direction of potential adverse effects.

The data contributing to this shift in the balance of evidence is as follows:

1. There are possible indications within the FERA field study on bumble bees that there could be a relationship between residues of the most persistent and toxic neonicotinoids in individual colonies and the production of new queens within those colonies. This is yet to be confirmed by a re-analysis of the raw data which should also address cumulative and individual exposure of bumble bees to neonicotinoids.
2. The study examining regional honey bee colony loss data compared to pesticide use is showing initial indications that one factor which might be statistically associated with in-season losses of honey bees colonies is usage of imidacloprid. (Other neonicotinoids have not been in use long enough in the UK to run a similar comparison for them). This association is not evidence of causation, but members commented that they had considered it unlikely to see such an association between the parameters. Whilst other factors explain more of the variability in colony loss (eg region, probably associated with differences in climatic conditions), patterns of use of imidacloprid explained in the region of 5–10% of the variability in recorded colony loss in different regions and different years.
3. Additional information is now available on possible mechanisms associated with the potential greater sensitivity of bumble bees compared to honey bees and thus it may not be appropriate to extrapolate risk assessment conclusions from honey bees to other pollinators such as bumble bees.
4. The EFSA consideration of current products and uses identified several data gaps as well as identifying some concerns about the reliability of existing regulatory risk assessments including field studies on honey bees in light of the latest scientific developments.

There is uncertainty about the magnitude of any such effects on bee and other pollinator populations [and the associated pollination services they supply], but effects on colonies could lead to impacts on populations and population effects could be very important ecologically.

Consequently the ACP advises:

(i) that a reanalysis of the results from the FERA bumble bee field study should be completed as a matter of urgency and the report completed and submitted for peer review; and

(ii) that the statistical analysis of bee health data and pesticide usage data be completed, again as a matter of urgency, in order to put the research results for neonicotinoids into a broader context. If available, additional information on the potential association of other factors with colony loss should be included in this assessment, and there should be a stringent analysis of the choice of statistical model.

B. The Need for Review

The ACP advised that there are therefore indications from the current balance of evidence that article 29 (1) (e) of regulation 1107/2009 may no longer be satisfied in respect of the risk to bees (and potentially other pollinators) from residues in the nectar and pollen of crops attractive to bees grown from seed treated with certain neonicotinoid insecticides. (ie article 4 (3)(e) it "shall have no unacceptable effects on the environment having particular regard to the following considerations where the scientific methods accepted by the Authority to assess such effects are available: ... (ii) its impact on non-target species, including on the on-going behaviour of those species" may no longer be satisfied).

In accordance with article 44 of regulation 1107/2009, Ministers are therefore advised that they may wish to initiate a review of the current authorisations of products containing neonicotinoids taking into account the additional advice provided by the Committee on the regulatory options across the range of products and uses and in particular focusing on the uses identified above. This would be a precautionary decision as the evidence currently available does not indicate that such effects are occurring, but there is an indication that effects might be occurring.

C. Imported Seed

As the need for review has been identified for seed treatments, the ACP additionally has considered whether the test set out in Regulation 5(1) of the UK Plant Protection Products Regulations 2011 for unilateral national action to restrict or prohibit the use and/or sale of treated seeds has been met. This test requires that Ministers act if they reasonably consider that treated seeds are likely to constitute a serious risk to human health or to the environment.

The ACP advises Ministers that whilst the potential risk is associated with the planting of treated seed wherever that seed has actually been treated, until such time as the re-analysis of the FERA field study is completed it is not yet possible to confirm that there is likely to be a serious risk to bees. However the ACP advises that the concerns about potential risks to bees from residues in bee-attractive crops grown from seed

treated with neonicotinoid seed treatments to date should be raised within discussions in the EU in light of any proposal by the European Commission to restrict treated seed across all Member States.

D. Restrictions on Current Uses within the UK

The committee urged that the further analysis of the FERA work should be completed urgently and consideration of the need for any additional regulatory action in the UK be undertaken in March 2013 in the light of such further analysis. This further consideration will not prevent action being taken on the major use of seed treatment in oilseed rape before the main autumn sowing season should this be deemed necessary. Nevertheless, the Committee recognises that the later a decision is made the more disruptive it will be to the seed supply chain.

An alternative view was expressed by Prof Colin Brown and Prof Peter Matthiessen (both having environmental expertise) that, despite the flaws within the studies as presented to the ACP at this meeting, there were associations indicative of concern reported in both the FERA field study and the analysis of bee colony loss data and pesticide usage. On this basis a precautionary approach would be to recommend regulatory action at this time in order that changes would come into effect in time to impact crops to be drilled in Autumn 2013. They recommended a moratorium of major uses on "bee attractive" crops would be appropriate whilst further data were considered to clarify the risk.

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