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IOMC

INTER-ORGANIZATION PROGRAMME FOR THE SOUND MANAGEMENT OF CHEMICALS

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FOREWORD

This document contains the results of an OECD Survey of Pollinator Testing, Research, Mitigation and Information Management carried out in 2009, the objective of which was to gather information related to pollinator declines, a topic of concern to OECD member countries.

The survey (Appendix B) consisted of questions related to:

- the importance of pollinators, including managed honeybees (*Apis mellifera*), in agriculture and observations on factors associated with pollinator declines,
- management of bee mortality incident information,
- regulatory pesticide toxicity testing requirements for pollinators,
- the range of potential regulatory responses to pollinator declines as they relate to the role of pesticides, and
- on-going research efforts related to declines in pollinator populations.

Responses were received from 17 countries and organizations: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, France, Germany, Ireland, Japan, Netherlands, Poland, Slovakia, Slovenia, United Kingdom, United States and International Biocontrol Manufacturers Association (IBMA-Italy).

The next steps will consist in reviewing the results of the survey in order to see how to address issues related to pollinator declines and in developing recommendations (not included in this report) based on the survey outcomes for future OECD activities

The draft survey report was approved out-of-session by the Working Group on Pesticides by written procedure that was finished on 20 March 2010.

This document is being published under the responsibility of the Joint Meeting of the Chemicals Committee and the Working Party on Chemicals, Pesticides and Biotechnology, which has agreed that it be unclassified and made available to the public.

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INTRODUCTION

1. In June 2008, the Organization for Economic Cooperation and Development (OECD) Working Group on Pesticides (WGP) endorsed the development of a survey to address issues related to pollinator declines, a topic of concern to OECD member countries. Countries were to be surveyed on how incident information on bees is handled, testing requirements for pollinators, active areas of research into pollinator issues, and approaches employed to mitigate potential risks to pollinators from pesticides. The US Environmental Protection Agency (US-EPA) and the Canadian Pest Management Regulatory Agency (PMRA) took the lead in developing the survey questionnaire, with input from Germany and the European Food Safety Authority (EFSA). In March 2009, the survey was distributed to WGP members. The final survey (**Appendix B**) consisted of questions related to the importance of pollinators, including managed honeybees (*Apis mellifera*), in agriculture and observations on factors associated with pollinator declines, management of bee mortality incident information, regulatory toxicity testing requirements for pollinators, the range of potential regulatory responses to pollinator declines as they relate to the role of pesticides, and on-going research efforts related to declines in pollinator populations.

EXECUTIVE SUMMARY

2. The first set of questions in the survey dealt with the importance of pollinators in agriculture and the extent to which declines of pollinators have been observed. In the majority of countries research has been conducted on the relative proportions of crops pollinated by native and non-native pollinators and all countries indicated that honeybees are responsible for pollinating major corps. A high percentage of respondents indicated that declines in bee populations have been documented in their country, and that declines have also been observed in other pollinator populations (mostly insect populations, especially bees). Respondents indicated that declines are not limited to commercial honeybee colonies, although a third were uncertain basing their conclusions dominantly on decreased numbers of bees and increased incidence of disease/parasites. Most were uncertain if managed honey bee colonies appear to be more severely affected than other pollinators. Disease, parasites, winter losses, and pesticides were factors most frequently associated with the declines in pollinators.

3. The second set of questions dealt with procedures for reporting of pollinator incidents. Most countries require reporting of honeybee-kill incidents, relying dominantly on beekeepers themselves to provide this information to a pesticide regulatory authority or Department/Ministry of Agriculture. Information most frequently required includes: the date and time of the incident, pesticide used, number of hives affected, and the degree of damage. For the most part, other interested parties may access this incident information by written request or in written reports; the information is not generally available electronically. Of the countries that do not currently have a reporting system for incidents, those considering establishing a system and those uncertain of establishing one are equal in number.

4. The third set of questions addressed testing requirements for pollinators. All the countries require pollinator toxicity testing for the registration of pesticides; the acute oral and contact toxicity tests are the most frequently required toxicity tests for pollinators. Only 20% of the

respondents indicated that they required field pollinator toxicity tests. Many respondents indicated that current testing requirements and assessment methods are useful for assessing risks to pollinators (adults and their brood); however, slightly more than half replied that the testing requirements and assessment methods are not useful or they are not certain if they are useful. Almost half the countries indicated that they are considering expanding their toxicity testing to include studies on the toxicity of residues on pollen and in nectar and on potential effects on brood. A large majority of countries indicated that current OECD toxicity tests study designs do not adequately evaluate potential sub-lethal effects of pesticides on adult and larval honeybees. Just over half the countries indicated they are not planning to develop study designs either to assess sub-lethal effects or to address potential effects of systemic pesticides.

5. The fourth set of questions was on regulatory responses where potential pollinator risks are identified. The most frequently reported regulatory response to mitigate the potential effects of pesticides was label restrictions. A large majority of countries rely on restrictions rather than voluntary (non-mandatory) practices. In the majority of countries, pollinator toxicity and risk is described in training materials and classes. Over half the respondents indicated that they were uncertain if efforts to reduce adverse impacts to bees were successful; although a significant percentage thought they were effective.

6. The last set of questions addressed research on pollinators. While the majority of countries are aware of research regarding the extent to which pesticides may be interacting with other factors associated with the phenomenon commonly referred to as Colony Collapse Disorder, the majority were split equally between those planning to invest in research in this area and those uncertain if research is being planned. About a third of the countries provided information on additional groups working on pollinator issues.

PROCEDURE

7. The survey consisted of 22 major questions with some questions further divided into subparts. Although the majority of the questions were intended to generate yes/no responses, several questions were multiple-choice or were open-ended to provide respondents with an opportunity to enter their own responses and supporting references.

8. The survey was responded to by representatives of 17 countries and organizations (Australia, Austria, Belgium, Canada, Czech Republic, Denmark, France, Germany, Ireland, Japan, Netherlands, Poland, Slovakia, Slovenia, United Kingdom, United States and IBMA-Italy) within the Organization for Economic Cooperation and Development (OECD). Respondents were primarily associated with pesticide regulation/policy (39%) or science staff (33%) (**Table 22**).

9. After the survey results were collected, they were entered into a spreadsheet. Frequency of response tables were then generated using the PROC FREQ procedure of the Statistical Analysis System (SAS® 9.2 TS Level 1 MO; SAS Institute, Cary, NC).

RESULTS

The Importance of Pollinators in Agriculture and the Extent of Declines

10. When asked whether they were aware of research that has been conducted on the relative proportion of crops pollinated by various native and non-native pollinators, the majority (65%) of respondents indicated that they were aware of this type of research (**Table 1**). Those responding affirmatively, provided references for the relevant research.

11. All of the respondents indicated that managed bees were responsible for pollinating major crops in their respective countries (**Table 2**). Respondents provided a list of crops requiring pollination and in some cases provided citations to support their understanding of the pollinator-dependent plant species. Almost all countries reported that fruit bearing trees are pollinated by bees. Apples, pears, cherries, plums and prunes were the most frequently mentioned crops requiring pollination. Caneberries (raspberries) and strawberries were frequently identified as well as sunflower and oil seed rape.

12. The majority of respondents (82%) indicated that declines in honeybee populations had been documented in their countries (**Table 3**). When asked the same question regarding other pollinator species, roughly 59% of the respondents indicated that declines of those populations had also been documented, while 35% indicated that they were uncertain regarding documentation of declines in other pollinators (**Table 4**). Respondents indicated that in addition to honeybees, documented declines in other species of bees (*e.g.*, bumble bees and solitary bees) and butterflies predominated (**Table 4a**). Declines in insects constituted the majority of responses. When asked if pollinator declines have been limited to commercial honeybees, a large percentage (47%) of the respondents said they have not been (**Table 5**); however, 53% of the respondents expressed uncertainty whether managed honeybees were more severely affected (**Table 5b**). While many countries used the options provided in the survey to express their response, a few countries added additional pollinator species, which they believed had declined, such as syrphid flies or hover flies (*Syrphidae* spp.) The United Kingdom specifically stated that birds and bats do NOT have a significant role in pollination for their country. The most frequent methods for documenting declines in honeybee populations included counting the number of bees and recording the incidence of disease and/or parasites in the bees (**Table 5a**).

13. When asked to describe what factors have been associated with declines, the most frequently cited factors were disease (94% of the countries surveyed), pesticides (82% of the countries surveyed), winter losses (82% of the countries surveyed) and parasites (82% of the countries surveyed) (**Table 6**). Additional factors that were linked with declines in pollinator populations included: small hive beetles in Australia; the economy of beekeeping and the decline of this sector in the Czech Republic and Netherlands, respectively; the age of beekeepers in Slovakia; the competition from invasive species along with habitat degradation and/or loss in Ireland; and the beekeeping management practice for honeybees in the United Kingdom.

Procedures for Reporting of Pollinator Incidents

14. The majority (71%) of countries surveyed indicated that they required reporting of bee kill incidents (**Table 7**), and the beekeepers themselves were most frequently (69% of the countries surveyed) cited as providing the information, followed by registrants (46% of the countries surveyed) and others (46% of the countries surveyed) (**Table 7a**). **Table 7b** summarizes the agencies to which bee kill incident reports are submitted. **Table 8** summarizes the information most frequently included in bee kill incidents, and as indicated in **Table 9**, this information is most typically available in the form of written requests (59% of the countries surveyed) or printed reports (47% of the countries surveyed) as opposed to web-based media (24% of the countries surveyed). Many countries listed on-line websites and contact phone numbers.

15. For those countries that did not have an established means of reporting bee kill incidents, 44% of the respondents indicated that they were considering the possibility of establishing such a system while an equal percentage were uncertain (**Table 10**). Based on the countries that responded to this question, France's Fédération Nationale des Organisations Sanitaires_Apicoles Départementales (FNOSAD) indicated their interest in establishing a reporting system and will be working with a think tank to develop one in the coming weeks. Poland is working with the international group Colony Loss (COLOSS) Action establishing a reporting system. Slovakia plans to create a database at their Bee Institute. The United States currently utilizes an existing system to receive and input registrant-submitted data and plans to incorporate a web-based reporting system to enable beekeepers and others to directly report bee incidents.

Testing Requirements for Pollinators

16. All of the respondents indicated that their respective countries required toxicity testing of pollinators as part of their pesticide registration process (**Table 11**). The most frequently required studies are the acute oral (94% of the countries surveyed) and the acute contact (100% of the countries surveyed) toxicity tests; less than 60% of the countries surveyed of the respondents indicated that they require whole colony testing (**Table 11a**). Other tests that countries listed included bee brood feeding tests, which may be required depending on the results of acute studies (Australia and the United Kingdom). The United Kingdom also listed other tests for which protocols are under development, such as concentrations of residues in pollen and nectar. Canada and the Netherlands require hive and/or field studies if there are concerns for a specific active ingredient (*e.g*., insect growth regulators) or if acute tests indicate a risk. France and Ireland may also require larval toxicity studies, and Ireland may require cage tests, tests on long-term residual effects, tests to assess disorienting effects on bees, and tunnel tests. Poland may also require these same sort of tests, but only when the first tier of their assessment process indicates potential risk for bees (*i.e*., hazard quotient [HQ]>50) or for pesticides with a specific mode of action, *e.g*. insect growth regulator or affecting feeding behavior. The United States typically requires the acute contact toxicity study and may require additional tests depending on the results of acute testing and toxicity of residues or information found in the open literature.

17. Roughly 47% of the respondents indicated that their current honeybee toxicity testing requirements and risk assessment methods are useful for assessing risks to honeybee adults and/or brood; however, 29% indicated that the current methods were not useful and 24% were uncertain (**Table 12**). Toxicity of residues on pollen and toxicity of residues in nectar were most frequently identified as additional studies being considered to address uncertainties associated with risks to pollinators (**Table 12a**). Some of the other studies being considered include: toxicity of residues in guttation water droplets; behavioral studies; larvae mortality; chronic toxicity; and assessment of abrasion of dust from treated seeds.

18. The majority of respondents (73%) did not believe that the current OECD pollinator toxicity study designs adequately evaluated the potential sublethal effects of pesticides on adult and larval honeybees (**Table 13**). However, roughly 53% of the respondents indicated that their countries were not planning to develop study designs to examine the potential sub-lethal effects of pesticides on honeybees (**Table 13a**). The United Kingdom is using data generated in cage or field studies, which they consider adequate to evaluate sub-lethal effects. The Netherlands follows European guidelines with respect to bee risk assessment and Denmark indicated it had only 3 cases last year that required investigation; neither are planning to develop new study designs. France is currently working to develop new study designs, Canada states that they are not planning to develop new studies, but they will ask for studies when concerns are identified. Roughly 59% of the respondents indicated that they did not have plans to develop study protocols for examining the potential effects of systemic pesticides on honeybees (**Table 14**).

19. France has efforts underway to address uncertainties in existing study designs, which include field studies supervised by the Direction Générale de l'Alimentation du Ministère de l'Agriculture (DGAL) and the Agence Française de Sécurité Sanitaire des Aliments Direction du végétal et de l'environnement (AFSSA-DIVE) for the post-registration of Cruiser (imidacloprid). Italy is utilizing the National Project Apenet to address uncertainties in existing study designs relative to systemic pesticides. Slovakia is encouraging positive cooperation with registrants to resolve uncertainties. Slovenia will rely on the new European Union (EU) Regulation of the European Parliament and of the Council, which directs the placement of plant protection products on the market and identifies which new data requirements will be developed to address uncertainties regarding the potential effects of systemic pesticides. The United States (EPA and USDA) is in the process of developing a study protocol on acute oral toxicity and more comprehensive field pollinator toxicity tests.

20. Countries were asked to describe strengths and weaknesses of existing testing protocols and risk assessment methods. Belgium described, as a strength of their risk assessment methods, the tests in the European and Mediterranean Plant Protection Organization (EPPO) guideline 170. Italy indicated that the available acute oral and contact toxicity test guidelines (OEPP, EPPO (Organisation Européenne et Méditerranéenne pour la Protection des Plantes), OECD) were strengths and their view that they are adequate to evaluate acute toxicity. Poland listed strengths of their assessment methods as: acute risk assessments for bees, assessments for all types of pesticides, and field studies that cover various effects on different life stages of bees, and routes of exposure. Slovakia listed as a strength of their risk assessment methods: simplicity, strong scientific analysis, and verification processes. The United States also listed the acute contact toxicity test as a strength of the risk assessment methods.

21. All the countries that replied to the request to identify weaknesses (Belgium, Italy, Poland and Slovakia) pointed to the lack of sub-lethal tests conducted on bees, especially over an adequate study period duration to examine chronic effects. Italy described several weaknesses of current assessment methods: effects of pesticides on behavior, and testing effects on other species of bees (other than honey bees), specifically solitary bees. Poland stated that the influence of insecticides on bees over-wintering is not taken into account in current pollinator field toxicity tests. Lastly, the United States indicated that the current acute toxicity tests do not adequately measure toxicity from systemic pesticides and only focus on testing young adult forage bees.

22. The countries of Belgium, Italy, Poland, Slovakia, United Kingdom, and the United States stated that additional tests need to be put in place to measure the sub-lethal and chronic effects of systemic and non-systemic pesticides to honeybees. A few of these countries, including Canada, mentioned the need for additional behavioral studies. Canada in particular mentioned the need for protocols and guidance for measuring pesticides in nectar and pollen as well as a model for measuring systemic pesticides in nectar and pollen. The Czech Republic thought that additional tests needed to be performed on assessing off-target pesticide movement for pesticide-treated seeds. Many countries, such as France, Poland, and Canada, called for improved protocols in general field or lab studies. The United States indicated that bee brood and adult development should be tested and specifically suggested tests on honeybee over-wintering and oral toxicity.

Regulatory Responses where Potential Pollinator Risks are Identified

23. When asked what regulatory responses authorities are taking when data indicate potential risks to pollinators, label restrictions (94% of the countries surveyed) and advisory labeling (71% of the countries surveyed) were the most frequent responses (**Table 15**). Austria indicated it will not provide authorization or will provide only restricted authorization for use of a pesticide when risks to pollinators have been identified. Denmark stated that education of applicators is crucial to mitigate risks for users to better understand the labels. France indicated that its authorities want to monitor populations of bees, but that the resources required are significant. Germany indicated they plan to withdraw certain pesticides if the products' label restrictions are inadequate. Italy indicated they will invoke financial penalties and/or suspension of authorization of pesticides when there are data indicating potential risks to pollinators. Slovakia indicated it would encourage communication between the applicators and the beekeepers. The United Kingdom indicated it would refuse to approve a product registration if data indicated potential risks to pollinators.

24. The majority (71%) of the countries relied on label restrictions rather than voluntary practices to reduce potential risks to pollinators (**Table 16**). The majority (56%) of respondents indicated that the topic of pollinator toxicity and risk is discussed in their country's training materials, while 25% indicated that no such information was included (**Table 17**). Of all the countries that provide training on pollinator protection, only 3 of the 17 countries indicated that mandatory training is (or will shortly be) required for pesticide applicators. Most of the countries have resources available for training, with classes are offered either through some part of their government or their respective bee or pollinator organizations (e.g. the United Kingdom).

25. The majority of respondents (53%) were uncertain whether efforts to reduce adverse impacts to honeybees had been effective, while 41% indicated efforts had been effective (**Table**

18). Most countries that reported effective measures attribute these successes to the application of pesticides [that are toxic to bees] when flowers are not in bloom and when bees are not actively foraging. These counties include Belgium, Italy, Netherlands (potatoes specifically), Slovenia, the United Kingdom, and the United States. A few countries attributed effective impacts to education, including Slovakia, Slovenia, Poland, Germany, and Denmark. Slovenia attributed some of the effective impacts to measures intended to reduce spray drift and reducing the dust drift from tested seeds.

Research on Pollinators

26. The majority (67%) of respondents indicated that they were aware of research examining the extent to which pesticides may be interacting with other factors (*e.g.,* disease) associated with declines in managed honeybee colonies known as Colony Collapse Disorder (**Table 19**). An equal percentage of the respondents were either uncertain (44%) or certain (44%) that their country is planning to invest in research regarding the potential sub-lethal and/or indirect effects of pesticides on pollinators (**Table 20**); however, the majority (71%) were not aware of groups other than those listed in the survey instrument that are working on pollinator issues (**Table 21**).

27. **Table 20a** lists organizations researching the potential sub-lethal or indirect effects of pesticides on pollinators. **Table 21a** lists organizations working on pollinator issues in different countries. **Table 23** provides a summary of organizations in each country that are dealing with issues related to pesticides and bees or other pollinators.

28. When respondents were asked to identify their expertise, roughly similar percentages were associated with pesticide regulation/policy (39%) or science staff (33%) (**Table 22**). Other than categories listed on the survey, additional responses relating to surveyor expertise included those from: a senior apiary officer (Queensland Department of Primary Industries and Fisheries from Australia); a person in an accredited laboratory for diagnosis of bee diseases (Austria); and, a person in charge of health monitoring in bee-keeping (France). All other nations listed pesticide regulation policy, scientist, or researcher as their expertise.

29. A full list of references provided by respondents is in Appendix A. The survey questionnaire is in Appendix B.

TABLES

Table 1. Frequency of responses when asked whether a country is aware of research on the relative proportion of crops pollinated by native and non-native pollinators (Question 1)

Response	Frequency	Percent*
Yes	11	64.7
No	4	23.5
Uncertain	2	11.8

*Percent calculated by dividing frequency by the number of countries that responded, *i.e.*, 17.

Table 2. Frequency of responses when asked whether managed honeybees pollinate major crops in their country (Question 2)

Response	Frequency	Percent*
Yes	17	100

*Percent calculated by dividing frequency by the number of countries that responded, *i.e.*, 17.

Table 3. Frequency of responses when asked whether declines in bee populations have been documented in their country (Question 3)

Response	Frequency	Percent*
Yes	14	82.4
No	3	17.6

* Percent calculated by dividing frequency by the number of countries that responded, *i.e.*, 17.

Table 4. Frequency of responses when asked if declines in other pollinator populations have been documented in their country (Question 4)

Response	Frequency	Percent*
Yes	10	58.8
No	1	5.9
Uncertain	6	35.3

* Percent calculated by dividing frequency by the number of countries that responded, *i.e.*, 17.

Table 4a. Frequency of multiple responses when asked what other pollinator declines have been documented in their country (Question 4)

Response	Frequency	Percent*
Bumble bee	12	92
Bat	1	7.7
Solitary bee	10	77
Other bee species	7	54
Birds	2	15
Moths	4	31
Butterflies	8	62
Other	3	23

*Three of the countries responding to Question 4 as “uncertain” indicated pollinators in decline in response to Question 4a; therefore, Percent is calculated by dividing the frequency by 13, *i.e.*, 10 yes + 3 uncertain.

Table 5. Frequency of responses when asked if pollinator declines have been limited to managed (commercial) honeybees (Question 5)

Response	Frequency	Percent*
Yes	3	17.6
No	8	47.1
Uncertain	6	35.3

* Percent calculated by dividing frequency by the number of countries that responded, *i.e.*, 17.

Table 5a. Frequency of multiple responses when asked how managed honeybee declines are measured in their country (Question 5a)

Response	Frequency	Percent*
Decreased number of bees	12	80
Increased incidence of disease/parasites	11	73
Other	5	33
Uncertain	1	6.7

*Two of the countries survey did not provide a response to Question 5a; therefore, "Percent" is calculated by dividing frequency by 15, *i.e.*, the total number of countries responding to Question 5a.

Table 5b. Frequency of responses when asked if managed honeybees appear to be more severely affected than other pollinators (Question 5b)

Response	Frequency	Percent*
Yes	3	17.6
No	5	29.4
Uncertain	9	52.9

* Percent calculated by dividing frequency by the number of countries that responded, *i.e.*, 17.

Table 6. Frequency of multiple responses when asked what factors have been associated with declines in pollinators in their country (Question 6)

Response	Frequency	Percent*
Disease	16	94
Nutrition	11	65
Transportation Stress	1	5.9
Pesticides	14	82
Habitat Degradation	11	65
Weather	8	47
Summer Losses	3	18
Winter Losses	14	82
Parasites	14	82
Other	6	35

*Percent calculated by dividing frequency by 17, *i.e.*, the total number of countries surveyed. . Since countries can provide more than one response, the sum of the frequencies is greater than the total number of countries surveyed, *i.e.*, 17

Table 7. Frequency of responses when asked if their country requires reporting of honeybee kill incidents (Question 7)

Response	Frequency	Percent*
Yes	12	70.6
No	5	29.4

* Percent calculated by dividing frequency by the number of countries that responded, *i.e.*, 17.

Table 7a. Frequency of multiple responses when asked who is required to submit bee kill incident reports (Question 7a)

Response	Frequency	Percent
Growers	1	7.7
Applicators	2	15
Beekeepers	9	69
Registrants	6	46
Other	6	46

*Since one of the countries surveyed in Question 7 responded no, but provided a response to Question 7a, the "Percent" is calculated by dividing the frequency of each response by13, *i.e.*, 12 yes + 1 no. . Since countries can provide more than one response, the sum of the frequencies is greater than the total number of countries responding yes to Question 7 (**Table 7**).

Table 7b. Summary of responses from countries when asked whether beekill incident reporting is required or not and where beekill incident reports are submitted (Question 7b)

Country	Incident reports required/not required	Agency
Australia	Voluntary	Australian Pesticides and Veterinary Medicines Authority (APVMA)
Austria	Not Required	None
Belgium	Required	Federal Agency for the Safety of the Food Chain(FAVV)
Canada	Required(registrants) & Voluntary (public)	Pesticide Regulatory Authority
Czech Republic	Required	State Veterinary Administration
Denmark	Required	Department of Agriculture
France	Required	Direction des services veterinaries (FNOSAD-AFSSA-SRPV)
Germany	Required	Pesticide Regulatory Authority
IBMA-Italy	Required	None centralized currently but in the future: National Institute CRA-Api (Agricultural Research and Development Council)
Ireland	Not Required	None
Japan	Not Required	None
Netherlands	Voluntary	Department/Ministry of Agriculture
Poland	Required	State Plant Health and Seed Inspection Service
Slovakia	Required	Veterinary Inspectors of Regional Veterinary and Food Administration
Slovenia	Required	Veterinary Administration and Agriculture Inspectorate
United Kingdom	Required from Registrants; voluntary from others	Pesticide Regulatory Authority and FERA Natural Bee Unit (NBU)
United States	Required	Pesticide Regulatory Authority

Table 8. Frequency of responses when asked what type of information is typically provided and/or required in a bee kill incident report (Question 8)

Response	Frequency	Percent*
Date	15	94
Location	16	100
Crop	12	75
Pesticide(s) used	14	88
Label use	9	56
Number of hives affected	14	88
Weather	10	63
Disease	9	56
Degree of damage	13	81
Types of bees affected (adult, larvae)	12	75
Disease control applied	9	56
Disease control details	8	50
What kind of control	7	44
Time	8	50
If successful or not	6	38

*Only one of the countries survey did not provide a response to Question 8; therefore, "Percent" is calculated by dividing the frequency of each response by 16, *i.e*, the total number of countries responding to Question 8. Since countries can provide more than one response, the sum of the frequencies is greater than the total number of countries responding, *i.e*, 16.

Table 9. Frequency of multiple responses when asked how bee kill incident information can be accessed by other interested parties (Question 9)

Response	Frequency	Percent*
On-line Access	4	24
Press Release	5	29
Printed Reports	8	47
Written Requests	10	59
Other	4	24

*All of the countries surveyed responded to Question 9; therefore, the "Percent" response is calculated by dividing the frequency by 17. Since countries can provide more than one response, the sum of the frequencies is greater than the total number of countries responding, *i.e.*, 17

Table 10. Frequency of responses when asked if a country is considering establishing a reporting system for bee kill incidents if one is not currently in place (Question 10)

Response	Frequency	Percent*
Yes	4	44.4
No	1	11.1
Uncertain	4	44.4

*Eight of the countries surveyed did not provide a response to this question; therefore, the "Percent" is calculated by dividing the frequency by 9, *i.e.*, the number of countries that responded to Question 10.

Table 11. Frequency of responses when asked if country requires toxicity testing of pollinators as a standard component of a dossier/re-registration package for pesticides (Question 11)

Response	Frequency	Percent
Yes	17	100

* Percent calculated by dividing frequency by the number of countries that responded, *i.e.*, 17.

Table 11a . Frequency of multiple responses when asked what battery of toxicity tests are typically required for registering a pesticide (Question 11a)

Response	Frequency	Percent*
Acute Honeybee Oral Toxicity	16	94
Acute Honeybee Contact Toxicity	17	100
Field Pollinator Study	10	59
Hive Study	7	41
Other	5	29

Percent determined by dividing frequency by 17, i.e.* the number of countries responding that they require pollinator toxicity tests (**Table 11**).

Table 12. Frequency of responses when asked whether the current testing requirements and risk assessment methods are useful for assessing risks to pollinator adults and brood (Question 12)

Response	Frequency	Percent*
Yes	8	47.1
No	5	29.4
Uncertain	4	23.5

* Percent calculated by dividing frequency by the number of countries that responded, *i.e.*, 17.

Table 12a. Frequency of multiple responses when asked what additional data are being considered (Question 12a)

Response	Frequency	Percent*
Toxicity of Residues on Foliage	4	44
Magnitude of Residues on Foliage	4	44
Toxicity of Residues on Pollen	8	89
Toxicity of Residues in Nectar	8	89
Other	8	89

Eight countries did not provide a response to Question 12a; therefore "Percent" is calculated by dividing the frequency by 9, *i.e.*, the number of countries that did repond to Question 12a. Since countries can provide more than one response, the sum of the frequencies is greater than the total number of countries responding, *i.e*, 9

Table 13. Frequency of responses when asked if current OECD toxicity study designs adequately evaluate the potential sublethal effects of pesticides on adult and larval honeybees (Question 13)

Response	Frequency	Percent*
Yes	2	13.3
No	11	73.3
Uncertain	2	13.3

*Percent based on responses from 15 countries; two of the countries surveyed did not provide a response.

Table 13a. Frequency of responses when asked if a country is planning to develop study designs to examine the potential sublethal effects of pesticides on honeybee adults and brood (Question 13a)

Response	Frequency	Percent*
Yes	5	33.3
No	8	53.3
Uncertain	2	13.3

*Percent based on responses from 15 countries; two of the countries surveyed did not provide a response to Question 13 (**Table 13**).

Table 14. Frequency of responses when asked if steps are underway to develop study protocols to address the potential effects of systemic pesticides on honeybees (Question 14)

Response	Frequency	Percent*
Yes	7	41.2
No	10	58.8

* Percent calculated by dividing frequency by the number of countries that responded, *i.e.*, 17.

Table 15. Frequency of multiple responses when asked what regulatory responses are authorities taking when there are data which indicate potential risks to pollinators (Question 15)

Response	Frequency	Percent*
Advisory Labeling	12	71
Label Restrictions	16	94
Integrated Pest Management	7	41
Other	6	35

*Percent determined by dividing frequency by 17, i.e. the number of countries responding to Question 15. Since countries can provide more than one response, the sum of the frequencies is greater than the total number of countries surveyed, *i.e.*, 15.

Table 16. Frequency of responses when asked to what extent member countries rely on voluntary practices as opposed to label restrictions to reduce potential risks to pollinators (Question 16)

Response	Frequency	Percent*
Typically Voluntary	5	29.4
Typically Label Restrictions	12	70.6

* Percent calculated by dividing frequency by the number of countries that responded, *i.e.*, 17.

Table 17. Frequency of responses when asked whether the topic of pollinator toxicity and risk is described in training materials and/or classes (Question 17)

Response	Frequency	Percent*
Yes	9	56.3
No	4	25
Uncertain	3	18.7

*Percent determined by dividing frequency by 16, i.e, the total number of countries responding to Question 17; one of the countries surveyed did not provide a response to this question.

Table 18. Frequency of responses when asked whether efforts to reduce adverse impacts to honeybees have been effective (Question 18)

Response	Frequency	Percent*
Yes	7	41.2
No	1	5.9
Uncertain	9	52.9

* Percent calculated by dividing frequency by the number of countries that responded, *i.e.*, 17.

Table 19. Frequency of responses when asked if countries are aware of any published or on-going research addressing the extent to which pesticides may be interacting with other factors (e.g., disease) associated with declines in managed honeybee colonies, aka Colony Collapse Disorder (Question 19)

Response	Frequency	Percent*
Yes	10	66.7
No	3	20.0
Uncertain	2	13.3

*Percent determined by dividing frequency by 15, i.e, the total number of countries responding to Question 19; two of the countries surveyed did not provide a response to this question.

Table 20. Frequency of responses when asked if a country is planning to invest in research that examines the potential sublethal and/or indirect effects of pesticides on pollinators (Question 20)

Response	Frequency	Percent*
Yes	7	43.8
No	2	12.5
Uncertain	7	43.8

*Percent determined by dividing frequency by 16, i.e, the total number of countries responding to Question 20; one of the countries surveyed did not provide a response to this question.

Table 20a. Summary of organizations researching the potential sublethal and/or indirect effects of pesticides on pollinators (Question 20a)

Country	Organization
Canada	NSERC-CANPOLIN
Germany	Julius Kühn-Institute JKI, AG Bienenschutz
IBMA-Italy	CRA – Api (Consiglio per la Ricerca e la Sperimentazione in Agricoltura – Api), Bologna, Italy
Japan	Ministry of Agriculture, Forestry and Fisheries
Slovakia	Bee Institute (Ústav včelárstva)
Slovenia	National institute of biology
United States	U.S. Department of Agriculture

Table 21. Frequency of responses when asked if country is aware of additional groups working on pollinator issues (Question 21)

Response	Frequency	Percent*
Yes	5	29.4
No	12	70.6

* Percent calculated by dividing frequency by the number of countries that responded, *i.e.*, 17.

Table 21a. Summary of responses listing organizations working on pollinator issues in different countries (Question 21a)

Country	Organization
Belgium	European Association for Bee Research (EurBee)
Canada	Canadian Pollinator Protection Initiative (CPPI)
France	Laboratoire de pollinisation entomophile - Avignon
Ireland	Bumblebee Conservation Trust, Scotland.
Ireland	International Union for the Study of Social Insects
Ireland	ALARM Group – Assessing Large-scale Risks for bio-diversity with test Methods
United Kingdom	Bee Research Funders Forum by Defra Plant Health
United States	The Xerces Society
United States	The American Beekeeper Federation
United States	The American Honey Producers Association

Table 22. Frequency of multiple responses when asked to describe respondents' expertise (Question 22)

Response	Frequency	Percent*
Pesticide Regulation/Policy	13	39.4
Scientist	11	33.3
Research	5	15.2
Other	4	12.1

All of the countries surveyed responded to Question 22; therefore, the “Percent” is calculated by dividing the frequency by 17. Since countries can provide more than one response, the sum of the frequencies is greater than the total number of countries surveyed, *i.e.*, 17.

Table 23. Summary of organizations in each country dealing with issues related to pesticides and bees/pollinators (Question 23)

Country	Organization
Australia	West Australian Department of Agriculture and Food
Austria	Austrian Agency for Health and Food Safety, Institute for Apiculture
Belgium	FPS Health, Food Chain Safety and Environment, DG 4 Animals, Plants and Food, Service Pesticides and Fertilizers
Canada (regulatory)	Health Canada, Pest Management Regulatory Agency
Canada (research- Academic)	NSERC-CANPOLIN
Canada (research- Federal Govt)	Agriculture Agri-Food Canada (AAFC)
Czech Republic	State Phytosanitary Administration
Denmark	MILJØSTYRELSEN
France	FNOSAD
Germany	Federal Office of Consumer Protection and Food Safety (BVL)
IBMA-Italy	DiSTA – Area Entomologia, Facoltà di Agraria, Università di Bologna, Bologna, Italy
Ireland	Department of Agriculture, Fisheries and Food
Japan	Ministry of Agriculture, Forestry and Fisheries
Netherlands	Plant Protection Service
Poland	Ministry of Agriculture and Rural Development
Poland	Institute of Environmental Protection
Poland	Research Institute of Pomology and Floriculture, Apiculture Division
Slovakia	Bee Institute (Ústav včelárstva)
Slovenia	Ministry of Agriculture, Forestry and Food, Phytosanitary Administration RS
United Kingdom	Chemicals Regulation Directorate, Health And Safety Executive
United States	U.S. Environmental Protection Agency

APPENDIX A

Summary of References
for Survey of Pollinator Testing, Research, Mitigation and Information Management

Question #1:

Are you aware of research that has been conducted on the relative proportions of crops pollinated by various native and non-native pollinators? If yes, please provide a reference.

Table 1. List of references from different countries that have conducted research on crops pollinated by various native and non-native pollinators.

Country	References
Belgium	• PC Fruit, Fruittuinweg 1, B-3800 Sint-Truiden Phone#: 011 69 70 80 Fax#: 011 69 71 10 Website: www.pcfruit.be • Simoens, C.; Hoorde, A. van; Jacobs, F.J. (2003). Economische Betekenis van de Honingbij. Bijen : maandblad voor imkers 12: 288-289 • Biesmeijer JC, Roberts SP, Reemer M, Ohlemüller R, Edwards M, Peeters T, Schaffers AP, Potts SG, Kleukers R, Thomas CD, Settele J, Kunin WE. (2006) Parallel declines in pollinators and insect-pollinated plants in Britain and the Netherlands. Science. 313:351-354. (For the Netherlands, not for Belgium) • Beliën T (2009) Cursus 'bestuivingsimkerij': de Honingbij als Bestuiver / Economisch Belang van de Honingbij (Presentation for beekeepers)
Canada	• Robinson, W.S., Nowogrodski, R. and R. Morse. (1989) The value of honey bees as pollinators of U.S. crops. American Bee Journal 129: 411-423. • Free, J. B. 1993. Insect Pollination of Crops. Second Edn. Academic Press, London. 684 pp.
Czech Republic	• Nedbálková B., Smolíková M, Kailerová J., Ptáček V., 1985: Perspektivy využití poznatků z květní biologie v semenářství vojtěšky. [Perspectives of Utilizing the Knowledge on Flower Biology in the Seed Production of Lucerne.] • Acta Univ. Agric., Fac. Agron., Brno, A, XXXIII(4): 177-182. [Cz., En. sum.] • Ptáček V. 1984 Possibilities of supporting Rhophitoides Canus Ev. populations in agricultural enterprises producing lucerne seed. • Proc. Eucarpia (Medicago sativa) session, Brno: 269-271.

Table 1. List of references from different countries that have conducted research on crops pollinated by various native and non-native pollinators.	
Denmark	• Importance of pollinators in changing landscapes for world crops Klein A-M et al. 2007 Proc Royal Soc. Lond. B 274:303-313
France	• Klein A., Vaissiere B. et al, 2006. Importance of pollinators in changing landscapes for world crops. Royal Soc of London. • Roubik D.W. 1995. Pollination of cultivated plants in the tropics. FAO agricultural services bulletin n°118. • Numerous publications from the "Laboratoire de pollinisation entomophile d'Avignon – B Vaissière. E.g : www.avignon.inra.fr/content/download/3781/60561/file/programmes-Bilan- Evaluation.htm • GRAPP : Groupement des Apicuteurs Pollinisateurs Professionnels http://pagesperso-orange.fr/cl.ivert/kiwi.htm
IBMA-Italy	• Accorti M., Luti F., 2000. Imenotteri pronubi e impollinazione. In: Api e impollinazione. Ed. Giunta Regionale Regione Toscana, Florence, Italy, pp. 57-72. • Accorti M., 2000. Impollinatori, economia e gestione delle risorse. In: Api e impollinazione. Ed. Giunta Regionale Toscana, Florence, Italy, pp. 219-231.
Japan	• Only available in Japanese, will translate to English if necessary
Netherlands	• Losey & Vaughan (2006): Bioscience 56, 311vv • Klein et al, 2007: Proc. R. Soc. B: 270, 955vv • Westerkamp & Gottsberger 2000: Crop Science 40, 1209vv
Slovakia	• Annual reports of Bee Institute
Slovenia	• Agricultural Institute of Slovenia (KIS)
United States	• Website: http://gears.tucson.ars.ag.gov/book • Keith S. Delaplane, D. F. Mayer, 2000, Crop pollination by bees, Pub. CABI, ISBN 0851994482, 9780851994482, 344 pp. • CRS Report for Congress on Recent Honey Bee Colony Declines, May 28, 2008, accessed at: http://www.fas.org/sgp/crs/misc/RL33938.pdf

Question #3

Have declines in honey bee populations been documented in your country? If yes, please provide a reference.

Table 2. List of references from different countries regarding decline in honey bee populations in their respective countries

Country	References
Australia	• Dr Denis Anderson (2004) Disappearing Disorder: a report for the Rural Industries Research and Development Corporation. RIRDC Publication No 04/152, RIRDC Project No CSE-85A.
Belgium	• Haubruge, E, Nguyen, B-K, Wildart, J, Thomé, J-P, Fickers, P & Depauw, E (2006) - Le dépérissement de l'abeille domestique, *Apis mellifera* L., 1758 (Hymenoptera : Apidae) : faits et causes probables. • Widart, J, Nguyen, B K, Deleuze, C, Heudt, L, Eppe, G, Focabt, J F, De Pauw, E & Haubruge, E - (2005) Honeybee (*Apis mellifera)* mortality : determination of up to 50 pesticides in honey and beeswax by LC-MS/MS and GC-MS detection. Symposium "Entomology in Belgium" Décember 2nd, Brussels. Notes fauniques de Gembloux, 59(1) : 3-21 • Nguyen, B k & Haubruge, E (2005) - Une étude sur le dépérissement des abeilles en Wallonie. Les amis des abeilles, 3-4: 53-57. • Nguyen, B k & Haubruge, E (2005) - Le dépérissement des abeilles en Wallonie : une attention particulière portée à la présence de Loque Américaine et de Varroase dans les ruchers. Le Canard Déchaîné du Kauwberg, 54 : 18-19. • Nguyen, B.K & Haubruge, E (2004) - Le dépérissement des abeilles en Wallonie. Le Canard Déchaîné du Kauwberg, 53 : 9-11
Canada	• http://www.capabees.com/main/files/pdf/canwintlossnewrev.pdf
Czech Republic	• Včelařství and Moderní včelař issues in 2009
Denmark	• Vejsnæs , 2007, Danish beekeeping journal.
France	• publication of P Duclos regarding the mortality in the department of Saone et Loire published in La Santé de l'abeille n° 231 (http://www.apiculture.com/sante-de-labeille/)
Germany	• FORSTER, R., BODE, E. und D. BRASSE: Das „Bienensterben“ im Winter 2002/2003 in Deutschland - zum Stand der wissenschaftlichen Erkenntnisse. Herausgeber: Bundesamt für Verbraucherschutz und Lebensmittelsicherheit. Braunschweig, 125 Seiten, 2005.
IBMA-Italy	• Porrini C., Sabatini A.G., Mutinelli F., Astuti M., Lavazza A., Piro R., Tesoriero D., Medrzycki P., Sgolastra F., BORTOLOTTI L., 2009. Le segnalazioni degli spopolamenti e delle mortalità degli alveari in Italia: resoconto 2008. L'Apis, 1: 15-19

Table 2. List of references from different countries regarding decline in honey bee populations in their respective countries	
Netherlands	• local publications in bee journals (Dutch) • Blacquière et al., 2009: Visie bijenhouderij en insectenbestuiving. Plant Research International report 227. 58 pages. in Dutch • Proceedings of the 4th Coloss conference Zagreb, March 2009. COST action FA0803
Poland	• Topolska G., Gajda A., Hartwig A. (2008) – Polish honey bee colony-loss during the winter of 2007/2008. Journal of Apicultural Science 52(2): 95-104)
Slovenia	• Beekeepers Association of Slovenia, • 4 COLOSS Conference, Abstract Bee losses in Slovenia (Gregorc, Kralj)
United Kingdom	• MAFF Beekeeping and Bee Health Statistics 1970-1993 • BeeBase on line 1993 - 2009
United States	• National Research Council, 2005, Status of Pollinators in North America, National Academy press 322 pp. (available from: http://dels.nas.edu/dels/viewreport.cgi?id=3664) • US Department of Agriculture, 2008, Analysis of National Agricultural Statistics Service data 1945 to 2005 USDA, Presentation to EPA PPDC entitled " Colony Collapse Disorder (CCD) Affecting Honey bee (*Apis mellifera*) colonies" http://www.epa.gov/pesticides/ppdc/2008/oct2008/session7-ccd.pdf • CRS Report for Congress on Recent Honey Bee Colony Declines, May 28, 2008, accessed at: http://www.fas.org/sgp/crs/misc/RL33938.pdf • U.S. National Bee Colony Loss Survey, March 26, 2007, accessed at: http://beealert.blackfoot.net/~beealert/CCDsurvey_map_march07.pdf • A Survey of Honey Bee Colony Losses in the U.S. 2007-2008, accessed at: http://www.plosone.org/article/info:doi/10.1371/journal.pone.0004071

Question #4:

Have declines in other pollinator (non-honey bee) populations been documented in your country? If yes, please provide a reference for the study or survey.

Table 3. List references for countries which have documented declines in other pollinator population s (non-honey bee)

Country	References
Belgium	• Rasmont, P., J.Leclercq, A.Jacob-Remacle, A.Pauly & C.Gaspar. 1993. The faunistic drift of Apoidea in Belgium. pp.65-87 in E. Bruneau, Bees for pollination. Commission of the European Communities, Brussels, 237 pp. Available at: http://www.zoologie.umh.ac.be/hymenoptera/biblio.asp?src=umh • http://www.inbo.be/ygen/bibliotheekref.asp?show=html&refid=180612&pid=PUB_ASP_ONA
Canada	• Kevan, P.G. and Plowright, R.C.. 1995. Impact of pesticides on forest pollination. pp. 607-618. • Armstrong, J.A. and Ives, W.G.H. (Eds.). Forest Insect Pests in Canada. Natural Resources Canada, Canadian Forest Service, Ottawa.
Denmark	• IUCN redlist for species of bumblebees
IBMA-Italy	• Quaranta M., Ambroselli S., Barro P., Bella S., Carini A., Celli G., Cogoi P., Comba L., Comoli R., Felicioli A., Floris I., Intoppa F., Longo S., Maini S., Manino A., Mazzeo G., Medrzycki P., Nardi E., Niccolini L., Palmieri N., Patetta A., Piatti C., Piazza M. G., Pinzauti M., Porporato M., Porrini C., Ricciardelli D'Albore G., Romagnoli F., Ruiu L., Satta A., Zandigiacomo P., 2004 - Wild bees in agro-ecosystems and semi-natural landscapes.1997-2000 collection period in Italy. Bulletin of Insectology, 57 (1): 11-61. • D'Amico G., 2003. Farfalle diurne (Lepidoptera: Rhopalocera): sensibili indicatori biologici. In: Acque a Cremona nell'anno internazionale dell'acqua-Atti della Giornata di studi 25 ottobre 2003. Museo Civico di Storia Naturale, Cremona: 101-110.
Ireland	• Regional Red List of Irish Bees; Ú. Fitzpatrick, T.E. Murray, A. Byrne, R.J. Paxton & M.J.F. Brown, (2006). Available at http://www.npws.ie/en/media/Media,4860,en.pdf
Netherlands	• Biesmeijer et al, 2006. Science 313, 351-354

Table 3. List references for countries which have documented declines in other pollinator population s (non-honey bee)	
United Kingdom	• Butterflies and moths: Butterfly Conservation www.butterfly-conservation.org • Bumble bees: The Bumblebee Conservation Trust www.bumblebeeconservation.co.uk • Biesmeijer, JC; Roberts, SPM; Reemer, M; Ohlemuller, R; Edwards, M; Peeters, T; Schaffers, AP; Potts, SG; Kleukers, R; Thomas, CD; Settele, J; Kunin, WE Parallel declines in pollinators and insect-pollinated plants in Britain and the Netherlands SCIENCE, 313(5785), pp351-354, 2006 • DOI:10.1126/science.1127863 • ALARM Assessing Large Scale risks for biodiversity with tested methods http://www.alarmproject.net/alarm/ • Bees wasps and ants recording society http://www.bwars.com/
United States	• National Research Council, 2005, Status of Pollinators in North America, National Academy press 322 pp. (available from: http://dels.nas.edu/dels/viewreport.cgi?id=3664); • Xerces Society_2008, Status Review of Three Formerly Common Species of Bumble Bee in the Subgenus Bombus, 63 pp.. (http://www.xerces.org/wp-content/uploads/2009/03/xerces_2008_bombus_status_review.pdf)

Question #6:

What factors have been associated with declines in pollinator populations in your country? Please provide citations for any studies that have ranked the relative importance of these factors.

Table 4. List of references for different countries with factors associated with declines in pollinator populations

Country	References
Belgium	• Gobin B (2008) Complexe oorzaken van wintersterfte bij Bijen. Maandblad van de Vlaamse Imkersbond 96: juli/augustus p17-19. • Gobin B (2008) Wintersterfte bij Bijen: Complexe oorzaken. Fruitteeltnieuws21 (06): 21 maart. p30-31.
Canada	• http://www.capabees.com/main/files/pdf/canwintlossnewrev.pdf
Denmark	• Vidensyntese om honningbier LM Hansen 2006 DJF rapport.
Germany	• FORSTER, R., BODE, E. und D. BRASSE: Das „Bienensterben“ im Winter 2002/2003 in Deutschland - zum Stand der wissenschaftlichen Erkenntnisse. Herausgeber: Bundesamt für Verbraucherschutz und Lebensmittelsicherheit. Braunschweig, 125 Seiten, 2005. • Pistorius, J. (2009): Bienenvergiftung durch Wirkstoffabrieb von Saatgutbehandlungsmitteln während der Maisaussaat im Frühjahr 2008. Journal für Kulturpflanzen, 61 (1), S. 9-14.
IBMA-Italy	• ISPRA (Istituto Superiore per la Protezione e la Ricerca Animale), 2008. Sindrome dello spopolamento degli Alveari in Italia: approccio multidisciplinare alla individuazione delle cause e delle strategie di contenimento. Workshop, Rome, Italy. On-line: http://www.apat.gov.it/site/it-IT/Rubriche/Eventi/2008/Gennaio/documenti_alveari.htm
Poland	• Topolska G., Gajda A., Hartwig A. (2008) – Polish honey bee colony-loss during the winter of 2007/2008. Journal of Apicultural Science 52(2): 95-104
Slovakia	• Kopernický, J.: „ Analýza vzájomného vplyvu klimatickej zmeny nachov hospodárskych zvierat a voľne žijúcu zver“ Rezortná výskumná úloha, Nitra 2008 (Analysis of interaction influence of climatic changes to livestock breeding and wild animals (Government department objective, Nitra 2008)
United Kingdom	• Biesmeijer, JC; Roberts, SPM; Reemer, M; Ohlemuller, R; Edwards, M; Peeters, T; Schaffers, AP; Potts, SG; Kleukers, R; Thomas, CD; Settele, J; Kunin, WE Parallel declines in pollinators and insect-pollinated plants in Britain and the Netherlands SCIENCE, 313(5785), pp351-354, 2006

Table 4. List of references for different countries with factors associated with declines in pollinator populations	
United States	• USDA, 2009,CCD Steering Committee Annual Report, in press • CRS Report for Congress on Recent Honey Bee Colony Declines, May 28, 2008, accessed at: http://www.fas.org/sgp/crs/misc/RL33938.pdf • U.S. National Bee Colony Loss Survey, March 26, 2007, accessed at: http://beealert.blackfoot.net/~beealert/CCDsurvey_map_march07.pdf • A Survey of Honey Bee Colony Losses in the U.S. 2007-2008, accessed at: http://www.plosone.org/article/info:doi/10.1371/journal.pone.0004071 • National Research Council, 2005, Status of Pollinators in North America, National Academy press 322 pp. (available from: http://dels.nas.edu/dels/viewreport.cgi?id=3664);

Question #19

Are you aware of any published or on-going research addressing the extent to which pesticides may be interacting with other factors (e.g. disease) associated with the sudden declines in managed honey bee colonies, also known as colony collapse Disorder (CCD)? Please provide citations for those studies that investigated potential associations between declines in managed honeybee populations and pesticides. Please list the pesticides studied.

Table 5. List of references for different countries aware of published or on-going research addressing the extent to which pesticides may be interacting with other factors associated with sudden declines in managed honey bee colonies

Country	References
Belgium	• Gobin B, Heylen K, Billen J, Arckens L, Huybrechts R. Commun Agric Appl Biol Sci. 2008;73(3):405-8. (Fenoxycarb, Imidacloprid, Indoxacarb) • GOBIN B, HEYLEN K, BILLEN J, HUYBRECHTS R, ARCKENS L (2009) Sub-lethal exposure of honey bees to crop-protection: Feeding behaviour and flower visits. IOBC/WPRS Profile 46: 155-159. (Fenoxycarb, Imidacloprid, Indoxacarb)
Denmark	• Studies in France, Chauzat, M-P Germany by Bayer, Spring 2008
Germany	• JANKE, M., OHE, W. VON DER, BRASSE, D., FORSTER, R.: Intoxication of Honeybees – Interaction of Plant Protection Products and Other Factors. Proceedings of the Second European Conference of Apidology EurBee, Prague (Czech Republic), 10.-16. September 2006. (Imidacloprid)

Table 5. List of references for different countries aware of published or on-going research addressing the extent to which pesticides may be interacting with other factors associated with sudden declines in managed honey bee colonies	
IBMA-Italy	• National Research Project AMA (Ape Miele Ambiente = Bee Honey Environment) (see: http://www.apicoltura.org/ama/; AAA, 2002. Il ruolo della ricerca in Apicoltura. Proc. Convegno Finale Progetto AMA, Bologna, Italy. • Bortolotti L., Montanari R., Marcelino J., Medrzycki P., Maini S., Porrini C. (2003) Effects of sublethal imidacloprid doses on the homing rate and foraging activity of honey bees, Bulletin of Insectology 56, 63-67. • Ladurner E., Bosch J., Kemp W.P., Maini S. (2005). Assessing delayed and acute toxicity of five formulated fungicides to Osmia lignaria Say and Apis mellifera L., Apidologie 36, 449-460. • Medrzycki P., Montanari R., Bortolotti L., Sabatini A.G., Maini S., Porrini C. (2003) Effects of imidacloprid administered in sub-lethal doses on honey bee behaviour. Laboratory tests, Bulletin of Insectology 56, 59-62. • Porrini C., Monaco L., Medrzycki P. (2000) Rilevamento della mortalità di Apis mellifera L. (Hymenoptera Apidae) nel biomonitoraggio dei pesticidi: strutture a confronto e prospettive, Bollettino dell'Istituto di Entomologia "G. Grandi" Univ. Bologna 54, 101-112. • Porrini C., Ghini S., Girotti S., Sabatini A.G., Gattavecchia E., Celli G. (2002) Use of honey bees as bioindicators of environmental pollution in Italy, in: Devillers J., Pham-Delègue M.-H. (eds.) Honey bees: estimating the environmental impact of chemicals, Taylor & Francis, London, UK, pp. 186-247. • Porrini C., Sabatini A.G., Sgolastra F., Maccagnani B., Tesoriero D., Medrzycki P., Venier F., Mencarelli M., Renzi T., Colombo R., Capelli M., Mattarrozzi A.R., 2008. Tossicità verso le api – (II). In: Prontuario degli Agrofarmaci. 12th edition, Ed. Edagricole, Milan, Italy, 916-919. • National Research Project Apenet (see http://www.reterurale.it/api) • Pesticides studied: for the detailed list see Porrini et al., 2008
Slovakia	• Čermáková, T.: Vplyv vybraných insekticídnych prípravkov na ochranu repky olejnej na včely a včelie produkty Priebežná správa za výskumnú etapu rezortného výskumného projektu – Liptovský Hrádok 2009 (Influence of particular insecticides for treatment of oil seed to bees and bee products, Interim Stage Report of research project, Liptovský Hrádok, 2009) • Čermáková, T.: Hodnotenie rizika vplyvu vybraných insekticídov na včely Správa z programu 08W/podprogram/01/ prvok C – Národná komisia pre bezpečnosť potravín a krmív. (Risk assessment of influence of particular insecticides to bees, report for National Commission for Food and Feed Safety

Table 5. List of references for different countries aware of published or on-going research addressing the extent to which pesticides may be interacting with other factors associated with sudden declines in managed honey bee colonies	
Slovenia	• Ministry of Agriculture, Forestry and Food - Phytosanitary Administration RS, Agricultural institute of Slovenia and national Veterinary institute: on-going research on "influence of intensive agriculture on honeybees". • National institute of biology (Bee losses and bee health in the agricultural polluted environment) University of Ljubljana, Department of Biology, Agricultural Institute of Slovenia
United Kingdom	• Bee Mortality and Bee Surveillance in Europe. (EFSA –Q-2008-428) August 11 2008 A report from the Assessment and Methodology Unit in Response to Agence Française de Sécurité Sanitaire des Aliments (AFSSA)
United States	• Frazier, M. et al., 2008, What have pesticides got to do with it, Bee Journal, June 2008 pp 521 – 523. Pennsylvania State University Department of Entomology. • Cox-Foster, D. and D. VanEngelsdorp, 2009. Solving the Mystery of the Vanishing Bees, Sci. Am, April 2009 (chlorothalonil). • Kaplan, K. 2008. Colony Collapse Disorder. A Complex Buzz. Agricultural Research May/June 2008. http://www.ars.usda.gov/is/AR/archive/may08/colony0508.pdf • USDA, 2007 Colony Collapse Disorder Action Plan, developed by the CCD steering Committee (USDA, Agricultural Research Service) accessed at: http://www.ars.usda.gov/is/br/ccd/ccd_actionplan.pdf • Congressional Research Service, 2008, Report for Congress: Recent Honey Bee Colony Declines, accessed at: http://www.fas.org/sgp/crs/misc/RL33938.pdf • Mullin, CA, Frazier M, Frazier JL, Ashcraft S, Simonds R, et al. (2009) Pesticides and honey bee health: High levels of acaricides and crop protection chemicals in US apiaries. Submitted • Dennis vanEngelsdorp, Jay D. Evans, Claude Saegerman, Chris Mullin, Eric Haubruge, Bach Kim Nguyen, Maryann Frazier, Jim Frazier, Diana Cox-Foster, Yanping Chen, Robyn Underwood, David R. Tarpy, and Jeffery S. Pettis. (accepted PLoS one) A descriptive epizootiological study of honey bee Colony Collapse Disorder. • Jeffery S. Pettis, Dennis vanEngelsdorp, Josephine Johnson and Galen Divley. 2009. Chronic pesticide exposure increases pathogen levels in honey bees. (in press) • Nguyen BK, Saegerman C, Pirard C, Mignon J, Widart J, et al. (2009) Does imidacloprid seed-treated maize have an impact on honey bee mortality? J. Econom. Entomol. 102: (in press). • vanEngelsdorp et al. (2009) "Entombed Pollen": a new condition in honey bee colonies associated with increased risk of colony mortality. short communication for Journal of Invertebrate Pathology (in press)

APPENDIX B

Questionnaire of the Survey of Pollinator Testing, Research, Mitigation and Information Management

Sponsored by the OECD Registration Steering Group of the Working Group on Pesticides

Much of agriculture has come to depend on managed European honeybee (*Apis mellifera*) populations for pollination services. Over the past several years, significant declines in the number of managed bee colonies have been observed in North America. Declines have also been observed in other pollinators, including native bee species, bats, and birds. This survey of OECD countries is intended to explore factors associated with pollinator declines (with special emphasis on managed honeybees), how incident information is managed, regulatory testing requirements, research, and the range of regulatory responses. We would appreciate your efforts to reach out to the appropriate national organizations in your country to provide answers to the following questions:

1. Are you aware of research that has been conducted on the relative proportions of crops pollinated by various native and non-native pollinators?
___Yes ___No ___Uncertain
If yes, please provide a reference.

2. Do managed bees pollinate major crops in your country?
___Yes ___No ___Uncertain
If yes, please list if known

3. Have declines in honey bee populations been documented in your country?
___Yes ___No ___Uncertain
If yes, please provide a reference.

4. Have declines in other pollinator (non-honey bee) populations been documented in your country?
_ __Yes ___No ___Uncertain
If yes, please provide a reference for the study or survey.

What other pollinator populations? (*Please place an X next to all that apply*)
___Bumble bee ___Bats ___Solitary Bees ___other bee species
___Birds ___Moths___Butterflies ___Other
(*specify*)_____

5. Have declines been limited to managed (commercial) honeybee colonies?
___Yes ___No ___Uncertain

Relative to declines in managed honeybee populations, how are these "declines" measured? (*Please place an X next to all that apply*)
__ Decreased number of bees ___increased incidence of disease/parasites __ Both
___ Other (*specify*)_____

Do managed bee colonies appear to be more severely affected than feral honeybees or other pollinators?
___ Yes ___No ___Uncertain

6. What factors have been associated with declines in pollinator populations in your county? (*Please place an X next to all that apply*)
___Disease ___Nutrition ___Transportation stress
__ Pesticides ___Habitat degradation/loss ___Weather
___summer losses ___ winter losses ___parasites
___Other (*please specify*)_____

Please provide citations for any studies that have ranked the relative importance of these factors.

The following set of questions are related to how bee mortality incidents are collected, investigated, and communicated and what actions authorities are taking when pollinator incidents are reported.

7. Does your country require reporting of honeybee-kill incidents?
___Yes ___No ___Uncertain

If yes, who is required to submit incident reports? *(Please place an X next to all that apply*).

___Growers ___Applicators ___Beekeepers ___ Registrants
___Others (*specify*)_____

If yes, where is the required information submitted? (*Please place an X next to all that apply*)
___Pesticide Regulatory Authority
___Department/Ministry of Agriculture
___Other (*specify*)_____

8. What type of information is typically provided or required to document bee-kill incidents? (*Please place an X next to all that apply)*

___Date ___Location ___Crop
__ Pesticide(s) used ___If this was labeled use ___Number of hives affected
__ Weather ___Disease ___Degree of damage
___Type of affected bees (adults, brood…) ___Disease control applied?
___Disease control details:
___what kind of control ___time ___if successful or not?

9. How can bee mortality incident information be accessed by other interested parties from the organization to which it is reported? (*Please place an X next to all that apply*)
___On-line access ___Press release ___Printed Reports
__ written request ___other (*specify*)_____

10. If no reporting system is available in your country, is your country considering establishing a reporting system or database?
___Yes ___No ___Uncertain

If yes, please describe characteristics of the reporting system or database considered to be important.

The next questions are related to regulatory authority testing requirements

11. Does your country require toxicity testing of pollinators (bees or non-bees) as a standard component of a dossier/(re-)registration data package for pesticides?
___Yes ___No ___Uncertain ___only conditionally

If yes, what battery of toxicity test(s) is typically required for registering a pesticide? (*Please place an X next to all that apply*)
___Acute honeybee oral toxicity ___Acute honeybee contact toxicity
___Field pollinator testing ___Hive Study
___Other (*please specify*) _ _____

12. Are current testing requirements and risk assessment methodologies useful for assessing risks to pollinators (adults and their brood)?
___Yes ___No ___Uncertain

If no, what additional data are being considered? (*Please place an X next to all that apply*)
___Toxicity of residues on foliage ___Magnitude of residues in foliage
___Toxicity of residues in pollen ___Toxicity of residues in nectar
___Other (specify)_ _____

13. Do current OECD toxicity test study designs adequately evaluate potential sublethal effects of pesticides on adult and larval honeybees?

___Yes ___No ___Uncertain

If not, is your country planning to develop test study designs to evaluate sub-lethal effects of pesticides on pollinators?

___Yes ___No ___Uncertain

14. Are steps underway to develop study protocols to address uncertainties regarding the potential effects of systemic pesticides?

___Yes ___No ___Uncertain

If yes, please list efforts underway to address uncertainties.

Provide several strengths and weakness of existing testing protocols and risk assessment methods?

What additional tests or assessment methodologies should be developed?

The next questions are related to regulatory responses

15. What regulatory responses are authorities taking when faced with data which indicate potential risks to pollinators? (*Please place an X next to all that apply*)
___Advisory labeling
___Label restrictions
___Integrated pest management
___Other (*please specify*)_____

16. To what extent do member countries rely on voluntary (non-mandatory) practices as opposed to label restrictions to reduce risks to pollinators?

___Typically voluntary ___Typically label restrictions ___Both equally

17. Is the topic of pollinator toxicity and risk described in training materials and classes?
___Yes ___No ___Uncertain

If yes, what training materials or classes are available?

18. Do you believe that efforts to reduce adverse impacts to bees due to pesticides have been effective?
___Yes ___ No ___ Uncertain

If yes, please list those measures that have been most effective at reducing bee mortality due to pesticides?

The next questions are related to research needs

19. Are you aware of any published or on-going research addressing the extent to which pesticides may be interacting with other factors (e.g., disease) associated with the sudden declines in managed honey bee colonies, also known as Colony Collapse Disorder (CCD)?
___ Yes ___No ___Uncertain

Please provide citations for those studies that investigated potential associations between declines in managed honeybee populations and pesticides. Please list the pesticides studied.

20. Is your country planning to invest in research that examines the potential sub-lethal and/or indirect effects of pesticides on pollinators?
___Yes ___No ___Uncertain

Name of Organization: _____
Name of Contact:_____

The next questions are about groups active in this area

21. The U.S. and Canada are aware of the following organizations (other than the OECD) working on pollinator issues:

- International Commission for Plant-Bee Relationships (ICP-BR)
- European Food Safety Agency (EFSA)
- Canadian Pollination Initiative (CANPOLIN)
- Prevention of Honeybee Colony Losses (COLOSS Network)
- International Bee Research Association (IBRA)
- International Initiative for the Conservation and Sustainable Use of Pollinators (FAO)
- European and Mediterranean Plant Protection Organization (EPPO)
- North American Pollinator Protection Campaign (NAPPC)

Are you aware of additional groups working on pollinator issues?
___Yes ___No ___Uncertain

22. Please describe your expertise

___pesticide regulation/policy
___scientist
___research
___Other (*please specify*)_____

23. Please provide a contact person in your country for issues related to pesticides and bee/pollinators.