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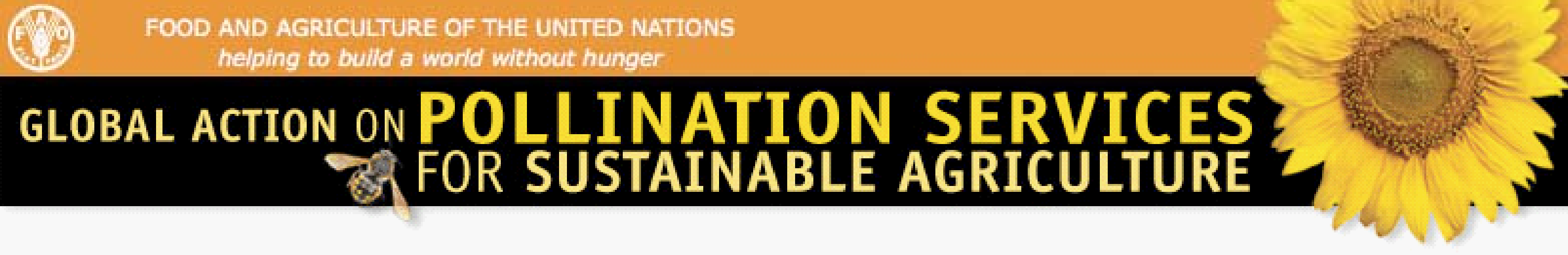
PROGRESS ON THE INTERNATIONAL INITIATIVE FOR THE CONSERVATION AND SUSTAINABLE USE OF POLLINATORS

1. The Executive Secretary is circulating herewith, for the information of participants in the fourteenth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice, the report on progress on the international initiative for the conservation and sustainable use of pollinators, as submitted by the Food and Agriculture Organization of the United Nations. The report is circulated in the form and language in which it was received by the Secretariat.

* UNEP/CBD/SBSTTA/14/1.



INFORMATION DOCUMENT PREPARED BY
THE FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS (FAO)

PROGRESS ON THE INTERNATIONAL INITIATIVE FOR THE CONSERVATION AND SUSTAINABLE USE OF POLLINATORS

SBSTTA-14

NAIROBI, KENYA
10-21 MAY 2010

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TABLE OF CONTENTS

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PROGRESS ON THE INTERNATIONAL INITIATIVE FOR THE CONSERVATION AND SUSTAINABLE USE OF POLLINATORS

I. INTRODUCTION

In 2008, in Decision IX/1, the Ninth Conference of Parties (COP) invited "the Food and Agriculture Organization of the United Nations in collaboration with Parties, other Governments and relevant organizations, to continue the implementation of the International Initiative for the Conservation and Sustainable Use of Pollinators (decision VI/5) and, in particular...:

- Complete information on pollinator species, populations and their taxonomy, ecology and interactions;
- Establish the framework for monitoring declines and identifying their causes;
- Assess the agricultural production, ecological, and socio-economic consequences of pollinator declines;
- Compile information on best practices and lessons learned;
- Develop response options to promote, and prevent the further loss of, pollination services that sustain human livelihoods;
- Disseminate openly the results through the CHM and other relevant means."

This paper, organized according to the elements of the Plan of Action of the International Pollinators initiative, provides an update of main activities undertaken since 2008. The information presented in this paper is also based mainly on consultations with participants at a September 17, 2009 meeting held during the 41st Apimondia Conference.

II. ASSESSMENT

A. Complete information on pollinator species, populations and their taxonomy, ecology and interactions

1. Taxonomy of Pollinators

World Bee Checklist. In collaboration with specialists around the world, a five-year project was undertaken with major support from the U.S. based National Biological Information Infrastructure, and the Global Biodiversity Information Facility, Copenhagen, Denmark . Through this project, a checklist of the bee species of the world has been compiled. The entire checklist (with some synonyms and subspecies) is fully integrated into the Integrated Taxonomic Information System (ITIS) database, and on the Discover Life website
(http://www.discoverlife.org/mp/20q?guide=Apoidea_species&flags). Bee data in ITIS can be accessed by searching by the following:

- Search by name from the ITIS home page.
- Download the full ITIS database.
- Download an ITIS Taxonomic Workbench file (includes only extant bee families).
- Download a simplified list of just the valid bee species in a Microsoft Excel file.

Bees are a subset of the superfamily Apoidea. The bee checklist includes all members of the following extant families in the superfamily Apoidea:

- Andrenidae -- andrenid bees, andrenids
- Apidae -- bumble bees, euglossines, honey bees, stingless bees
- Colletidae -- colletid bees, plasterer bees, yellow-faced bees
- Halictidae -- halictid bees, sweat bees
- Megachilidae -- leafcutting bees
- Melittidae -- melittid bees, melittids
- Stenotritidae -- stenotritid bees, stenotritids

The Catalogue of the Bees of the Neotropical Region. The American continent, principally the Neotropic Region, presents one of the richest faunas of bees in the world. A catalogue of all information published in reference to the species of bees present in the Neotropic Region was started in 1938, which, at the end of 1950, was changed into a catalog in the form of typed cards. This system of cards was maintained and updated up to 1975, with a total of 11 200 typed cards when its maintenance was interrupted. Through the work of researchers with vast experience of the bees of the Neotropics, the updating of this information was taken up again and the catalogue organized and brought up to date including all pertinent bibliographic references - in the format of a published volume (Moure, Urban, and Melo, 2007) and an electronic database. The online version of the Neotropics is available at http://moure.cria.org.br/index.

Atlas Hymenoptera is an online resource including photographs and other ecological information on bees around the world: http://zoologie.umh.ac.be/hymenoptera/ .Atlas Hymenoptera originated from collaboration between the Laboratoire de Zoologie de l'Université de Mons and the Entomology Unit of Gembloux agro bio tech (formerly the Faculté Universitaire Agronomique de Gembloux). This initiative was the result of common work of these two services that have maintained a biogeographic database on the hymenoptera of Western Europe. Atlas Hymenoptera is now a platform that brings together many people that are interested in the systematics, ecology, behaviour and biogeography of the Hymenoptera.

2. Identification Tools for Pollinators

A *"Key to the Bee Families of the World"* has been developed and made available over the internet at: http://www.yorku.ca/bugsrus/BFoW/Images/Introduction/Introduction.html through a collaborative agreement between the Food and Agriculture Organization of the United Nations and the Packer Lab at York University in Canada. The website is intended to allow the user to identify a bee from anywhere in the world to family level. It is comprised of three independent keys: 1) a key to determining the sex of a bee 2) a key to family level for both male and female bees 3) a key to family level for female bees only.

The keys are modifications of those provided by Michener (2007). The modifications are either aimed at making it as easy as possible for a beginner to identify a bee specimen to the correct family or permit the identification of the, usually rare, exceptions to the main characteristics of bee families. The key is illustrated with high-resolution photographs of bee characters.

Bee Barcoding: New interactive identification tools may hold the potential to overcome large challenges in identification that could otherwise impede progress in pollinator conservation and management. Amongst these, DNA barcoding is a recent development that permits the identification of organisms based upon sequencing a small fragment of their mitochondrial DNA. The long term goal is to produce a DNA database that will permit identification of unknown specimens by comparison to archived sequences. Under the Consortium for the Barcode of Life (CBOL), an international collaboration to barcode the Apoidea (bees) has been initiated, coordinated by York University in Canada, in collaboration with the Canadian Centre for DNA barcoding at Guelph. Sequence information for over 15% of the bee species of the world have already been collected. http://www.bee-bol.org/

3. Pollinator Interactions

Pollination depends to a large extent on the symbiosis between species, the pollinated and the pollinator, and often is the result of intricate relationships between plant and animal - the reduction or loss of either affecting the survival of both. To better understand pollination and how to conserve and manage it, there is a need to capture more information about plant-pollinator interactions. People have been observing the process of pollination for centuries, but new data management tools can make it easier to share and compile information on plant and pollinator interactions, so that overall trends can be better documented.

An initiative is underway to develop a common protocol for sharing pollinator interaction data, as explained on the website: http://www.webbee.org.br/interaction/

4. Citizen Science

In the last few years, there has been an increase in "citizen science" projects that permit amateurs to document information on the status, ecology and interactions of pollinators. Two examples of these are:

BugGuide: Bugguide.net is an online community of naturalists who enjoy learning about and sharing observations of insects, spiders, and other related creatures. The community works to instill in others a fascination and appreciation for the intricate lives of these creatures. Its mission is to creating a knowledge base to help each other and the online community. As a clearinghouse for information, this site helps expand on the natural histories of the organisms presented. By capturing the place and time that submitted images were taken, it builds a virtual collection that helps define where and when things might be found. The website has thus captured unique behaviors and photos of species. http://bugguide.net/node/view/15740

Amateur natural history societies: That amateurs can be major contributors to the appreciation and understanding of pollinators is documented in many instances. A major paper published in Science magazine in 2006 found evidence of declines in both bee pollinators and plants dependent on pollinators, suggesting local extinctions of functionally linked plant and pollinator species. The databases upon which this research was based was collected in large measure by amateur natural history societies. http://www.sciencemag.org/cgi/content/abstract/313/5785/351

B. Establish the framework for monitoring declines and identifying their causes

1. Contribution to a Global Framework

Although the conservation of pollinators - managed and wild - is central to biodiversity, to food security and to the global economy, no global monitoring program exists to evaluate whether pollinator populations – and in particular bees - are declining. Recent declines in US and UK commercial honey bee hives have highlighted the degree of reliance on bees, both managed and wild, for the pollination service they provide. Indirect evidence for declines reported for certain native pollinators at point locations in Europe, Asia, North, Central and South America, Africa, and Australia are based primarily on post hoc analyses or resurveys of studies not designed to detect change or trends. However, there has been no long-term global survey of the status of bee pollinators and the currently available evaluations do not permit inference beyond their very limited areas.

Recognizing the need for a global assessment of pollinators' status and trends, in 2008 the Convention on Biological Diversity requested Parties to the Convention, through the IPI, to establish a framework for monitoring pollinator declines. FAO, as coordinator of the IPI, has thus collaborated with an international group of scientists to review monitoring methods and recommends an overall approach that could be applied to assess global, or sub-global, trends in pollinator populations. Using data from multiple local surveys of pollinators, a cost-effective design for a global monitoring program has been developed that has sufficient power to detect declines in the number of pollinator species, the total abundance of pollinators and, if possible, pollinator species. The protocol will be tested and piloted in multiple locations over the next year, including locations under the FAO coordinated UNEP/GEF global-sized project.

2. Use of Expert Opinions

Within the European Pollinator Initiative, the urgent need to identify trends in the provision of pollination services and the driving forces behind perceived declines in pollinator populations has been addressed by a survey of experts. Supplementing red list information with expert opinion, this survey identified trends such as that among pollinators, habitat specialists are more threatened than generalists; and those species with only one generation in a year are more threatened than those with multiple generations. Based on the expert survey, habitat loss and degradation were identified as the major driver of declines. Those practices contributing most to habitat loss were identified as agricultural intensification, and specifically within intensification, the loss of legumes as part of farming systems, as fertilizers replace or eliminate the leguminous flora on farms. (Biesmeijer et al. in prep.)

3. Special issue of Apidologie

A special issue of the journal Apidologie devoted to bee conservation was produced in 2009. This special edition asked some of the world's leading experts to bring together current knowledge on the status of bees and their conservation, and factors determining bee abundance and biodiversity with the aim of identifying major trends and knowledge gaps (Byrne and Fitzpatrick 2009).

Among the findings in these reviews were the following:

(1) The global decline in bees has sparked the formation of a global policy framework for pollinators, primarily through the International Pollinator Initiative within the Convention of Biological Diversity (COP Decision V/5). There are now regional Pollinator Initiatives, along with regional and national conservation legislation, that can impact on the conservation of bees. The creation of bee Regional Red Lists, under guidance from the International Union for Conservation of Nature, along with conservation priority lists, offer another mechanism for streamlining bees into regional, national or sub-national conservation policy and practice. These structures, if utilized properly, can form a coordinated and effective policy framework on which conservation actions can be based. (Byrne and Fitzpatrick 2009).

(2) Bee populations and communities are typified by considerable spatio-temporal variation; whereby autecological traits, population size and growth rate, and plant-pollinator network architecture all play a role in their vulnerability to extinction. As contemporary insect conservation management is broadly based on species and habitat- targeted approaches, ecological data will be central to integrating management strategies into a broader/landscape scale of dynamic, interconnected habitats capable of delivering bee conservation in the context of global environmental change (Murray, Kuhlmann and Potts. 2009).

(3) The trait of haplodiploidy amongst bees has several unusual genetic properties of relevance to their conservation which warrant special attention. Bees are especially prone to extinction for genetic reasons, and genetics can provide invaluable tools for managing bee populations to circumvent pollinator decline (Zayed 2009).

(4) The nine indigenous species of honey bee native to East Asia are extremely valuable because they are key pollinators to many crop species, provide significant income to some of the world's poorest people, and are prey for some endemic vertebrates. Furthermore, Southeast Asian Dipterocarp forests

appear to be adapted to pollination by honey bees. Thus long-term decline in honeybee populations may lead to significant changes in the pollinator ecology of these forests, exacerbating the more direct effects of deforestation and wood harvesting on forest health. The most significant threats to local honeybee populations are deforestation and excessive hunting pressure (Oldroyd and Nanork 2009).

(5) In the Neotropics- with a highly rich bee fauna - deforestation, agriculture intensification and introduction/spread of exotic competing bee species are considered to be the main threats to most indigenous species. Efforts to conserve the native bee fauna include better knowledge of bee richness and diversity and of their population dynamics, raising of public and policy makers' awareness, commercial applications of bee products and services such as pollination and preservation of natural habitat (Freitas et al. 2009).

(6) In Australia, the main threats to the native bee fauna include removal of nesting and foraging opportunities through land clearing and agriculture, the spread of exotic plant species and the consequences of climate change. Early steps to conserve the native bee fauna include commercial applications, raising of public awareness and preservation of natural habitat. (Batley and Hogendoorn, 2009).

(7) Although Africa contains seven biodiversity hotspots, the bee fauna appears rather moderate given the size of the continent. This could be due to various factors, an important one being the dearth of bee taxonomists working in Africa and difficulties in carrying out research in many regions. Anecdotal observations suggest a very large number of undescribed bee species. A number of serious threats to this diversity exist, especially habitat destruction and degradation. Bee diversity in these regions is likely to be important for both agriculture and indigenous ecosystems, but is under-appreciated. Reliance on conserved areas such as National Parks will not be sufficient to preserve bee diversity in Africa and Madagascar; changes to land use practices and development of industries that facilitate conservation, such as ecotourism, will be essential (Eardley, Gikungu and Schwarz 2009).

(8) Evidence from around the world indicates that some bumblebee species are declining in Europe, North America, and Asia. Land-use changes may be having a negative effect through reductions in food plants in many parts of the world, but that other factors such as pathogens may be having a stronger effect for a few species in some regions (especially for Bombus s. str. in North America). Evidence so far is that greater susceptibility to land-use change is associated worldwide with small climatic ranges, range edges, and late-starting colony-development cycles. More evidence is needed on the roles of pollen specialization, nest sites, hibernation sites, and pesticides. It is still too early to assess the success of schemes aimed at improving forage in agricultural and conservation areas. However, schemes aimed at raising public awareness have been very successful (Williams and Osborne 2009).

(9) Global threats to bees can be best addressed by conservation strategies that prioritize (i) minimizing habitat loss; (ii) making agricultural habitats bee-friendly; (iii) training scientists and the public in bee taxonomy and identification; (iv) basic autecological and population genetic studies to underpin conservation strategies; (v) assessing the value of DNA barcoding for bee conservation; (vi) determining the impact of invasive plants, animals, parasites and pathogens; and (vii) integrating this information to understand the potential impact of climate change on current bee diversity (Brown and Paxton. 2009)

4. Colony Collapse Disorder

A critical driver of pollinator declines is the widespread and severe loss of honeybees around the world in recent years, especially in the USA, which have attracted great media attention, and stimulated much scientific research. To keep the extent of the disorder in perspective, however, it should be clarified that only those colony losses conforming to the specific set of defined symptoms should be termed CCD ("Colony Collapse Disorder"); these specific sets of symptoms are found in the USA. Colony losses elsewhere may have entirely different causes. The recent Special Issue of the Journal of Apicultural

Research (2009) drew together reports of colony losses from many countries, together with research reports and reviews discussing possible causes. It concluded, with respect to honeybee declines, that the causes are probably multi-factorial, and as with previous historical episodes of colony losses, scientists may jump to conclusions about the causes, which are certainly complex. Indeed, due to the ubiquitous ectoparasitic mite Varroa destructor, present in all regions where extensive colony losses have occurred, interactions with other drivers of mortality are inevitable. Therefore, massive unexplained honeybee colony losses have not been driven by a single agent or factor as the definitive cause but rather from particular virulent combinations of pesticides, parasites and viruses. Moreover, chronic exposures to pesticides that cause no problems for healthy colonies are suspected to kill colonies if weakened by diseases. It is thus the combination of pests, viruses and pesticides that results in an inadvertent "meltdown" with one negative factor enhancing the negative impacts on honeybee health of the others. Such complex interactions between individual drivers of honey bee colony losses in particular and pollinator decline in general and the high number of interacting factors easily exceed the research facilities of individual laboratories or even entire countries.

The EU has foreseen these problems and is supporting two large-scale research projects: STEP (Status and Trends of European Pollinators) and BEE DOC (BEes in Europe and the Decline Of Colonies). The two research projects are expected to address many of the issues surrounding the plight of pollinators in Europe and what consequences their loss will have for different stakeholders. The projects aim to develop mitigation strategies to halt the loss of pollinators and more effectively manage them to safeguard the services they provide, over a short-term framework of three years.

Equally within the United States, the Agricultural Research Service has developed a research action plan to coordinate a comprehensive response for discovering what factors may be causing CCD and what actions need to be taken. The search for factors that are involved in CCD is focusing on four areas: pathogens, parasites, environmental stresses, and bee management stresses such as poor nutrition. This action plan also recognizes that it is unlikely that a single factor is the cause of CCD; it is more likely that there is a complex of different components.

International standards for monitoring honeybee declines and researching its causes are currently lacking. International networking, coordination and sharing of information are needed. For that purpose, the global COLOSS network (Prevention of honey bee COlony LOSSes) has been created to coordinate efforts to explain and prevent large scale losses of honeybee colonies and pollinator decline. As of February 2010, 189 individual members from 42 countries closely collaborate. The EU is currently providing financial support (Action FA0803) until November 2012.

C. Assess the agricultural production, ecological, and socio-economic consequences of pollinator declines

1. Dependency of Food Crops on Pollination

In agro-ecosystems, pollinators are essential for orchard, horticultural and forage production, as well as the production of seed for many root and fibre crops. Eighty-seven of the leading global food crops are dependent on pollination services provided by animals out of a total of 113 food crops, and 35% of all food production globally comes from crops dependent on pollinators. For human nutrition the benefits of pollination include not just abundance of fruits, nuts and seeds, but also their variety and quality.

2. Economic Valuation of Pollination Services

Pollination is one ecosystem service that until recently was considered poorly documented from an economic standpoint, and had few hard figures to justify its value. But that has been rectified with a recent careful assessment of the contribution of animal pollination services to the global economy that places the total economic value of pollination worldwide at €153 billion, representing 9.5% of the value of the world agricultural production used for human food in 2005. Those crops that depend on pollination services are high-value, averaging values of €761 per ton, against €151 a ton for those crops that do not depend on animal pollination.

These figures do not include the contribution of pollinators to crop seed production (which can contribute many-fold to seed yields), nor to pasture and forage crops. Nor do these figures include the value of pollinators to maintaining the structure and functioning of wild ecosystems- as yet these are all uncalculated. Table 1. shows that the leading pollinator dependent crop being vegetables and fruits representing about € 50 billion each, followed by edible oil crops, stimulants (coffee, cocoa etc), nuts and spices (Gallai et al. 2009).

3. Tool for Assessing National Value of Pollination Services, and Vulnerabilities to Pollinator Declines

FAO's Plant Production and Protection Division (AGP), in collaboration with INRA (Institut National de la Recherche Agronomique, a French government agency) has developed a tool for assessing the value of pollination services and national vulnerabilities to pollinator declines. Guidelines explaining the use of the tool, and a downloadable spreadsheet for applying the assessment, are available on the "Documents" page of FAO's Global Action on Pollination Services for Sustainable Agriculture website (http://www.internationalpollinatorsinitiative.org/jsp/documents/documents.jsp).

TABLE 1.Economic impacts of insect pollination of the world agricultural production used directly for human food and listed by the main categories ranked by their rate of vulnerability to pollinator loss (Gallai et al. 2009).

CROP CATEGORY	AVERAGE VALUE OF A PRODUCTION UNIT € PER METRIC TON	TOTAL PRODUCTION ECONOMIC VALUE (EV) 10^9€	INSECT POLLINATION ECONOMIC VALUE (IPEV) 10^9€	RATIO OF VULNERABILITY (IPEV/EV) %
Stimulant crops	1225	19	7.0	39.0
Nuts	1269	13	4.2	31.0
Fruits	452	219	50.6	23.1
Edible oil crops	385	240	39.0	16.3
Vegetables	468	418	50.9	12.2
Pulses	515	24	1.0	4.3
Spices	1003	7	0.2	2.7
Cereals	139	312	0.0	0.0
Sugar crops	177	268	0.0	0.0
Roots and tubers	137	98	0.0	0.0
All categories pooled		1618	152.9	9.5

The spreadsheet also presents as examples the analysis of the vulnerability of the national economies of Ghana and Nepal, using 2005 FAOSTAT data . The economic value of pollinators in Ghana - with a high dependence of its economy on cocoa production which in turn is 90% dependent on insect pollinators for yields - was estimated at $788 million dollars; the economic value of pollinators to the Nepal economy in 2005 was $81 million.

4. Trends in Demands for Pollination Services

A series of studies have related the growth in the production of fruits and vegetables to growth of beekeeping, as a means of assessing trends in supply and demand for pollination services. The studies found that:

(1) Since 1961, crop yield (Mt/ha) has increased consistently at average annual growth rates of 1.5%. Temporal trends were similar between pollinator-dependent and non-dependent crops in both the developed and developing world. Over this same time, agriculture has become more pollinator dependent because of a disproportionate increase in the area cultivated with pollinator-dependent crops (Aizen et al 2009a).

(2) The global population of managed honey-bee hives has increased by 45% during the last half century. But with the much more rapid (>300%) increase in the fraction of agriculture that depends on animal pollination during the last half century (Figure 1), the global capacity to provide sufficient pollination services may be stressed, and more pronouncedly in the developing world than in the developed world (Aizen and Harder 2009).

(3) For those crops for which animal pollination is essential (i.e. 95% average yield reduction without pollinators) there was higher growth in yield and lower expansion in area than for crops with less dependence, probably reflecting the effects of explicit pollination management, such as renting hives or hand pollination (Garibaldi et al. 2009).

5. Human Food Provisioning Dependence on Pollinators

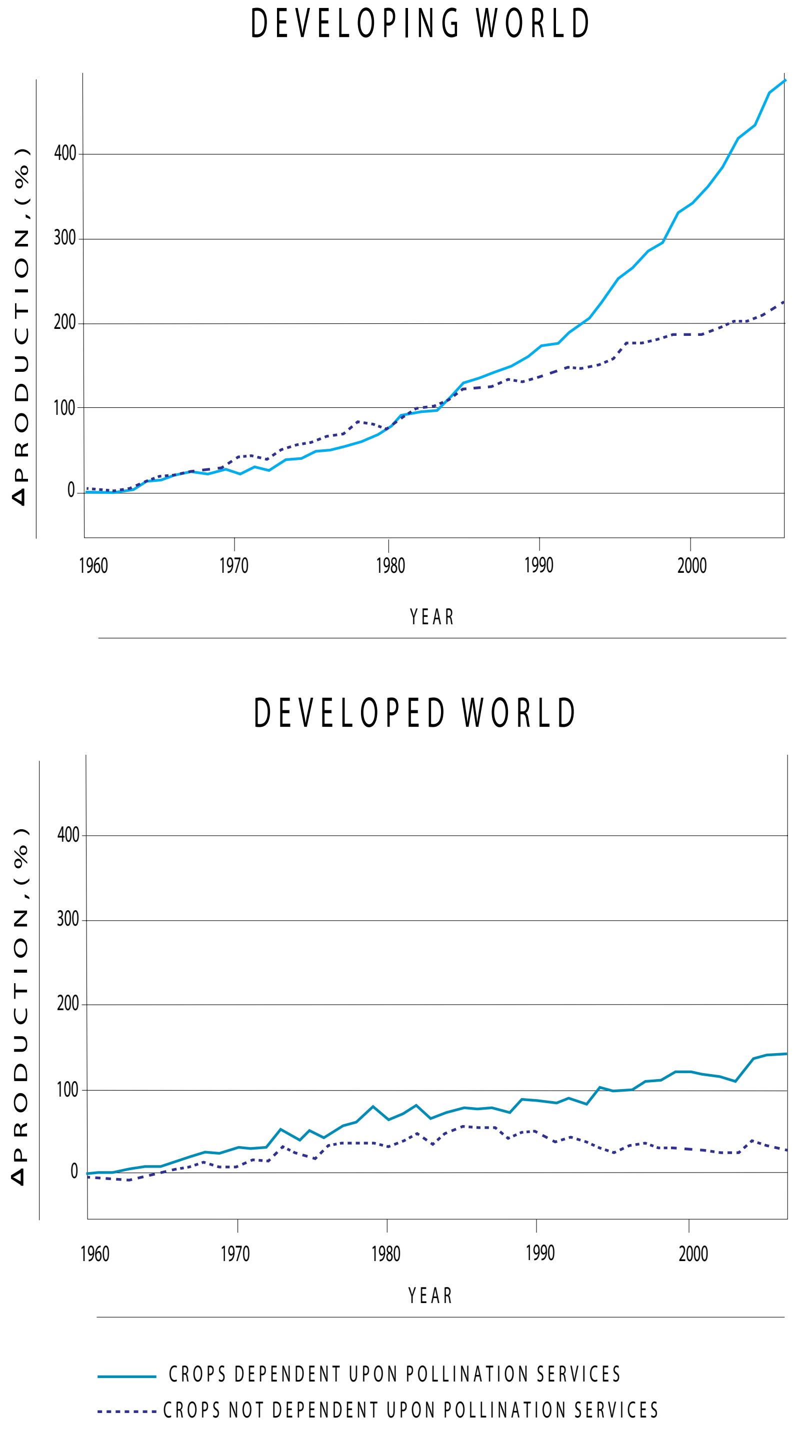
Work in Mexico has evaluated linked aspects of poverty level, population density and the level of pollinator dependence for food provisioning. The diversity of crop species in Mexico is exceptionally high. Nearly 85% of fruit and/or seed consumed species depend to some degree on pollinators for productivity. Overall, pollinator-dependent crops generate larger income but cover a lower cultivated area and produce less volume compared to non-pollinator-dependent crops. Volume per unit area, however, as well as revenue per unit area, is much higher for pollinator-dependent crops. Native wild pollinators also play a key role in fruit or seed production of Mexican domesticated plant species and in the reproduction of many useful wild species. Thus, assuring free pollination services is particularly important in Mexico as the livelihood of a large proportion of the population exclusively and directly depends on ecosystem services for subsistence (Ashworth, L., M. et al. 2009).

6. Ecological Aspects: Diversity of pollinators in a community may collectively improve overall levels of pollination

One remarkable feature of pollinators is their capacity to adapt and adjust to changing circumstances, and to accommodate other pollinators. The common honeybee, Apis mellifera is not native to the Americas yet now figures greatly as a provider of pollination services throughout the region. In Panama and Mexico it has been shown that over a span of about twenty years – during the period when Afri-

FIGURE 1.

Temporal Trends in Total Crop Production from 1961 to 2006 (from Aizen et al. 2008)



canized honeybees increased their range into Central America, native bees shifted the types of flowers that they foraged on. While the relatively aggressive Africanized honeybees may have dominated certain floral resources, native bees compensated with making greater use of other plant groups. The overall greater levels of pollination services as a consequence of the Africanized honeybees may have augmented the native bees' primary pollen resource (as food) and thus prevented their decline (Roubik and Moreno Patiño. 2009; Roubik and Villanueva-Gutierrez. 2009).

In California, researchers found that behavioral interactions between wild and honey bees increase the pollination efficiency of honey bees on hybrid sunflower up to five-fold, effectively doubling honey bee pollination services on the average field. These indirect contributions caused by interspecific interactions between wild and honeybees were more than five times more important than the contributions wild bees make to sunflower pollination directly (Greenleaf and Kremen 2006).

7. Ecological Aspects: Climate change impacts on pollinators; temporal shifts in crop pollinators in the UK

For six UK bee species that are known to forage for pollen in a range of fruit crops including currants, researchers calculated how they may have altered the time that they begin to forage (from spring 1970 to 2007). Over this time, bees began to forage 10 days earlier per decade, such that the flowering of currants and one of its key visitors has diverged by a month since 1970 (Roberts et al. 2009).

III. ADAPTIVE MANAGEMENT

A. Compile information on best practices and lessons learned

FAO has assembled an initial survey of good pollination practices, profiling nine pollinator-dependent cropping systems from around the world. The profiles provide detailed information on the impacts of specific practices on pollination services and the research or traditional systems supporting these practices, their socio-economic aspects, environmental costs, benefits and replicability.
http://www.internationalpollinatorsinitiative.org/jsp/documents/documents.jsp

A five-year FAO coordinated UNEP/GEF/ global-sized project beginning in 2009 will explore and test, in multiple agro-ecosystems and ecologies in Latin America, Africa and Asia, the practices that will prevent the loss of pollination services provided by wild indigenous pollinators. Regional initiatives in other areas- including Europe, North America and Oceania - have similar objectives.
http://www.internationalpollinatorsinitiative.org/jsp/globalpollproject.jsp

IV. MAINSTREAMING

A. Develop response options to promote, and prevent the further loss of, pollination services that sustain human livelihoods

More work needs to be undertaken on understanding the effects of policies on pollinator populations in order to identify areas to target policy-related efforts. It has been recognized that most solutions designed to make modern agriculture more biodiversity-friendly will need to be developed within a supportive policy framework.

To this effect, work has been undertaken to apply the Driving forces–Pressures–State–Impact–Responses (DPSIR) framework to identify the issues of pollinator loss. The linkages between the significant pressures on insect pollinators and their underlying socio-economic driving forces and responses in Estonia were explored in a study. Based on written evidence and expert judgment, land use practices and the use of agrochemicals were regarded as the most significant pressures on different functional groups of pollinators. As demonstrated in the study, agricultural and rural development policy has been the key driving force of these pressures (Kuldna 2009).

A study in Mexico noted that assuring free pollination services is particularly important in that country as the livelihood of a large proportion of the population exclusively and directly depends on ecosystem services for subsistence. Feasible conservation strategies involve the payment of environmental services to Ejidos (communal land tenure systems) making efforts to protect or restore plant resources and native pollinators, and the creation of new protected natural areas which ensures food provision, mating and nesting sites for pollinators (Ashworth et al. 2009).

REFERENCES

Aizen, M.A., L.A. Garibaldi, S.A. Cunningham and A.M. Klein. 2009. Long-Term Global Trends in Crop Yield and Production Reveal No Current Pollination Shortage but Increasing Pollinator Dependency. Curr Biol 2008; 18:1-4.

Aizen, M.A. and L.D. Harder. 2009. The global stock of domesticated honey bees is growing slower than agricultural demand for pollination. Curr. Biol. v. 19, p. 915-918.

Ashworth, L., M. Quesada, A. Casas, R. Aguilar and K. Oyama. 2009. Pollinator-dependent food production in Mexico. Biological Conservation 142(5): 1050-1057.

Batley, M., K. Hogendoorn. 2009. Diversity and conservation status of native Australian bees. Apidologie 40 (2009) 347–354.

Brown, M. J.F. and R. J. Paxton. 2009. The conservation of bees: a global perspective. Apidologie 40 (2009) 410–416

Byrne, A. and Ú. Fitzpatrick. 2009. Bee conservation policy at the global, regional and national levels. Apidologie 40 (2009) 194–210.

Eardley, C.D., M. Gikungu, M. P. Schwarz. 2009. Bee conservation in Sub-Saharan Africa and Madagascar: diversity, status and threats. Apidologie 40 (2009) 355–366 .

Freitas, B.M., V. L. Imperatriz-Fonseca, L. M. Medina, A.de Matos Peixoto Kleinert, L. Galetto4, G. Nates-Parra,, J. Javier, G. Quezada-Euan. 2009. Diversity, threats and conservation of native bees in the Neotropics Apidologie 40 (2009) 332–346.

Garibaldi, L.A. , M.A. Aizen, S.A. Cunningham and A.M. Klein. 2009. Pollinator shortage and global crop yield: Looking at the whole spectrum of pollinator dependency. Communicative and Integrative Biology 2:1, 37-39.

Greenleaf, S.S. and C. Kremen. 2006. Wild bees enhance honey bees' pollination of hybrid sunflower. PNAS September 12, 2006 vol. 103(37): 13890-13895.

Kuldna, P., K. Peterson , H. Poltimäe and J. Luig. 2009. An application of DPSIR framework to identify issues of pollinator loss Ecological Economics Volume 69, Issue 1, 15 November 2009, Pages 32-42.

Moure, J. S., D. Urban and G. A. R. Melo (Orgs.). 2007. Catalogue of Bees (Hymenoptera, Apoidea) in the Neotropical Region. 1058 pp. Curitiba: Sociedade Brasileira de Entomologia.

Murray, T.E., M. Kuhlmann and S. G. Potts. 2009. Conservation ecology of bees: populations, species and communities. Apidologie 40 (2009) 211–236.

Neumann, P. 2010. (pers. communication)

Oldroyd, B.P. and P. Nanork. 2009. Conservation of Asian honey bees. Apidologie 40 (2009) 296–312

Roberts, S. Potts, S.G., Kuhlmann, M., Biejsmeijer, K., Kunin, B., Ohlemuller, R. 2009. Impact of climate change on European pollinators. Presentation at Apimondia 2009, Montpellier, France.

Roubik, D.W. and J. E. Moreno Patiño. 2009. Trigona corvina : An Ecological Study Based on Unusual Nest
Structure and Pollen Analysis Psyche. Volume 2009, Article ID 268756, 7 pages.

Roubik, D.W. and R.Villanueva-Gutierrez. 2009. Invasive Africanized honey bee impact on native solitary bees: a pollen resource and trap nest analysis Biological Journal of the Linnean Society 9: 152–160.

Williams, P.H. and J. L. Osborne. 2009. Bumblebee vulnerability and conservation world-wide. Apidologie 40 (2009) 367–387.

Zayed, A. 2009. Bee genetics and conservation. Apidologie 40 (2009) 237–262.