Policy Action Brief
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Policies to Protect Pollinators:
Actions Needed to Avert a Global Crisis in Agriculture

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Overview

Pollinators play a critical role in agriculture and food security and for the broader functioning of ecosystems. Pollination enables the natural fertilization and reproduction of flowering plants. Seventy-five percent of the world's leading food crops, from cacao to pumpkins, are partially reliant on animal pollinators for fruit and seed production. One-third of all crop production depends on animal pollinators. The overall value of pollination services globally was estimated at $173 billion per year in 2009, and the acreage of crops requiring pollination is increasing.

However, pollinator populations have seriously declined in recent years in many areas of the world leading to serious concerns and a significant economic threat to farmers and related businesses. In response to this threat, governments and organizations have created policies and programs aimed to conserve and protect pollinators. While these efforts are a first step, they need greater political support to truly reverse the conditions threatening pollinators and by extension, our agricultural system.

This brief outlines key recommendations of policies that are needed to protect and enhance pollinators:

1. **Support Pollinator-friendly Pesticide Policies**
2. **Conserve Pollinator Habitats**
3. **Value Ecosystem Services**
4. **Ensure Participation and Empowerment of Diverse Stakeholders**
5. **Support Collaborative Research and Outreach**

Final overarching recommendations are to incorporate pollinator protection into existing agricultural policies and address the root causes of pollinator decline.

Why Do Pollinators Matter?

Bees are thought to be the most important pollinators in most environments, including agriculture. Honey bees are the main pollinators managed today for farming; yet native bees and other wild pollinators are now known to be as important, if not more so, in agriculture. (See

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Figure A: Contribution of Wild Insects and Honey Bees to Fruit Set, from a Global Analysis

Relative visitation by wild insects and honey bees to flowers of 41 crop systems on six continents. Scientists found that that wild pollinators were more prevalent at crop flowers than previously thought and that crop pollination responded more to wild pollinator abundance than honey bee abundance.

Source: Garibaldi et al. 2013. Reprinted with permission.

Figure A) Other animals, including birds, bats, flies, butterflies, moths, and beetles, also provide pollination.

Species of both managed and native bee pollinators have recently experienced declines. For example, honey bees have experienced accelerated rates of annual colony losses across the Global North in recent years, from an average of thirty percent in the United States to as high as eighty-five percent in the Middle East. An estimated 24% of bumble bees in Europe face extinction, and one-third of all bumble bee species in North America face threats.

Pollinator declines can result in pollination deficits, which typically manifest as reduced crop yields and/or malformed fruits and vegetables. These declines have profound adverse impacts on farming operations that depend on pollinators for their crop productivity. Further losses to pollination would have serious and substantial economic impacts.

The proximate causes of pollinator declines that have been identified by scientists include:

- Habitat destruction
- Pesticides
- Diseases and parasites
- Invasive species
- Climate change and related impacts

Some researchers suggest that these individual drivers combine to produce negative synergistic effects. Others acknowledge that deeper root causes behind these trends include: the predominance of

Wild vs. Managed Pollinators: A distinction must be made between wild and managed pollinators. Both wild and managed pollinators provide pollination services for crops. Globally, honey bees (*Apis mellifera*) are the predominant pollinators managed for agriculture. Honey bees have the capacity to increase yield in the majority of animal-pollinated crops. However, native bees and other wild pollinators contribute substantially to agricultural production, and recent work (Figure A) has shown that these contributions frequently equal or exceed those of managed honey bees. More research is needed to quantify the economic contributions of wild pollinators.

Agrobiodiversity: Agricultural biodiversity (or agrobiodiversity) refers to diversity of life within farming systems, ranging from soil microorganisms to the diverse genetic resources, crops, insects and other species that are needed for production, as well as diversity in surrounding landscapes/ecosystems that influence agriculture. Numerous species of pollinators illustrate the importance of agricultural biodiversity.

monocultural chemical-intensive agriculture systems, policies and incentives that support this kind of agriculture, and the lack of integration of biodiversity and ecosystem services into agricultural development.

The urgency of this problem globally requires serious action by policymakers. Because there is not one single explanation, multiple policy approaches in a variety of sectors must be adopted to mitigate the declines.

Recommended Policy Strategies

The following five policy areas are recommended for pollinator conservation and protection, based on an analysis of trends, case studies and policies.

1. Enact Pollinator-Friendly Pesticide Policies

Some pesticides (including insecticides, herbicides and fungicides) have negative impacts on pollinators either directly or indirectly. Certain herbicides indirectly impact pollinators through the elimination of plants used for foraging and nesting materials. Some fungicides may produce indirect and/or sub-lethal effects on honey bees. One class of insecticides, neonicotinoids, is increasingly implicated in pollinator declines and bee kills. Regulatory approaches to pesticide mitigation include:

- Pesticide Restrictions or Bans: Some governments have instituted temporary or permanent bans of certain classes of pesticides, primarily those in the neonicotinoid family, due to their impact on pollinators. Another approach is to restrict pesticide use by creating a permitting process that limits pesticide applications. Examples of neonicotinoid restrictions can be found in the European Union, Eugene, Oregon (US), Prince Edward County, Ontario (Canada) and Yucatán (Mexico).
- Pesticide Labeling: Labels should contain information about toxicity to bees and other pollinators and risk mitigation suggestions. Native pollinator toxicity should be included on labels. Restrictions and labelling laws are more effective when combined with education and training programs about practices that eliminate or reduce pesticide use, such as Integrated Pest Management. Education and training about appropriate pesticide application practices can also help reduce risks for people and pollinators. Examples of successful education programs have been documented in Nepal and other parts of Asia.

ACTION SUMMARY 1: Pesticide Policies

- ✓ Heavily restrict or ban pesticides known to be toxic to pollinators
- ✓ Require pesticide labels to include information about impact to pollinators
- ✓ Incorporate pollinator impact into pesticide permitting or licensing processes
- ✓ Ensure applicators have access to training for pesticide application
- ✓ Combine laws with programs on integrated pest management (IPM)

2: Conserve & Enhance Pollinator Habitats

Conserving existing habitats and rehabilitating new habitats are important steps to preserve pollinators and provide pollination services to crops. This can be done through several policy mechanisms, including:

- Incentives for habitat enhancement
- Mandatory conservation set-asides.

Where known pollinator population declines have occurred, invoking endangered species laws may be used to promote habitat conservation. Habitat planting may be done on farmers' land, or on public lands, such as parks, roadsides and rights-of-way.

Examples of programs and policies to conserve habitat include: the Environmental Quality Incentives Program (EQIP) of the Natural Resource Conservation Service (US Department of Agriculture) and the Urban Pollination Project in the United Kingdom.

ACTION SUMMARY 2: Conservation and Enhancement of Pollinator Habitats

- √ Promote pollinator habitat conservation through financial or other incentives for beneficial on-farm activities, penalties for harmful activities, and/or mandatory habitat set-asides
- √ Ensure pollinators are included in agricultural advice tailored for farmers and other audiences
- √ Utilize protected species laws to protect pollinators as appropriate
- √ Utilize pollinator-friendly plants in public areas, coordinating with the appropriate local entities

3. Develop Incentives & Payments for Ecosystem Services from Pollinators

Farmers that grow pollinator-dependent crops have a built-in incentive to manage for native pollinators. Successful projects that have encouraged habitat management based on pollination benefits include: Farming with Alternative Pollinators in Uzbekistan, and the Integrated Crop Pollination Project in the U.S. through the USDA Specialty Crops Research Initiative.

In recent years, government agencies and other organizations have attempted to assign economic value to the benefits provided by ecosystem services like pollination. One approach receiving attention is Payments for Ecosystem Services (PES) schemes. A PES scheme is an arrangement where "the beneficiaries, or users, of ecosystem services provide payments to the stewards, or providers, of ecosystem services."

Several PES programs that promote broader sustainable agriculture efforts may also produce beneficial effects for pollinators. They include programs for reducing pesticide use and supporting organic practices, crop rotation, diversified farming and integrated pest management.

ACTION SUMMARY 3: Develop Incentives and Payments for Ecosystem Services

- √ Provide outreach and education to farmers and landowners emphasizing how habitat management for pollinators can improve crop yields
- √ Incentivize conservation and sustainable agricultural practices by payments for ecosystem services or by cost-share arrangements
- √ If PES schemes already exist, consider modifying practices to benefit to pollinators

4. Ensure Participation & Empowerment of Diverse Stakeholders, Including Rural and Indigenous People

Public outreach, raising awareness and tapping local knowledge are key elements to reversing the pollinator crisis. In many areas of the world, rural and indigenous people have important knowledge related to pollinators and farming practices that conserve biodiversity. Yet there are rarely means of documenting and sharing that information with scientists and policymakers. It is important to include local indigenous groups who understand and manage pollinators in discussions of policies that influence pollination. Examples of efforts to involve indigenous and rural groups in pollinator policies are:

- Indigenous Pollinators Network for Agro-biodiversity and Food Sovereignty, mainly focused on Africa
- Women's Beekeeping Group in Kenya, a program of the Kenyan Ministry of Agriculture, Livestock and Fisheries in partnership with World Neighbors

Regulated labeling programs like the "Bee Friendly" Consumer Product Certification (active in the U.S. and Canada) can also raise awareness of farmers who use bee-friendly farming practices.

ACTION SUMMARY 4: Building Diverse Research Partnerships

- √ Ensure that existing networks and organizations working on pollinator protection include representatives from rural and indigenous groups
- √ Identify individuals and groups with a stake in pollination; include indigenous groups, women, and urban citizens in policy advocacy efforts
- √ Utilize technology to empower local citizens to contribute to pollination management

5. Support Collaborative Research and Training

Much basic information is missing about how to maintain our pollinator populations, despite increased research in the past decades. Important topics that need more work include:

- Causes of pollinator decline and most effective strategies to prevent or slow the causes
- Documenting habitat requirements for pollinators
- Understanding the synergies and tradeoffs between management for pollination and other farming practices
- Biologically-based organic pest control methods
- Monitoring of pollinator populations in response to habitat management

Additionally, scientists and citizens need additional training on identification and pollinator protection. For example, the Pollinator Partnership (US) publishes "Planting Guides" by region to encourage citizens to plant pollinator habitats.

ACTION SUMMARY 5: Support Collaborative Research

- √ Invest in research and create a clearinghouse of information on pollinators
- √ Train scientists and citizen scientists on identification and pollinator protection
- √ Increase research funding for wild pollinators and the assessing the economic value of pollination services

Conclusion: Incorporate Pollinator Protection into Existing Policies and Address Causes of Decline

Policy efforts aimed to increase the sustainability of agricultural practices may indirectly benefit pollinators. For example, many governments are involved in efforts to increase adoption of organic farming. Some organic farming practices confer benefits to pollinators, by reducing use of pesticides and enhancing floral diversity, particularly when broadly adopted in the landscape. However, some common organic practices, such as tillage for weed control, may harm some pollinators. Thus, pollinator protection measures must be integrated into the development of organic as well as conventional agriculture systems, programs and policies.

Pollinator protection can also be stimulated through demand-side channels such as food procurement policies. For example, the City of Malmo, Sweden adopted a policy requiring that all food that is served or ordered by the city should be climate-friendly, organic, and ethically certified (where appropriate) by 2020. Emphasizing sustainability in food purchasing can be an indirect way to support ecological farming practices that benefit pollinators and other ecosystem services.

The protection and enhancement of pollinators should be part of broader efforts to "mainstream" ecosystem services in planning and policy-making that affect

agriculture and natural resources. There are on-going efforts at the international and national levels to incorporate conservation of biodiversity and ecosystem services in international sustainable development strategies, including the Convention on Biological Diversity. By mainstreaming pollination and other ecosystem services into public policy, governments can act now to help stem future pollination declines that could significantly threaten agriculture and the economy, human nutrition and biodiversity.

Finally, it is important to develop new policies and actions that address the root causes of the pollinator decline, and that counteract the dependence on chemical-intensive monocultural agriculture systems.

Further Information

This Policy Action Brief is derived from a report titled "Policy Mainstreaming of Biodiversity and Ecosystem Services with a Focus on Pollination" (December 2015) by Terra Rose, Claire Kremen, and Lori Ann Thrupp of the Berkeley Food Institute, in collaboration with Barbara Herren, Benjamin Graub, and Nadine Azzu of the Food and Agriculture Organization of the United Nations. That work has received support from the Norwegian Environment Agency, the Global Environment Facility (GEF), and the United Nations Environment Programme (UNEP). Full text, including complete citations,is available on the Berkeley Food Institute website: http://food.berkeley.edu/policy-program/

References

Aizen, M. A., Garibaldi, L.A., Cunningham, S.A. & Klein, A.M. 2009. How much does agriculture depend on pollinators? Lessons from long-term trends in crop production. *Ann Bot.* 103(9): 1579-1588.

Gallai, N., Salles, J., Settele, J. & Vaissiere, B.E. 2009. Economic valuation of the vulnerability of world agriculture confronted with pollinator decline. *Ecological Economics.* 68(3): 810-821.

Garibaldi, L. A., I. Steffan-Dewenter, R. Winfree, M. A. Aizen, R. Bommarco, S. A. Cunningham, C. Kremen, L. G. Carvalheiro, L. D. Harder, O. Afik, I. Bartomeus, F. Benjamin, V. Boreux, D. Cariveau, N. P. Chacoff, J. H. Dudenhöffer, B. M. Freitas, J. Ghazoul, S. Greenleaf, J. Hipólito, A. Holzschuh, B. Howlett, R. Isaacs, S. K. Javorek, C. M. Kennedy, K. M. Krewenka, S. Krishnan, Y. Mandelik, M. M. Mayfield, I. Motzke, T. Munyuli, B. A. Nault, M. Otieno, J. Petersen, G. Pisanty, S. G. Potts, R. Rader, T. H. Ricketts, M. Rundlöf, C. L. Seymour, C. Schüepp, H. Szentgyörgyi, H. Taki, T. Tscharntke, C. H. Vergara, B. F. Viana, T. C. Wanger, C. Westphal, N. Williams, and A. M. Klein. 2013. Wild pollinators enhance fruit set of crops regardless of honey bee abundance. *Science*. 339:1608–11.

Klein, A. M., B. Vaissière, J. H. Cane, I. Steffan-Dewenter, S. A. Cunningham, C. Kremen, and T. Tscharntke. 2007. Importance of crop pollinators in changing landscapes for world crops. Proceedings of the Royal Society of London Series B-Biological Sciences. 274:303-313.

Potts, S. G., J. C. Biesmeijer, C. Kremen, P. Neumann, O. Schweiger, and W. E. Kunin. 2010. Global pollinator declines: trends, impacts and drivers. *Trends in Ecology and Evolution*. 24:345-353.

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