Policy brief

Pesticides, pollination and native bees

Experiences from Brazil, Kenya and the Netherlands

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Image: *Xylocopa* sp. on green bean

Pollinators contribute greatly to food security. Effective pollination results in increased crop production, commodity quality and greater seed production. Many fruits, vegetables, edible oil crops, stimulant crops and nuts are highly dependent on bee pollination. Even where honey bees or bumble bees are used to pollinate high value crops, concurrence of native bees, both social and solitary species, increases yield and quality of those crops.

A serious threat to this essential pollination service is the increasing evidence of a global decline in insect pollinators, both native and managed. Various causes for this decline have been identified, including loss, destruction and degradation of habitats; reduced genetic diversity of nectar plants; pests and pathogens; competition by introduced pollinators; climate change; and pesticide use – all individually or in concert, potentially causing direct and indirect adverse effects on pollinator populations.

Pesticides pose a considerable, and growing, risk due to their increased use in agricultural systems. In appreciation of this, experts from Brazil, Kenya, and the Netherlands, in close collaboration with the Food and Agriculture Organization of the United Nations (FAO), joined forces to address pesticide risks to native pollinators. Several focal crops were studied, with the aim of developing practical strategies that regulators, farmers and farmer organizations, and bee keepers can use to assess and reduce risks of pesticides to native and managed bees.

Key messages

- Native bees contribute greatly to pollination and hence to food security;
- Many pesticides have adverse effects on bees. Since native bees are not managed, little is known about their rate of decline. Native bees, with a different and often less resilient life history than the large social colonies of honey bees, may be more adversely impacted;
- Risk assessment of pesticides is based on toxicity tests with honey bees, but it is not clear whether native bees have the same susceptibility to pesticides. Behaviour and biology of native bee species is extremely diverse, and little studied. There is scarce information on their response to pesticides exposure;
- Awareness amongst farmers on the importance of native bees to crop yield is extremely limited;
- Better knowledge management and mitigation of the risks of pesticides to pollinators will protect native bees, enhance pollination and ultimately ensure endurable food security in both developing and developed regions.

The project *Knowledge Management of Pesticide Risks to Wild Pollinators for Sustainable Production of High-Value Crops in Brazil and Kenya* was funded by the Netherlands Ministry of Economic Affairs, Agriculture & Innovation.
The project is a partnership between **Brazil** (Universidade Federal de São Carlos (Araras/SP), Embrapa Semiárido (Petrolina/PE), Universidade Federal do Ceará (Fortaleza/CE) and Universidade Estadual Paulista (Rio Claro/SP)), **Kenya** (Kenya Agricultural Research Institute, Pest Control Products Board, National Museums of Kenya, Nature Kenya and Turkana Basin Institute), **the Netherlands** (Wageningen University & Research Centre and the Board for the Authorization of Plant Protection Products and Biocides) and the GEF/UNEP/FAO Global Pollination Project coordinated by **FAO.**

Activities included: (1) Pesticide toxicity tests on native bee species and honey bees in all three countries; (2) Development of a methodology for pesticide risk profiling; (3) Raising awareness amongst farmers, beekeepers and policymakers on the risk of pesticides to (native) bee pollinators.

Key Findings of the project

Toxicity tests: Preliminary results using two insecticides (deltamethrin and dimethoate) show that the honey bee was not the most sensitive species tested. The difference with the most sensitive one was a factor of 15 and 2.5 for deltamethrin and dimethoate, respectively. However, further tests are necessary to confirm this.

Farmers receiving training on recognition of pollinators

Brazil: This country is one of the highest users of pesticides per unit of cultivated land, globally. In the focal crops (tomato and melon), farmers use a wide range of insecticides, often applied as mixtures. Only beekeepers are keen on the effects of pesticides to their colonies, however mortality due to pesticides is rarely reported to the relevant authorities. Awareness programmes amongst farmers, who lack information on economic effects of pesticides use to native bees, have been initiated but close collaboration with pesticide regulators is essential. This should result in a review of the registered pesticides and the provision of necessary guidance information on pesticide labels. A central point for reporting honey bee mortality due to pesticide spraying has been established.

Kenya: Farm surveys of tomato, coffee, French beans and cucurbits (watermelons and squash) revealed that farmers do not distinguish between bees and insect pests. Some native bees, e.g. carpenter bees, are considered more as roof timber pests and a cause of flower abortion. Farmers recognize the role of honey bees only in honey production but not in pollination. Agrochemical stores are the main source of information for farmers on pesticide choice. Most farmers apply insecticides after scouting for pest infestation, but spraying against diseases is mainly calendar-based. Farmers keenly read and use information provided on pesticide labels, but these should be improved to include guidance on risks to key pollinators in addition to the current information about risks to honey bees alone. More information is needed on the extent of exposure of native bees to pesticides, e.g. when exactly do bees forage.

Netherlands: Tomato and apple were studied as focal crops. Tomato is produced under cover and managed bumble bee colonies are introduced for pollination. These are usually protected during periods of pesticide spraying. Apple orchards are pollinated by honey bees and bumble bees, but the red mason and other native bees also contribute to pollination. The general advice given on the label to protect bees will, to some extent, also protect native bees but does not take into account their different biology, such as nesting and foraging behaviour.

Awareness raising about the negative effects that certain pesticides can have on bees has in recent years increased. The importance of native bees is not generally recognised.

Risk profiles: In the absence of a consensus on quantitative risk assessment procedures for native bees, or honey bees in (sub-) tropical cropping systems, risk profiles – i.e. structured assessments of potential risks of pesticides to bees in a given crop situation – were compiled. Overall, the likelihood of bee exposure to pesticides used in the studied crops can be considered high. The only exception is coffee in Kenya, where pesticides tend not to be applied in the period when bees are foraging.

Policy options

The following measures may be taken to protect native bees from pesticide effects.

- Review existing national policies, or create new policies where they do not exist, to protect native bees in agricultural systems. These may include measures to conserve at least 10% of farmland in set-asides (hedges or undisturbed areas) as refuges,

Tomato farmers discussing problems with pollination in greenhouses

or requirements to apply integrated pest management in pollinator-dependent crops.
- Create awareness amongst farmers, through extension services, that pollination is an essential input of production, and use pesticide risk profile information to inform farmers on possible risk mitigation measures.
- Research, develop and deliver bee-friendly low-cost farm practices and native bee management plans that can protect or enhance native bee populations, reduce crop pests and increase crop yields.
- Conduct locally relevant risk assessments when registering a pesticide, and review pesticide label information to include guidance on how to use the product while protecting native bees.
- Establish bee mortality monitoring systems to ensure fast response to bee problems.

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