



## Protecting the pollinators

**Farmers have long considered pollination as one of nature's many "free services". But all that is now changing...**

In the early 1960s, a multinational food company started plantations of West African oil palms in Malaysia, hoping to fill a growing global market for palm oil. The plants thrived, but had one serious problem: they produced little fruit because pollen from the palm's male flowers often failed to reach its female flowers.

While plantation management reverted to laborious and costly pollination by hand, researchers discovered that in the oil palm's native Cameroon the plant's male flowers host a weevil, *Elaeidobius kamerunicus*, that feeds on the flowers' pollen. When the female flowers are ready for fecundation, they release a scent that attracts the tiny beetle - and its thick cloak of male DNA. After careful screening and quarantine, the weevil was introduced to Malaysia's oil palm plantations in 1981. Result: the cost of pollination fell to virtually zero and fruit production rose from 13 million tonnes to 23 million within five years.

*Elaeidobius kamerunicus* is just one of an estimated 100,000 species of insects, birds and mammals that mediate the sexual reproduction of most of the world's flowering plants - including more than two-thirds of food plants - through pollination. Until very recently, most farmers considered pollination as one of nature's many "free services", so taken for granted that it has rarely figured as an "agricultural input" or even as a subject in agricultural science courses.

But that is changing. Today, mounting evidence indicates that pollinator populations are declining worldwide. In Europe and North America, the number of honeybee colonies has plummeted and most wild bee colonies have been lost. Many European butterflies are under serious threat owing to changing land-use and agriculture intensification. Among mammalian and bird pollinators globally, at least 45 species of bats, 36 species of non-flying mammals, 26 species of hummingbirds, seven species of sunbirds and 70 species of passerine birds are considered threatened or extinct.

Responding to what some scientists fear is a



looming "pollination crisis", the United Nations Convention on Biological Diversity established in 2002 an International Initiative for the Conservation and Sustainable Use of Pollinators within its work programme on agricultural biodiversity. As coordinator of that initiative, FAO is now preparing a UNEP/GEF project aimed at filling very large gaps in the knowledge base on pollination services, and pioneering good agricultural practices for pollinator conservation in a wide range of ecological zones and farming systems.

Linda Collette, an FAO crop biodiversity specialist, points out that - with the notable exception of Cameroon's celebrated oil palm weevil - the world's pollinators are still largely underappreciated: "Because insects are so inconspicuous, or perhaps because the system worked fine without much intervention in the past, the level of general public awareness, or even specialized awareness among farmers and agronomists, remains quite low. The fact is that ecosystem services provided by pollinators are essential for food production and contribute to the sustainable livelihoods of many farmers world-wide."

**Wild bees.** While not all flowering plants depend on animals for pollination - cereals, for example, are wind-pollinated - most of the

world's orchard, horticultural and forage crops can only produce seeds and fruit if animals move pollen from the flower's male anthers to the female stigma of the same or another flower.

FAO estimates that of the slightly more than 100 crop species that provide 90 percent of food supplies for 146 countries, 71 are bee-pollinated (mainly by wild bees), and several others are pollinated by thrips, wasps, flies, beetles, moths and other insects. It has been estimated that at least 20 genera of animals other than honeybees provide pollination services to the world's most important crops.

Poor pollination leads to poor fruit development. In watermelon, more frequent visits by pollinators ensure fruit that is darker in colour and richer in flavour, while out-crossing pollen carried by long-distance bees may have a measurable impact on the quality of coffee. The chrysanthemum flower produces a more potent pyrethrum insecticide after flower heads have been visited by insects.

Exposure to pollinators may also be a way of maintaining genetic diversity in crops. Studies on bottle-gourd in Kenya have shown a varied pollinator community helps maintain the extraordinarily diverse forms of gourds, while in Mexico scientists hope to boost disease resistance in agave - the basic ingredient in tequila - using two endangered species of bats that pollinate wild forms of the plant.

While pollination is not a factor in production of leafy vegetables and root crops, they are important for seed production. Estimates of seed yield increases due to optimum pollination range from 100 percent for radish and cabbage to more than 350 percent for onion.

**Monetary value.** How much human food production depends on animal pollination services is difficult to quantify. But by one estimate, the annual monetary value of

pollination services in global agriculture could be as high as \$200 billion. Recent research in coffee ecosystems in Costa Rica have shown that pollination by wild bees living in adjacent forest patches contribute to 20% greater yields.

Assessment of the impacts of pollination disruptions on plant reproduction is largely unexplored. But, says Collette, the evidence suggests that under natural conditions, pollinator scarcity is a greater limiting factor on successful reproduction than weather, soil fertility or disease.

The knowledge base needed for pollinator conservation is patchy. Scientists lack information on plants' pollination needs, on essential pollinators and on trends in pollinator populations. Pollinators have their own resource needs - for nesting, feeding and reproduction, they require particular vegetation and habitat conditions. Thus, the application of "pollinator-friendly" land-use management practices can help to ensure their survival. But there is virtually no knowledge base about the specific needs of wild pollinators, particularly in developing countries.

The project now in preparation will seek to fill many of those gaps through activities in seven developing countries across the globe. A major objective will be to identify, test and document good agricultural practices for pollinator conservation and management, through an "ecosystem approach". For example, farmers might be encouraged to protect "corridors" that connect natural habitats, or uncultivated areas within and around cultivated ones.

The project also underlines the importance of linkages between conservation of ecosystem functions, sustainable production systems, and poverty reduction. "What we hope to produce is a set of tools, methodologies, strategies and best management practices which can be applied to pollinator conservation efforts worldwide," said Linda Collette. "That, in turn, will contribute to realizing a broader objective: improving the food security, nutrition and livelihoods of rural communities."