

Linking insects to forest conservation through honey and silk

Key fact

Mwingi, in eastern Kenya, is an arid area, but for over 2,000 local people it is also a land of silk and honey. To stimulate forest communities to undertake management of forest buffer zones and reduce poverty, the insect research institute, *icipe*, introduced alternative sources of income generation through the development of silkworm and honeybee technologies in Mwingi District, in Kenya.

Summary

Improving forest resource management and conserving biodiversity requires a strategic mix of law enforcement and community participation. Members of the Mwingi honey and silk marketplaces farm silk worms, practise beekeeping and are responsible for managing and conserving the acacia forest. With more bees and enhanced pollination, agricultural production has also improved.

At the same time, the causes of ecosystem degradation have been addressed through vital information provided by the project, which has influenced policies that link integrated biodiversity conservation with economic development. New forest and environmental policies and legislation in Kenya now promote local community conservation of natural forest cover through participatory management processes.



Training on honey bee queen rearing
© *icipe*

Facts & figures

- This intervention led to an increase in the volume of premium honey produced. In 2002, 2.5 tonnes was produced by 100 individual beekeepers and sold for US\$0.58 per kg. In 2011, production rose to 17.3 tonnes of uncertified honey (produced by 16 organised groups and sold for US\$1.80 per kg) and 54 tonnes of certified organic honey (sold for US\$2.50 per kg and produced by 38 organised groups).
- Due to the importance of bees in the process of pollination and for the health of agricultural crops, farmers who kept hives in the vicinity of their farmlands saw an increase in productivity of 10-18%. Overall, household income in pilot areas increased by 15%.
- Between 2007 and 2011, over half a tonne of silk cocoons were produced by 300 silk farmers (50% women). The cocoons were transformed into over 1,000 metres of African silk cloth blended with mulberry silk, worth US\$15 per meter, compared to US\$7 for unblended silk.
- The number of beekeeping groups within Mwingi District rose from 0 in 1996 to 54 in 2011, comprising 1,890 individual beekeepers. Over 100 beekeepers have been trained to assist in extension work and training of other beekeepers in improved honey production technologies.
- In 2009, the Mwingi honey marketplace won a top International Award at the Trade Fair, Biofach, in Germany in 2009 and 1,350 beekeepers (40% women) achieved organic certification status.

European funding

icipe's Mwingi programme was funded by a grant from the International Fund for Agricultural Development (IFAD) (70 per cent) and *icipe's* core resources (30 per cent). *icipe* receives unrestricted support from Denmark, France, the Netherlands, Sweden, Switzerland and the UK's Department for International Development (DFID). The programme received additional support from the Dutch Ministry of Foreign Affairs, specifically for capacity building.

IFAD and the European Commission (EC) are strategic partners in supporting the international agricultural research system. The EC's support for the CGIAR is channelled through and managed by IFAD together with its own grant resources. IFAD receives significant funding from several European countries to support its programme of loans and grants, currently at the level of US\$1 billion annually.

Project milestones

- 1996: Feasibility studies to introduce silkmoth rearing and modern honey beekeeping with Langstroth hives in Mwingi District.
- 1998: Queen breeding with African honeybees using Langstroth hives successfully undertaken.
- 2000: Research on natural enemy control in wild silkmoth populations.
- 2002: Construction of a honey marketplace in Mwingi town is completed.
- 2002: Training to produce underexploited beehive products (candles, propolis and royal jelly).
- 2005: Semiochemicals from acacia plant volatiles are identified.
- 2006: Construction of a silk marketplace is completed. Training on reeling, spinning and hand loom use conducted.
- 2006: Mwingi silk and honey marketplaces are handed over to the community with involvement of the local government.
- 2008: Successful domestication of stingless bees is carried out for the first time in East Africa.
- 2009: Mwingi honey is organically certified and recertified in 2012 to receive 20 per cent additional premium on packed honey for the community.
- 2009: The Mwingi honey marketplace wins a top international award for its organic honey.

Costs and benefits

- The Mwingi programme cost US\$395,000 to implement and reach current production levels. The most significant expenditures were bee hives (2,680 x US\$45 = US\$120,600), honey and silk marketplace construction, processing and packaging equipment (US\$163,000), training (US\$80,000), *icipe* staff cost and organic certification, including fees and marketing (US\$31,000).
- *icipe's* intervention led to an increase in the volume of premium honey produced. In 2002, 2.5 tonnes was produced by 100 individual beekeepers and sold for US\$0.58 per kg. In 2011, production rose to 17.3 tonnes of uncertified honey (produced by 16 organised groups and sold for US\$1.80 per kg) and 54 tonnes of certified organic honey (sold for US\$2.50 per kg and produced by 38 organised groups marketing certified honey at the farm gate price).

Linking insects to forest conservation through honey and silk

Thousands of people live within five kilometres of Kenya's forest boundaries, and benefit from a wide range of forest resources. But these forests are under increasing pressure from encroachment and deforestation for fuelwood. The resulting loss of forest cover and associated biodiversity has led to serious environmental deterioration, a marked decrease in food production and an increase in rural poverty.

Insects are one of the most critical natural resources of forest ecosystems, but general understanding of their activity and interaction with the wider biodiversity is poor. Besides serving as efficient pollinators and protecting crops, insects are good indicators of a healthy ecosystem.



To stimulate forest conservation, *icipe* introduced alternative sources of income generation

© R. Ramasomanana/IFAD

Improving forest resource management and conserving biodiversity requires a strategic mix of law enforcement and community participation. To stimulate forest communities to undertake management of forest buffer zones, restore the ecosystem and reduce poverty, the insect research institute, *icipe*, introduced alternative sources of income generation through the development of wild silkmoth (silkmoths that live in forests and belong to the families of *Saturniidae*, *Lasiocampidae*, and *Thaumetopoeidae*) and honeybee technologies in Mwingi District, Kenya.

“Initially I had 20 hives and a few traditional ones. Now I have more than 170 hives (yielding up to 1.3 tonnes of honey per year), and over 30 stingless bee hives. I also keep livestock and do crop farming for my livelihood. My children go to school with the support of the income derived from honey and livestock.”

**Kasanga Munyoki Kimwele, beekeeper,
Mwingi, Kenya**

From 2004 to 2008, with the support of UNDP-GEF, and finance from the International Fund for Agricultural Development (IFAD) and other key donors, *icipe* focused its activities on Village Forest Associations and used participatory forest management systems and methodologies to develop conservation approaches. Wild silkmoth

and honeybee technologies which protected forest resources were promoted. For example, local communities were taught about the importance of conserving the wild silkmoth host plants (*Acacia spp.*) and how they could use fine mosquito nets to protect the young silkmoth larvae from natural enemies.

Training in hive management, harvesting techniques and methods of handling honeycomb and silk cocoons enabled farmers to attain the necessary quality for market standards. Using modern Langstroth hives, for example, increased honey harvested by three-fold and enabled women to engage in beekeeping as they stand just two metres above the ground, instead of being placed high within trees. Farmers were also taught how to rear stingless bees and queens for colony multiplication, rear wild silkmoth in semi-captive conditions and



Training enabled farmers to produce high quality honey

© *icipe*

produce moth eggs in field cages, as well as how to unwind silk and make handlooms to produce silk cloth.

To ensure the economic success of the enterprise and maximise returns, the project developed and fully equipped two market centres in Mwingi for wild silk and honey processing, helping the community package and market their products. Linkages with private sector companies (Milba Enterprise, Kiko Romeo, Wild Living and Viking Ltd) were also established.



Many insects are efficient pollinators

© R. Ramasomanana/IFAD

In 1996 there were no organised groups of beekeepers, but by 2009 *icipe* had helped farmers to form 54 groups, each with 30-40 members. Among them, 300 members were also involved in wild silk. The groups also formed a district beekeeping group called the Mwingi District Beekeepers Self Help Group that strengthened the Mwingi honey marketplace by streamlining honey production and pricing, which has improved their livelihoods.

Further training in the management of an Internal Control System (ICS) for organic certification enabled 38 out of 54 producer groups to gain organic certification in 2009 and access premium international markets. The honey marketplace won a top International Award at the Trade Fair, Biofach, in Germany in 2009 after a blind tasting competition against honey from Ethiopia, Rwanda, Tanzania and Uganda.

Before the market centres were established, Mwingi beekeepers sold their honey for US\$0.58 per kilo to middlemen. As a consequence of *icipe*'s intervention, in 2005 beekeepers were directly marketing their honey for US\$1.33 per kilo. In 2008, farmers produced 24,500 kg of honey (fetching US\$32,500) and by 2011 the beekeepers produced 54 tonnes of honey, selling it for US\$2.5 per kilo (fetching US\$135,000). This compared well with uncertified honey, which was sold at US\$1.80.

Between 2007 and 2011, 300 silk farmers (55 per cent of whom were women) produced over half a tonne of wild silk cocoons; a high level of production. The cocoons fetched US\$4 per kilo (US\$2,000 in total). Using a processing unit at the silk marketplace, cocoons were transformed into over 1,000 metres of African wild silk cloth blended with mulberry silk (one metre of the blended silk cloth sells at US\$15 while unblended silk fetches US\$7), to yield superior quality silk, which was sold to local and international markets through private traders.

Having collaborated closely with key stakeholders, including the Government of Kenya and private sector companies, a sound knowledge base has been developed and a business culture has been instilled throughout the project. All project stakeholders have a sense of positive ownership over the information, skills and enterprise developed, which is important if production is to be scaled up, with support from the Government of Kenya.



By 2011, bee keepers were producing 54 tonnes of honey

© Robert Grossman/IFAD



Making beeswax candles at Mwingi honey marketplace
© icipe

Management Effectiveness Tracking (METT) and Threat Reduction Assessment (TRA) tools were used to monitor the management impact of this project, resulting in increased insect pollinators' biodiversity and increased forest cover. Biodiversity monitoring was carried out through surveys of stingless bees, honey bees, wild silkmths, one red-listed bird species and the threatened pancake tortoise in Mwingi's hilltop forests. The project benefited from a previously developed monitoring programme by Nature Kenya and implemented by the community-based Kakamega Environmental Education Programme (KEEP).

The project has helped raise the awareness of communities and national institutions to the ecological and economic importance of insects and their forest habitats. Forest-adjacent communities are now actively engaged in forest conservation. This was achieved through highlighting and demonstrating the direct links between commercial insect and forest conservation, for example, the value of wild nectar sources in the forests for enhanced honey production and improved income generation. This has reinforced positive attitudes to forest conservation within the local communities.

The importance of pollination for the productivity and health of agricultural crops was demonstrated through experimenting with various crops like tomatoes, cucumbers, green gram and beans. These were planted at varying distances from the beehives and increased seed set and fruit size was recorded, raising awareness of pollination among the communities. Farmers who kept their hives in the vicinity of their farmlands saw an increase in productivity of 10-18 per cent. Overall, household income in pilot areas increased by 15 per cent.

"The capacity of beekeepers has increased tremendously since 1998. The honey which we used to sell to the middlemen is now going straight to the marketplace and beekeepers are earning more than 200% profit for their honey based commodities. In addition, beekeepers learn about the use of wax, propolis, pollen and royal jelly. We have an association of 52 groups, each having 30-50 members with over 2,000 registered members trained in beekeeping, pollination awareness, queen rearing, marketing of honey and certification."

Peter Munyithya, Chairman Mwingi District Joint Self Help Group

Vital information provided by the project has influenced policies that link integrated biodiversity conservation with economic development. New forest and environmental policies and legislation in Kenya now promote local community conservation of natural forest cover through participatory management processes. The Protected Area (PA) system of forest management, for example, has been developed as part of Kenya's global and national commitment to biodiversity conservation, as expressed within Kenya's National Biodiversity Strategy and Action Plan. Improved methodologies and insect resources have also been made available, through training and capacity building, to allow efficient resource use for improved livelihoods and conservation practices elsewhere in Africa.

More information

icipe - www.icipe.org

References

Addis T., J.M. Onyari, S.K. Raina, J.M. Kabaru and F. Vollrath (2013) Mechanical and Thermal

Degradation Properties of Silk from African Wild Silkmoths. *Journal of Applied Polymer Sciences*, 127 (1), pp. 289-297.

Fening K.O., E.N. Kioko, S.K. Raina and J.M. Mueke (2008) Monitoring Wild Silkmoth, *Gonometa postica* Walker, Abundance, Host Plant Diversity and Distribution in Imba and Mumoni Woodlands in Mwingi, Kenya, *International Journal of Biodiversity Science and Management*, 4 (2), pp. 104-111.

Fening K.O., E.N. Kioko, S.K. Raina and J.M. Mueke (2009) Parasitoids of the African Wild Silkmoth, *Gonometa postica* (Lepidoptera: Lasiocampidae) in the Mwingi Forests, Kenya, *Journal of Applied Entomology*, 133 (6), pp. 411-415.

Macharia J., S.K. Raina and E. Muli (2007) Stingless Bees in Kenya, *Bees for Development Journal*, 83, pp. 9.

Raina S.K., (2004) *Commercial Insects: A Practical Guide for Raising and Utilizing Silkmoths and Honey Bees in Africa*. Cardiff, UK: IBRA Press.

Raina S.K., E.N. Kioko, I. Gordon and C. Nyandiga (2009) [Improving Forest Conservation and Community Livelihoods through Income Generation from Commercial Insects in Three Kenyan Forests](#). Nairobi, Kenya: icipe Science Press.

Raina S.K., E. Kioko, O. Zethner and S. Wren (2011) Forest Habitat Conservation in Africa Using Commercially Important Insects, *Annual Review of Entomology*, 56, pp. 465-485.

Shi W., S.K. Raina and I. Fries (2001) Colony Development and Queen Rearing in Kenyan Honey Bees (*Apis mellifera scutellata*), *Acta Universitatis Agriculturae Sueciae: Agraria*, 291 (3), pp. 1-10.

Contacts

Professor Suresh K. Raina

Environmental Health Division
icipe
PO Box 30772-00100
Nairobi
Kenya
Tel: +254 20 8632 060
Email: raina@icipe.org

Dr Everlyn Nguku

Environmental Health Division
icipe
PO Box 30772-00100
Nairobi
Kenya
Tel: +254 20 8632 062
Email: enguku@icipe.org

This case study has been produced by WRENmedia, funded by the Swiss Agency for Development and Cooperation (SDC) and implemented by the European Initiative on Agriculture Research for Development (EIARD). It is intended to share knowledge and promote more effective agricultural research for development (AR4D) policies and does not necessarily reflect the official position of EIARD or of individual EIARD members.



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

**Swiss Agency for Development
and Cooperation SDC**

