

# 11. Edible insects as an engine for improving livelihoods

For most people living in rural areas, especially the poor, forests and trees are important sources of food and cash income. Some 350 million of the world's poorest people – including 60 million indigenous peoples – depend on forests for their daily subsistence and long-term survival (FAO, 2012a). Insects are a major source of animal protein in many communities and are critical for diet diversification but, in most countries, eating insects is not a matter of survival but a question of personal choice. In fact, the vast majority of insect consumption is by choice, not necessity, and insects are a part of local culture. Nevertheless, insects do provide valuable buffers against seasonal shortages of food (Dufour, 1987). As well as acting as important food items, insects provide additional cash for basic expenditure, including on food, farming inputs and education (Agea *et al.*, 2008; Hope *et al.*, 2009).

Trade in edible insects is a major source of income in some places and what is collected is not always fully consumed directly by the collectors themselves. Insects offer important livelihood opportunities for many people in developing countries, including some of the poorest segments of society and particularly women and children. In a post-Rio+20 context, “greening” the economy with forestry – including edible insects – can help redress the social, economic and regional asymmetries and inequalities that still prevail in many parts of the world (FAO, 2012d). This chapter looks specifically at the potential of insects to improve local diets, contribute to strengthening access and tenure rights to local resources, and provide opportunities for improving the livelihoods of women. The economic contribution (sale and cash income) of insects is presented in Chapter 12.

## 11.1 INSECTS AS PART OF THE MINILIVESTOCK SECTOR

The livestock sector is important in providing income and livelihoods for people around the world and accounts for 40 percent of agriculture's total gross domestic product (Steinfeld *et al.*, 2006). However, despite the growing demand for animal products, livestock ranging beyond classical species such as pigs, goats and chickens are often not seen as significant. However, minilivestock (defined in Chapter 4), such as insects, can be important for economic diversification.

Insect cultivation can be carried out in urban, peri-urban and rural areas and is an efficient use of space (Oonincx and de Boer, 2012). Although some attempts have been made to domesticate certain insects, most species, such as tarantulas, can only be collected in the wild (C. Munke, personal communication, 2012). Minilivestock enterprises are advantageous because they (FAO, 2011b):

- require minimal space;
- do not compete directly with food for human consumption;
- have a demand which outstrips their supply;
- have high reproductive rates;
- create cash inflow in a short period;
- have high to very high financial returns in many cases;
- are nutritional and a part of human nutrition;
- convert feed to protein efficiently;
- are relatively easy to manage;
- are easily transportable;
- are often easy to raise and do not require in-depth training.

Insects, along with other minilivestock, support diversified markets because they can be sold to consumers across the rural–urban spectrum. In many cases, rural people will sell their minilivestock within their villages; however, due to their transportability, insects can easily be moved to urban markets by, for example, bus, truck or bicycle. Rearing insects can also be carried out as a complement to other livelihood strategies. Additionally, insect rearing can be done by both landowners and the landless (FAO, 2011b) because not much space is required.

For domestic insect production, insects are reared in a controlled setting (farming), and the assurance of consistent production can evenly distribute related annual earnings, an advantage over the seasonality of some insects. For many households, a consistent income flow promotes savings and the ability to pay periodic expenditures such as school fees (FAO, 2011b). However, the wild collection of insects should not be considered insignificant because it can also contribute to livelihood diversification. In some regions of Africa, for example, the consumption of insects has been estimated to fluctuate between 2 percent and 30 percent of total meat consumption in a year, depending on the availability of insects (FAO/WUR, 2012).

In many cases, rearing minilivestock is not resource intensive; thus, it can be practised by women, men, the elderly and even children. Insect rearing and collecting, in both captivity and the wild, generally requires only a small initial investment followed by small, incremental investments, which can reduce economic risk. Infrastructural investments can include nets, plastic sheets and containers (Hanboonsong, 2010). Therefore, insect rearing and harvesting can contribute positively to equal participation and involvement in economic growth, especially for marginalized groups such as the landless.

## 11.2 IMPROVING LOCAL DIETS

Most insects collected by rural people are destined for personal consumption; however, this depends significantly on location and species. Any excess is likely to be sold in local and regional markets. In Papua, Indonesia, for example, indigenous communities consume between 60 and 100 edible insect species to diversify their dietary needs. Surplus is sold in markets, such as the black palm weevil (*Rhynchophorus bilineatus*), which is collected from the sago palm (*Metroxylon sagu*). Palm weevils are the most commonly consumed insect species in the region (Box 11.1). The price of one bag containing 100–120 larvae fetches US\$2.11 in local markets, comparable in value with 20 chicken eggs and 3 kg of rice (Ramandey and Mastrigt, 2010). However, some insects are collected more for commercial sale than for household consumption. Moreover, there is a lot more commercial, albeit often informal, trading of insects than is generally acknowledged or documented.

Although edible insects are often consumed for their taste, they can also provide food in times of low supply. Nonetheless, it should be emphasized that the consumption of insects as a source of emergency food is not the most common reason for their consumption. A survey conducted in Kinshasa in 2003 reported that 70 percent of the city's population eats mopane caterpillars because of their nutritional value and taste. However, during periods when other protein sources may be more difficult to find, insects are an important part of the diet. In the Central African Republic, 95 percent of forest people are dependent on eating insects for their protein intake (FAO, 2004). Insects are sometimes the only source of essential proteins (amino acids), fats, vitamins and minerals for forest people.

In many parts of the world, consumption is seasonal for two reasons: local people feed on seasonally available plants; and the surplus is not stored due to a lack of processing and conservation methods. In West and Central Africa, as well as parts of the Amazon, bushmeat and fish are scarce during the rainy season, and it is during this time that edible insect consumption increases considerably (see Chapter 2). Not surprisingly, insects tend to be more abundant during the rainy season, when they constitute valuable parts of local diets and provide essential nutrients.

## BOX 11.1

**The red palm weevil (*Rynchophorus ferrugineus*) as an important source of nutrition and livelihood in New Guinea**

Rural people on the island of New Guinea (Papua New Guinea and Indonesia) have developed an intimate relationship with insects. Many species form an integral part of subsistence diets: beetle larvae and adults (Cerambycidae, Scarabaeidae and Curculionidae); cicadas (*Homoptera*); stick insects (*Phasmida*); termites (*Isoptera*); mayflies (*Ephemeroptera*); wasp larvae (*Hymenoptera*); caterpillars and moths (*Lepidoptera*); dragonfly larvae (*Odonata*); grasshoppers and locusts (*Orthoptera*); and many spider species (*Arachnida*). However, the larvae of the red palm weevil (*Rynchophorus ferrugineus papuanus*), which grows in the trunk of the sago palm, is the most widely consumed insect on the island. Special festivities are organized at which many palm trees are cut to collect weevil larvae. Raised as a byproduct of sago starch (prepared from carbohydrate material stored in the trunks of several palms, including *Metroxylum rumphii*), the larvae are commonly found in markets around the island. One study documented how at the market in Lae, Papua New Guinea, village women sold about 40 larvae (250 g) for approximately US\$1.00. Buyers will pay about US\$0.50 in the market for 12–15 larvae when they are grilled.

Locals grill, boil and roast the larvae and sometimes fortify sago pancakes with the insects, increasing the pancakes' nutritional value. In parts of the island where sago is a staple, the consumption of the red palm weevil provides locals with much-needed protein, as sago starch is low in protein. According to WHO, every 100 g of weevil larvae contains: 182 kilocalories, 6.1 percent protein, 13.1 percent fat, 9 percent carbohydrates, 4.3 mg iron, 461 mg calcium, and other vitamins and minerals.

Source: Mercer, 1997.

**11.3 ACCESS, TENURE AND RIGHTS TO NATURAL CAPITAL**

Access to natural resources is an important factor in the improvement of livelihoods. Insect harvesting can help to strengthen tenure rights and increase responsibility for the conservation of natural resources.

Insects provide an easily accessible source of income in many rural areas, particularly for women and children who are typically involved in their harvest. Insects can be directly and easily collected from nature – with minimal expenditure (i.e. basic harvesting equipment) – when access to land (farmland or forests) to harvest insects is not limited. For vulnerable segments of society, like indigenous people, women and the elderly, access to land is a traditional impediment to livelihood development and could thus present a barrier to edible insect harvesting. Insect collection can generally take place in public forests. This makes the practice far more accessible than many traditional agricultural activities that require either direct access to land or land tenure. Insect harvesting from nature may be less destructive to forest resources than the gathering of NWFPs such as medical plants or rattan, which require killing the host plant. For this reason, insect harvesting should be recognized as a vital component in ensuring food security, as long it is performed in a sustainable manner.

The reduced availability of wild edible insects is set to make collecting more difficult and in turn lead to lower consumption and trade in insects. For this reason, conservation and management measures need to be put in place to protect insects and their environments (Yhoung-Aree, 2010) (see section 4.3). Local authorities should recognize the contribution that insect harvesting makes to the livelihoods of local people. Once local people see the benefits that can arise from the participatory management of natural resources, they

may be more convinced to protect the (forest)lands in which the insects are gathered and more eager to participate.

While overexploitation and overharvesting are concerns, there are few documented cases in which collection has depleted arthropod populations (Box 11.2). In some cases of claimed overharvest, it has later been realized that declining insect populations were a part of natural population fluctuations and cycles. There is also a risk that, since farming can produce larger volumes than collecting, it will displace poorer collectors from their livelihoods.

#### BOX 11.2

##### Cambodian spiders

The sale of spiders is an important source of income for many poor farmers in Cambodia, who average a daily income of US\$2. A species of tarantula, *Haplopelma albostriatum* (Thai zebra tarantula), locally named a-ping, is typically served fried and sold in street stalls in Skuon at the Kampong Thom market or in restaurants in the capital, Phnom Penh. Spiders are collected from forests or in cashew nut plantations during the day. Vendors buy live spiders from collectors, who find and dig them out of their dens, selling up to 100–200 spiders per day. There are about twelve vendors in Skuon alone. The fear is that these spiders will be collected to extinction. Vendors are reporting a sharp decline in numbers and blame farmers for clearing and burning forests (Yen, Hanboonsong and van Huis, 2013).

#### 11.4 INCLUSION OF WOMEN

Rural communities across the developing world – especially vulnerable segments of society, such as women and indigenous peoples – depend greatly on natural resources, including insects, which act as a buffer against poverty (Box 11.3). In South Africa, for example, research on the use of a range of bioresources among 110 households in Limpopo Province found that the use of natural resources including wild herbs and fruit as well as edible insects was extensive among poor households (Twine *et al.*, 2003). However, access to natural resources is sometimes restricted for historical and cultural reasons. For example, although many countries have extended legal rights to women over land inheritance, customary practices as well as the inability of women to assert those rights makes ownership of land problematic. Ensuring equitable access to local natural resources and, by extension, to wild foods, including edible insects, remains a key factor in ensuring food security.

Women are the backbone of rural economies, especially in the developing world. Yet they still encounter difficulties in accessing essential resources such as land, credit, inputs (including improved seeds and fertilizers), technology, agricultural training and information. Studies show that empowering and investing in rural women can significantly increase productivity, improve rural livelihoods and reduce hunger and malnutrition. It is estimated that if women had the same access to productive resources as men, their farm yields could increase by 20 percent or even 30 percent. Moreover, closing the gender gap in agriculture could lift 100–150 million people out of hunger (FAO, 2011c).

Throughout the world, many women are engaged in small and medium-scale forest-based enterprises and depend on forest products for generating income. They are actively involved in collecting, processing and marketing a number of NWFPs, including edible insects. One study found that over 94 percent of the 1 100 NWFP traders surveyed in rural and urban markets in Cameroon were women. The same study showed that in the Democratic Republic of the Congo, more women than men participated in the bushmeat

trade, representing 80 percent of bushmeat traders in Kinshasa markets (Tieguhong *et al.*, 2009). Yet for most of the time these activities are informal in nature, for a number of reasons: women tend to have greater household responsibilities, which limit their ability to participate fully in formal economies; women often have unrecognized or low levels of skills and education; and any income derived from the sale of NWFPs tends to be used for household needs rather than for expanding their businesses (FAO, 2007). Small and medium-sized forest-based enterprises provide an opportunity for the edible insect sector to reduce poverty, improve equity and protect forests and other natural resources.

Women and children play active roles in the edible insect sector, mainly because the entry requirements to engage in insect collection, processing and sales are relatively low. In southern Zimbabwe, the collection, processing (removing gut content, roasting and drying), packing, blending and trading of mopane caterpillars have traditionally been carried out by women (Hobane, 1994; Kozanayi and Frost, 2002) (Box 12.1). Women are the main sellers of mopane caterpillars in towns and small business centres, mostly in small volumes (Kozanayi and Frost, 2002), but men tend to dominate the more lucrative long-distance and large-volume trading chains. The main problem cited by the women is that the large volumes of mopane caterpillars are too cumbersome to transport to make cross-border trade worthwhile. For these reasons, women generally sell their catch in small volumes at open markets, sales points along roads, bus termini and municipal markets. Most women collectors and processors come from local communities and are traditionally highly immobile. They also have many domestic obligations to fulfil, such as working in the field, harvesting food, cooking, looking after the children, and collecting fuelwood and water.

In Mexico, studies have shown that gender plays a significant role in the search, collection, preparation, marketing and sale of edible insects among ethnic groups (Ramos Elorduy, Carbajal Valdés and Pino, 2012). Women and children tend to be the principal foragers if the species in question is relatively easy to access. Poisonous insects, and insects that inhabit dangerous environments, are generally harvested by men. Additionally, while insects harvested by women generally contribute to household food needs, men's harvests typically end up on the wholesale market, especially when large volumes have been collected. Women assist men in this process by selling insects on the retail market. Insects sold by women include grasshoppers, stink bugs (*jumiles*), the giant mesquite bug (*Thasus giagas*) (*xamues*), small beetles, cicadas, the immature larvae of butterflies and moths, ants (*Atta* spp., including their queens, *chicatana*) and stingless bees. Not surprisingly, honey derived from stingless bees is the best-selling insect product at local markets (Ramos Elorduy, Carbajal Valdés and Pino, 2012).

#### BOX 11.3

##### Edible insect consumption and indigenous peoples

Indigenous peoples live in symbiosis with their natural environment and are highly dependent on natural resources for their livelihoods. For this reason, they have time-honoured understandings of how and where to find insects and different methods of preparation. This knowledge is particularly important in times of food shortages (Ramos Elorduy, 1984).

In Australia, "bush foods", including edible insects, are highly valued by Aborigines. They are still harvested and seen as an integral part their culture. Some of the better-known insects that they traditionally consume are edible beetle larvae and caterpillars (witchetty grubs), honey ants, scale insects, lerps and the Bogong moth, *Agrotis infusa* (Yen, 2005).

*Continues*

*Box 11.3 continued*

In addition to caterpillars, honey ants have traditionally been an important part of local cultures, and are generally gathered by women and children (Yen, 2010). Honey ants were important seasonal sources of carbohydrates for indigenous Australians and also serve as a living food store for other ants in a colony. They hang from the ceiling of underground chambers and are gorged with food from other workers. The food is stored in the abdomen, which can become distended to many times its normal size. The ant remains hanging, sometimes for months, until the ant colony needs the stored food. After stimulation, the ant regurgitates the sweet honey.

Given their different activities, men, women and children naturally possess different types of knowledge about insects. One study in Niger found that women were able to name as many as 30 grasshopper species using their vernacular names, which was approximately ten more than men (Groot, 1995), because women play a larger role in collecting and preparing the insects. Similarly, Aboriginal men and women contribute differently to subsistence diets in Australia (women providing plants, honey, eggs, small vertebrates and invertebrates and men primarily hunting larger vertebrates) and consequently their knowledge varies vastly (Yen, 2010). Given the importance of traditional ecological knowledge in improving general understanding of insect ecology and biology, policies on the sustainable management and development of the edible insect sector must take into account the different roles that men and women play in edible insect practices, and involve them accordingly.

For a number of reasons, protein and other nutritional deficiencies are typically more widespread in disadvantaged segments of society. Women and other vulnerable people are at a disadvantage in accessing productive resources. Women have different biological needs than men, necessitating a more targeted dietary regimen. For example, women typically need 2.5 times more dietary iron than men, as well as more protein when pregnant or lactating (FAO, 2012e). Access to non-insect animal protein also differs between men and women in some societies, with men generally having greater access. For the Tukanoan Indians in the northwest Amazon, for example, insects provide up to 12 percent of the crude protein derived from animal foods in men's diets in one season, compared with 26 percent in the women's diets (Dufour, 1987). The same study provided examples showing that insects are the only protein source accessible to women during certain periods of the year; at the same time they constitute important sources of fat. Because of their nutritional composition and the relative accessibility of the resource, edible insects offer an important opportunity to counter nutritional insecurity and improve livelihoods among vulnerable people.