

OPINION: BUGS CAN SOLVE FOOD CRISIS

A tropical entomologist argues that edible insects offer a sustainable alternative for conventional meat

By Arnold van Huis [Published 29th September 2010]

As early as 1885, the British entomologist Vincent M. Holt wrote a booklet with the title: "Why not eat insects?" It is a good question, as most of the world population does. More than 1000 insect species are eaten in the tropics, including caterpillars, grasshoppers, beetles, termites, ants, bees, wasps, and true bugs. This is probably because insects in warmer climates are bigger and show more crowding behaviour than in temperate zones, making harvesting from nature easier. It is an erroneous Western assumption that people in the tropics eat insects because they are starving. To the contrary, an insect snack is often considered a delicacy.

Nutritionally, insects are comparable to conventional meat such as pork, beef, mutton, or fish. Depending on the species, insects contain between 30 and 70 percent protein, and are a good source of essential fatty acids, vitamins (in particular the B vitamins) and minerals (such as iron and zinc). The chitinous exoskeleton comprises only a small part of the total biomass (<10 percent) and can even be partially digested, as chitinase has been found in human gastric juices.



Insects sold at Laotian markets.

Image: Arnold van Huis

The meat crisis may prompt us to look for alternative protein sources. Since 1970, world meat consumption has increased almost three-fold, and is expected to have doubled by 2050. However, already 70 percent of all agricultural land is used for livestock. Further intensification of industrial livestock production could increase health and environmental costs, such as contamination of surface and groundwater with nutrients, heavy metals and pathogens; acidification of ecosystems because of ammonia emissions; and use of huge amounts of fresh water (40,000 liters for one kilogram of beef). Besides, high-density animal production systems increase livestock disease incidence, and new, often antibiotic-resistant diseases emerge. Ruminants also emit large amounts of the greenhouse gas methane by enteric fermentation. Although termites, cockroaches and certain beetle species produce methane, most edible insect species do not. Meanwhile, the Food and Agricultural Organization of the United Nations estimates that 18 percent of all greenhouse gas emissions is derived from livestock.

An advantage of insects compared to conventional meat is that they are cold-blooded and do not use energy to maintain a constant high body temperature. For that reason, they convert feed more efficiently to body mass. To produce one kilogram of meat, a cricket needs 1.7 kilogram of feed -- significantly less than a chicken (2.2), pig (3.6), sheep (6.3), and cow (7.7). Additionally, the edible proportion after processing is much higher for insects -- it's 80 percent in crickets -- than for pork (70 percent), chicken (65 percent), beef (55 percent), and lamb (35 percent).



Bamboo caterpillars in Laotian markets
Image: Arnold van Huis

Bees and silk worms have been domesticated because of the honey and silk they produce, but they also serve as food. Some insects like palm weevils are semi-domesticated, where people cut palm trees to promote egg laying. The resulting larvae are considered a delicacy all over the tropics. When collected from nature, the sustainability of harvesting practices becomes an issue. Rearing edible insects under artificial conditions offers another possibility. In Thailand, thousands of households produce crickets either for their own consumption or for the market. In the West, companies produce insects as fish bait and as live feed for domestic and zoo animals such as birds and reptiles. Three insect-rearing

companies in The Netherlands since 2008 have been producing locusts and mealworms (Tenebrionid beetle larvae) for human consumption. Mechanized rearing procedures should be capable of achieving high production volumes as insects can be reared under crowded conditions and they have high multiplication and development rates. Only those insects should be reared that are not a threat to the environment, so those cleared by quarantine services. However, house crickets and mealworms are not at threat as they are cosmopolitan.

What are the prospects for human entomophagy (the formal term for the practice of eating insects)? In tropical countries, eating insects is already common practice; governments and entrepreneurs should exploit the potential, promote the industry, and develop the entomophagy food chain. Mopane worm production in southern Africa is already a US\$85 million business, in which 10 billion caterpillars are harvested annually. Improved preservation procedures (drying, freeze drying, tinning) would alleviate the current irregular supply. In Western countries, it may be difficult to change food habits, although we have learned to eat shrimps, oysters and snails. Could insects be made more acceptable by processing them into something unrecognizable (such as the ever-mysterious fish sticks, or hot dogs)? Or, as Wageningen University in The Netherlands is investigating, could we extract, purify and use insect protein as a significant component of the human diet? So why not eat insects? To convince Western consumers, it would be essential to provide information about the nutritional value, ensure food safety, explain the environmental benefits, develop good recipes, make the product accessible, and establish a regulatory and legislative framework. A taste experience is generally a first step for consumers in crossing the psychological barrier.

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