

## 13. Promoting insects as feed and food

The polarity of views surrounding the practice of entomophagy requires tailor-made communication approaches. In parts of the world where entomophagy is well established, such as the tropics, communication strategies need to promote and preserve edible insects as valuable sources of nutrition in order to counter the growing westernization of diets. In areas where food security is fragile, edible insects need to be promoted as key foods and feeds for nutritional, cultural and economic reasons. However, Western societies still largely averse to the practice of eating insects will require tailored strategies that address the disgust factor and break down common myths surrounding the practice. Governments, ministries of agriculture and even knowledge institutions in developed countries will need to be targeted, given that insects as food and feed are still largely absent from political and research agendas. Insects are still viewed as pests by a large majority of people, despite the increasing literature pointing to their valuable role in the diets of humans and animals.

### 13.1 THE DISGUST FACTOR

Common prejudice against eating insects is not justified from a nutritional point of view. Insects are not inferior to other protein sources such as fish, chicken and beef. Feelings of disgust in the West towards entomophagy contributes to the common misconception that entomophagy in the developing world is prompted by starvation and is merely a survival mechanism. This is far from the truth. Although it will require considerable convincing to reverse this mentality, it is not an impossible feat (Pliner and Salvy, 2006). Arthropods like lobsters and shrimps, once considered poor-man's food in the West, are now expensive delicacies there. It is hoped that arguments such as the high nutritional value of insects and their low environmental impact, low-risk nature (from a disease standpoint) and palatability may also contribute to a shift in perception (Box 13.1).

#### BOX 13.1

##### **How can people with an aversion to insects understand and accept that insects are palatable?**

Learning to accept insects as food means tackling negative attitudes towards insects in general. A better understanding of *what an insect is* and *what an insect does*, particularly through direct experience, can trigger appreciative reactions, even in the short run (Vernon and Berenbaum, 2004). Further exposure and introduction to entomophagy itself can help to reduce the surprise and novelty of seeing insects on the plate. Zoos, museums and universities can play an important role here. However, the emotion of disgust can be very hard to change.

The question of whether edible insects can be accepted as a food item and become a part of food habits in Western societies depends on at least two crucial factors: availability and learning.

"Bug banquets" (Wood and Looy, 2000; Looy and Wood, 2006) are a combination

*Continues*

*Box 13.1 continued*

of educational talk and the chance to directly experience entomophagy. Insects are presented as food that can be tasted, and prejudices are tackled. Years of experimental experience in the Netherlands and the United States have confirmed the effectiveness of bug banquets in overcoming the disgust factor.

Source: F. Dunkel, personal communication, 2012; M. Peters, personal communication, 2012.

Perhaps Bequaert (1921) in his paper, *Insects as Food: How They Have Augmented the Food Supply of Mankind in Early and Recent Times*, best sums up the issues that entomologists are still grappling with:

In spite of the weight of evidence from an historical point of view, it is not the purpose of the present article to furnish arguments regarding the value of insects as food or for including them in our own diet. **What we eat is, after all, more a matter of custom and fashion than anything else.** ... It can be attributed only to prejudice, that civilized man of today shows such a decided aversion to including any six-legged creatures in his diet. [Emphasis added.]

In general, education is the key instrument for creating public awareness of the potential roles of insects and in influencing consumer choices towards a more balanced and favourable outlook on insects as food and feed; innovative cookbooks can help in this (Box 13.2). Although the disgust factor is more common in Western societies, aversion towards eating insects in the West has also arguably affected people in tropical countries. In Malawi, Morris (2004) found that people living in urban areas and devout Christians reacted with disdain to eating insects. As a result of Western influences, particularly in Africa, research on the contribution of edible insects to nutrition and economy, and on insect species' biology and ecology, has been sporadic (Kenis *et al.*, 2006).

## BOX 13.2

**Edible insect cookbooks**

Chefs and food culture play a large role in determining the acceptance of foods. In some cases, those who would be averse to eating a whole grasshopper might enjoy a mealworm cupcake instead. Here are examples of cookbooks that feature insect recipes:

- *Creepy Crawly Cuisine: The Gourmet Guide to Edible Insects*, by Julieta Ramos Elorduy
- *Eat-a-Bug Cookbook: 33 Ways to Cook Grasshoppers, Ants, Water Bugs, Spiders, Centipedes and their Kin*, by David George Gordon
- *Man Eating Bugs: The Art and Science of Eating Insects*, by Peter Menzel and Faith D'Aluisio
- *Het Insectenkookboek (The Insect Cookbook)*, by Arnold van Huis, Henk van Gorp and Marcel Dicke.

According to UNESCO (2005), the success of education for sustainable development (Box 13.3) hinges on cooperation between all sectors of the education community: formal, non-formal and informal. Taking this as a building block, addressing the entomophagy disgust factor in Western societies might depend largely on the ability to involve the entire educational community. For this reason, engaging all sectors is recommended, particularly in Western societies.

## BOX 13.3

**Established approaches used in education for sustainable development**

**Formal education:** Primary, secondary, post-secondary and higher education.

**Non-formal education:** Nature centres, NGOs, public health educators, private companies, private research centres and agricultural extension agents.

**Informal education:** Traditional and online media, including television, radio, websites, newspapers, magazines, Twitter, blogs, YouTube and Facebook.

Source: UNESCO, 2005.

**13.1.1 Edible insects in formal curricula**

Until recently, edible insects as a subject – which includes farming techniques, conservation and management issues, as well as insect ecology and biology in the context of food and feed – has been largely absent in formal curricula. Although the topic of insects in biocontrol (e.g. IPM) has been fully entrenched in agricultural sciences for over 35 years (Kogan, 1998), insects in Western sciences are still largely conceptualized as agricultural pests. Therefore, departments of entomology often form part of agriculture faculties rather than science. The past decade, however, has seen a slow but steady rise in food insects in formal education. As of the end of 2011, 46 percent of the 50 land grant universities in the United States – the main food and agricultural universities in the country – had at least one course in their curricula or an annual event that featured food insects (F. Dunkel, personal communication, 2012). Some, such as Montana State University, the University of Illinois and the University of Georgia, have annual events involving 50 to several hundred participants (F. Dunkel, personal communication, 2012). In the Netherlands, the Laboratory of Entomology at Wageningen University offers “insects and society” courses (including entomophagy), which have proved popular among university students. In the Lao People’s Democratic Republic, the Faculty of Agriculture at the National University offers “cricket farming” as a subject.

**13.1.2 Research and development**

Formal education programmes are based on research and are conducted primarily at universities and governmental and non-governmental agencies. This section provides a non-exhaustive overview of ongoing edible insect research and education.

*The Netherlands*

The Laboratory of Entomology is part of the Plant Sciences Group of Wageningen University. The group carries out fundamental and applied research related to the biology of insects. Its mission is to unravel the ecology of interactions between insects and other ecosystem components by combining ecological studies (population and community levels) with investigations of the underlying mechanisms (subcellular to individual levels). Integrated pest, vector and disease management strategies are being developed in both developed and developing countries. The Chair group has an outstanding reputation in multitrophic interactions, biological control, malaria vector research and entomophagy, and draws worldwide attention to the issue of entomophagy. Professor van Huis coordinates the programme “Sustainable production of insect proteins for human consumption” (known as Supro2) (2010–2013), which is funded by the Ministry of Economic Affairs. The objective is to explore the potential sustainable production of edible insects and insect-derived products, particularly proteins, as a reliable and high-quality food source with a lower negative environmental impact than conventional meat production. Edible insects are reared on organic side streams, after which their

proteins are separated and purified and then characterized in order to tailor them for food products.

The laboratory has been instrumental in compiling a list of over 1 900 edible insect species (as of 2012) worldwide. The Netherlands is one of the few countries in the Western world where insect-rearing companies produce insects for human consumption, which are subsequently marketed.

### *United States*

Universities in the United States have been working on promoting insects as food and feed for many years. Montana State University is a leading centre on entomophagy initiated by the late Professor Gene DeFoliart. Florence Dunkel is an associated professor of Entomology in the Department of Plant Sciences and Plant Pathology. Her research focuses on plant-based natural products for insect management, particularly related to post-harvest ecosystems worldwide. Current projects include the exploration of Montana wheat varietal resistance to postharvest insects; the use of plant-based products with entomopathogenic fungi for the management of insect pests; and the use of natural products in the holistic management of malaria in West African (Malian) villages. Food insects and an insect feast have formed part of her curriculum in entomology for 24 years, after a tasty introduction to sautéed brown locusts while working in Rwanda. In 1995, Gene DeFoliart invited her to take over the editorship of *The Food Insects Newsletter*, also published as a book (DeFoliart *et al.*, 2009) (Box 13.4).

#### BOX 13.4

#### ***The Food Insects Newsletter***<sup>14</sup>

In 1988, several years after Western science had begun to take a strong interest in insects as food, Gene DeFoliart launched *The Food Insects Newsletter*. Funding for some of the early work was provided by forward-looking and interculturally competent programme officers at USAID-Washington. At the time, scientists in the United States had begun to recognize the usefulness of biocontrol and plant-based insect management – techniques of insect management appreciated and understood in native systems for millennia. After a flurry of research it became clear, however, that this research area was not a good fit with the tenure process, either in terms of obtaining funding or attracting graduate students to the research programme. Moreover, public interest and Western scientific attitude were unsupportive. The last 20 years, however, have seen a gradual rise in interest in food insects among the same groups.

<sup>14</sup> Florence Dunkel provided this box.

### *Denmark*

The Faculty of Sciences of the University of Copenhagen specializes in a range of research and teaching on sustainable agriculture, food production and processing, and human welfare related to nature and managed ecosystems. The faculty offers several well-attended international courses at the MSc and PhD levels, including a course on biocontrol. The Department of Plant and Environmental Science also offers courses in sustainable crop production, including the management of pest insects and the protection of beneficial insects – the latter group including honeybees. A research group, Insect Pathology and Biological Control, was established 20 years ago and focuses on insect pathogenic fungi. Today, it is a leading international team in insect pathology and has published many studies on the natural occurrence of insect pathogens among wild and domesticated insects. At the same university, the Research Group on Paediatric and

International Nutrition, which forms part of the Department of Nutrition, Exercise and Sports, developed expertise in performing population-based studies of healthy (in Denmark) and malnourished (in developing countries) infants and children. Chapter 6 contains details of their WinFood project on combating malnutrition with insect-based diets in Cambodia and Kenya. In fact, the present publication contains a variety of nutritional data obtained from studies carried out by Nanna Roos, the coordinator of the WinFood project.

### *Thailand*

Khon Kaen University is the largest public university in northeastern Thailand and is recognized as the regional leader in innovation relating to teaching, learning and research. The Entomology Division falls under the management of the Faculty of Agriculture and carries out teaching and research on useful insects, industrial insects and insect pests to ascertain their effects in agricultural systems, and the management and conservation of insect biodiversity. The Entomology Division pioneered edible insect farming and is one of only three universities in Thailand to conduct research and offer undergraduate and graduate studies in entomology. Professor Yupa Hanboonsong is the contact person and expert in the field, and has conducted several projects concerned with the diversity of edible insects in Thailand, in addition to acting as a technical advisor to the FAO edible insect project in the Lao People's Democratic Republic from 2010 to 2013.

### *China*

The Research Institute of Resource Insects of the Chinese Academy of Forestry, located in Kunming, Yunnan province, is the only national forest research institute in southwestern China. The research institute mainly carries out application-based and basic research related to resources such as insects, economic plants, micro-organisms, vegetation restoration and ecological reconstruction. The research, exploitation and use of resource insects constitute one of the main study objects. Investigated insect species include industrial material insects (such as lac insects, white wax scale insects, gallnut aphids and cochineals), environmental insects, pollination insects, edible and medicinal insects and ornamental insects (butterflies). Research areas include biology, ecology, molecule biology, chemistry, usage, processing of insect materials, mass rearing, artificial cultivation and host plants. The research group, led by Dr Ying Feng, has conducted research for many years, particularly in the southwest, relating to the culture, harvesting and mass-rearing of edible insects in China. They have collected more than 100 specimens of edible and medicinal insects and published more than 20 research papers and two books.

### *Kenya*

In Kenya, Professor Monica Ayieko of Jaramogi Oginga Odinga University of Science and Technology collaborates with other Kenyan research institutes to raise awareness of insects in universities and at the national level. With the limited laboratory resources at her university and by seeking help from other institutions with conventional food analysis technology, she has undertaken basic nutritional analysis of edible winged termites (*Macrotermes* spp.), lake flies (*Chironomus* and *Chaoborus* spp.), the edible grasshopper (*Ruspolia differens*) and the African thief ant (*Carebara vidua*), which are readily available in the Lake Victoria region. In response to requests from consumers, Professor Ayieko has attempted to work on processed products of termites and lake flies and has successfully formulated insect-based biscuits, crackers, muffins, meatloaf and sausages.

The aforementioned WinFood project (facilitated by the University of Copenhagen) collaborated with researchers at the University of Nairobi on termites as a potential additive in baby food.

The International Centre of Insect Physiology and Ecology is a pan-African research and development organization based in Nairobi, Kenya. Its mission is to help alleviate poverty, ensure food security and improve the overall health status of people living in the tropics by developing and extending management tools and strategies for harmful and useful arthropods, while preserving the natural resource base through research and capacity building. The International Centre of Insect Physiology and Ecology will continue to develop, introduce and adapt new tools and strategies for arthropod management that are environmentally safe, affordable, appropriate, socially acceptable and applicable by the target end-users, with full community participation. Its Commercial Insects Programme studies honeybees, stingless bees and silkworms. The centre helps scale up beekeeping and sericulture-based products, as well as pollination services, in several East African countries and the Near East and North Africa region. It also obtains certification and develops market linkages through private entrepreneurs.

### ***Benin***

In Cotonou, Benin, the non-profit organization Centre de Recherche pour la Gestion de la Biodiversité (CRGB) has completed numerous studies of an environmental nature, such as fauna and flora inventories, nature conservation and management plans in many French-speaking African countries. Over the years, the centre has accumulated a wealth of experience in entomology, the preservation of cultures, IPM programmes, sustainable agriculture and environmental protection. In 2008, Sévérin Tchibofo, coordinator of CRGB, established a website and database of edible insects, LINCAOCNET, which contains information on edible insects in Benin, Burkina Faso, Cameroon, Central African Republic, the Republic of the Congo, the Democratic Republic of the Congo, Mali, Niger, the Republic of Guinea and Togo. It is the result of collaboration between the CRGB and the Royal Museum for Central Africa of Tervuren, Belgium. The purpose of the LINCAOCNET project is to collect and disseminate information to the people of sub-Saharan Africa about edible insect species and their handling, as well as where to find them and how to catch and prepare them. This information source serves as a basis for better scientific knowledge and for the improved use of insects as food. The project promotes entomophagy by providing information on the management and conservation of edible insects that is accessible to all. The CRGB cooperates with several African and overseas research and development institutions, including the French Global Environment Facility; the Van Tienhoven Foundation; the Netherlands Centre for Biodiversity Naturalis; the French Foundation for Research on Biodiversity; the National Biodiversity Institute in Costa Rica; the International Organization of Francophonie; French Agricultural Research for Development; the Pesticides Initiative Programme of the Europe–Africa–Caribbean–Pacific Liaison Committee; the International Commission for Food Industries; the National Museum of Natural History in Paris, France; and the Royal Museum for Central Africa in Belgium. Benin is part of a recent south–south initiative to exchange traditional and scientific knowledge on food with Bhutan and Costa Rica (Box 13.5).

### ***Mexico***

The National Autonomous University of Mexico, the oldest university in Latin America and the best known in Mexico, has an outstanding reputation in edible insect research. Professor Julieta Ramos Elorduy and her team within the Institute of Biology, Faculty of Sciences, are dedicated to the study of biodiversity in the country, employing classical methods as well as molecular biology and electronic microscopy. The Institute has a botanical and zoological department, biological research stations in the east and west of the country, and a botanical garden in Mexico City. The Edible Insects Laboratory is dedicated to the study of edible insects among ethnic groups and the performance of related biological and ecological studies, including on nutritional value. Applied

research involves the recognition, identification, collection, preparation, storage, sale and marketing of edible insects. The goal is to improve rural livelihoods and to contribute to regional and national economies.

Professor Ramos Elorduy began to study edible insects in 1974, and in 1982 she wrote a book titled *Insects as a Source of Protein in the Future*. This was followed, in 1984, by *Los Insectos comestibles en el México antiguo* (Edible Insects in Ancient Mexico) and in 1998 by *Creepy Crawly Cuisine*. She founded the Ethnobiological Scientific Society and organized the First Congress in Ethnobiology in 1994. She is recognized as an expert in edible and medicinal insects.

### ***Lao People's Democratic Republic***

In the Lao People's Democratic Republic, the Faculty of Agriculture at the National University of Laos has initiated an innovative and successful programme to introduce insect farming to students, coupled with awareness-raising on the nutritional value of insects and livelihood potential. Students are taught basic insect-farming practices and raise crickets in groups, culminating in harvesting and insect eating at a major social event. Some students have subsequently introduced insect farming to their families (P. Durst, personal communication, 2012).

## **13.2 DRAWING ON TRADITIONAL KNOWLEDGE**

### **13.2.1 Insect farmers and collectors**

The primary producers of edible insects are farmers and collectors. In most cases, indigenous knowledge forms the basis of sustainable collection and harvest practices. Therefore, it is important to document and promote sustainable traditional best practices to share with others. To this end, education on best practices, training and the creation of associations to enable knowledge-sharing can help both farmers and collectors.

Several individuals, organizations and companies have raised questions on good farming practices, markets, and processing and legal requirements, in particular regarding regulations on the use of insects in food and feed products. Since this demand exists, governments may wish to expand their technical capacities within their agricultural (extension) services. An example of possible support is the FAO-assisted Technical Cooperation Programme in the Lao People's Democratic Republic, "Sustainable insect farming and harvesting for better nutrition, improved food security, and household income generation".

An interesting aspect in training programmes is the merging of traditional knowledge with new technologies. In Kenya, indigenous ways of collecting termites (*Macrotermes subhyalinus*) have been improved to ensure reliable collection; for example, a new light trap was designed in collaboration with the Kenya Industrial Research and Development Institute (Ayieko *et al.*, 2011).

### **13.2.2 Cultural and gastronomic activities (festivals, expo, restaurant, museums)**

Cultural and gastronomic activities include festivals, art and scientific exhibitions in museums and zoos, insect menus in restaurants and snacks in bars, and cooking workshops. Governments, knowledge institutions, farmers and producers, among others, can sponsor such activities.

#### ***Museums***

In 2008, the Royal Museum for Central Africa in Tervuren, Belgium, initiated a project called the Central African Biodiversity Information Network (CABIN). The aim of this project – funded for five years by the Belgian Cooperation and Development Agency – is the implementation of a network of databases on biodiversity, in collaboration with

several research institutions in Central Africa (mainly Burundi, the Democratic Republic of the Congo and Rwanda). The LINCAOCNET database project (see section 13.1) was established by CRBG in the context of the CABIN project.

The Natural History Museum in London, home to one of the world's richest entomological collections, has also shown interest in the topic, setting up a travelling exhibition in London shopping centres on the theme of edible insects (Fairman, 2010). Additionally, the Victoria Bug Zoo, located in British Columbia, Canada, offers visitors hands-on interaction with insects.

#### BOX 13.5

##### **International knowledge-sharing between developing countries on the use of edible insects in diets**

A programme for the exchange of traditional and scientific knowledge on food has been launched by Benin, Bhutan and Costa Rica. Experts from the Faculty of Agronomic Sciences of the University of Abomey/Calavi, in Benin, the National Mushroom Centre in Bhutan and the National Institute of Biodiversity in Costa Rica have joined forces in this initiative.

In particular, Costa Rica and Bhutan are obtaining information from Benin regarding which insects are edible and can be introduced to people's daily diets. Costa Rica is sharing knowledge on how to classify the various species of insect and the different ways in which they can be used, and on how to breed and preserve them efficiently. Although such insects constitute an important part of the diet of people in Benin, expertise on how to best exploit them is lacking.

In the meantime, the National Institute of Biodiversity is working to change the attitude of people in Costa Rica towards insects. The country is host to 365 species of insect, many of which could be used as feed for farm animals.

*Source:* Cooperation, 2012.

### **13.2.3 Recent examples of key results**

Research on edible insects has concentrated on the traditional food habits of indigenous people. Julietta Ramos Elorduy has published an impressive number of articles about entomophagy in Mexico from 1977 up to the present (see section 13.1). A landmark was the publication in 2005 of *Ecological Implications of Mini-livestock: Potential of Insects, Rodents, Frogs, and Snails*, edited by Professor Maurizio G. Paoletti at the University of Padua in Italy. The book contains contributions by many authors covering various aspects of entomophagy from around the world.

There have been three international meetings in which edible insects figured prominently:

- In 2000, the conference *Les Insectes dans la tradition orale* [Insects in oral literature and traditions] took place in Paris. It was ethnologically oriented and had edible insects as a topic. The proceedings were published in 2003 (Motte-Florac and Thomas, 2003).
- In February 2008, FAO organized a workshop in Chiang Mai, Thailand, titled *Forest Insects as Food: Humans Bite Back*. It focused on edible insects in the Asia-Pacific region.
- In January 2012, FAO and Wageningen University jointly organized the Expert Consultation Meeting on Assessing the Potential of Insects as Food and Feed in Assuring Food Security at FAO in Rome. This consultation was the first of its kind co-organized by FAO (see section 1.2).

The topic of insects as a source of food and feed has attracted strong media attention in the last couple of years: international and national newspapers, TV stations and other media sources have produced articles and documentaries on the topic. Strong media attention is helping to influence public policymaking regarding, for example, the review of food and feed regulations with respect to the use of insects.

### 13.3 ROLE OF STAKEHOLDERS

The communication strategies of stakeholders need to be comprehensive and should target region, culture, locality (rural, urban), economics, environment, nutrition, gastronomy and tradition. In developing countries, different approaches are needed for urban, peri-urban and rural communities.

#### 13.3.1 Governmental bodies

Governmental bodies have important roles to play in promoting insects as food and feed. In particular, the development of this new sector as a viable (and environmentally friendly) alternative to the conventional food and feed sector will require that governmental bodies address the following issues:

- awareness and collaboration among relevant ministries, such as agriculture, health and the environment;
- the implementation of existing policies and the creation of new policies, such as food and feed regulations;
- the creation of incentives aimed at knowledge centres for research, development and graduate and post-graduate training;
- the creation of incentives aimed at the private sector for investment and technical development;
- the provision of technical assistance in sustainable insect harvesting and insect farming through agricultural extension services.

One example of government incentives is the three-year, €3 million EU FP7 project “Insects as novel sources of proteins”. Starting in the second half of 2013, this collective research project will involve various universities and companies in examining ways of rearing and processing insects for feed.

An effective communication strategy needs to differentiate between insects as food and as feed and also to minimize sensationalism about insect consumption by using well-documented literature to increase credibility. Among the strategies to be considered for developing effective communication strategies for governments, international agencies, the private sector and NGOs are: tailoring messages for different audiences; identifying incentives for using insects as food; using success stories and best practices/experiences to promote the consumption of insects; involving (local) media to raise awareness; creating a communication toolkit on the importance of and opportunities for insects as food and feed; and seeking endorsements from celebrities to improve the credibility of the sector.

#### 13.3.2 Industry

Industrial producers have undertaken research and development on insects in cooperation with knowledge institutions with the objectives of centralizing scattered information including data, literature, economics, methods and practices as a basis for investment options. Industry can further advance insects on the agenda by contributing to investment in infrastructure, research and technology, and can increase awareness by marketing products to the general public.

The industry also has good contacts with regulators and policymakers. It could take a proactive stance by facilitating the development of regulations with government agencies.

The industry could also develop a roadmap on insect protein technology for the private sector. At the Expert Consultation Meeting in January 2012, stakeholders from the private sector emphasized the need to create an international industry association

to support insect-sector initiatives. These could include effective awareness-raising with the general public and the use of a common language by industrial stakeholders to avoid confusion and help ensure effective marketing.

### 13.3.3 Non-governmental organizations

NGOs play a significant role in increasing awareness of entomophagy, as well as in promoting insect rearing as a diversified livelihood strategy. Environmentally oriented NGOs can help to strengthen guidelines for sustainable harvesting through governmental lobbying and practical experience in local communities. NGOs can also raise awareness of this already significant informal activity and promote it as an environmental strategy for food and feed on political agendas in both developed and developing countries.

Moreover, NGOs can assist in technical training for rural, peri-urban and urban households on market linkages, entrepreneurship, the domestic rearing of insects, and the identification of producers' objectives (such as subsistence, semi-commercial and commercial enterprises). Examples of such projects are the Insect Centre in the Netherlands and BugsforLife in Benin.

Other resources available online include the Bay Area Bug Eating Society and the popular website Girl Meets Bug, maintained by Daniella Martin.

### 13.3.4 Gastronomic enterprises

Making insects tasty and attractive is one of the biggest challenges facing new insect-based food enterprises. Initiatives like the Nordic Food Lab in Copenhagen (Box 13.6) and the Ento project in London are examples of this larger effort for palatability. These organizations focus on optimizing colour, texture, taste and flavour to make insects appealing to the Western palate. The Tokyo Mushikui (bug-eating) Festival is attempting to revive interest in edible insects in Japan (Box 13.7).

#### BOX 13.6

#### The Nordic Food Lab

How do you take something considered inedible, like an insect, and have it recategorized as edible? One of the many powers of cooking, and science in general, is that it can bring to us a new understanding and appreciation of the world. Instead of serving a cricket whole on a plate, as other attempts at normalizing entomophagy have done, in this case it is more effective to transform the raw material into something that will be recognized as delicious before edibility is even raised as an issue. If it looks, smells and tastes delicious, it must be edible.

The strategy of the Nordic Food Lab is based on the following assumption: instead of accepting, as contemporary culture does, that something must be edible before it can be delicious, these two categories are viewed as distinct, though overlapping, like a Venn diagram. Just as there are foods that are edible but not necessarily delicious (certain "weeds", for example), there are foods that are delicious before edibility is considered in popular consciousness. It is this boundary that the Nordic Food Lab wants to push – to explore the vast range of delicious flavours in order to incorporate an increasingly wide array of foods into the sphere of the edible.

The Nordic Food Lab is a non-profit organization that explores the building blocks of Nordic cuisine through traditional and modern gastronomies, generating knowledge for chefs, industry and the public. Much of its research has focused on wild foods like plants, seaweed, shellfish, game and edible insects.

Source: Nordic Food Lab, 2012.

## BOX 13.7

**Konchu Ryori Kenkyukai**

In Japan, the Konchu Ryori Kenkyukai (Insect Cuisine Research Association) was created to acknowledge the presence of insect delicacies in historical Japanese cuisine. The group organizes the Tokyo Mushikui (bug-eating) Festival, which celebrated its fourth year in 2012. The group's first bug-eating festival drew only 30 participants, but numbers have more than doubled since.

There are many traditional insect dishes in traditional Japanese cuisine. For example, sanagi, a silkworm delicacy, used to be a fairly common dish and is still available canned. Other formerly common delicacies were inago (grasshoppers, often steeped in sugar and soy sauce), hachinoko (bee larvae) and zazamushi (stonefly larvae). Many Japanese today, however, have never tried such dishes. One reason behind the Tokyo Mushikui Festival is to revive this older culinary culture, as well as to stoke interest in new flavours.

Source: adapted from Tempelado, 2012.

In much of its work, the Nordic Food Lab explores the relationship between edibility and deliciousness, asking questions like, What makes something good to eat and why? How can we come to understand more deeply the systems that tell us, in different places and times? What can we – and what should we – put “inside” to transform the “outside” into part of us? By exploring the vast range of flavours, the Nordic Food Lab aims to turn “inedibles” into edible ingredients. Seaweed is one such food source: just a few years ago it was considered in the West as either exotic or niche, but now, in certain places, it is celebrated as a new, versatile ingredient – since it was shown to be delicious (Nordic Food Lab, 2012). The head of the culinary research and development group says that deliciousness is the first and most important factor in developing new gastronomic building blocks. Mayonnaise from bee larvae works not because of its novelty but rather because of its earthier and more satisfying taste – its unique deliciousness (Baines, 2012).

The Ento project is a roadmap for introducing edible insects to the Western diet. This group of designers of the Royal College of Art and Imperial College in London has tackled the issue of sustainability from an innovative, design-driven approach. Ento focuses on acceptance and proposes the creation of a culture surrounding insects. Ento took sushi as an example of a recently accepted food and used it as the inspiration for its design concept. They created a roadmap for launching insects as a new food, focusing on different groups of the public at different stages. The underlying logic is that not everyone will suddenly start to eat new foods and therefore it is necessary to target the more adventurous user before eventually offering it in supermarkets as a normal, everyday food item.

Ento conducted tasting tests of various processed insects and concluded that the power of abstraction was critical for food design as well as for the entire branding of the company. Their “entocubes” abstract the animal behind the food and emphasize the cleanliness, human control and futuristic aspect of insects as food. Ento conducts taste experiments using different types of processing, such as boiling, frying and baking. Based on a technique called molecular food pairing, they have created a database of foods that could be used with insects to create new recipes (Ento, 2012).

In San Francisco, curious market-goers wait in line to get wax moth larvae tacos and mealworm ice cream at Monica Martinez's company, the Don Bugito Prehispanic Snackeria. Her company revives prehispanic traditional Mexican foods, selected because they are nutritious and sustainable (see section 6.3).

At an industrial scale, the meat industry can be used as a model for experimenting with insect processing for product development. Just as processed meat contains non-meat ingredients, insect products may contain non-insect ingredients. In addition, several physical and chemical properties of insect products need to be taken into account, such as structure, pH changes, colour, water-holding capacity and flavour.