



Insects as feed or food – potential and challenges?

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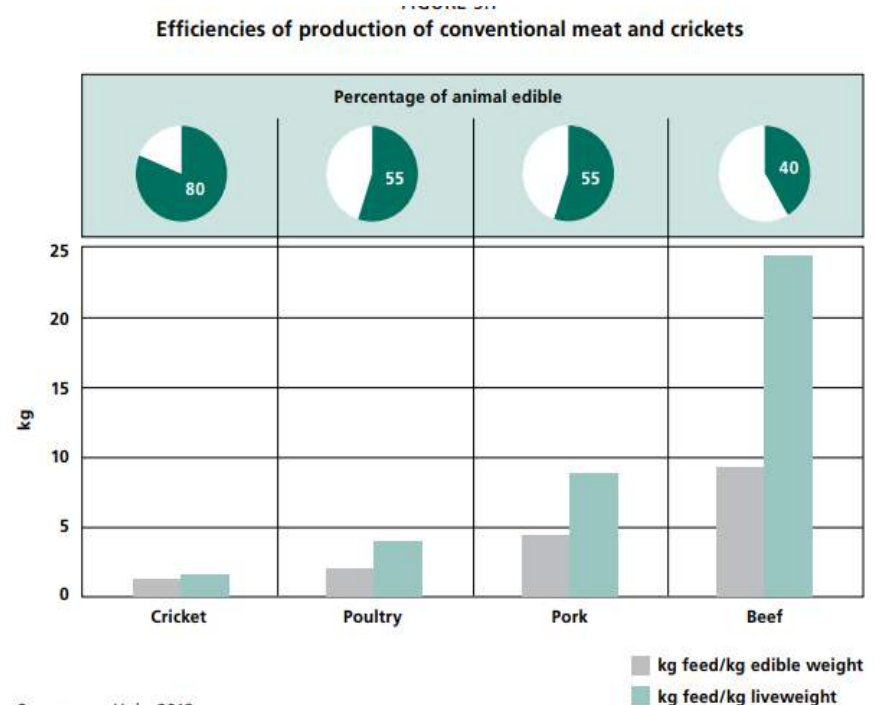
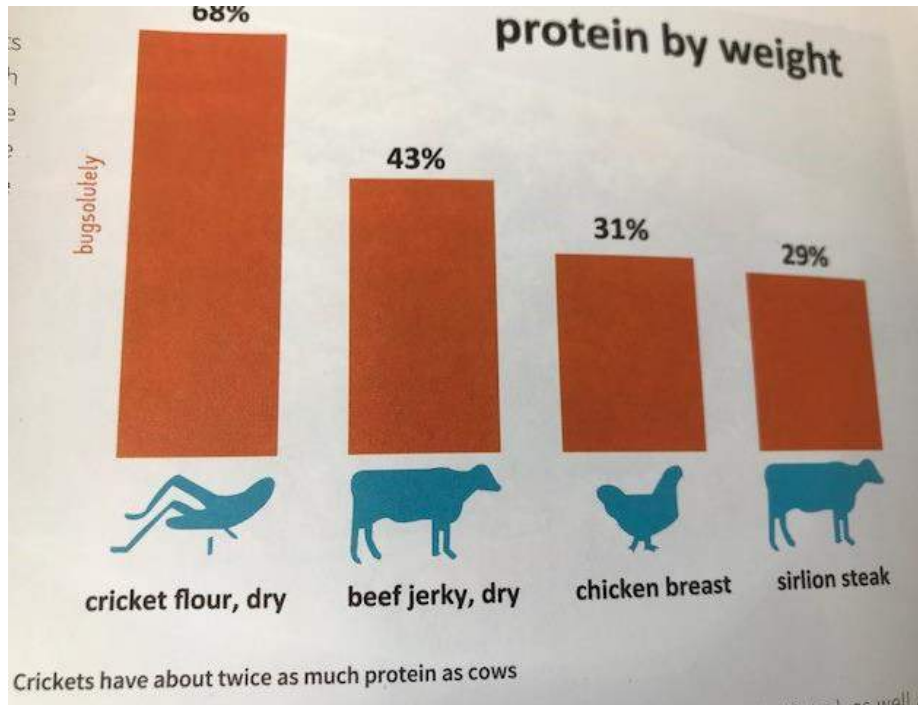


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As feed..

- Population growth and increased demand for animal based products (protein)



Insect biomass as feedstock for animals and fish can be combined with the biodegradation of manure and the composting and sanitizing of waste. Grains/Soy now used as livestock feed, which often comprise half the cost of meat production, could then be used for human consumption (van Huis, 2013) and less deforestation and environmental contamination from glyphosate...



Developing feed for aquaculture systems from Black soldier fly larvae



Feeding trials with magmeal made from the common housefly



Karen Li
Online Marketing Specialist, Bugolutely

Cricket pasta – the edible insect revolution is served

For the first time, the most common food in the world contains... insects. With 20% cricket flour, Cricket Pasta has a number of nutritional benefits, and it is set to start a completely new segment in the pasta business.

Only a couple of years ago, nobody would have thought of a pasta containing insects. Insect flour, to be precise. But in the last few months, an entire industry developing food products containing insects has appeared, and seems to be thriving vigorously. Cricket Pasta has recently joined this group of unexpected, newly-born bug delicatessens.

Why cricket flour?

When someone mentions protein, you think of beef. Someone mentions omega-3, salmon is in your mind. When someone mentions iron, it is likely spinach will be named. Cricket flour contains all these nutritional benefits, and more. Crickets have about twice as much protein as cows, and five times more magnesium for about half the calories. But just as important as the nutritional characteristics, cricket flour tastes good. The taste is similar to roasted nuts, and it goes perfectly with wheat flour, creating a pasta with a distinct and satisfying flavor.

For these reasons and more, in 2015 Massimo Reverberi founded the Bangkok-based company Bugolutely (www.bugolutely.com), which just launched their Cricket Pasta. "The entomophagy industry is based on a simple idea: the entire world eat insects, except western countries,"

explained Reverberi. "We are the only people that think crickets are completely different from something like a shrimp, when in fact they are very similar. We eat animals with an obvious disgusting appearance, like an oyster or a snail, but because of our education and subconscious, fuelled by movies and fairy tales, ants or crickets as food gives us that 'gag' reflex."

Reverberi added: "Luckily, market researchers indicate that about half of the western population is willing to overcome this cultural obstacle and try something new. We think that pasta will be a great way to reduce the dissonance for their first time eating bugs. The wide press coverage recently is also helping to correct the prejudices a lot."

Creating cricket pasta

Bugolutely started with testing different mixes of ingredients and first created a gluten-free pasta. "But gluten free, despite being popular these days, does not taste as good as a gluten pasta," in Reverberi's opinion. "And we do not want people to think that it is because of the cricket flour. It is the consumer's first contact with this new ingredient, and it has to be perfect. Our current generation of pasta, with 80% wheat flour imported

As food..



Sky prawns and sea crickets

Native Americans, such as those who lived freely in what today is called the state of Utah, were very accustomed to eating grasshoppers, locusts and crickets. On their first tasting of shrimp, the Goshute Indians are reported to have named the creatures "sea crickets" (Lockwood, 2004).

Recently in Australia, Christopher Carr and Edward Joshua of the New South Wales Department of Primary Industries proposed the renaming of locusts as "sky prawns", a more acceptable description in Western countries, and compiled recipes in a cookbook, *Cooking with Sky-prawns* (BBC, 2004).





A variety of insects for sale as street food in Bangkok, Thailand



Chapulines vending in Oaxaca, Mexico



HARAKE KLUNDER

A woman harvests grasshoppers in Laos



FAO/GIULIO NAPOLITANO

Caterpillars for sale in Kinshasa, Democratic Republic of the Congo

Role of EFSA

Risk profile related to production and consumption of insects as food and feed

EFSA Scientific Committee

Abstract

The present opinion has the format of a risk profile and presents potential biological and chemical hazards as well as allergenicity and environmental hazards associated with farmed insects used as food and feed taking into account of the entire chain, from farming to the final product. The opinion also addresses the occurrence of these hazards in non-processed insects, grown on different substrate categories, in comparison to the occurrence of these hazards in other non-processed sources of protein of animal origin. When currently allowed feed materials are used as substrate to feed insects, the possible occurrence of microbiological hazards is expected to be comparable to their occurrence in other non-processed sources of protein of animal origin. The possible occurrence of prions in non-processed insects will depend on whether the substrate includes protein of human or ruminant origin. Data on transfer of chemical contaminants from different substrates to the insects are very limited. Substrates like kitchen waste, human and animal manure are also considered and hazards from insects fed on these substrates need to be specifically assessed. It is concluded that for both biological and chemical hazards, the specific production methods, the substrate used, the stage of harvest, the insect species and developmental stage, as well as the methods for further processing will all have an impact on the occurrence and levels of biological and chemical contaminants in food and feed products derived from insects. Hazards related to the environment are expected to be comparable to other animal production systems. The opinion also identifies the uncertainties (lack of knowledge) related to possible hazards when insects are used as food and feed and notes that there are no systematically collected data on animal and human consumption of insects. Studies on the occurrence of microbial pathogens of vertebrates as well as published data on hazardous chemicals in reared insects are scarce. Further data generation on these issues are highly recommended.

Keywords: insects, food, feed, microbes, allergenicity, chemicals, safety, production, consumption

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7. Recommendations
It is recommended to initiate research on the issues mentioned in Section 6, Uncertainties.

6. Uncertainties

The uncertainties which arise due to the lack of knowledge in the following areas are listed and not characterised further as this opinion has the format of a risk profile.

Human consumption

- There are no systematically collected data available on insect consumption in European countries;
- The pattern of consumption may only be estimated through sales data of insect product;
- How and to what extent the inclusion of insects in gastronomy and in the product range of food suppliers can impact the general consumption pattern in the population is unclear but holds the potential for a rapid change in future consumption patterns.

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The new EU Novel Food Regulation: the Special Case of Insects



Bangkok, 26/10/2016 - 10:32 - UNIQUE ID: 170308_11

Press releases

On 1 January, 2018, a new regulation on “Novel Food”, replacing the current rules adopted in 1997, will come into application in the EU. This new regulation will pave the way for a simpler, clearer and more efficient authorisation procedure, fully centralised at EU level, which should enable safe and innovative food to be placed on the EU market faster, without compromising a high level of public health.

AGRICOLTURA

Insetti interi come cibo, da gennaio a tavola. La denuncia di Coldiretti, italiani contrari

Dal primo gennaio scatta il nuovo regolamento Ue sui «novel food» che permetterà di riconoscere gli insetti interi sia come nuovi alimenti che come prodotti tradizionali da paesi terzi, aprendo di fatto alla loro produzione e vendita anche in Italia. Coldiretti al forum di Cernobbio: il 54% degli italiani è contrario

di Fabrizio Massaro



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EFSA scientific opinion

Animal/pet consumption

- There is lack of consolidated information relating to the magnitude and frequency of managed feeding of insects to farm animals.

Bacteria

- There is a lack of studies on the occurrence of human and animal bacterial pathogens in insects processed for food and feed are very scarce in the scientific literature.

Viruses

- Insect virus infections do induce major metabolic changes in insects and may produce substances toxic to humans, but there is no scientific evidence for such a case;
- There is lack of information relating to the likelihood of human viruses such as norovirus, rotavirus, Hepatitis E and A being passively transferred from feedstock through residual insect gut contents.

Parasites

- Information in the literature refers to non-European areas (mostly Asia) and to insects harvested in the wild, and so the risk can be very different from what is found in farmed insects, with strict control of environmental conditions and substrates applied.

Prions

- There is lack of information on the extent to which insects act as mechanical vectors of prions.

Allergens

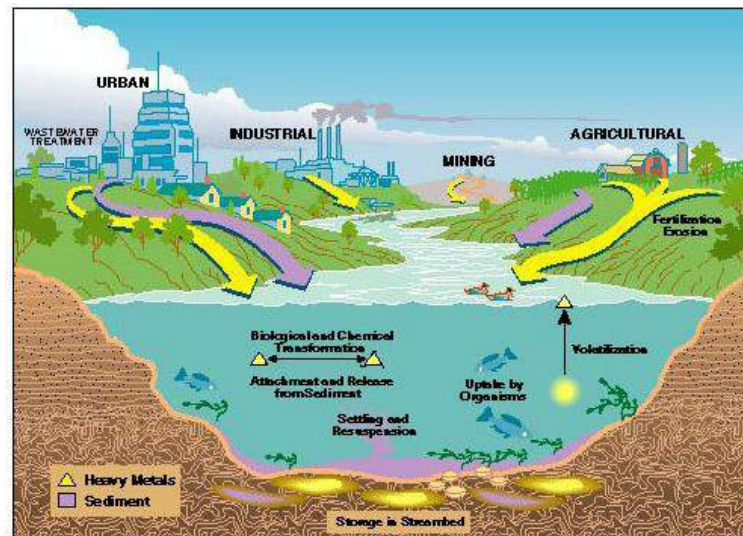
- There is lack of pre-marketing human results and reports of workers' sensitizations.



EFSA scientific opinion

Chemicals

- Published data on hazardous chemicals in reared insects in scientific literature are scarce;
- Data on accumulation/excretion of chemical contaminants from the substrates are very limited;
- To date, there is lack of information on the use of veterinary medicines for the treatment of insects to be used for food and feed;
- No information is available on the potential formation of food-processing contaminants during processing insects.



Edible insects

Future prospects for food and feed security

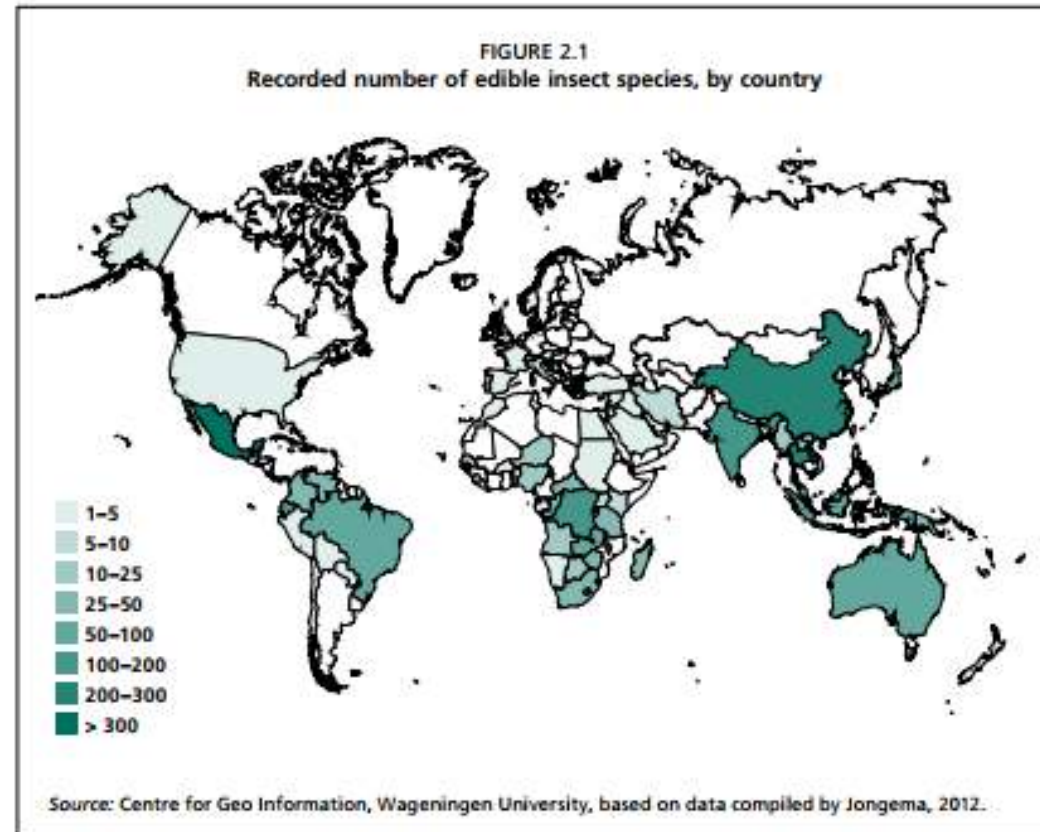


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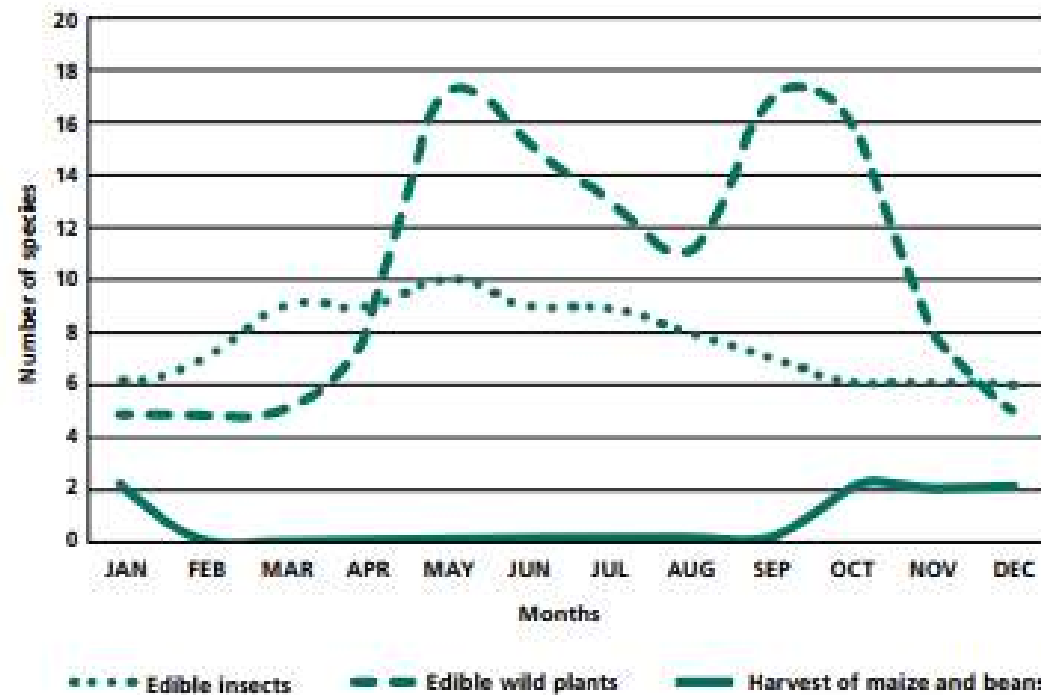
Edible insects: a global issue

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In Mexico

FIGURE 2.4
Temporal availability of edible insects, wild plants and subsistence crops for the
Popoloca people of Los Reyes Metzontla Puebla, Mexico



Source: Acuña et al., 2011.

Lao People's Democratic Republic

In the village of Dong Makkhai in the Lao People's Democratic Republic, 21 species of edible insect are collected and sold at the Sahakone Ban Yang fresh food market. On average, 23 percent of the combined household income of the village is derived from the production and sale of edible insects. Most favoured by consumers are ant "eggs" (larvae and pupae of *Oecophylla smaragdina*), grasshoppers (various species), crickets (*Tarbinskiellus portentosus*, *Teleogryllus mitratus* and *Acheta domesticus*), wasps (*Vespa* spp.), cicadas (*Orientopsaltria* spp.) and honeybees (*Apis* spp.). Today, collectors claim they need more time to find similar amounts of edible insects compared with ten years ago, most likely as a result of the increased number of collectors.

Source: Boulidam, 2010.

Sustainability

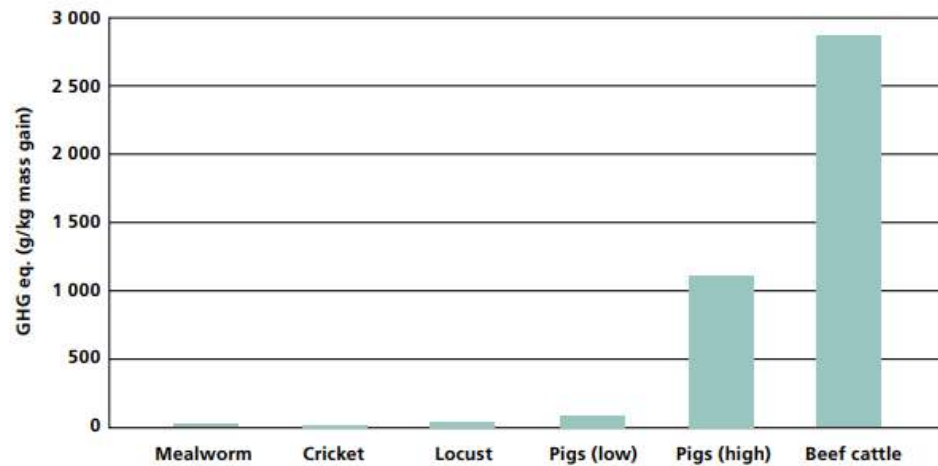
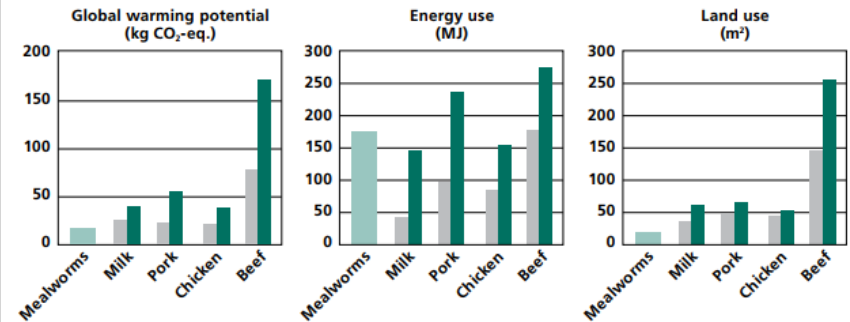


FIGURE 5.5
Greenhouse gas production (global warming potential), energy use and land use due to the production of 1 kg of protein from mealworms, milk, pork, chicken and beef



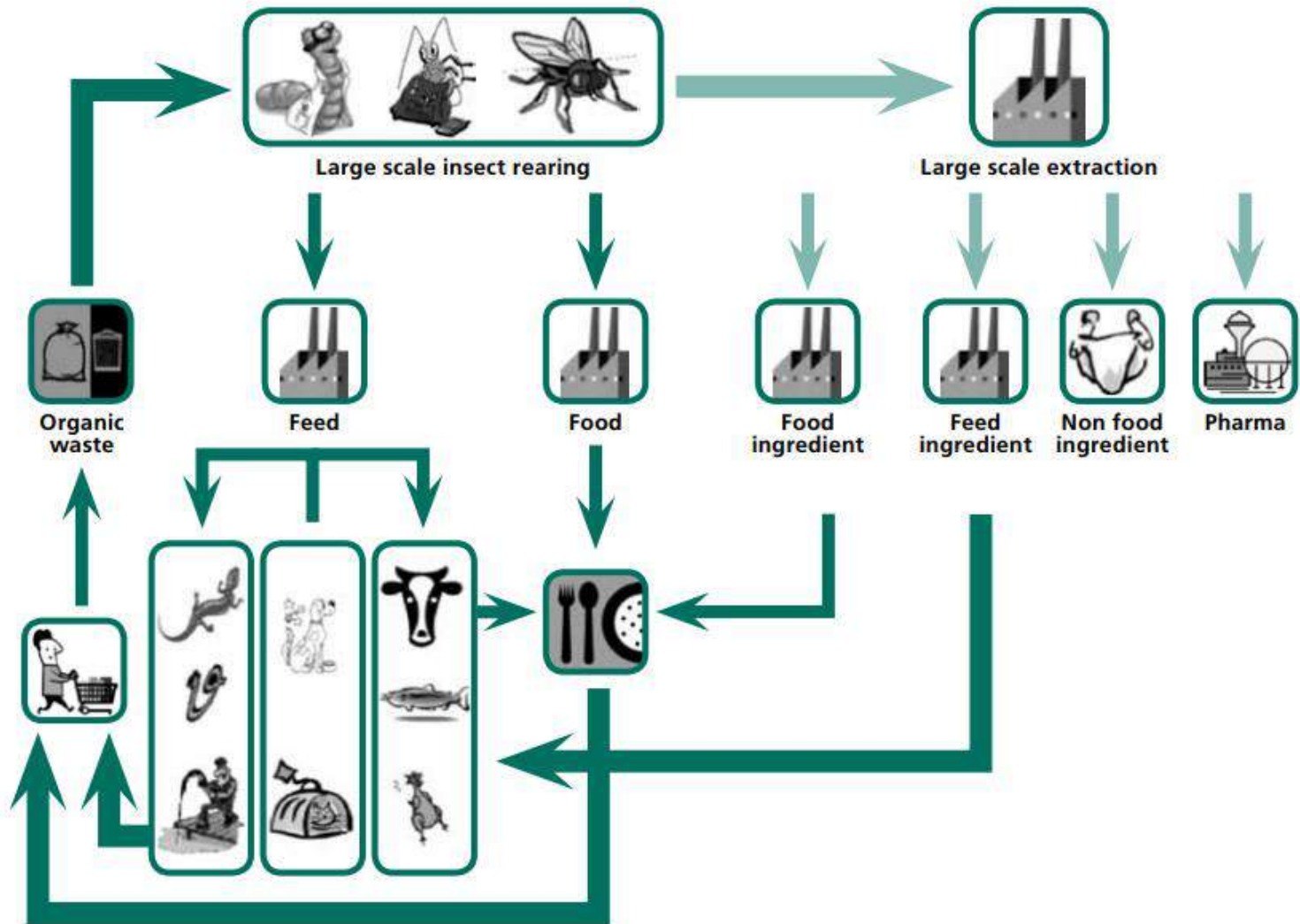
Note: The grey bars are minimal values and the dark green bars are maximum values found in the literature.
Source: Oonincx and de Boer, 2012.

FIGURE 5.2
Use of insects in the animal feed chain



Source: adapted from Veldkamp et al., 2012.

FIGURE 9.3



Source: M. Peters, personal communication, 2012.

Market..ability

Examples of insect prices are shown to give an idea of orders of magnitude and are taken from a wide variety of specific cases at the village level, in markets and online. These prices should not be used for extrapolation and should not be taken out of context. In Kenya, 1 kg of termites sells for €10 (V. Owino, personal communication, 2012). One can purchase 70 g of weaver ant pupae online for €7.50 in the United Kingdom of Great Britain and Northern Ireland. In the Netherlands, 50 g of the yellow mealworm and the lesser mealworm costs €4.85, and 35 migratory locusts cost around €9.99 online. In the Lao People's Democratic Republic, the price of grasshoppers is much lower, at approximately €8–10 per kg. In Oaxaca, Mexico, chapulines sell for around €12 per kg. At markets in Cambodia, one can (150–200 g) of fried crickets (*Acheta testacea* and *Gyllus bimaculatus*) sells for €0.40–0.70. Prices vary between rural and urban areas (C. Munke, personal communication, 2012).



Regulatory framework

- Regulatory frameworks need to be developed.
- The close collaboration of government, industry and academia will be essential for success.



Conclusions



- Insects already form part of the human diet in many countries, they need to be re-evaluated; however the sustainable harvesting of edible insects in the wild requires nature conservation strategies (environmental considerations and sustainability)
- Insect rearing is a socially inclusive activity (requires minimal technical knowledge and capital investment and lies within the reach of even the poorest and most vulnerable members of society)
- Consumer acceptability as a barrier or an opportunity? (factors could be pricing, perceived environmental benefits, development by the catering industry of tasty insect-derived protein products).
- A tremendous amount of work, research and feasibility, still needs to be done by a wide range of stakeholders over many years to fully realize the potential that insects offer for food and feed security: RESEARCH and DEVELOPMENT

Insects as feed or food – a potential and/or a challenge?

MEALWORMS - A COMBINATION OF THE BEST⁶



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