HSBC Global Research

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ESG Summer Series

The menu: An exclusive edible insect excursion

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- Insect protein plays an important role in future food security
- Edible insects provide rich nutritional content and produce little environmental impact given their high feed conversion efficiency
- We think the insect protein market will grow with the increasing risk of food insecurity driven by extreme weather events

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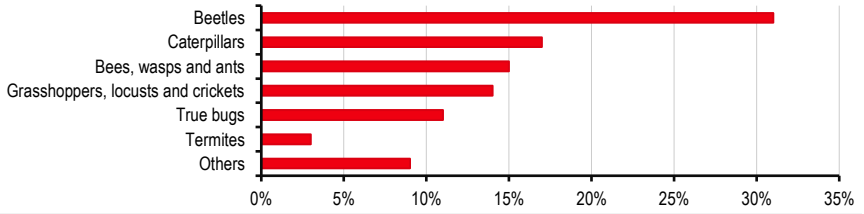
*This is the 3rd report in our **ESG Summer Series** – looking at sustainability issues in less obvious places. These issues could grow to become bigger trends in the future.*

Welcoming drinks: Insects could be the key to resolve malnutrition and future food insecurity problems exacerbated by climate change. They are widely available and offer ample macronutrients and micronutrients. In addition, insect farming requires less natural resources, while it generates less waste and emissions compared with conventional livestock farming. We think consuming insects as a major protein source instead of livestock could mitigate the impact of the agricultural sector on the environment. It also allows the global food system to adapt to changes brought about by climate change.

Main course: Governments are aware of the risks and opportunities that increasing the consumption of insects in diets could bring. Poland is proposing an 'anti-bug' law that requires a warning label on food products containing insects, while Italy has banned the use of insect flour in traditional food products such as pasta and pizza. Some places are more receptive: Singapore and the EU, for example, have approved certain insects for human consumption, but acceptance of edible insects varies across regions and culture.

Dessert: The increase in occurrence of extreme weather events will lead to a shrinking supply of animal-based protein. Insect protein can be an alternative. However, the 'yuck factor' remains a concern. Researchers found that when the natural form of insects is hidden in familiar foods, consumers are less resistant to their consumption[1]. For example, cupcakes made with cricket flour tend to be more acceptable than a cricket lollipop.

Figure 1: Percentage of recorded edible insect species per group globally



Note: True bugs: a hemiptera is an order of insects commonly called 'true bugs', comprising over 80,000 species within groups such as cicadas, aphids & planthoppers.
Source: Food and Agriculture Organization of the United Nations

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[1] Liceaga A.M., Processing insects for use in the food and feed industry, Current Opinion in Insect Science, 2021

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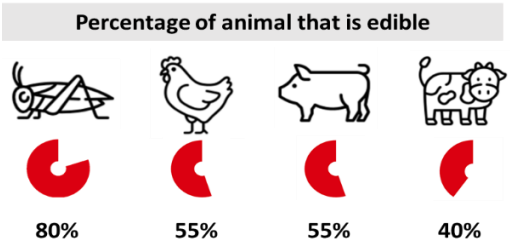
Sustainability in eating insects

Climate change has made an impact on the agricultural industry and has sparked discussions over food insecurity. Eating insects might be an ideal resolution for some of the food insecurity problems we face. For example, extreme weather exacerbates the seriousness of swarming locusts and worsens food insecurity in Africa. Swarming locusts used to be eaten by humans and animals during locust outbreaks when crops were destroyed. However, due to extensive use of insecticides, consumption of locusts is not recommended nowadays. In many developed countries, safe harvest of locusts for humans and animals could serve as a more sustainable management method compared to the use of insecticides[2]. Consumption of insects might be an adaptive method to a number of agricultural and food insecurity problems brought about by climate change.

Big edible insect buffet, but tiny livestock 'amuse bouche'

Animal-based protein is becoming more expensive, driven largely by years of drought conditions and inflation in the cost of feed and fuel. Compared to animal-based protein, insect protein is more efficient and reliable for human consumption. Around 80% of insects are edible, vs c50% for livestock. That said, insects' energy conversion from feed to edible weight is significantly higher than livestock. Also, abundance of insects is high and the reproduction cycle is shorter than vertebrates. As a result, the supply of insect protein is more scalable.

Figure 2: Insects have a higher feed conversion efficiency than some animals

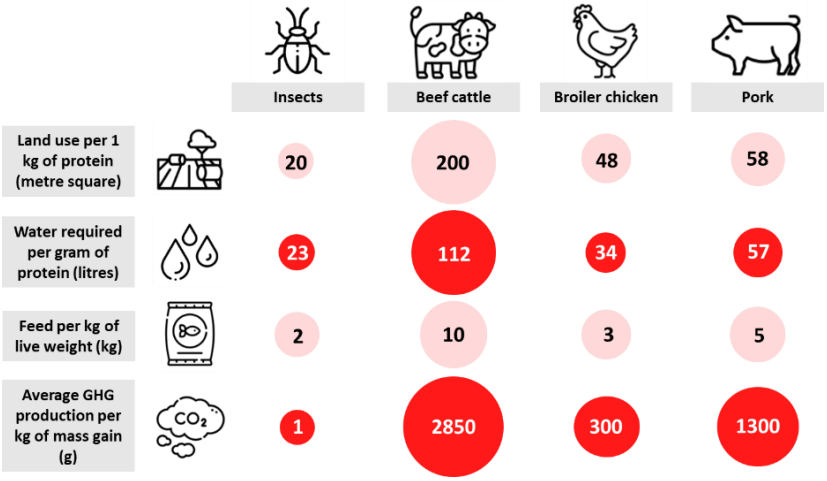


Source: Food and Agriculture Organization of the United Nations

Environmental impact of insects

Insects produce lower emissions compared to livestock. This can be partly explained by insects' high feed conversion efficiency and little reliance on natural resources.

Figure 3: Environmental impact of different protein sources



Source: Guiné, Correia, Coelho, and Costa (2021); Miglietta, De Leo, Ruberti, and Massari (2015) and Sogari (2015)

[2] Global overview of locusts as food feed and other uses, European Commission, 2021

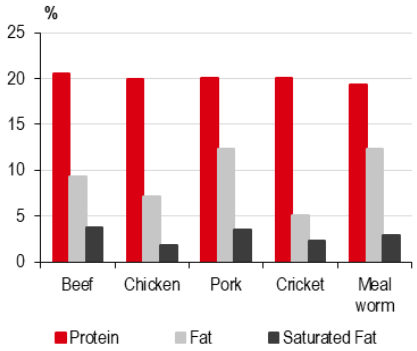
The amount of feed needed for insects to produce one kilogram of increase in weight is much lower than cattle and pork. Insect farming also requires less land and water. That said, insect farming is less land dependent and more drought resistant than most of the livestock.

Nutrition of insects

Insects provide all of the essential amino acids for human nutrition. Yet, some insects have high sodium content and high saturated fat[3]. The sodium content of an adult cricket is more than double that of beef or pork. Thus, if insects are to be used to replace conventional livestock to prevent diseases related to over-nutrition in the community, we need to be aware of any downsides.

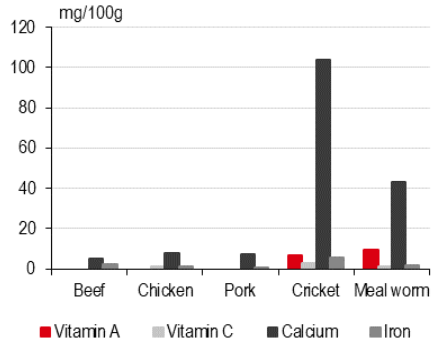
However, in situations of undernutrition, insects may be preferable as they contain various vitamins and minerals in addition to essential macronutrients. Undernutrition tends to be tied to low income as people cannot afford to eat a varied diet. Most of the food used to fight undernutrition are energy dense and there is often deficiency in micronutrients. Micronutrients play an important role in child growth and maternal health, helping to meet the increased need for vitamins and minerals intake. Including insects in meals can be a feasible solution to malnutrition problems.

Figure 4: Edible insects and livestock – nutritional value



Source: European Journal of Clinical Nutrition

Figure 5: Edible insects and livestock – vitamin and mineral content

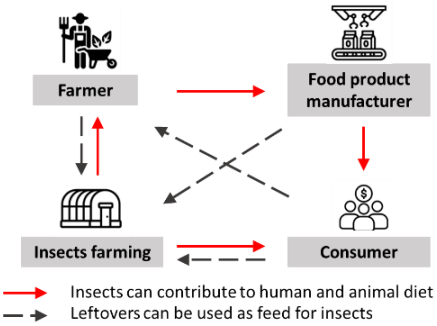


Source: European Journal of Clinical Nutrition

Saviour of food insecurity?

Apart from insects' high nutritional value, circularity and resilience of the insect food system make edible insects a means to fight food insecurity. Insects can transform food waste into nutritious biomass, while insect frass can be used as a fertiliser. Farming insects has little dependency on other external factors and the insect food system can be shown to be sustainable.

Figure 6: Circularity of the insect food system



Source: The World Bank

[3] Payne CL et al., Are edible insects more or less 'healthy' than commonly consumed meats? A comparison using two nutrient profiling models developed to combat over- and under nutrition, March 2016

Challenges in incorporating edible insects into our meals

Farming insects is complicated

Insect farming can lead to negative impacts on the environment if it is performed inadequately. Some insects are not suited to be farmed in a captive and enclosed environment. The living condition of insects should be optimal for their species, otherwise it might cause fighting and induce stress. Also, farming non-native insect species might harm domestic biodiversity. Regulators should look into species-specific measures to ensure insects' welfare is protected.

Testing the tolerance level

It would require the elimination of the 'yuck factor' towards eating insects in order to successfully promote them as a common protein source. Many would see insects as a symbol of rot and pestilence. In order to gain broader public acceptance of insect consumption, researchers have been trying out different strategies. For example, in a trial, edible insects have been served in school meals in four primary schools in Wales as researchers explore young people's attitudes to alternative proteins[4].

Also, consumers are found to be more willing to try insects when their natural shape is hidden and they are incorporated into foods they are familiar with, such as grounded insects being blended into baked goods or protein shakes[5]. There is growing variety and supply of insect infused food in the market to cater to different diet preferences and understand consumer acceptance.

Figure 7: The flavour profile of edible insects

Edible insects	Flavour categories	Common way to cook
Crickets and mealworms	Seeds, nuts or mushrooms	Grinded to powder
Locusts and scorpions	Fishy and seafood-like	Deep-fry
Sago grubs	Meaty and savoury	Grilled

Source: Institute of Culinary Education

Countries are paying more attention to edible insects

Governments are starting to recognise the importance of insect protein in diets in the future. Regulators are stepping in to oversee the novel food industry and build consumer trust. The Singapore Food Agency, for example, has given approval for 16 species of insects (including crickets, silkworms and grasshoppers) for human consumption starting from 2H 2023. In the EU, four applications for insects for human consumption have been approved, with eight more applications pending authorisation.

However, there are still concerns over the safety of directly eating edible insects or eating livestock that are fed by insects. Insects host microorganisms and some can do harm to humans. Regular updates on regulatory frameworks and controls over production and marketing can drive the expansion of the edible insect market by building consumer confidence.

Conclusion

Despite all the environmental benefits of eating insects, it would require a change in consumer psychology in order for insects to become one of the major protein sources. Concerns are mostly over the 'yuck factor' of eating insects and food safety. These are just some factors that need to be resolved in order to promote insects as a mainstream protein. However, we think the growing severity of the climate crisis and food insecurity will push countries to reconsider the food system and be more attentive to the development of insect protein. We believe insect protein will play a more important role in our diets in the near future.

[4] Eating insects: Should we be eating more? Why are they so good?, BBC News, 2022
[5] Liceaga A.M., Processing insects for use in the food and feed industry, Current Opinion in Insect Science, 2021

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Dead or alive – the worth of a tree, 13 July 2023

Ice cream: deliciously sustainable?, 06 July 2023

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