

Entomophagy could feed the world

By Annemarie Kruse

In around 80% of the world, edible insects are an established part of the local cuisine. In Thailand and Cambodia you can buy bags of deep-fried, seasoned or toasted grasshoppers, crickets or beetles on any street food market; Colombian fried and salted big-butt ants command premium prices amongst gourmets in Latin America.

But quite apart from individual cultural, ethnic and culinary preferences, insects are potentially a vital food source to feed the world's rapidly growing population. By 2050, it is estimated that there will be some 9 billion people living on our planet. As a result, food production will

have to almost double. At the same time, the existing ecosystems and environmental resources will continue to decrease.

Although the scientific field of edible insect research is still in its early years, many international research institutes and associations are convinced that raising insects for human consumption or for use as animal feed could play an important role in finding sustainable solutions to achieve global food security.

The UN's Food & Agriculture Administration (FAO) has been involved in edible insect research projects since 2003. In 2013, the FAO published a 200-page report on the edible insect food and feed value chain, concluding



Bug cuisine! Tempura silkworms. Courtesy of Tiny Farms

that insect harvesting was especially relevant issue in the 21st century due to the rising cost of animal protein, food and feed insecurity, environmental pressures and population growth.

Besides their nutritional

value, insects and bugs are easier to rear than other animals. They have a higher food conversion rate, which means that they need less feed than cattle, pigs or chicken to produce the same amount of animal protein. Raising insects

also exerts less pressure on the environment: they produce less ammonia or greenhouse gases than conventional livestock.

In addition, the FAO report says, raising, processing and selling of insects can also contribute to the economic development in some of the poorest regions of the world, especially at a micro-economic level: insects are the ideal mini livestock for small householders since they require comparatively little technical or capital expenditure.

However, insect farming for food is now also starting to take off in developed countries - like the US, for example, where over the last few years numerous cricket farms have been established. ■

Leading the pack: Insect farming consultancy Tiny Farms

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Over the last five years, the edible insects market in the US has been growing strongly. And this is no surprise: according to a 2014 report by research consultancy New Nutrition Business, the edible insect industry is projected to reach a turnover worth 360 million USD by 2019/2010.

Online stores and start-up companies are offering insect food products that range from bags of cricket flour over dried, salted or roasted insects all the way to chocolate-dipped grasshoppers, cricket protein bars or scorpion-lollies. You can also sample insect cuisine offline: the number of US restaurants that are introducing insect dishes to their menus is growing steadily. Alternatively, check out DIY recipes for silkworm burgers or kofta cricket patties in one of the many blogs and other online resources dedicated to the joys of entomophagy (insect eating).

California-based insect farming consultancy Tiny Farms has been instrumental in driving the edible insect market in the US forward. The company specializes in designing and building insect and runs the Open Bug Farm, an online collaborative platform for anyone interested in insect farming. Co-founder Daniel Imrie-Situnayake explains how Tiny Farms came about:

"Back in 2012, the first wave of American edible insect products was just entering



Daniel Imrie-Situnayake, founder, Tiny Farms in California

the market. We noticed that while dozens of companies offering edible insect products were starting up, there were very few suppliers of the ingredients themselves. There was a supply crunch coming, and we realized we had the skills to help avert it. Insects have tremendous potential to reduce our food system's impact on the environment, so we jumped in head first."

At the moment insect foods - and especially cricket products - are still comparatively expensive in the US. And as long as edible insects remain a niche category, and making them accessible to all demographic groups will be a challenge.

Imrie-Situnayake comments: "It's all about one thing: getting costs lower. Insects can't live up to their potential as a low-cost, nutritious and sustainable food while they cost USD 40/lb. One part of that is automation.

We need to build systems that allow a single farmer to take care of more insects so that they can charge lower prices. We can design equipment that takes care of repetitive tasks and software that helps farmers

run their farms. The second part is feed. One of the big benefits of insect livestock is they can eat stuff that would otherwise go to waste - think corn cobs, expired vegetables or the leftovers from making nut milk. We need to put together a supply chain for safe, reliable use of alternative feeds."

"Most cricket farms are extremely basic. Picture a warehouse, heated to around 32 C and filled with boxes of crickets on shelves. Almost every farm task is done entirely by hand, and even today's biggest farms still do things this way. It is extremely labor intensive to produce crickets and there's been little innovation in the field. That's why cricket powder costs so much."

We decided to do things differently. Our team's background is in design, and in logistics technology. We had the skills to create a different system, using technology and interaction design in an elegant way to help insect farming live up to its promises. So we spent several years on R&D, which is finally beginning to pay off."

Initially, Tiny Farms worked with companies that were looking to start individual farms, Imrie-Situnayake says.

"However, it's difficult for a single farm to engage in the R&D track that is necessary to deliver cost-effective crickets - and to stay price competitive over time. From our experience, and from watching the industry grow, we discovered that the only way to

make crickets affordable is to work together as a community.

So Tiny Farms decided to develop a more comprehensive strategy. "Farmers need to focus on farming while teams like ours focus on developing the technology that makes it possible. We're aiming to build a network of farms under the Tiny Farms brand - first in America and then across the world. As a community, we can better ensure produce quality, obtain excellent sources of feed, and can help protect farmers from market fluctuations that could put individuals out of business. Our standard feed is GMO-free, organic and 100% vegetable (it's common for feeds to contain animal products). A typical farm will be one large enough to provide income for a family. And we're raising banded crickets, a hardy insect species that tastes great and does well in large numbers.

As the edible insects market in the US is still under development it is an unregulated industry - there is no official industry association or legal framework, at least not at the moment. Imrie-Situnayake says that eventually a regulatory framework will have to be introduced, but not just yet:

"This is an industry with tremendous potential, but we're still in the early stages, figuring out the best ways to do things. Plus most companies are small, and they don't have the resources to create well thought out standards. Premature standardization can

be disastrous. If we establish a set of rules that lock in an inefficient way of harvesting crickets, for example, we could make it impossible to improve beyond today's prices - which are far too high to make a sustainability impact. Once we've passed the early stages, though, regulation will be necessary to protect consumers and suppliers from low-quality producers."

And what can manufacturers or retailers do to raise the profile of edible insects and to get more consumers interested in entomophagy? Imrie-Situnayake believes that it is important to let people experience these products in a familiar setting:

"Consumers are fascinated by edible insects, but most don't know where to find them. I think manufacturers and retailers need to work together more on things like shelf placement, sampling, and in-store promotion. As the price of crickets drops, we'll see a greater diversity in the types of products available. Insect-based products are evolving outwards from sports nutrition to more conventional food; we saw a lot of protein bars, then baked goods and granolas.

I think we'll see eventually more products that focus on the sensory characteristics of the insects themselves rather than disguising them in performance foods. I'm excited that there's a generation of kids being raised who will think of insect-based foods as entirely normal." ■