

LEAD ARTICLE

INSECTS MEET AN INCREASING DEMAND FOR ALTERNATIVE ANIMAL PROTEINS



Scholars project an exponential rise in future demand for animal protein. This demand is currently met by the constant expansion of intensive livestock production. But this development is environmentally unsustainable because livestock production already accounts for the largest share of agricultural land use, either for grazing or producing feed crops. An environmentally sustainable alternative to intensive livestock production needs to be found to ensure a more food-secure world in future.

A significant amount of annual global food production is wasted, both pre- and post-harvest. Vegetables and fruits account for almost half of that waste. Food waste has been traditionally used in compost and feed production. However, traditional conversion systems are time-consuming and inefficient. Bioconversion — the process of converting food waste into insect larval biomass and organic residues — can be an alternative to these present practices. Bioconversion reduces the amount of organic material using biological processing agents such as microorganisms or enzymes that transform organic material into usable products or energy sources, thus providing greater spatial potential for landfills and waste containers.

Edible insects require up to six times less feed than livestock for the production of the same amount of high quality protein. They provide oils, vitamins and minerals

but emit less greenhouse gases and ammonia than livestock. This opens up a potentially powerful source of food for direct human consumption or for protein in livestock feed meal mixtures.

ZEF research on the black soldier flies

ZEF researchers are currently engaged in exploring the use of black soldier flies (*Hermetia illucens*) for feed production and as a potential candidate for the bioconversion of organic waste and have come up with the following preliminary results and conclusions: Black soldier flies efficiently convert various organic wastes into high-profile protein through decomposition. The flies have a global distribution, including most tropical and subtropical regions, and can tolerate extreme temperatures.



Black soldier flies have been successfully used for waste management. They can also make use of various nutrients abundant in waste streams. In particular, Black soldier fly larvae can reduce a significant amount of food, animal, and sewage waste. The insects are not pests and actually deter the common houseflies that are normally linked to waste, low hygiene and poor health standards. When compared to livestock, the flies have some distinct advantages: They are cold-blooded and they can convert feed into edible products much more efficiently. They emit considerably less ammonia and greenhouse gases than conventional livestock, and, of course, they occupy less space.

Moreover, Black soldier flies have the ability to inactivate and reduce harmful microbial contaminants in waste streams by modifying the microflora of the waste. The flies also show some potential in reducing heavy-metal traces by incorporating and concentrating nutrients from waste samples into livestock feed. This reduces the pollution potential by 50 to 60 percent or more. After bioconversion, the remaining waste can be used as a bio-fertilizer.

Insect meal is a nutritional product prepared by drying and pulverizing insects. The meal promotes food assimilation and growth in animals because it is rich in protein, oils, essential minerals and vitamins. It can substitute the costly fishmeal, soymeal, and grains that are routinely added to livestock feed in order to promote food assimilation and growth in animals. Insects like Black soldier flies are good alternatives because of their ability to efficiently transform waste into high protein products. Clearly, edible insects provide a promising future source for animal protein. Yet, there remain many challenges to their use. The sustainable harvest of these insects is one. Producing numbers that can meet rising global demand is another. So far, most edible insects have been collected from nature. But their potential future use as feed meal will require large-scale production. In addition, legislation on their production and use needs to be developed to address sustainability and food safety.

See a longer version of this article:

Shumo, M. 2016. Black Soldier Fly: A Bio Tool for Converting Food Waste into Livestock Feed. *Solutions* 7(4): 36-39. <http://bit.ly/black-soldier-fly>

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EDITORIAL: MINI LIVESTOCKS - INSECTS AS PROTEIN SOURCE

There will soon be nine billion people on this planet. Feeding them alone will be a huge challenge for humanity, but providing them with the crucially needed animal protein is a daunting task, especially considering the fragility of our ecosystems. This challenge cannot be addressed using a 'business as usual' approach, which would imply utilizing more arable land for the production of animal

feed, or further depleting marine fish stocks worldwide. Thus feasible and sustainable alternatives need to be developed. An innovative and highly promising concept is to use mass produced insects as a novel protein source for animal and fish feed. Some insect species have a high oil and fat content. They are easily mass-produced, and they can even convert organic



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waste, including human and animal waste, into valuable biomass. These 'mini livestock' require significantly less space than their larger, conventional 'relatives' and also produce considerably less methane and other greenhouse gases. The consumption of insects (entomophagy) has been part of traditional diets across all continents. Food stands in night-time downtown Bangkok, a traditional restaurant in Mexico City or a market in northern Benin reveal how popular edible insects are in many parts of the world. Yet in North America and Europe, insects constitute niche products at best. Moreover, following the mad cow disease scandal, the use of animal protein in feed is still prohibited in the EU except for fish meal. Consider the irony: It is illegal for a European chicken to eat a 'worm' when it comes from a bag of feed. Yet it is perfectly fine for it to eat fish meal - certainly not a natural food source for our poultry. Removing these and other obstacles will help to provide our growing world population, especially in the Global South, with the much needed animal protein without further destroying our environment.