

The Benefits of Insects as Food for Human Consumption

Eating insects, though common in many parts of the world, is rare in the U.S. and most European countries. But increasing focus on sustainable agricultural practices has catalyzed a growing interest in the use of insects for human consumption. Insects can be farmed more efficiently than other animals, placing less demand on land and water resources while providing a valuable source of protein and other nutrients.

Resource Efficiency

It is widely agreed that meat consumption must be reduced to feed a growing human population in a manner that does not result in catastrophic habitat degradation. By replacing other animals as a protein source, the consumption of insects can contribute to the development of a more environmentally sustainable diet.

When farmed insects are compared with traditional livestock, studies show that insects are more efficient, generating more edible biomass and protein with less feed and water. They can be accommodated indoors, in compact, modular facilities, which allows for tremendous flexibility in farm location and can minimize the distance between the farm and the consumer. No part of the insect need be wasted; they can be eaten whole or made into a powder with a shelf life of months or years.

Nutrition and Safety

Like other animals, insects are an excellent source of high-quality protein. Depending on the species and its diet, insects can also provide significant amounts of mono- and polyunsaturated fatty acids, B-vitamins, and minerals including iron, calcium, magnesium, potassium, zinc, copper, and selenium.

In the U.S., the use of insects as a food or food ingredient falls under the authority of the U.S. Food and Drug Administration (FDA). The FDA has stipulated that insects, like any other food ingredient, must be clean and wholesome, produced with good farming and manufacturing practices, and labeled appropriately. Consumers, particularly those with crustacean allergies, would be advised to carefully read labels and be aware that little is yet known about the allergenic properties of insects. If these guidelines and practices are followed, insects are safe for most people to eat.

Culture

Many companies worldwide already operate commercial insect farming facilities, with more planned as the global demand for insects as food is expected to increase. Although some 2,000 insect species are consumed worldwide, only a few are reared commercially. In North America and Europe, three cosmopolitan species are now commercially raised for food and feed: crickets (*Acheta domesticus*), mealworms (*Tenebrio molitor*), and black soldier flies (*Hermetia illucens*). Much of what is known of the health, economic, and environmental aspects of eating insects comes from scientific studies of these species.

Historically, and on a global scale, it can be argued that eating insects is normal. Hundreds of cultures and ethnic groups, on all inhabited continents, regularly include insects in their culinary traditions. It is not clear why some food cultures have abandoned insects as ingredients, though often these cultures ate insects in the past. Even in Europe, the ancient Greeks and Romans recorded that they enjoyed eating insects, a tradition that survived until the mid-20th century with foods like cockchafer (beetle) soup. The use of insects as food can expand cultural awareness, and, alongside a plant-based diet with ingredients that are farmed as sustainably as possible, contribute to the global development of more sustainable agricultural practices.



The Benefits of Insects as Livestock, Poultry, and Aquaculture Feed

Resources essential to produce feed for livestock, poultry, and aquaculture are limited. Balancing these resources with the need to produce row crops and other essential food items for human consumption is a daily challenge. Insects can serve as a pressure release point by using material not consumed by people or animals (e.g., food waste) to produce protein that can then be used as animal feed.

Status of Feed Industry

The production of livestock, poultry, and aquaculture is a trillion-dollar global industry. Materials such as soy, corn, or wild-caught fish (in the case of aquaculture) are used to create feed that can be used to nourish animals in confined animal facilities. These animals must eat, but the agricultural system can be strained when human-edible food is consumed by livestock, particularly human-edible food that is slow to replenish.

Current Regulations

The Association of American Feed Control Officials (AAFCO) is charged with regulating the sale and distribution of animal feeds. They determine what can, and cannot, be used as feed ingredients for animals in the United States. Currently, the black soldier fly (*Hermetia illucens*)—considered a non-pest species, native to North America and currently farmed globally—is the only insect approved for use as a feed ingredient. Its larvae can be produced on human grade food waste (i.e., pre-consumer food waste, such as brewer's grain, grocery store surplus, etc.) and used as an ingredient in poultry and select fish species' diets.

How Can Insects Meet Demand?

Current facilities allow for insects, such as the black soldier fly, to be mass-produced at the tonnage scale. Facilities currently developed in the United States and abroad are capable of digesting <100 tons of food waste daily, resulting in the production of 10-20 tons of insect biomass, which can then be dried and used as a feed ingredient.

Benefits of the Insect Feed Industry

Using this system to convert such food wastes into biomass is an extremely efficient (for every two pounds of waste, one pound of biomass can potentially be produced), sustainable practice that protects the environment. Insect digestion of these materials reduces wastes in landfills and associated greenhouse gas production.

Challenges of Insect Mass Production

To realize these potential benefits for agriculture, diversification and investment in facilities is sorely needed to allow industry and research to advance, while vetting the process. Currently, few facilities exist in North America or anywhere else. Federal, state, and local investments in new facilities would increase industry stability as far as production while creating jobs and protecting the environment.

The Entomological Society of America is the largest organization in the world serving the needs of entomologists and other insect scientists. ESA stands as a resource for policymakers and the general public who seek to understand the importance and diversity of earth's most diverse multicellular lifeform—insects. Learn more at www.entsoc.org.

