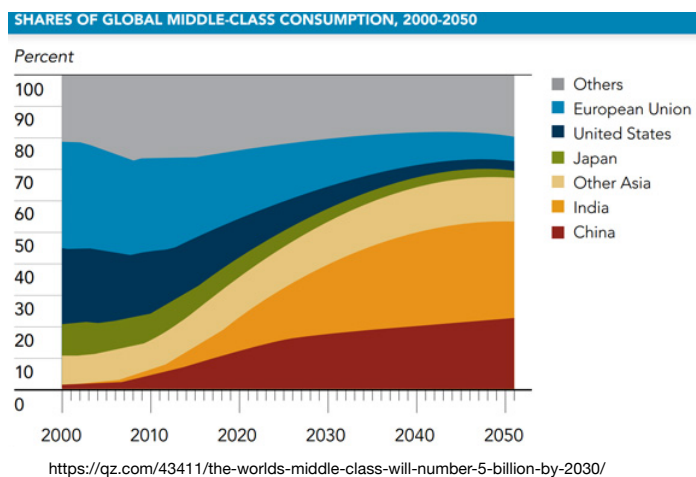


New Source of Protein

It is estimated that there are roughly 124 million people facing food insecurity. Currently the world population is believed to be 7.7 billion, and it is expected to increase by approximately 2.0 billion by 2050. This suggests that the number of people facing food insecurity will dramatically increase as well, unless agricultural practices are enhanced or new practices are found. “An expanding middle class has raised per capita meat consumption by 50 percent over the past four decades, fueling fears of a protein pinch (Plume, 1).”

A new up and coming theory is the use of insects as a source of protein. Insects are a probable solution, because there is a limited supply of natural resources and insects have very few needs. Many cultures across the world consume insects on a daily basis. While some people consider certain insects a delicacy, many in western cultures can't get past the ick factor. Since many of us aren't willing to eat them ourselves, the next best thing is to feed it to our livestock. This idea has the potential to help abolish food insecurity.



Insect Farming

A few new trends have led people to raise crickets in the comfort of their home. The home grown crickets feed their backyard chickens, and a few fanatics even consume the crickets themselves. In 2012 a company called Tiny Farms started enlisting everyday people to grow crickets, under contract, and they are used as a product in pet food. If you are interested in raising insects a good place to start is tiny-farms.com. “In Thailand, more than 20,000 insect farming enterprises are now registered in the country, most of which are small-scale household operations (Hanboonsong, iv).” Most small scale insect farmers raise fly larva and mealworms, because they are easy to grow, docile, and consume waste products. Four common breeding container types; concrete blocks, concrete cylinders, plywood boxes, and plastic drawers. AFFI claims

that the concrete enclosures are for larger scale farms, because they are large and do not need many repairs. The plywood and plastic boxes are perfect for small scale farming. The downfall to using plywood or plastic is they are susceptible to temperature and are less durable than concrete. Crickets farmers usually bed their enclosures with rice hulls, weevil farmers use palm bark, bamboo stalks are placed in the bamboo caterpillar enclosure, and giant water bugs are placed in rice paddies (Hanboonsong, 28).



Imagine if we able to efficiently industrialize this farming technique. “Insects have characteristics that make them an excellent alternative to feed products(Ismail, 528).” This is because they have brief lifecycles, can be found in large numbers in almost all ecosystems, they can reproduce rapidly, breeding is uncomplicated, and they have great biodiversity. Industrialized insect farms would also provide an outlet for waste products. Insects are able to convert organic byproducts such as food and livestock waste into a high protein biomass. According to J.K. Tomberlin, the United States has about 750 billion dollars worth of food waste every year and does not efficiently utilize this renewable resource.

Nutritional Value

There are over 2,000 edible insects in the world, but we are only going to discuss a few of the most popular. Insect meals have nutritional values very comparable to that of meals currently being used in feed rations. In 2014 FAO’s feeding trials concluded that insects could replace 25-100% of meals in fish, chickens, crustaceans, and pig rations without negative effects (Kupferschmidt,1). For example, black soldier fly larvae can be

a high value feed source, if fed a rich diet. The amount of available DM lipids can range from 15-49%. Larvae on a poultry waste diet had the lowest fat content, while the larvae on oil-rich diet had the highest. On average the larvae contained 26% DM lipids. The black soldier larvae have enough crude protein to be a substitute for soybean meal, but not fish meal. One research project found that chickens had no problem with the black soldier fly larva substitutions, while pigs required a few amino acid supplements (Makkar, 4).

Grasshoppers and locust are also a potential protein source for feed, but their nutritional values are greatly varied. While some species are in the upper crude protein range, others are a poor source of crude protein. Therefore, it is difficult to predict a majority of their nutritional values. Makkar stated that Calcium and Phosphorus are usually lower than crickets, but adult locust have a significant fibre content. Clearly grasshoppers are not going to be the best substitution, therefore scientists have decided to focus on other species.

Silkworm pupae have one of the highest nutritional values in the insect world. They are high in crude protein (60-80%), lipids (37%), lysine (6-7%), methionine (4%), and cysteine (4%). However, the chitin content is low (3-4% DM basis) (Makkar, 21). Crickets are also high on the nutritional value list. A poultry feed study proved that crickets had a higher energy content, amino acid profile, and digestibility coefficient than that of fishmeal. The conclusion of the study indicated that the cricket could not be the sole source of protein, but served as a beneficial supplement, because of the added amino acids (Wang, 670). "Insects have proven to be a sustainable source of protein, are of an attractive quantity and quality, and have acceptable nutritive properties (Ismail, 1).

Table 33

Main chemical constituents in insect meals vis-à-vis fishmeal and soymeal.

Constituents (% in DM)	Black soldier fly larvae	Housefly maggot meal	Meal-worm	Locust meal	House cricket	Mormon cricket	Silkworm pupae meal	Silkworm pupae meal (defatted)	Fishmeal	Soymeal
Crude protein	42.1 (56.9)	50.4 (62.1)	52.8 (82.6)	57.3 (62.6)	63.3 (76.5)	59.8 (69.0)	60.7 (81.7)	75.6	70.6	51.8
Lipid	26.0	18.9	36.1	8.5	17.3	13.3	25.7	4.7	9.9	2.0
Calcium	7.56	0.47	0.27	0.13	1.01	0.20	0.38	0.40	4.34	0.39
Phosphorus	0.90	1.60	0.78	0.11	0.79	1.04	0.60	0.87	2.79	0.69
Ca:P ratio	8.4	0.29	0.35	1.18	1.28	0.19	0.63	0.46	1.56	0.57

Values in parentheses are calculated values of the defatted meals.

http://www.researchgate.net/profile/Gilles_Tran/publication/264287361_State-of-the-art_on_use_of_insects_as_animal_feed/links/5a0daca0f7e9b7d4dba361b/State-of-the-art-on-use-of-insects-as-animal-feed.pdf

Concerns and Regulations

Before insect products can hit the market, there are a few things that need to be addressed. One major hurdle is varying or restrictive regulations. According to Dr. Stiles, “Under existing EU legislation EC999/2001 the production of animal feed containing insects is not possible and further work is needed to confirm that there are no potential food safety issues with regard to using insects as a feed source.” The United States and many other countries have similar legislation. These regulations were put into place, because scientists are unsure if there are any health risks associated with eating insect fed livestock.



The European Food Safety Authority (EFSA) and United States Department of Agriculture (USDA) have been conducting experiments on the risks of using insects as livestock feed. The EFSA just released a statement declaring that more studies needed to be conducted, because the amount of risk depends on the species of insect (Kupferschmidt,1). Large corporations like Cargill, McDonalds, Wilbur-Ellis, and Swiss-based Buhler are investing in case studies that evaluate how livestock fare on insect based diets. While, Protix and Aqua-Spark are now investigating ways to farm insects on a commercial scale. When these products are considered safe, they should start hitting the market.

Conclusion

Insects are now being seriously considered as an alternative source of protein in livestock feed, to assist in the fight to decrease food insecurity. Food safety organizations are working around the clock to determine the risks, if any, involved with insect products. Insect meals are very nutritional and would serve as an excellent replacement for soybean and fish meal. While, small scale insect farming is on the rise, large scale farming is still difficult. However, many companies are vigilantly working on ways to farm on a much larger scale. Insects products are not on the market just yet, but they will be; and when that happens seriously consider adding them to your ration. This simple substitution would benefit your livestock, and help build a new sector of agriculture.

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