

Could insects really replace meat?

Suwannachai Yodmingkwan^{1*} and Thitinun Naksang¹

¹Business English Program, Humanities and Social Sciences Nakhon Pathom Rajabhat University

*634327062@webmail.npru.ac.th

Abstract

In 2023, our world already has a population of more than 8 billion people. The next thing that will happen next it will be about food shortages. Although food production yearly does not decrease much, the fasting rate is increasing. People must find something new food to replace or increase food production in various ways to solve the problem of food shortages in the future. Insects can be one food choice; this document answers that insects have many reasons to be future food, like the time spent raising them, pollution during raising, and resources you use to spend on farming. We must compare it with chicken meat, pork, beef, and fish fillet. How many types of insects are popular worldwide, and of course pros and cons of the insects? Moreover, the last topic is about the insect opportunity we can do with this article. The writer would like to study the once of food shortage crisis that will happen in the future. The writer would like to study the market and the export of insects.

Keywords: Insects, Food shortages, Meat, Protein, Future food

1. Introduction

As we know, the world population has significantly expanded as of 2023. The world's population has continued to grow despite reduced birth rates; in 2023, it is predicted that there will be 8 billion people on the planet [1]. Thus, there is more demand for food. On the other hand, there has been a very slight increase in food production, which has contaminated the waterways and the symptoms. Food shortages occur frequently and in some nations already. It is also a well-known dish. Future food will produce meat that is simple to consume, like an insect. quick harvest. Furthermore, it has high nutritional value.

The global food crisis is caused by three main factors which are [2]:

1) Pandemic (COVID-19)

COVID-19 has caused an abnormal increase in demand for certain products, such as bottled water, instant noodles, chicken eggs, rice, frozen food, canned food, and dry food, which are food and beverage products that are essential for living and can be stored for long-term consumption without perishability. As a result, most consumers are stocking up on these items for household consumption during lockdown measures, resulting in short-term shortages of some food and beverage products.

2) The war between Ukraine and Russia

Ukraine is the world's fourth largest grain exporter, with significant exports, including sunflower oil (42%), corn (16%), barley (10%), and wheat (9%). In addition, the fighting has made it impossible to plant or harvest crops in some areas. Moreover, Prices of fertilizers and agricultural chemicals have also increased considerably. Because Russia is the world's largest exporter of raw materials for chemical fertilizers, this causes the production cost of agricultural products and processed agricultural products, including various food products, Which is also more expensive downstream of the food industry production chain.

3) Climate change

Climate change has a direct impact on the physical suitability of agriculture. Ranching also affects the overall environment in the ecosystem, continuously affecting the world's agricultural production as a whole tends to decrease. In the worst-case scenario, when global temperatures rise to 5°C from global warming. As a result, up to 60% of the world's fish species will be unable to cope with rising temperatures and will become extinct by 2100.

2. Information about insect and another meat

Why be Insect not chicken meat, pork, beef and fish fillet?

Because of 6 reasons why use insect be main raw food material :

1. It is too long for another meat.

Chicken takes around five months to raise [4], pig takes around five months to raise and eat many foods [5], a cow takes around 12 - 27 months to raise [6], and fish takes around 8 - 12 months to raise [7], it uses much water and easy dead infected, But Insect takes around 1-2 months to raise [8].

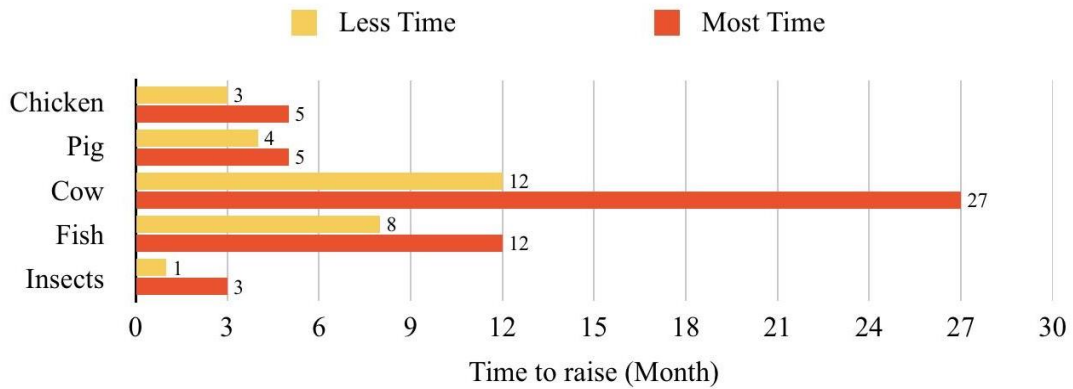


Figure 1 : Time to raise animals when compared with chicken, pig, cow, fish and insects.

2. Less pollution while raising and less food to raise

Process animals used in agriculture, such as pigs, cows, chickens, and fish, release Methane (CH₄) and Carbon dioxide (CO₂). The generation of these gases by insects[11] is 5 to 20 times lower than that of chickens[10], pigs[9], cows, and fish, even though it increases greenhouse gas emissions, contributes to global pollution, and depletes ozone (O₃) .

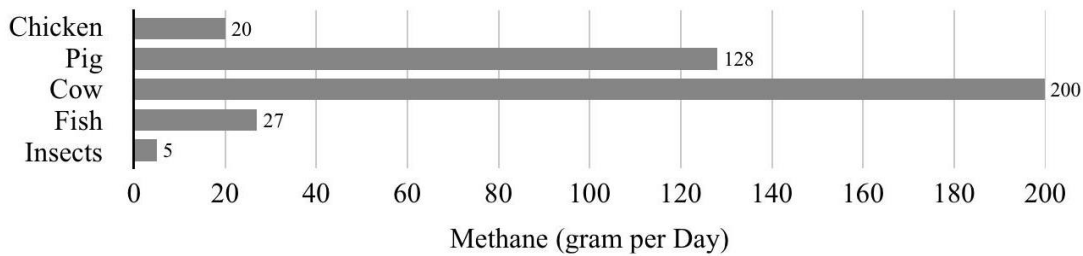


Figure 2 : Methane that animals process when compared with chicken, pig, cow, fish and insects.

Additionally, while raising fish[14], cows[13], pigs[5], chickens[12], and other animals for food, farmers feed them more food than they do insects[15] five times a week.

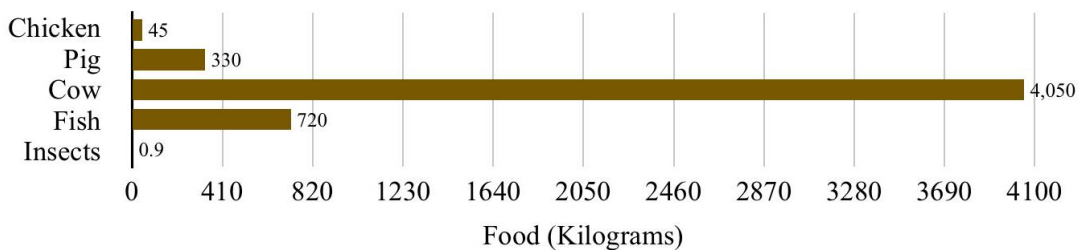


Figure 3 : Food to raise animals when compared with chicken, pig, cow, fish and insects.

3. More Profit use of Platform (Area)

Every business needs a certain amount of space to operate, and farmers need a certain amount to raise animals. For example, chickens[16], pigs[17], cows[6], and fish[7] require much space, whereas insects[8] require considerably less space and can produce layers while being raised.



Figure 4 : Area to raise animals when compared with chicken, pig, cow, fish and insects.

4. Zero waste and Perfect Yield

We currently produce much rubbish, which pollutes the environment. One example of this waste is food, almost entirely comprised of organs from extinct species of chicken[18], pig[19], cow[20], and fish[21] that were not used for cooking.

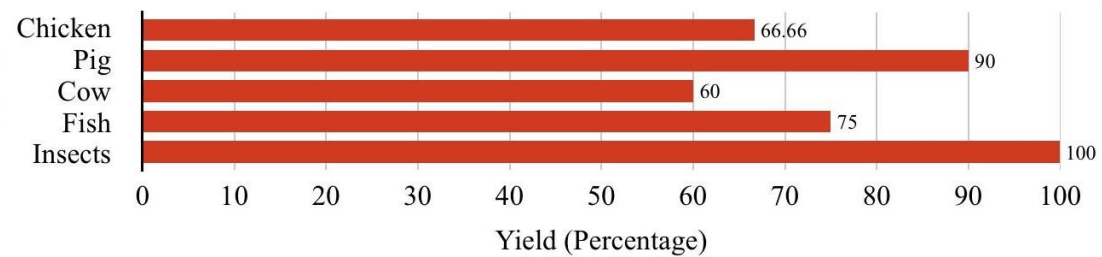


Figure 5 : Yield rate animals when compared with chicken, pig, cow, fish and insects.

5. More than Nutrients

The dietary nutrients that we need from meat are protein types. Additionally, our bodies have other types of nutrients, and in different types of meat, there are also different substances. The nutrient that is commonly used in comparison to proteins [24, 25, 26, 27] has iron[24, 27], calcium[27], and omega-3.

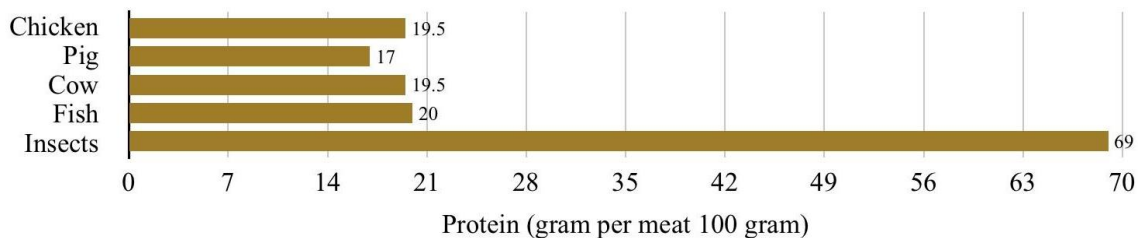


Figure 6 : Protein that animals produce when compared with chicken, pig, cow, fish and insects.

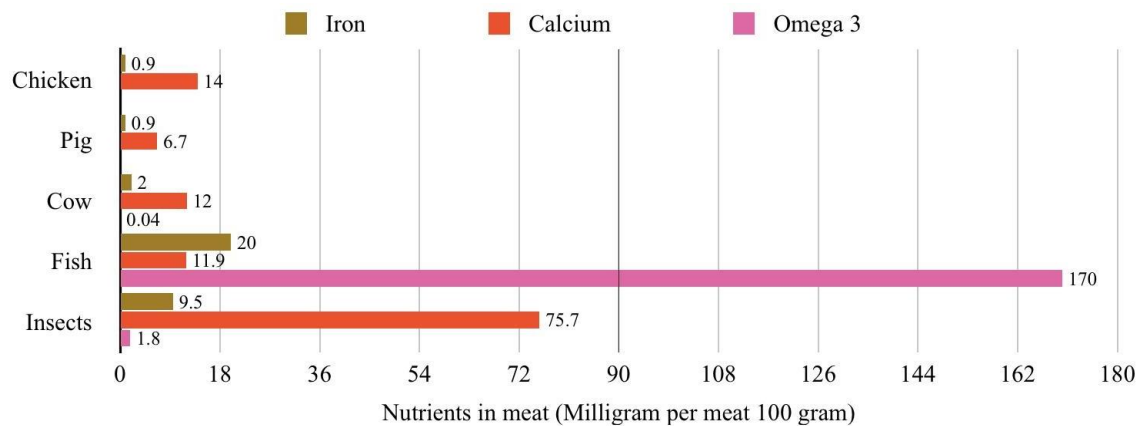


Figure 7 : Nutrients in animals meat when compared with chicken, pig, cow, fish and insects.

Charlotte Payne said that insects are lighter than meat and heavier than seafood. It also has a delicious taste. It is a food that humans have been consuming since ancient times. At present, efforts are being made to encourage more consumption of this type of food. It is advertised as the future food rich in nutrition and reduces greenhouse gas emissions and pollution. The following are the pros of insects meat;

1. Insects are easier than other animals to raise
2. Insects can get meat faster than other animals
3. Insects have more nutrients than other meats
4. Insects can be transformed into other products like powder insect

However, if we replace it with meat, histamine in the insect's meat should be considered. (Histamine is a naturally occurring substance found in various body tissues that occurs from a reaction to remove an acid group from an amino acid molecule.)

Type of Insect that popular in the world [28] :

Silkworms

The domestic silkmoth's caterpillars, known as silkworms, are raised for their elastic material, which is produced while constructing a cocoon. Many textiles are made from silk, which is recognized as a critical cash crop.

Mealworms

Mealworms The larval stage of a particular species of darkling beetle (Coleoptera) is known as the mealworm (*Tenebrio molitor* L.). The ideal incubation temperature is between 25 and 27 degrees Celsius, and the embryo develops for 4 to 6 days. It has an extended larval stage that lasts almost half a year at the ideal temperature and low moisture levels.[Reference needed] *Tenebrio molitor* larvae, adults, exuvium, and excreta all have protein contents of 46.44, 63.34, 32.87, and 18.51%, respectively.

Buffalo worms

The common name for *Alphitobius diapering* is buffalo worms, sometimes known as smaller mealworms. The larvae of this species resemble natural mealworms or little wireworms (*Tenebrio* spp.). They measure 7 and 11 mm in length at the last instar. Larvae that have just emerged have a milky

appearance. When the larva is about to molt, the pale color tinge returns to that of the first or second instar larva, while the post-molt appearance is yellowish-brown. Additionally, it has the highest level of iron bioavailability, according to reports.

Honeybees

Beeswax, bee bread, pollen, propolis, honey, royal jelly, and brood are among the products that can be obtained from honeybees. All of the ingredients above are primarily utilized in food, but because they are wax, they also have a variety of other purposes. For example, beeswax is used in candles, while propolis can be used to polish wood. However, the presence of honeybees can have a negative impact on the diversity and abundance of wild bees, which will have an impact on crop pollination.

Lac insects

Lac is a resinous substance that lac insects secrete. Lac is used in various products, including food, colorants, and wood finishes. With nearly 2 million residents working there, India and Thailand are the countries with the most lac farming.

Cochineal

Cochineal is used to create the red carmine, used in various goods like cosmetics, food, paint, and clothing. An estimated 100,000 insects are required to produce one kilogram of dye. The method used to process the insect determines what shade of red the dye produces. The most significant importer of carmine in the world is France.

Crickets

Terreform ONE's Cricket Shelter Modular Edible Insect Farm. The house cricket (*Acheta domesticus*), one of the many varieties of crickets, is the one most frequently consumed by humans. One of the healthiest edible insects is the cricket, which is eaten boiled, deep-fried, baked, and dry-roasted worldwide. The most convenient way to consume crickets is to use cricket flour, a powder made from dried and crushed insects. Because they are a rich source of nutrition for the numerous species of reptiles, fish, birds, and other mammals that eat them, crickets are frequently raised for non-human animal food. Deep freezing is typically used to kill crickets, rendered unconscious and painless before dying neurologically.

Waxworms

Waxworms are the larvae of wax moths. These caterpillars are used worldwide for food, fish bait, animal testing, and plastic degradation. Low in protein but high in fat content, they are a valuable source of fat for many insectivorous organisms. Waxworms are popular in many parts of the world due to their ability to live in low temperatures and their simplicity in production.

Cockroaches

Cockroaches are farmed by million in China and used in traditional medicine and cosmetics. The main species farmed is the American cockroach (*Periplaneta americana*). The cockroaches are reared on food such as potato and pumpkin peeling waste from restaurants, then scooped or vacuumed from their nests, killed in boiling water, and dried in the sun.

NEWS

Cricket Cookies processed products make an extra income for intelligent women in Ubon Ratchathani [3]. "Insects" are a food source of protein recognized by the Food and Agriculture Organization of the United Nations (FAO) as a "rising export product" with a promising future. Nowadays, few entrepreneurs foresee the opportunity from here. Development of Thai processing insects to create added value, Especially the most popular cricket for being processed into both savory and sweet foods, To the point that there is an encouragement to raise crickets as an economic animal ever.

3. Conclusion

The practice of raising and breeding insects as livestock is also referred to as mini-livestock or micro-stock. Insects may be farmed for the commodities they produce, like silk, honey, lac, or insect tea, or for them themselves, to be used as food, feed, dye, or otherwise. Insects cannot wholly replace other meat. However, insects can be used to increase the quantity and production capacity of food to reduce the problem of food shortages.

However, business in the food industry and the meat we will produce is made from insects; the product is not only any style like fried insects or baked insects but any style like instant food, meatball, and meat with sauces, etc. It is adaptable to changes in your lifestyle. And this research the writer can extend it into a business in raising insects to support future food needs.

4. References

- [1] Voice Online Editorial department. (2022, November 15). The United Nations reveals that the world's population has surpassed 8,000,000,000 people already. Voice online.
<https://voicetv.co.th/read/jv1BxbvTO>
- [2] Springnews. (2022, November 23). The global food crisis affects the food production chain from upstream to downstream. <https://www.springnews.co.th/keep-the-world/climate-change/832570>
- [3] Technologychaoban. (2021, February 11). Cricket Cookies processed products make an extra income for intelligent women in Ubon Ratchathani.
https://www.technologychaoban.com/marketing/article_171853
- [4] weotec. (2015). Raising hen. <http://www.weotec.com/article/3/Raisinghen> (In Thai)
- [5] moopakchong. (n.d.). Pig knowledge. <https://moopakchong.org/knowledge/pig-farming.html?view=category&id=12>
- [6] Department of Livestock Development. (n.d.). Raising cows.
<https://pvlo-cmi.dld.go.th/Doc/Publication02cattle.pdf>.
- [7] otopmidyear. (n.d.). Raising fish in the soil pothole. <https://www.otopmidyear.com/page-977.php>
- [8] Regional Livestock office 6. (2021, april). The manual to Raising Crickets public edition.
<https://region6.dld.go.th/webnew/images/Z016.pdf>.
- [9] GOV.WALES. (2020, August 17). Greenhouse gasses produced in pig rearing.

<https://businesswales.gov.wales/farmingconnect/news-and-events/technical-articles/part-1-greenhouse-gases-produced-pig-rearing#:~:text=On%20a%20global%20scale%2C%20pigs,to%20their%20different%20digestive%20strategies.>

- [10] Schlesinger W. (2018, December 27). Silent but Deadly. Translational Ecology.
<https://blogs.nicholas.duke.edu/citizenscientist/silent-but-deadly/#:~:text=Humans%20are%20reported%20to%20emit,million%20metric%20tons%20per%20year.>
- [11] Jackie. (2016, July 19). Flatulent cockroaches adapt to climate change. Rentokit.
<https://www.rentokil.co.uk/blog/flatulent-cockroaches-adapt-climate-change/#:~:text=The%20American%20cockroach%20for%20example,biggest%20contributors%20to%20global%20warming.>
- [12] Biological garden. (2019, July 26). Raising laying hens (semi-released).
<https://gdpark.asia/seed/animal/533#:~:text=Layinghens,girlswilleat,self-pollinate,bio-waygarden.>
- [13] nutrition. (n.d.). Guidelines for Raising Beef Cattle with Waste Materials and by-products of agriculture as roughage. [http://nutrition.dld.go.th/Nutrition_Knowledge/ARTICLE/ArtileD.htm#:~:text=Normally,cowscaneatfood,getprotein=0.29 gram/day.](http://nutrition.dld.go.th/Nutrition_Knowledge/ARTICLE/ArtileD.htm#:~:text=Normally,cowscaneatfood,getprotein=0.29%20gram/day.)
- [14] otopmidyear. (n.d.). Feeding frequency. [https://www.otopmidyear.com/page-340.php#:~:text=Feeding frequency,There will be good growth.](https://www.otopmidyear.com/page-340.php#:~:text=Feeding%20frequency,There%20will%20be%20good%20growth.)
- [15] Jeepkapoohpooh. (n.d.). Eating insect food.
[https://jeepkapoohpooh.wordpress.com/Content/Content-1/Insect feeding/.](https://jeepkapoohpooh.wordpress.com/Content/Content-1/Insect%20feeding/)
- [16] Page Kai Khai Good Mood Thailand. (2018, January 18). #wanttoraise100layinghens #howmucharea. Facebook. https://web.facebook.com/aggsth/posts/1571874112928077/?locale=th_TH&_rdc=1&_rdr.
- [17] Thai swine veterinary association. (n.d.). Farm standard criteria.
[https://tsva.or.th/standard-of-pig-farm-criteria#:~:text=Breeders with empty stomachs 1.2,3-4 square meters/each.](https://tsva.or.th/standard-of-pig-farm-criteria#:~:text=Breeders%20with%20empty%20stomachs%201.2,3-4%20square%20meters/each.)
- [18] garden.desiguspro.com. (n.d.). Table of broiler weight by day, instructions for calculating weight gain.
<https://garden.desiguspro.com/th/kury/soderzhanie/ves-brojlerov-po-dnyam-tablitsa.html.>
- [19] Thai PBS. (2020, July 21). Traders offer to control the price of the slaughterhouse to solve the problem of expensive pork. <https://www.thaipbs.or.th/news/content/294792.>
- [20] kasetporpeang. (n.d.). Confirmed!!! about beef.
<http://www.kasetporpeang.com/forums/index.php?topic=123119.180;wap2.>
- [21] SalmonFarm By Mon Uan Fresh Norwegian Salmon Delivered to the front of the house Delivery Salmon. (2018, October 6). Fresh Mon. 1 fat ones. Only 3,000 baht..
[https://web.facebook.com/salmonfarmm/posts/1127783550704209/.](https://web.facebook.com/salmonfarmm/posts/1127783550704209/)
- [22] MGR Online. (2016, August 4). Benefits of mackerel.
<https://mgronline.com/infographic/detail/9590000077535.>
- [23] Amarin Baby&kids. (2022, May 21). A list of 15 Thai fish, high in omega 3. Eat smart and have a good memory. [https://www.amarinbabyandkids.com/food-nutrition/thai-fish-omega-3/.](https://www.amarinbabyandkids.com/food-nutrition/thai-fish-omega-3/) (In Thai)

- [24] bangkokbiznews. (2018, August 01). 'Insects', a great dish with great value.
<https://www.bangkokbiznews.com/business/809072>.
- [25] bangkokbiznews. (2018, August 09). 'Insect farm', high income occupation - low cost.
<https://www.bangkokbiznews.com/business/809885>.
- [26] Benison media. (2020, January 22). Insect Protein in Europe.
<https://benisonmedia.com/insect-protein-in-europe/>.
- [27] Eatgrub. (n.d.). INSECT AND OTHER ANIMAL PROTEIN COMPARISON.
<https://www.eatgrub.co.uk/why-eat-insects/01-5/>.
- [28] wikipedia. (n.d.). Insect farming. https://en.wikipedia.org/wiki/Insect_farming.