

# THE CASE AGAINST INSECT FARMING



Insect farming, marketed since the early 2010s as an exciting and sustainable alternative to traditional meat, has failed to live up to its promise. Initially embraced by investors and academics as a potential way to reduce the environmental impacts of global agriculture, the industry has failed to meet the conditions that would make it a realistic, sustainable alternative to meat.

The most common insect species farmed for consumption by humans, companion animals, and livestock are black soldier flies, mealworms, and crickets. While each species has specific needs and comes with its own farming system, insects destined for food production are typically raised in humid conditions in plastic bins or trays. These can be stacked, allowing for the intensive rearing of billions or even tens of billions of insects at once inside large factory buildings. Annually an estimated 1.9 trillion insects are farmed for food and feed throughout the world, with an estimated 142 billion alive at a given time.<sup>1</sup>

Where it's being used as feed in the industrial factory farm and aquaculture industries, as well as an ingredient in high-end pet food, insect protein is not necessarily more sustainable than the traditional ingredients it would replace. Furthermore, the insect farming industry poses significant risks to vulnerable native ecosystems.<sup>2</sup>

## **INSECT POPULATIONS ARE ALREADY DECLINING AT ALARMING RATES; INSECT FARMING COULD EXACERBATE THE PROBLEM**

Insects are a diverse and fascinating group of animals encompassing over 1 million described species.<sup>3</sup> Wild insects are declining across the globe due to human activity. Their extinction crisis

jump-started in the mid-20th century and has dramatically worsened over the past few decades. Today an estimated 41% of insect species are declining and could be at risk of extinction — twice as many insects are at risk of extinction as vertebrates.<sup>4</sup> Factors driving their decline include habitat destruction, pesticides, invasive species and climate change, all of which can be traced directly to human activity.<sup>5</sup> Pollinators, who play a vital role in functioning ecosystems, are particularly threatened. Twenty-four percent of native bees are imperiled, and population declines are occurring in 52% of native bees.<sup>6</sup> A primary driver of their decline is agricultural intensification, which includes habitat destruction and pesticide use.<sup>7</sup>

Rearing insects en masse under high-density conditions is another unnatural, human-caused activity that will only exacerbate the wild insect extinction crisis. Concerns from insect farming include genetic changes in wild insect populations due to farm escapes, competition from invasive behavior of farmed insects, and pathogen spillover into wild communities.

According to a declaration signed by 582 scientists and philosophers, certain invertebrates, including insects, may well possess consciousness.<sup>8-9</sup> For example, scientists have observed, bees appear to engage in play.<sup>10</sup> Humans should weigh actions that threaten their welfare.<sup>11</sup>

## INSECT FARMING POSES A THREAT TO BIODIVERSITY AND ECOSYSTEMS



**Escapes:** Insect farms have insufficient controls to prevent farmed insects from escaping and disrupting local ecosystems.<sup>12</sup> The potential for farmed insects to escape or be released poses a significant biological invasion risk, threatening biodiversity, human well-being, and economies.<sup>13</sup> Escaped insects can come into contact with wild populations, potentially spreading diseases or causing other problems.<sup>14</sup> Of the insect species commonly farmed for human food and animal feed, black soldier flies and banded crickets pose the greatest risks.<sup>15</sup> Many of the commonly farmed species have been selected for traits that enhance establishment risk such as high phenotypic plasticity, generalist habits, disease resistance, and rapid life cycles.<sup>16</sup>

**Genetic impacts:** Selectively bred or genetically modified insects may compromise local biodiversity by spreading their genes. Where farmed insect species are native, wild populations may be harmed by the introduction of nonadaptive genes from farmed populations or be replaced by farmed strains that have been engineered to grow larger or more disease resistant.<sup>17</sup>

- There is already evidence of hybridization between domestic and wild strains of black soldier flies, indicating that farmed black soldier flies have escaped and mated with wild flies.<sup>18</sup> Domestic black soldier flies are likely to become even more genetically uniform as they are selectively bred for certain traits and subjected to gene editing.<sup>19</sup>

**Competition:** Nonnative species could upset local ecosystems and outcompete native insects for food, habitat, or other resources. This could pose a particular problem for pollinators, given that the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services found in a 2017 pollinator assessment report that “[e]radicating invasive species that negatively impact pollinators is rarely successful, and so policies that focus on mitigating their impact and preventing new invasions are important.”<sup>20</sup>

**Disease spread:** Farmed insects are susceptible to a variety of transmissible pathogens and parasites that can easily spread between insects of the same and different species, posing additional risks to wild insect populations.<sup>21 22</sup> In addition to insect escapes caused by improper containment, another pathway for the spread of diseases and pathogens occurs when farmers cull diseased populations and dispose of the remains in dumpsters without proper containment or treatment.<sup>23</sup> When a pathogen spreads in high density settings or where multiple species are present, that provides ample opportunities for mutations in the pathogen to make it more dangerous to new species.<sup>24</sup>

- Other farmed insect systems provide insight into the potential risks of insect farming for food production.<sup>25</sup> Bumblebees farmed to pollinate greenhouse plants are an example of insects that are ostensibly kept separate from the outside environment. Farmed bumblebees have higher levels of pathogens than wild bumblebees, and those pathogens were found in higher levels among wild bumblebees captured closer to greenhouses than wild bumblebees foraging further away.<sup>26 27</sup>

**Economic agricultural losses:** Invasive insect species can cause significant economic losses by damaging crops, stored goods, and infrastructure. For instance, lesser mealworms (*Alphitobius diaperinus*) are pests in poultry farms, damaging insulation materials and acting as a reservoir for avian pathogens. Additionally, lesser mealworms act as a reservoir of avian pathogens such as infectious bursal disease virus (IBDV), turkey enterovirus and rotavirus, *Salmonella* sp., the protozoan *Eimeria*, the turkey coronavirus, and *Escherichia coli*.<sup>28</sup>

- Another example of an economically damaging disease outbreak was *Acheta domesticus* densovirus (AdDNV), attributed to farmed insects imported to the United States that resulted in several U.S. and European cricket operations declaring bankruptcy or abandoning *A. domesticus* as livestock.<sup>29</sup>



## INSECTS WILL NOT REPLACE CONVENTIONAL MEAT



**Barriers to marketability of edible insects:** Despite initial enthusiasm about edible insects becoming a sustainable alternative to conventional meat, the market for human consumption of insects in the Global North has not materialized as expected. Insurmountable feelings of disgust in cultures such as the United States, which currently overconsume meat and poultry and other barriers, have hindered a market for human consumption of insects, and the prospect for a future market in edible insects is extremely low.<sup>30</sup> These barriers will prevent edible insects from competing with more widely accepted alternatives to meat, such as plant-based options, in efforts to move toward more sustainable food systems and reduce the environmental impacts of industrial animal production.<sup>31</sup>

- A comprehensive review of 91 articles revealed that insect-based proteins ranked lowest in acceptance among various meat substitutes, falling behind cultured meat, with plant-based options rating the highest acceptance, up to 91%.<sup>32</sup>

**Most insects are not farmed for human consumption:** Only a negligible share of insect protein is used as food for humans today.<sup>33</sup> Instead, the majority of the nearly 2 trillion insects farmed worldwide annually are now used for livestock feed, fish feed for aquaculture, and pet food.<sup>34 35</sup> This means that today's insect-farming sector is directly contributing to the environmentally destructive and inhumane industrial livestock and aquaculture industries, rather than serving as a sustainable alternative to conventional meat, as insect companies first promised.

**Insect-based foods that *are* for human consumption do not replace meat:** Instead of replacing resource-intensive meat, most insect-based foods are enhanced versions of existing snack foods or pantry staples (i.e. chips, biscuits, bread, flour), which are made from comparatively low-impact ingredients. Adding insects only increases the environmental cost of production by increasing the

agricultural and processing demands of the products. The incorporation of insects into such foods limits their contribution to reducing the overall environmental impact of the food system, as those snack foods and staples are often consumed in addition to, rather than instead of, other animal products.

**Price barriers:** While prospects for insects being embraced as a replacement for meat in the United States are very low due to consumer disgust, an additional barrier is that edible insects are projected to achieve price parity with conventional counterparts later than other alternative protein options (plant-based meat substitutes, single-cell proteins, and cultivated meat).<sup>36</sup>

## **INSECT FARMING IS A PART OF FACTORY FARMING, NOT AN ALTERNATIVE**

The current market for commercially produced insect protein is dominated by the livestock, aquaculture, and pet-food industries. In fact some of the same giant multinational agribusinesses that control most of the American meat market have partnered with insect companies to produce insect feed to use in their lines of business.<sup>37</sup> Insect farming itself is a form of industrial animal agriculture, since insects are reared in dense conditions without the ability to engage in all their natural behaviors.

## **INSECT-BASED LIVESTOCK FEED AND FISH FEED ARE NOT NECESSARILY MORE SUSTAINABLE THAN PRODUCTS THEY'RE REPLACING**

Far from fulfilling the original promise of developing alternatives to meat and increasing food sovereignty in the Global North, the insect farming industry is actively contributing to unsustainable elements of global food systems.

Proponents of insect protein as livestock feed and fish feed argue that insect protein is preferable to conventional ingredients (such as soymeal for livestock or wild fish meal for aquaculture) because it avoids ethical challenges such as deforestation from harvesting soy, or overexploitation of fisheries through fish feed. However, studies have shown that insect protein is less sustainable than traditional feed ingredients in many respects.<sup>38</sup>

There are multiple barriers preventing insect protein from becoming a more sustainable or economically viable alternative to soymeal feed and fish feed. The industry claimed that insect protein would contribute to the “circular economy” because in theory, some insect species can subsist on organic waste. However, for reasons that are likely to persist (such as availability, consistency, and regulatory restrictions), most large producers have instead chosen to feed their insects the same high-grade substrates that could be fed directly to livestock.<sup>39</sup> This makes insect feed less sustainable than soymeal or fish feed.



## CONCLUSION



When insect-farming companies launched, many lauded the environmental benefits of their products compared to conventional meat.<sup>40</sup> But the lower environmental impact of insects compared to meat is not extraordinary — most plant foods, including protein-rich plant foods, are less resource-intensive than meat.<sup>41 42 43</sup> Many studies note that plant-based options (both whole plant proteins and plant-based meat alternatives) are more scalable and widely accepted in the Global North.

Commercial insect farming in the Global North frequently falls short of its environmental potential. Concerningly, it introduces new risks to the natural environment through the escape of farmed insects and potential spread of genes, pathogens, and parasites. An additional concern is the opportunity cost of diverting resources from more sustainable and appetizing meat alternatives. Investment and policy support for alternative proteins should go toward solutions that demonstrate clear potential to displace conventional meat consumption, particularly increased production and consumption of healthy whole plant proteins.

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