

# The future of insect farming: where's the catch?

Report  
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# The most farmed animals on the planet

There are [300 million farmed mammals](#) including cows, pigs, sheep and goats in the EU. Moreover, it is estimated that across Europe, [over 1.6 billion poultry](#) are farmed each year and [over one billion fish are farmed](#) at any one time. **This represents six and a half farmed animals for every EU citizen.**

Since 2017, European industry has started significantly scaling up the industrial farming of new animals, including several species of insects. Touted for the perceived smaller environmental footprint of insect facilities compared to other farms, **the industry aims to rear trillions of insects annually, which would make them the most industrially-farmed animals in Europe.**

This report looks at two main aspects of this new type of farming: the validity of farming processes (how they impact the wellbeing of insects) and how this new source of feed and food could impact the livestock farming sector, as well as the sustainability of Europe's food systems.

It has become clear that - behind its image as a "sustainable" food source for people - insect farming is really about insects being used as feed for animals, with the growing industry **predominantly being driven by a need to feed other farm animals in intensive systems**. Therefore, its success depends on an increased demand for (and consumption of) animals, shifting focus from a move towards more plant-based diets that is an integral aspect of creating more sustainable food systems in the EU.

However, this distinction between the farming of insects for food or feed is not readily made. Farmed insects are claimed to be sustainable because they are "alternative proteins" that could reduce the human consumption of (other) animal products. Yet by being mainly farmed to produce feed for other farmed animals, insect farming fundamentally encourages unsustainable practices.

**Eurogroup for Animals has scoped the European insect farming landscape and prepared this short summary of how insect farming fits into Europe's agri-food policy debate.** The report is divided in two parts:

- In **Part One**, it illustrates the policy debate as it stands today in the EU. This landscape is mainly characterised by fragmented policy processes and significant knowledge gaps, despite which, authorisations for new insect species to enter the food and feed chains are given;
- **Part Two** takes a first look at the multi-million-dollar, multinational agri-food and feed funding streams going into the insect farming sector. The economics of the industry confirms that feed is the main investment made, not food.

For more detailed information and findings on insect farming, including for the welfare of insects and the industry's potential drawbacks for the environment and the EU's sustainability goals, we invite you to explore "[Insect farming and sustainable food systems: the precautionary principle](#)", a report prepared by independent animal welfare expert Dr Helen Lambert.

# Part One: joined up political thinking for coherent policy

In most EU countries and within the EU institutions, insect farming is seen as a promising and fast fix to the lack of sustainability in our agri-food system. Yet although insect farming is included in EU strategies and reports as a sustainable alternative, when it comes to authorisations to actually farm them, the approach focuses on details and not the bigger picture.

## 1. A damaging technocratic discussion

Within the European Commission, different departments and agencies deal with specific technical issues in isolation as and when they land on their desks, with little joined up thinking with other departments or strategic political considerations.

The European Commission only looks at specific, individual regulatory questions as and when they arise, such as whether bovine meat is used in insect feed (known as insect substrates) or the toxicological analysis of new species as Novel Foods.

This technical-silos approach makes it difficult to have an informed, broader political conversation. However, insect farming raises both an ethical question around insect welfare *and* connects systemically with the food system, agriculture and intensive animal farming.

**Within a broad strategy called [Farm to Fork](#), the EU is in the process of developing policies that will direct Europe's food and agricultural systems, along with animal welfare, for years to come.** It is therefore both urgent and necessary to fully include insect farming in these political processes.

## 2. An overwhelming lack of knowledge and precaution

According to the Commission itself, there is an "[overwhelming lack of knowledge](#)" surrounding all aspects of insects and insect farming. This void is currently filled by industry and, due to lack of other evidence, their argumentation is readily picked up by both policymakers and (public) financing institutions.

Inevitably, most research commissioned or carried out by industry is centred around industry needs: increased productivity and faster or more cost-efficient production processes, rather than insect welfare, behavioural needs or even sentience. Nor does industry readily research the implications of insect farming on the food system, including to what extent it supports intensive animal farming. In fact, the approach taken to date in developing insect farming is similar to what has been done in the past with the intensive farming of other animals. Thereby, the negative consequences in terms of animal welfare, environmental damage and human health have the potential to be the same in the context of farming insects, too.

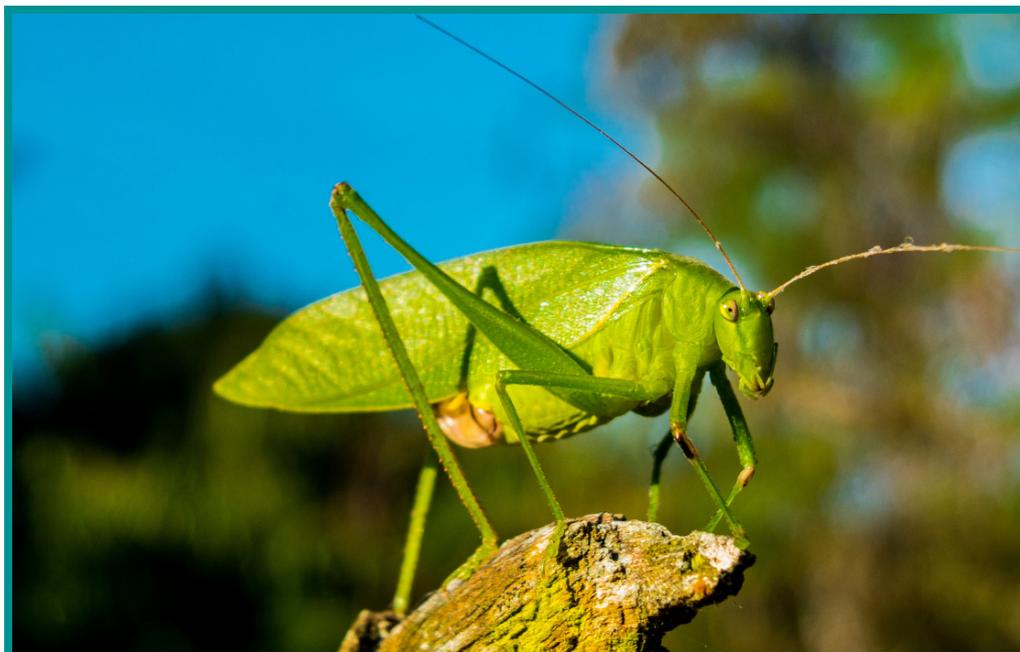
Public authorities at national and European level should ensure that the appropriate research is carried out to allow informed policymaking. That said, insect farming receives significant public funding. **An analysis of funding data from the [EU's Horizon Europe](#) research programme shows that insect farming has received at least €47m in EU funding over the past nine years.** Nonetheless, this information is required before the insect farming industry is allowed (or left) to invest, develop and grow. The precautionary principle - which entails obtaining scientific evidence before going ahead with a policy that could cause harm - should be applied.

### 3. The “alternative protein” veil

At EU level, as is the case nationally, the products of insect farming are regularly referred to as “alternative proteins”. Insect products are thus bundled together with algae, yeast, and fermentation, as well as cultivated meats on occasion.

In fact, in November 2021, the European lobby groups [International Platform for Insects for Food and Feed](#) (IPIFF), the [European Algae Biomass Association](#) and the [Confederation of European Yeast Producers](#) announced they would work together on alternative protein policy.

This increasingly used narrative needs to be changed, not only for semantic reasons. Insects are farmed animals that are used to produce animal proteins to feed other animals, and to a significantly lesser extent, food for people. **The term “alternative” is, essentially, a veil that masks an inconvenient image for the industry.**



## 4. An increasing number of new species to farm

Insects were first authorised in animal feed by the European Commission in 2017. Subsequently, the first requests to authorise certain species as “Novel Food” were introduced by industry<sup>1</sup>. **Today, eight insect species are authorised in feed and four species are authorised for human consumption.**

Six other applications, including two further species, are being assessed, and a number of other applications are at very early stages<sup>2</sup>:

Feed	Food
Hermetia Illucens (Black Soldier Fly)	Locusta Migratoria (Grasshopper)
Musca Domestica (Common House Fly)	Acheta Domesticus (House Cricket)
Tenebrio Molitor (Yellow Mealworm)	Tenebrio Molitor (Yellow Mealworm)
Alphitobius Diaperinus (Lesser Mealworm)	Alphitobius Diaperinus (Lesser Mealworm)
Acheta Domesticus (House Cricket)	<i>Authorisation pending</i>
Gryllodes Sigillatus (Banded Cricket)	Apis Melifera (Western Honey Bee)
Gryllus Assimilis (Field Cricket)	Gryllodes Sigillatus (Banded Cricket).
Bombyx Mori (Silkworm)	

*Insect species authorised in the EU for food and feed, January 2023.*

<sup>1</sup> To be authorised as a Novel Food or feed, producers must request an opinion of the European Food Safety Agency (EFSA). If EFSA issues a positive opinion, the European Commission and representatives of its Member States meet in the [Standing Committee on Plants, Animals, Food and Feed](#) - PAFF Committee to authorise or reject the product.

<sup>2</sup> EFA regularly monitors [EFSA's database](#) and [IPIFF](#) to update its internal list of authorised producers and species.

## Part Two: big money for big industry - a lot of feed, but not much food

A plethora of small and, sometimes, micro enterprises have emerged, producing a variety of insect-based products. The international Platform for Insects in Food and Feed calculated that just in Europe, [71 companies are active in rearing insects for food](#). However, the products proposed extend beyond food to pharmaceuticals and dietary supplements. **The majority of the sales volumes and, consequently, economic activity come from large industrial players in the feed market.**

### 1. Market: a predominantly feed-driven industry

#### European Circular and Bioeconomy Fund

Although insect farming is still in its early stages, growing numbers reveal that most of the insect meal produced will be used for livestock and fish feed. And growth can be rapid. [...].

At ECBF, we keep an open mind for the opportunity of insects for human food applications, but nevertheless bank on the market for animal feed as the more immediate business and growth opportunity for the insect industry.

Investors in insect farming (such as banks, venture capitalists, sovereign wealth funds, and public institutions funding research) are primarily interested in developing feed businesses. Most investors consider the “yuck” factor a barrier to market uptake of insects as food. However, it is also clear that the sheer volumes involved in producing feed are more likely to bring the short- to medium-term returns investors require. There is, therefore, little economic appetite for insect farming to produce food for people.

Pet food, a *sui generis* feed, remains a market of interest for the industry as it is a longer-established practice. Firstly because, historically, there have been less restrictions on the use of insects to feed domestic animals - as opposed to animals that could end up in the human food chain - and, secondly, because it is a high-margin business where most pet owners have little regard for the price of goods when it comes to their pets’ diet and welfare.

Consequently, insect farming is a predominantly animal feed business. [Pet food and aquaculture are, currently, the two biggest market segments](#), with poultry and pig feed having great growth potential.

#### Gorjan Nikolik - Rabobank economist

“Pet owners do not skimp and, if they are vegetarian, they are more likely to prefer insect-based food for their animals than pork or beef”.

Financiële Dagblad - 9 June 2022  
'Huisdier eigenaren kijken niet op een dubbeltje. Zeker als ze zelf vegetariër zijn, geven ze hun lievelingsbeestje liever eten op basis van insecten dan van varken of rund.'

## Frass could be an interesting market, but will it work in practice?

In November 2021 the European Union [authorised the use of frass](#), which is fertiliser made from the leftovers of insect farming - composed of insect excrement, remaining substrate and insect body parts.

The use of frass is central to the insect farming industry's circularity claims, and can be a lucrative side business for insect farming facilities. It is, therefore, promoted by industry that has successfully built excitement around its potential.

However, this part of the insect farming business has, to date, not taken off. Regulatory constraints, such as maximum amounts of insect body parts and dead eggs or heat treatment requirements<sup>3</sup>, are still hindering its development.

It is noteworthy that the insect industry is lobbying to reduce or remove certain requirements, notably the heat treatment requirement. This indicates that current health regulations do not allow frass as fertiliser to be economically viable. Nevertheless, for industry, the environmental and health implications of spreading untreated insect farm waste does need to be taken into account and appropriately regulated.

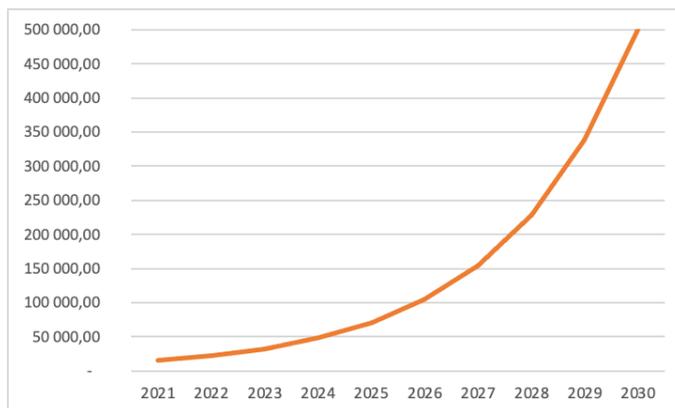
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<sup>3</sup> EU regulations require frass to contain insect parts and dead insect eggs in quantities less than 5% in volume and 3% in weight and a heat treatment at 70°C for one hour (pasteurisation), as is the case for other animal manure.

## 2. The race to upscale

Industry's most important challenge is upscaling. The most widely quoted industry growth scenario is [Rabobank's 2021 estimate](#) that by the end of the decade, 500,000 tonnes of insect protein will be produced, up from 10,000 tonnes last year. **This could translate to 45 to 50 trillion individual insects being farmed every year<sup>4</sup>. These estimates suggest a Compound Annual Growth Rate of just under 48%**, which translates to a growth curve similar to the figure below.

*Compound Annual Growth Rate (CAGR) of production of insects for feed according to Rabobank's 2021 estimate:*



**“Industry’s biggest challenge is upscaling”**

*Eselina Battenberg, Head of Communication, Protix (June 2022).*

To achieve this 50-fold increase in 10 years, the industry needs three things:

- 1) More and larger production facilities;
- 2) Expansion to other markets;
- 3) Better raw material - in other words, genetically modified insects.

### More and larger production facilities

**Market leader Ÿnsect looks to buffalo mealworm for productivity gains**  
Market leader Ÿnsect set up in February 2022 a genetic manipulation programme called ŸNFABRE to use a strain of Buffalo worms that grow 25% faster as part of its race to increase productivity.  
The project, that received over €4m in public funds is expected to be fully operational by 2026.  
*NewProtein.net, February 2022*

The insect farming industry needs to multiply large production facilities such as Protix's in Bergen-op-Zoom, the Netherlands or Ÿnsect's in Amiens, France, moving away from micro start-ups towards large industrial players.

<sup>4</sup> EFA's own calculation, and [Rethink Priorities](#) calculations.

## Expansion to other markets

European companies looking to upscale need to try and capitalise on the EU's first mover advantage, ensuring, early on, a footing in other emerging non-EU markets, particularly North America and South-East Asia.

After making some sales in the US, Ÿnsect has begun growing inorganically by buying and incorporating US-based insect farming companies. In March 2022, Ÿnsect [acquired Nebraska-based Jord Producers](#) to begin producing directly in the US. In December 2022 a further cooperation with Ardent Mills and Mexican Corporativo Kosmos was [announced](#). Ÿnsect is considering going public to fund further expansion.

Another French insects-for-feed producer, InnovaFeed, began collaborating with global food, feed, cosmetic and pharmaceutical giant [Cargill](#) in 2019. In September this year, InnovaFeed [announced a \\$250m funding round](#) aimed at both increasing production capacity in Europe and expanding to the US by opening a production facility in Decatur, Illinois, as well as expanding to South-East Asia. Along with financial investors, Cargill and ADM - a US food processing company - participated in the fundraising round.

## Better raw material

Another aspect of the race to upscale is accelerating the insects' life cycle and making individual insects grow bigger. Consequently, genetic breeding and manipulation are essential and lucrative avenues for the industry to explore. Moreover, industry is being successful in tapping both private and public funds to finance these activities.

What we have is effectively a kind of raw material which can then be improved through selective breeding. (...) Increasingly I think people are starting to realise that this is how we make the industry scale over time.  
*Thomas Farrugia  
CEO Beta Bugs in Wired 15 Feb. 2022*

## 3. Drivers: significantly more demand than supply

The 50-fold increase in insects-for-feed production over 10 years, as estimated by Rabobank, is an impressive growth rate. However, if achieved, it will only cover a very small part of global feed demand.

Global compound feed production in 2020 was approximately 1.17bn tonnes, according to the [International Feed Industry Federation](#) (IFIF), of which 157m (13%) was produced in the EU. Feed production is expected to grow over the coming years to meet increased demand for animal products from a growing population. Indeed, other sources estimate that the feed market grew 2.3% in 2020 to reach [1.24bn tonnes in 2021](#).

**Even assuming feed market stagnation, insect feed would represent “only” 0.04% of the global feed market in 2030. The opportunity for insect farming beyond 2030 is, therefore, significant if the industry is successful in upscaling.**

An unsustainable farm is where you have many animals and depend on imported feed.

*Humberto Delgado Rosa  
European Commission Director Biodiversity  
– DG Environment, 7 Feb. 2023*

The intensive aquaculture industry and, in a few years, the intensive animal farming industry will be insect farmers' main clients. **Necessarily a drive to upscale and increase volumes of feed produced from insects will put insect farming at odds with EU policies that are aimed at reducing the consumption of animal**

**products, promoting more extensive and high welfare animal farming practices, and supporting the uptake of more plant-based diets across Europe.**

## 4. Costs: despite Ukraine crisis, insect meal is still costly, but gap is reducing

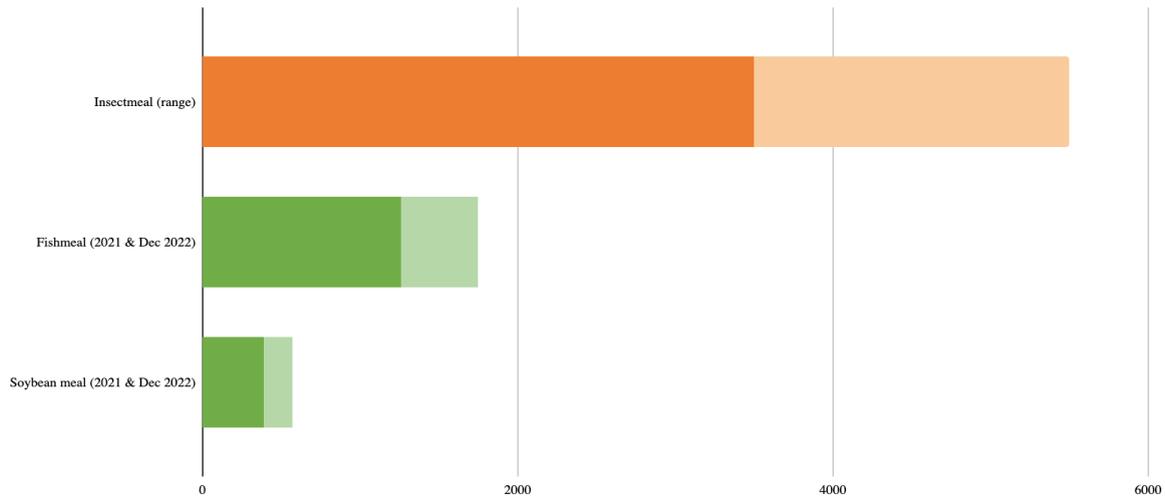
The cost of insect meal can be estimated between €3,300 and €5,000 per tonne, which is significantly more than the cost of fish and soy meal.

Taking the average price on the commodities market of both soy and fish meal shows that there is a significant cost-gap with insect meal. Although this may be slowly closing as industry upscales, it is still notable. Insect meal competitiveness is still a long way off.

Despite steep price hikes in international commodities markets at the beginning of the war in Ukraine, in December 2022, [soymeal was trading around €541](#) per tonne and [fishmeal around €1,655](#). Whereas these figures are up 46% and 36% respectively compared to October 2021, more recent data available for soymeal indicates that in mid-January of this year, prices had dropped and were trading at 9% above January 2022 prices.

No new estimate was found for the cost of insect meal, however, it is possible to assume that increased production since 2020 has also had a downward impact on the cost of production. Nevertheless, insect meal is still more expensive. The price difference with fishmeal is not as big as compared to soymeal, meaning that large industry players are still focusing on the aquaculture market where inroads can be made faster than in the poultry and pig markets.

Perhaps a more significant, albeit temporary, impact on the competitiveness of insect meal is the dollar/euro exchange rate. Commodities bought in international markets in dollars have increased in price for EU-based companies due to the value of the euro dropping beneath that of the US currency in September 2022 and still trading at \$1.09 in mid-January 2023.



Cost of insect meal in 2020, compared to fish and soy meal in October 2021 and December 2022 (€/per tonne). Prices in \$ have been converted to € at October 2021 exchange rate and at 1:1 for December 2022.

Source(s): Rabobank 2020, Indexmundi

## 5. Market players: Europe leads

There are a plethora of small and bigger companies active in all aspects of insect farming, making it difficult to compile a complete list.

[Labiotech.eu](https://www.labiotech.eu), an online media source reporting on the biotechnology industry, lists what it considers to be the top 10 insect farming companies. The list contains a number of similarities with the top European companies identified by Eurogroup for Animals.

Labiotech March 2022		Eurogroup for Animals January 2023	
Company	Country	Company	Country
Algenex	Spain	Alltech Coppens	The Netherlands / Germany
Ynsect	France	Ynsect	France
Oxitec	United Kingdom	Agriprotein	United Kingdom
Protix Biosystems	The Netherlands	Protix Biosystems	The Netherlands
Tebrio	Spain	InnovaFeed	France
Smart Resilin	Israel	Next Protein	France
Hexafly	Ireland	Hexafly	Ireland

Norbite	Sweden	Nextalim	France
BioPhero	Denmark	Volare	Finland
Sibö	The Netherlands	Entocycle	United Kingdom

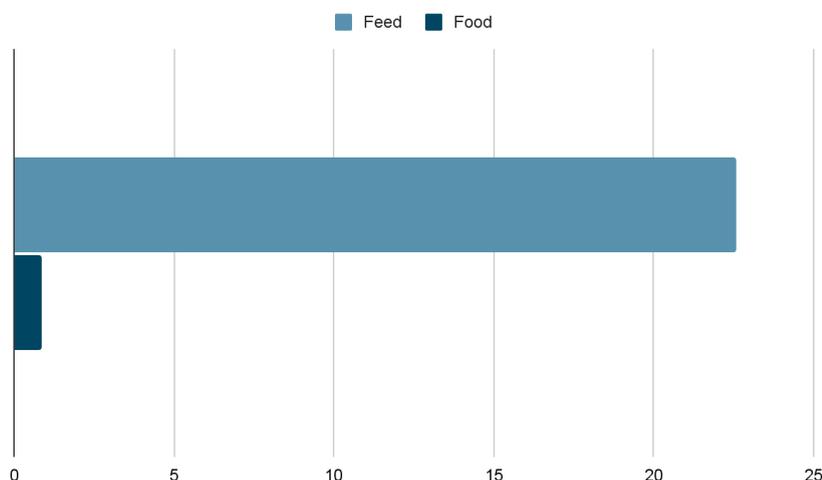
**It is interesting to note that in Labiotech’s list of top ten companies, nine are European, of which eight are EU-based.** The only non-European company is based in Israel. **Moreover, all the companies identified by Labiotech are predominantly focused on feed.** An exception is Algenex, which is mainly a pharmaceutical company that uses insect proteins.

However, as discussed earlier in the report, the biggest EU market players are expanding globally. This move is dictated by their capacity to open up new markets for their products, in addition to being driven by the more relaxed regulations on both insect and animal farming outside of Europe. **A real prospect for Europe’s insect farming industry is that, once the market for insects in feed is established, EU companies turn to producing abroad and importing back into the EU.**

## 6. Turnover and funding: feed takes the lion’s share of the protein pie

Complete or precise information on the insect farming industry’s turnover, capitalisations and funding is not readily available. Moreover, as few companies are public, their financial or annual reports are not always public either. Nevertheless, online database [Dealroom](#) tracks 53 feed producing insect companies and 72 food producing insect companies. Although financial information is incomplete, analysis of this database gives useful insight into the industry’s size and growth over recent years.

The first significant insight is that the 53 feed companies have a combined funding of €1.2bn (an average of \$22.6m per company), whereas the combined funding of the 72 food companies is just \$62m (or an average of \$861k). These numbers highlight once more that feed is the main industry driver by a large extent.



*Average funding of Dealroom.com analysed insect producing companies in food and feed markets, October 2022.*

Although incomplete, zooming in on funding data for eight of the main European feed players, there is a 20-fold increase in funds raised in 2020 compared to all funding received up to 2016. This rapid flow of money to the insects-for-feed sector corresponds to EU legislation authorising insects as feed, first in aquaculture (2017) and subsequently for poultry and pigs (2021).

		Funding (grants, debt and venture capital)							
Company	Turnover	>2016	2017	2018	2019	2020	2021	2022	Total
Entocycle	n/a		2.3	3.2	1.5	15.2			22.2
Hexafly	n/a	0.1	1.1	1.2	1.1				3.5
InnovaFeed	n/a	0.6	3	61.8		210		288	563.4
Nextalim	n/a		7						7
NextProtein	1	0.1				11.2			12.2
Protix	12		45				15.5	50	110.5
Tebrio	1					50			50
Ynsect	10.2	21.6			168	205	5		399.6
<b>Total</b>		<b>22.4</b>	<b>58.4</b>	<b>66.2</b>	<b>170.6</b>	<b>491.4</b>	<b>20.5</b>	<b>338</b>	

*Turnover and funding of 8 European insects-for-feed companies in million euros (where data was in USD, conversion rate was assumed 1:1).*

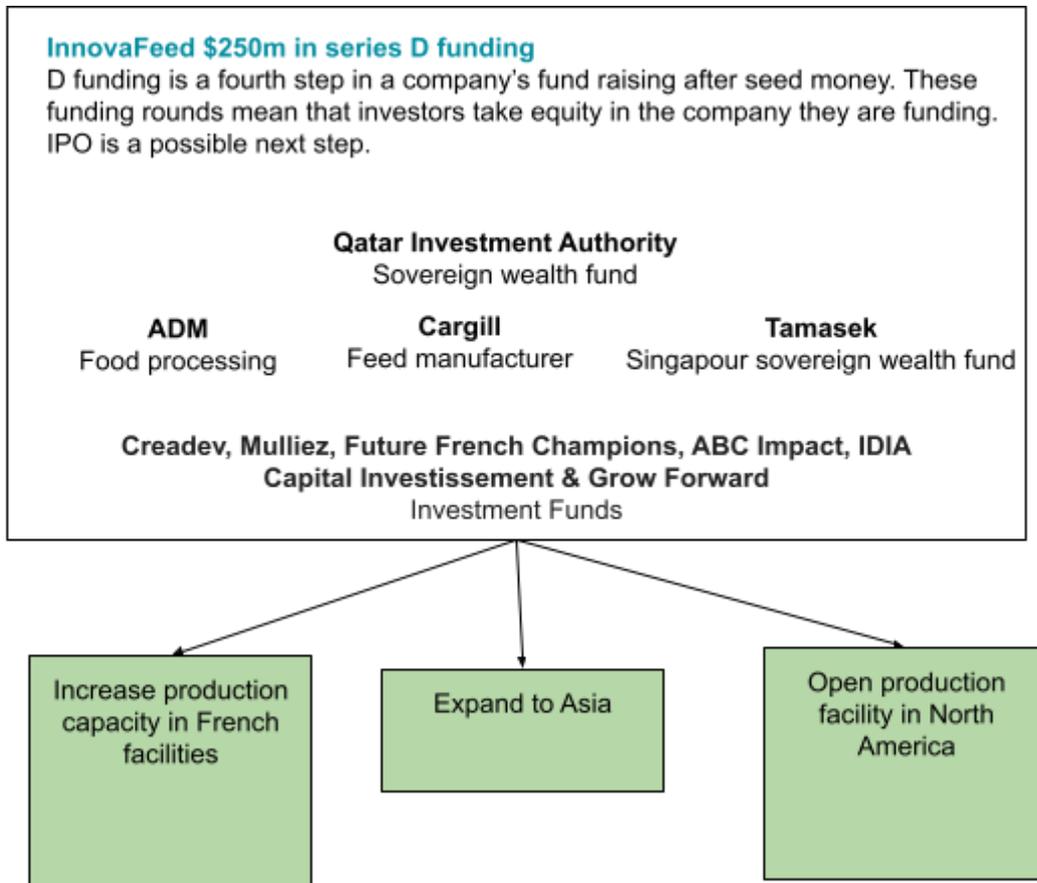
**Source(s): Dealroom.com October 2022**

The most significant funding activity in the insect farming sector is arguably that of France's InnovaFeed, which [raised €250m](#) in a funding round piloted by the Qatari sovereign wealth fund QIA, discussed previously. As part of its expansion to Asia, InnovaFeed is also seeking financing from multilateral bank International Finance Corporation (IFC), a member of the World Bank.

The majority of the companies analysed obtained most of their funding through venture capital, investment funds or debt. However, as they move through their various funding rounds to upscale production, it is probable that other agri-food businesses will begin taking stakes, particularly as some like Ynsect are considering going public.



It is too early to make any definite comment as to how the traditional agri-food and feed industry views the arrival of insects on the market. Nevertheless, ADM's and Cargill's participation in InnovaFeed's expansion (both in Europe and other continents) indicates there is growing interest in the sector. **If insects are to take a part of the feed pie, it is likely that upscaling will be increasingly funded - and controlled - by established feed and agri-food multinationals.**



## Conclusion

As the EU attempts to sail towards a more sustainable agricultural and food system, insect farming's siren song is attractive. It promises environmental sustainability, circular supply chains and an end to over reliance on animal products in Europeans' diets. In short, it touts a simple technological fix that will produce a remedy to cure our agri-food system of all its ills.

However, the industry's true sustainability credentials are still to be demonstrated. As the industry upscales and rears more and more insects, many crucial questions remain unanswered, or hidden, particularly in regards to the welfare of the trillions of individual insects involved and millions of intensively farmed animals it aims to feed. **From a policymaking perspective, it is necessary to take a step back and look at the whole picture, ensuring insect farming truly fits the EU's environmental, animal welfare and food system objectives.**

## Recommendations

To properly inform the debate surrounding insect farming, and to allow the EU to make sound policy decisions in-line with its political objectives, there are two main points that need to be taken up:

- Firstly it is necessary to bridge the knowledge gaps surrounding almost all aspects of insect farming and improve our understanding of insect welfare, behavioural needs and sentience. Through this, the wellbeing of insects can be included under the scope of the European Commission's animal welfare department;
- Secondly, it is necessary for the European Commission to recognise insects as farmed animals and integrate intensive insect farming's impacts on its sustainable agriculture and food system policies, rather than looking at it in isolation.

The European Commission should, therefore, take the following actions:

- 1. Recognise insects as animals and investigate their behavioural needs and sentience**, by mandating the European Food Safety Authority to study the sentience of farmed insect species, and ensure insect farming is included in the scope of its Animal Welfare unit.
- 2. Ensure sound, joined-up policymaking by:**
  - Improving the coordination of insect farming decision-making across its departments (agriculture, fisheries, environment, human and animal health), a task that should be led and coordinated by the Animal Welfare unit from the Directorate-General for Health and Food Safety of the European Commission (DG SANTE);
  - Analysing how insect farming for feed production could strengthen intensive animal farming, and its environmental, health and animal welfare consequences - hindering rather than helping the EU reach the objectives of the Farm to Fork Strategy.

**3. Conduct and commission research to bridge knowledge gaps, in particular on:**

- Use of antibiotics in insect farming facilities and its impact on Antimicrobial Resistance (AMR);
- Diversion of resources that could otherwise be used in food, feed or other industries to produce substrates (insect feed), analysing the insect farming industry's circularity;
- The probability of insect farms to spread pathogens, diseases and zoonosis;
- The welfare implications of the genetic manipulation of insects carried out by industry;
- The risks to biodiversity of the (accidental) release of insects from farming facilities.

# EUROGROUP FOR ANIMALS

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