

The European plant-based food sector - R&I priorities to drive further uptake by 2030

Summary

European policy-makers have a significant opportunity to support the transition to a more sustainable and secure food system through financing R&I for the plant-based food sector. For a competitive European plant-based food sector to succeed as quickly as possible, a long-term vision is essential, particularly with respect to funding research. It is crucial that the revised FOOD2030 Strategy reflect the role of public R&I in achieving higher uptake of plant-based foods, and that Horizon Europe directs sufficient funds towards the sector.

Given the urgency of reducing agricultural emissions, an easily and quickly scalable solution is needed - such as plant-based foods. This sector is already booming and consumer demand is running high, but it still holds a relatively small market share therefore the potential for growth is high. Publicly funded R&I can play an important role in driving uptake, and can ensure that plant-based foods move from being a luxury item to being the default choice. In order to achieve this, public R&I must be impact-focussed with the aims of improving taste and bringing down costs in order to boost uptake. Public funding can play a key role in addressing long-term, forward-looking R&I questions that catalyse progress and maximise public benefits, as well as supporting spin-offs to further develop.

The EU has all the research competency to be the world leader in this sector with strong R&I competencies across all the areas of science relevance for plant-based foods (for example, crop breeding, regenerative medicine, protein characterisation and biochemistry, and food science). Publicly funded projects in the EU have led to demonstrable market successes, such as in the case of the Alseos and ProFuture projects (see section 5 for more detail).

However, crucial areas of plant-based food R&I are missing from prior and current EU funding calls, such as improving taste and reducing price, crop optimisation, and exploring novel

diverse crop sources. In section 6 are a set of proposals which represent a subset of high-impact opportunities relating to the EU's scientific and technical strengths and that have emerged from [a GFI analysis](#) of the white spaces and innovation priority areas in the sector.

Addressing these fundamental R&I gaps would not only be beneficial for unlocking the transformative potential of plant-based foods by bringing them closer to price and taste parity, but it would also allow the EU to leverage its existing advantages, build capability in this field, and thereby position itself as a strong contender to capture a significant share of the projected economic growth in this sector.

1. Context

Our current food production and consumption patterns are a threat to food security and environmental stability worldwide, and cannot sustain an increase in food demand given the already strong pressure they exert on natural resources: food systems are responsible for 80% of land desertification, 70% of freshwater use and are the single greatest cause of terrestrial biodiversity loss. In this context, nearly 80% of total agricultural land is dedicated to feed and livestock production, while providing less than 20% of the world's food calories. Given the current food security crisis, shifting to more efficient ways of producing food are paramount. In addition, recent studies show that it will be [scientifically impossible to meet the Paris climate change targets](#) to keep climate change below 1.5°C unless industrial meat production goes down.

However, incentivising mass dietary change is a challenging and sensitive area, and few governments want to be seen as telling people what to eat. In the absence of demand-focused interventions, policymakers must develop supply-driven solutions by investing in accelerating more sustainable methods of meeting current and future demand for meat, eggs, dairy, and seafood. Just like the world is changing how energy is produced and cars are powered, we need to change how meat is made. Just like eliminating fossil fuels and combustion engines requires government support, so too do alternative methods of making meat.

Making meat from plants presents enormous opportunities to provide European consumers with the familiar foods they love, but at a fraction of the cost to the environment and planetary health.

Plant-based meat production [emits](#) up to 90% fewer greenhouse gas emissions and uses up to 99% less land than conventional meat. As using crops for plant-based foods is dramatically more efficient than using them as feed for animals, a substantial shift to plant-based foods would free up land for use in meeting the EU's biodiversity targets. It would also have a substantial impact on reducing the EU's dependence on imports and thereby boosting food security. In addition, these sustainable proteins are free of antibiotics, and involve no risk of the emergence of zoonotic diseases, as is [associated](#) with raising and killing animals for food.

2. The crucial role of public funding

As has already happened in the field of renewable energy, governments can play a unique role by prioritising open-access R&I funding that ensures that benefits can be democratised, further catalysing innovation across the whole sector. In the case of renewable energy, governments recognised that this was a crucial climate change solution to transform the energy sector and therefore invested heavily in making it affordable and accessible for consumers. As a result, renewable energy became the default option, taking the onus of choice off consumers and making sure that this solution could scale up quickly enough to have a significant impact on climate change reductions.

The same path to uptake is feasible with plant-based foods if significant public funds are invested. While this sector continues to grow, in order to substantially scale up from a niche option to a widely consumed staple in European diets, governments need to get behind this as a climate change solution. In a future where plant-based foods are the default rather than a luxury product, the onus is not on consumers to seek out the most sustainable option. In this scenario where plant-based foods are mainstreamed, emissions reductions driven by this shift would play a substantial role in helping the EU to meet its agricultural climate change targets. To date and in comparison with animal-based agriculture, plant-based foods R&I has been woefully underfunded through the public sector.

This R&I may take place in the private market, but results will not be open-access, efforts may be duplicative, and it is uncertain how quickly this will happen. Given the urgency of reducing food systems emissions to meet the EU's climate change targets, solutions such as plant-based foods that can help dramatically reduce these emissions need to be funded quickly on a large scale. In addition, increasing public sector investment in R&I creates a 'rising tide' for the industry, addressing pre-competitive research challenges while empowering the industry to focus its efforts primarily upon questions of scale.

Why public funding is unique

Public R&I funding is key to scale up and reduce production costs, and thereby fulfil the societal potential of plant-based foods. Unlike companies which are bound by short-term profit-making margins, public funds can be invested into long-term, forward-looking R&I questions that catalyse progress and maximise public benefits. Because the public sector has a higher tolerance for the long time horizons inherent in fundamental technological and scientific R&I, it can support foundational research that may spawn novel technology rather than merely incremental advances.

3. Consumer demand by flexitarians

Consumer market data shows that demand is growing rapidly, however the potential for higher uptake is huge given that plant-based foods make up only 4-6% of the total dairy market and 1% of the total meat market.

Innovations in plant-based technology are driving appeal beyond traditional consumer segments, and thereby even further growth. For example, the Impossible Burger – which uses precision fermentation technology to create a meaty taste and texture – now accounts for roughly [10% of the average daily orders](#) at Burger King's largest US franchise. Further expanding the appeal of plant-based foods to flexitarians would drive much higher uptake, as 89% of the consumers who regularly eat plant-based foods do not consider themselves vegan or vegetarian.

Data shows that while health and environmental concerns bring consumers into the plant-based food category, taste and price are the key factors influencing continued consumption¹. When consumers don't take the step of integrating plant-based foods fully into their diets, it is due to the taste and texture not replicating animal-based foods convincingly enough, and the fact that many of these products are still priced out of the regular consumer's price bracket. Therefore, R&I to address the taste and price points will dramatically increase the market uptake of plant-based food.

¹ Mintel Reports US, Plant-based Proteins, 2020; pricing data lists point-in-time, non-promotional prices, for products at select stores.

4. State of the industry

The plant-based food sector is a rapidly-developing industry, projected to maintain high levels of growth over the coming decade. Fueled by increasing public awareness of the food system's environmental impacts and a growing range of options, the European plant-based food market has seen almost [double digit growth](#) every year for the last decade.

The plant-based industry, despite being relatively young, experienced a steep growth in recent years and the European market is expected to reach €7.5 billion by 2025² and €16.7 billion by 2029³. Retail sales grew at an average of almost 10% per year between 2010 and 2020, and in some EU countries increased by 49% within two years⁴. Such development is supported by increasing consumer demand, and provides the opportunity for the EU to be at the forefront of the sustainability transition in the food sector.

Global plant-based, fermentation-made and cultivated meat companies are currently scanning the marketplace for where to set up shop next. It is clear from wider conversations with these companies that, alongside regulation, the national research and innovation ecosystem is a major factor in these calculations. For example, the CEO of Sophie's Bionutrients – a Singapore-based company using microalgae to produce high quality protein – [explained](#) the company's decision to open a new base in the Netherlands: *"All in all, you can say that the Netherlands is really the Silicon Valley of global food and ag-tech. That's why we think we need to be here."* By prioritising the cultivation of such dynamic research ecosystems, the EU can attract global talent and a significant share of the private capital ([\\$3.4bn in Q3 2021](#)) that is being directed towards this burgeoning sector.

The high expected growth in this sector also highlights a strong "spend to save" argument, as public investment now would make reaching the EU's climate targets significantly cheaper to

² [Growth of meat and dairy alternatives is stirring up the European food industry](#). ING Report, October 2020

³ [Europe Plant-based Food Market by Type \[Dairy Alternatives, Plant-based Meat, Meals, Confectionery, Beverages, Egg Substitutes, Seafood\], Source \(Soy, Wheat, Pea, Rice\), Distribution Channel \(B2B, B2C \[Convenience Store, Online Retail\]\) - Forecast to 2029](#). Meticulous Research, March 2022

⁴ [Plant-based foods in Europe: How big is the market?](#). SmartProtein EU project, 2021

achieve in the long run. For example, the [GINA 2021 Report](#) predicts that public investment in sustainable proteins would make the 1.5° target \$5.49 trillion cheaper to meet between now and 2050.

Examples of international support for alternative proteins

- The Canadian government has supported the establishment of the Protein Industries Canada supercluster, previously allocating more than €100 million to its establishing the cluster and renewing this support in its recent 2022 budget.
- As part of its €11.5 million investment towards the space, the Israeli Innovation Authority has established food-tech incubators such as the Kitchen and Freshstart, with significant alternative protein representation in their portfolio
- The Australian public sector committed more than €100 million towards a partnership initiative to develop the infrastructure for plant-based protein in South Australia.
- The Israeli Innovation Authority (the IIA) has invested more than €10 million towards direct investments into startups in different stages (from early seed up to manufacturing phases).

5. European research strengths in plant-based food

Europe is well-poised to be a world leader in plant-based food R&I with its reputation as leading the way with R&I - with European universities representing [38% of the world's best](#). Specifically, there are strong R&I competencies across all the [areas of science relevance for alternative proteins](#) (for example, crop breeding, regenerative medicine, protein characterisation and biochemistry, and food science). Additionally, Europe has led on key technology developments intentionally applicable to developing plant-based foods (including shear cell technology, 3D printing, and high- and low- moisture extrusion technologies). Moreover, various mapping exercises and conversations with researchers have revealed that there is strong, *presently latent*, potential in Europe for more research into developing plant-based alternative food. As such, the continent is poised to be the world leader in plant-based food science. Leveraging existing academic strengths to develop new plant-based innovations in the EU would enable



the EU to retain and attract talent, provide investors and companies with the confidence to set up shop in the EU, and ultimately capture some of this future growth through export potential.

At present, there are in the region of 200 academic researchers in Europe working on plant-based alternative proteins (though for many of these, this is not their exclusive or primary focus). Key research institutions leading on this research include Wageningen University & Research, the Fraunhofer Institute, German Institute of Food Technologies (DIL), the Danish Technical University, Lund University, University of Bologna, and Aarhus University.

Much of their research has been publicly funded - from GFI's mapping of projects which have taken place since 2000, a total of 91 publicly-funded research projects were identified (with a total budget of over €220 million) focused on developing plant-based alternative proteins having taken place. Of these, 35 of the projects were at least partly funded by the EU (contributing approximately €126 million). These projects have focused on research across the full length of the value chain, from identifying novel or adapting existing crop or algal sources and agricultural practices (PROTEIN2FOOD or Legvalue), optimising processing and conversion methods to extract high-value ingredients (ProVegFlake and NextGenProteins) to working with food suppliers and manufacturers to develop novel, texturised alternative protein products (e.g. SMARTPROTEIN). Recent calls as part of H2020 and Horizon Europe have been increasingly targeted towards plant-based food applications, including "HORIZON-CL6-2022-FARM2FORK-01-07: Building alternative protein-friendly sustainable and healthy food environments", and "HORIZON-CL6-2021-FARM2FORK-01-12: Filling knowledge gaps on the nutritional, safety, allergenicity and environmental assessment of alternative proteins and dietary shift".

Selected successes from EU funded projects

- **Pro-Future:** ProFuture is a European-funded Horizon 2020 research project focused on boosting the production and use of microalgae protein-rich ingredients in food and feed. It has produced [a range of technical, environmental, nutritional, and regulatory assessments](#) relating to alternative protein production - one highlight has been the [scaling up of production of a new microalgae strain with a higher protein content and better organoleptic properties than the wild type](#).
- **Smart protein:** Smart protein is a European-funded Horizon 2020 project aiming to develop alternative protein ingredients and products for humans which have a positive impact on bio-economy, environment, biodiversity, nutrition, food security and consumer trust and acceptance. It has produced a range of outcomes, including [5 technical publications](#) facilitating the production of alternative proteins, and [2 publications](#) providing the most up-to-date and comprehensive information available on Europe's consumer market base for plant-based proteins.
- **PROTEIN2FOOD:** PROTEIN2FOOD is a European-funded Horizon 2020 project which focuses on developing high-quality food protein from multi-purpose seed crops and grain legumes, through optimised, sustainable production and processing methods. This produced [a range of technical and environmental publications](#) (15 in total) which drove forward the science of isolating and processing protein with high functionality from diverse crop sources.
- **Alseos:** Alseos was a European-funded Horizon 2020 project which enabled the company NapiFeryn BioTech (NFB) to further develop, scale up, and commercialise their technology to turn waste from rapeseed oil production into valuable food protein as an ingredient for alternative proteins. The grantees stated that "With our technology the value that could be derived from the same amount of crop will double, from EUR 450 to EUR 900 per ton, which might be the only way for rapeseed processors to stay in business."

Given the EU's highly relevant latent scientific strengths - even a relatively modest amount of research funding would allow the EU research community to make meaningful progress on a number of fundamental, pre-competitive R&I gaps in the plant-based food space. GFI's competitive research grant programme is an illustration of this - though modest (with \$13 million awarded to 82 distinct research projects over 3 years from the year 2019), it has led

to 33 scientific papers published and 3 spinout companies. The specific areas particularly suited to the EU's scientific strengths are identified in the next section.

6. Research gaps

While the EU has funded a number of highly impactful projects in plant-based foods, the amount of funding committed so far is far from commiserate with the potential of this sector to help meet EU policy goals.

Most notably, within the research that has already taken place, several key areas have been neglected. More specifically, the vast majority of the plant-based research funded to date has focused on developing alternative protein sources for applications outside of meat, eggs, and dairy analogues for human consumption. These include animal feed applications, nutraceuticals, speciality ingredients, cosmetics, and pharmaceuticals. In all of these contexts, the core R&I drivers are fundamentally different, meaning that research has not been most effectively allocated towards protein diversification in the truest sense. For example, there has been relatively little EU-funded research on one of the core drivers of plant-based meat's uptake: taste and texture equivalence with meat (where optimisation of extrusion (or its alternatives) has been sorely neglected). Similarly, crops have been optimised and chosen on the basis of criteria which are less relevant to plant-based meat applications, and there has therefore been limited research into identifying entirely novel diverse crop sources which are *chosen on the basis of their suitability* for plant-based meat applications: for example, identifying and breeding diverse crop sources with higher protein content and lower levels of undesirable metabolites is an extremely important research gap for plant-based meat. At present, most producers rely on soy and wheat, as these are the crops which are most readily available at a commercial scale.

The proposals below represent a subset of high-impact opportunities that have emerged from [a GFI analysis](#) of the white spaces and innovation priority areas in the sector. Projects within the portfolio will have synergistic impacts, supporting the whole portfolio will therefore have a greater effect than the sum of each individual project and provide a greater return on

investment. The following priority areas have been identified as particularly well-suited to the EU's scientific and technical strengths:

- [Protein sequence, structure, and functionality database](#)

There is a need for deeper fundamental research on the relationships between protein sequence, structure, functionality, and ultimately performance in plant-based food products.

- [Production process innovations for fibre formation and improved plant protein texturisation](#)

High moisture extrusion is currently the most widely used technique for plant-based protein texturisation, but innovative alternatives to extrusion are desperately needed. Fibres from techniques like electrospinning, jet spinning, or blow spinning may be able to impart texture throughout a product even if they do not comprise the bulk of the end product, which may render these approaches economically viable for enhancing texture within a bulk product even at a relatively small scale.

- [Fat and moisture encapsulation techniques for sustainable protein applications](#)

Plant-based products will all require solutions for encapsulating fat and moisture to ensure that these components are protected from damage or loss throughout manufacturing, storage, and preparation.

- [Affordable animal-free omega-3 ingredients for plant-based protein applications](#)

In order to appeal to health-conscious consumers, plant-based products should contain similar omega-3 fatty acids, especially DHA and EPA, content to conventional seafood. Scaling up animal-free omega-3 production is critical to the success of the global plant-based and cultivated seafood market, which is seeing increased attention and promising growth.

- [Biological processing methods for isolating protein ingredients](#)

Processing crops into flours, isolates, and concentrates often relies on chemical and mechanical methods. Biological processing techniques may impart the desired composition and molecular structure for optimal functionality with increased precision,

lower cost, and greater suitability for small-scale processing, but this needs further exploration.

Addressing these fundamental R&I gaps would not only be beneficial for unlocking the transformative potential of plant-based foods by bringing them closer to price and taste parity, but it would also allow the EU to leverage its existing advantages, build capability in this field, and thereby position itself as a strong contender to capture a significant share of the projected economic growth in this sector.

GFI's full open-access database of solutions plant-based, fermentation-derived, and cultivated products can be accessed [here](#).

7. R&I policy recommendations

The EU should fund open-access science, create scientific innovation centres, and incentivise private sector R&I and private sector manufacturing and infrastructure build up focused on alternative meat production methods.

The EU should take the approach of other countries who are ensuring an interdisciplinary and cross-departmental approach to this field. The Israeli Government has [developed a National Alternative Protein Strategy](#), and appointed a Coordinator to oversee its implementation, and the Singaporean Government [launched a hub](#) in 2021 to bridge the gap between research and regulators.

Under **Horizon Europe**, the EU should:

- Create calls focused on **advancing taste, price, and availability** of plant-based foods.
- Support **CBE JU** to dedicate funding towards plant-based foods, such as research into feedstocks for plant-based meat, and fermentation.

- Ensure that the **EU Missions** create consistency by also highlighting the role of sustainable proteins in food systems transformation (in particular the Mission on Soil Health and Food, and the Oceans Mission).
- Ensure there are opportunities to take advantage of cascading uses of biomass by ensuring **cross-over between Horizon Europe destinations on food and non-food sectors**.
- Develop a partnership dedicated to novel foods.

In addition, the EU should:

- Create **innovation hubs for plant-based food** dedicated to accelerating the R&I development and commercial applicability of plant-based products. The centres should act as an accelerator between the public and private sectors, bringing together researchers, universities and companies.
- **Provide matching investment** to that invested by foundations, corporations, and others in open-access R&I.
- **Increase availability of grant funding** for plant-based foods startups to provide non-dilutive funding options.
- Establish a **grant programme or prize incentives** to develop supply chain solutions to address projected future bottlenecks (for which there is otherwise no current economic incentive to begin the necessary R&I).
- Allow **tax relief** for companies investing in R&I with societal benefits.
- **Provide funding to universities with high potential** for the establishment of cross-departmental plant-based foods research tracks.



Co-signed by:

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- VIVERA BV | Contact person: Mr. Willem van Weede, CEO
- Willcroft | Contact person: Mr. Brad Vanstone, Founder
- World Animal Protection | Contact person: Mr. Dirk-Jan Verdonk, Director
- Yoghurt Barn | Contact person: Mr. Wouter Staal, CEO



European Alliance for Plant-based Foods:

The European Alliance for Plant-Based Foods (EAPF) brings together like-minded organisations in the plant-based value chain around a unique mission: To put plant-based foods at the heart of the transition towards more sustainable and healthy food systems. The Alliance represents the entire plant-based value chain: Food producers and manufacturers, NGOs, nutritionists, research & academia, and consumers.
<https://plantbasedfoodalliance.eu>

Bridge2Food:

*Bridge2Food brings together industry & research leaders from around the world in the Global Plant-Based Foods & Proteins Ecosystem. The aim of this EcoSystem is to **accelerate the transition** towards a more plant-based diet, with better foods, produced in a **sustainable way**, as well as **increase food security** with an **abundant supply of proteins** for food, feed, and petfood markets as well as initiating €1 Billion Public-Private Partnerships by 2025.*

GFI Europe:

The Good Food Institute Europe is an international NGO helping to build a more sustainable, secure and just food system by transforming meat production. GFI works with scientists, businesses and policymakers to advance plant-based and cultivated meat – making them delicious, affordable and accessible across Europe. GFI Europe is powered by philanthropy.

Annex - Text for a call dedicated to plant-based food

Expected Outcome

The successful proposal will be in line with the European Green Deal priorities and the farm to fork strategy for a fair, healthy and environmentally friendly food system, as well as with the EU's Climate ambition for 2030 and 2050. It will support R&I to foster advances in research related to plant-based food for a safer, healthier and more environmentally friendly food industry. This is along with contributing to the transformation of food systems to deliver co-benefits for climate (mitigation and adaptation), biodiversity, environmental sustainability and circularity, dietary shift, sustainable healthy nutrition and safe food, food poverty reduction and empowerment of communities, and thriving businesses. It will also deliver co-benefits by reducing the risk of antibiotic resistance and spread of pandemics related to the current farming system.

Projects should contribute to fostering European comparative advantage in the plant-based food sector and increasing food sovereignty.

Scope

Many studies (e.g. IPCC, EAT-Lancet) have highlighted the significant negative impacts of traditional animal agriculture and the need for and benefits of a dietary shift to alternative protein sources. Plant-based meat production is one of many strategies to provide more food with less land. Research shows that producing meat from plants could [cut the climate impact of meat](#) by up to 90%, and use up to [96% less land](#) and [99% less water](#). Freeing up 96% more land would have flow-on benefits such as creating more space for carbon sequestration and for more sustainable forms of regenerative farming. Plant-based food can also be produced entirely free of antibiotics, and in a sterile environment meaning there are none of the food safety hazards that are associated with current meat production. It will also be free from the faecal bacteria E. coli, Salmonella, and other pathogens that currently sicken and kill thousands of people each year. Plant-based food involves no risk of causing the next pandemic because it is made without farming animals.

In order to realise these benefits, various knowledge and innovation gaps need to be addressed around technology development (improving sensory properties), and scale-up and

commercialisation (bringing down costs). Additionally, more research is needed on the nutritional, environmental, and consumer uptake aspects of plant-based foods. Given the potential role that these proteins could play in addressing these societal issues and given the different consumer targets, dedicated calls should be opened up to advance these food technologies. Projects should be holistic and interdisciplinary.

Proposals are expected to address the following:

- consider exclusively animal protein substitutes derived from plant or microbial sources;
- fill fundamental knowledge gaps to enable the development of novel (or improve existing) plant-based proteins, including addressing sensory properties. Research advancements could include any of the following: 1) identifying and/or breeding improved application-focused, climate- and pest-resilient crop-based raw materials, improved protein fractionation technologies, improved plant fat profiles to recapitulate the organoleptic properties of animal equivalents, and improved texturisation methods to optimise upon or beyond extrusion, 3D printing, shear cell technology fill fundamental knowledge gaps around the production of plant-based proteins at industrial scale, including: producing techno-economic models to inform product and process development, and analysing potential gaps in existing industrial infrastructure for process scaling development and manufacturing;
- greater resource efficiency of production pathways, by applying upcycling and the cascading use of biomass residues or side-streams (e.g. as growing substrates), or valorising waste side-streams downstream of plant-based protein production (potential side streams should be identified and analysed for their utility and economic viability, in addition to developing methods for efficient side stream capture);
- fill knowledge gaps and improve our understanding of the positive and negative impacts of plant-based proteins and the overall dietary shift with respect to

environment, natural resources, biodiversity and climate (considering global aspects, pedo-climatic and biogeographical conditions, pollution pressure and trade issues);

- fill knowledge gaps on the characteristics of plant-based proteins, including nutritional quality (e.g. bioavailability, the quality of the protein itself and of combined protein sources), alone and in the context of its introduction in European diets (taking into account the cultural aspects of diets and national dietary advice in the EU);
- fill knowledge gaps on the health impact of plant-based proteins, and overall dietary shift in the European Union (e.g. allergies, compliance with nutrient-based and food-based dietary guidelines and recommended dietary patterns), while considering gender aspects, and other safety aspects (e.g. not cytotoxic, no toxic aggregates or excessive amount of toxic substances);
- conduct a comparative systemic analysis of conventional and plant-based. New Product Environmental Footprint (PEF)-based categories should be created and health effects should be included in diet assessment frameworks. Non-linear effects should be studied, with regard to both consumption and production;
- highlight the need for new future-proof technologies and anticipate potential issues in relation to resource availability, pollution and societal acceptability;
- create or contribute to a data space to gather knowledge, information and results of studies, and share them openly (open science) among research communities, interested parties and the public. Seek interactions and complementarities with the data space for R&I and the European Open Science Cloud, and contribute to increasing the level of FAIRness (Findability, Accessibility, Interoperability and Reusability) of data;
- clearly explain how they will contribute to the farm to fork objectives and deliver co-benefits on each of the Food 2030 priorities: nutrition for sustainable healthy diets, climate and environment, circularity and resource efficiency, innovation and empowering communities (e.g. meeting the needs, values and expectations of society in a responsible and ethical way); and
- implement the multi-actor approach by involving a wide range of food system actors and conducting interdisciplinary research. Proposals should also promote international cooperation. Where relevant, activities should build and expand on

the results of past and ongoing research projects (especially the projects funded under topics LC-SFS17-2019: Alternative proteins for food and feed and "HORIZON-CL6-2021-FARM2FORK-01-12: Filling knowledge gaps on the nutritional, safety, allergenicity and environmental assessment of alternative proteins and dietary shift). Projects should have a clear plan as to how they will collaborate with other projects selected under this topic (if funding of more than one project is possible) and topic HORIZON-CL6-2021-FARM2FORK-01-02: Developing sustainable and competitive land-based protein crop systems and value chains. They should participate in joint activities, workshops, focus groups or social labs, and common communication and dissemination activities, and show potential for upscaling. Applicants should plan the necessary budget to cover these activities. The possible participation of the JRC in the projects will also ensure that the proposed approach will be compatible with and/or improve existing databases and tools used at the European Commission with regard to the environmental aspects, and ensure open access to data.

- this topic should involve the effective contribution of SSH disciplines.