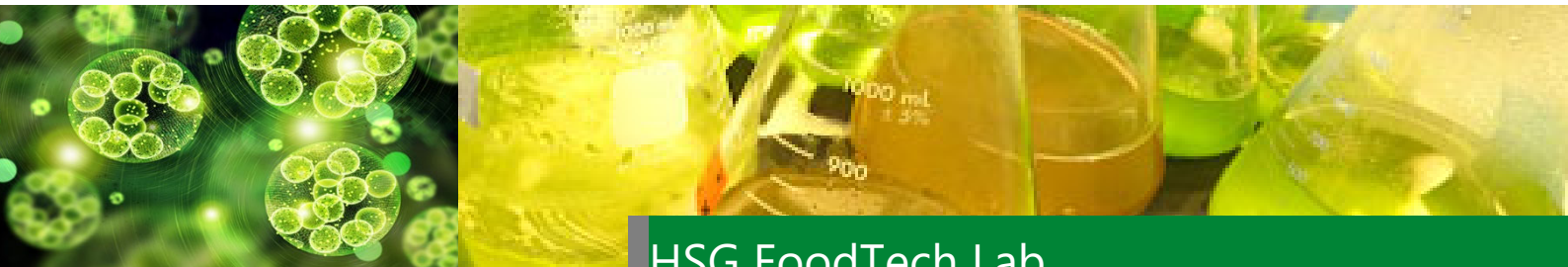




Alternative proteins

(Can) alternative proteins take over—one way out of the grand food challenges?

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Table of Contents

Table of Contents.....	1
Introduction.....	3
Grand challenges of our food production related to proteins.....	3
Definition of alternative proteins.....	5
Categorization of alternative proteins.....	6
Market opportunity of alternative proteins.....	12
Six major growth drivers of alternative proteins.....	12
Investment in alternative protein start-ups.....	15
Conclusion.....	19
Authors.....	20
References.....	21

Key Facts

56%
Increase in food demand 2010–2050

300%
Growth of global VC investment in alternative proteins (2019–2020)

75%
Percentage of consumers who could accept eating more plant-based proteins

54%
Percentage of consumers who could imagine fully replacing meat with alternative proteins

France
Receives highest total investments in Europe

5
Different alternative protein categories

Willingness to Pay
Strongly correlates with consumer acceptance

\$22.8bn
Market size by 2025

Get the full report with 71 slides at
www.foodtechlab.ch or by contacting Robert.schreiber@unisg.ch

Introduction



During times of overpopulation, resource stagnation, and lacking health systems, it is our responsibility to rethink food production and consumption to help future generations. Bringing technology and innovation out of the labs will help tackle the great food challenges to come. This white paper intends to highlight the relevance of alternative proteins to the development of sustainable and healthy food production and consumption by analyzing the challenges associated with our current protein consumption and identifying opportunities within the food market. We conducted an academic literature review and a consumer survey, receiving deep insights through 215 survey responses from the DACH region regarding consumer acceptance and willingness to pay for alternative proteins.

Grand challenges of our food production related to proteins

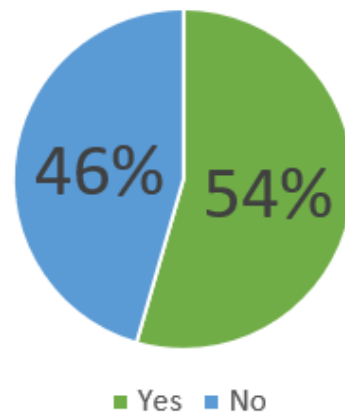
One of the grand challenges facing the world today is to ensure that the growing population has access to an adequate, sustainable, and nutritious food supply.ⁱ Protein is one of the main nutrients for humans.ⁱⁱ The demand for protein is estimated to nearly double globally due to rising living standards and world population growth, reaching an estimated 10 billion by 2050.ⁱⁱⁱ



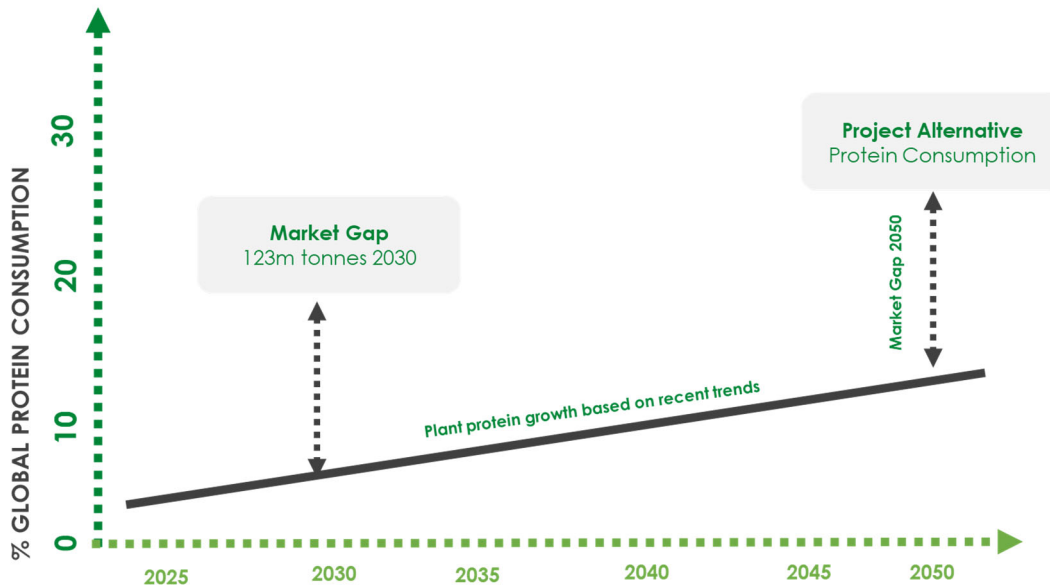
The crucial question that arises is whether global food production will develop in a similarly rapid and sustainable way so that we can cope with the rising demand for protein from humankind. Taking the current agricultural system into account, which is responsible for 30% of the world's greenhouse gas (GHG) emissions and around 70% of the global water footprint,

it is estimated that the food production industry will neither meet future demand for protein nor the targets of the Sustainable Development Goals set by the United Nations.^{iv} Furthermore, the Food and Agriculture Organization (FAO) estimated that approximately 330 million head of cattle, 1 billion head of sheep and goats, 1.5 billion head of pigs, and 66 billion chickens are slaughtered each year, and this is just to meet current demand. Collectively, all animals reared for consumption, including the land necessary to grow their feed, require an estimated 32.1 million km², a land area approximately equivalent to the size of Africa. It is already apparent that our planet does not provide enough space for the growing number of needed animals. Alternative proteins are therefore needed to cover the demand for protein considering the components of sustainability and food security. Additionally, consumer preferences have shifted toward more plant-based and meat-alternative diets due to increased consumer awareness of unsustainable meat production and preference for environmentally friendly production methods, leading to an even higher demand for alternative protein.^v For instance, this study conducted by the HSG FoodTech Lab in the DACH region in 2021 showed that 54% of participants could imagine replacing their animal-based protein consumption with alternative proteins due to animal welfare, environmental, and personal health concerns.^{vi} The sustainability impact of switching from beef to plant-based meat and other protein alternatives would be immense in terms of GHG emissions, land usage, and water consumption. However, plant-based meat currently comprises less than 1% of the global meat market.^{vii} An attempt to counter this grand challenge would shift the market toward increased alternative protein production and consumption because of alternative protein's ability to mitigate the impact of food production on climate change, animal welfare, and public health while simultaneously offering great opportunities for innovation, impactful investment, and economic growth.^{viii}

Share of consumers that could imagine replacing animal proteins with alternative proteins



Alternative protein growth factor too slow to solve grand challenge



Source: OECD-FAO Agricultural Outlook 2017–2026 Statistics

Definition of alternative proteins

Alternative protein is a general term that includes all protein sources intended as substitutes for animal-based meat, seafood, eggs, and dairy products. An exception is insect protein, which is also considered to be an alternative protein source even though it could be considered an animal protein according to its taxonomic classification.^{ix} Alternative proteins can also be described as novel food produced by combining various ingredients into edible food in order to mimic animal meat, seafood, fish, and dairy. Alternative protein companies, including start-ups, corporations, and even established meat processors, intend to target consumers with plant- or meat-based diets alike by placing the alternative protein products on the same shelf as meat products.^x This will allow customers to consume an environmentally friendly product without compromising on taste, flavor, appearance, or texture.^{xi} Therefore, the key promises of alternative proteins include—among others—redesigning the way meat, fish, and dairy are produced and consumed to feed the growing world population while tackling animal welfare and environmental concerns.

We separate the market of alternative proteins into five categories: 1) plant-based, 2) algae-based, 3) insect-based, 4) fermented, and 5) lab-grown proteins. Each category has manifold subcategories, which are described in the following chapter.

Alternative Protein Categorization



Plant-based proteins

Most commonly used for the production of meat analogues

Sources: oilseeds, cereals, legume and leaf proteins

Technology: thermomechanical protein extraction and extrusion methods



Algae proteins

Micro-algae are single cell organisms, containing up to 70% protein

Sources: microbial species like Chlorella and Spirulina

Technology: aquatic cultivation systems combined with drying, blending and binding techniques



Insect proteins

Insects are high in protein and are often processed to a flour

Sources: beetles, caterpillars, grasshoppers, and termites

Technology: cultivated in automated farms where living conditions and diet is controlled



Fermented proteins

Refers to cultivating microbial organism for the purpose of processing protein rich food

Sources: microorganisms such as bacteria, yeasts, and molds
Technology: 3 diff. methods exist microbial-, biomass-, and precision fermentation



Lab-grown proteins

Lab-grown proteins are produced by cultivating...

Sources: ...stem cells of the respective animal..

Technology: ..in a bio reactor; where the cells are "fed" with a nutrient rich culture

Source: HSG FoodTech Lab (2021)

Categorization of alternative proteins



Source: Unsplash.com

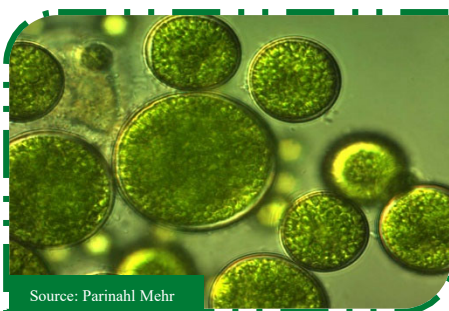
Plant-based alternative proteins are the most common meat analogs, delivering a direct replacement for animal-based products.^{xii} **Sources:** Plant-based protein stems from four main sources: 1. oilseed proteins (e.g. soybeans, peanut, and linseed), 2. cereal proteins (e.g. wheat, corn, rice, and oats), 3. legume and pulse proteins (e.g. beans, chickpeas, lentils, lupines, and peas), and 4. leaf proteins (alfalfa, lucerne, sugar beet, and clovers).^{xiii} **Technology:** The protein is manufactured using innovative thermomechanical protein extraction and extrusion techniques, which is then squeezed into a narrow hole to produce meat-like fibers and mixed with different fats, colors, and flavorings.^{xiv} **Use cases:** For instance, Beyond Meat's burger is composed out of proteins from peas, mung beans, and rice, and the patty is also filled with beetroot juice to imitate bleeding with a reddish color when bitten. Additionally, the cocoa butter and coconut oil give the eater a similar mouthfeel to a beef burger.^{xv} New technological solutions enter the market, such as the 3D printing of plant-based protein alternatives to produce plant-based steaks that can mimic the taste and texture of meat, including beef and chicken, to a high degree.^{xvi} **Sustainability:** Plant-based alternative proteins require 47–99 % less land, emit 30–90% less GHG than conventional meat production, and cause 51–91% less nutrient pollution

in aquatic systems.^{xvii}

Consumer acceptance: Our consumer insight study revealed that out of the five alternative protein categories,

CONSUMER ACCEPTANCE	WILLINGNESS TO PAY
<p>75.3% are willing to consume plant-based proteins, but consumers are only willing to pay...</p>	<p>0.83x of the price that they are willing to pay for products containing animal protein.</p>

plant-based alternative proteins hold the highest consumer acceptance, with 75.3% consuming more plant-based alternative protein food, though they would pay slightly less for these alternatives compared to meat products (0.83x).



Algae alternative proteins, or microalgae, are single-cell proteins produced from biomass that emerges from various microbial sources (tiny plant-like organisms measuring between 1 and 50 micrometers).^{xviii} We intentionally list algae alternative proteins as a separate category to plant-based proteins as they significantly differ in nutritional value,

cultivation methods, and end-use and economic efficiency compared to plant-based alternative proteins. **Sources:** Many species were tested for cultivation, but only two species, *Chlorella* and *Spirulina*, were identified as promising for large-scale production. They are reported to contain up to 70% protein of the dry mass and contain all essential amino acids. The downsides of microalgae are a strong taste and high production costs.^{xix} **Technology:** Microalgae typically grow in aquatic habitats such as lakes, ponds, rivers, oceans, and even wastewater. However, the majority of microalgae cultivation happens in outdoor cultivation systems such as artificial open ponds. After cultivation, microalgae are harvested and dried, and finally, proteins are obtained. To create an end product, the obtained proteins are usually blended with binders and flavors.^{xx} **Use cases:** Algae alternative proteins can be consumed as dietary supplements in the form of powders, pills, or tablets. The most common species, *Spirulina* and *Chlorella*, can also be consumed as extracts or processed in pasta, biscuits, and other functional food products.^{xxi} **Sustainability:** Microalgae can demonstrate growth rates of up to 5–10 times of conventional food crops and can display 15–30 times the lipid productivity of common crops.^{xxii} Furthermore, they have very low land requirements and minimal fresh water needs and can be produced under extreme conditions, resulting in positive environmental impacts.^{xxiii} **Consumer acceptance:** In our study, 60.7% of participants stated their willingness to consume algae-

based proteins over conventional meat products and would pay 24% less for them than meat products.

CONSUMER ACCEPTANCE	WILLINGNESS TO PAY
<p>60.7% are willing to consume algae-based proteins, but consumers are only willing to pay...</p>	<p>0.76x of the price they are willing to pay for products containing animal protein.</p>



The next category of alternative proteins encompasses edible **insect proteins**. They can be turned into flour or eaten whole for human and animal consumption. Insect proteins contain up to 70% of protein of dry matter and have high nutritional value, including high levels of calcium and iron.^{xxiv} **Sources:** The most frequently

consumed species of insects are beetles, caterpillars, grasshoppers, and termites. Protein-rich insects, such as buffalo worms and crickets, can contain up to 76% of the protein of dry matter.^{xxv} **Technology:** Edible insects are cultivated in automated farms where living conditions, diet, and food quality can be regulated to obtain optimal outcomes. Insects are usually boiled, fried, baked, dried and processed into powder, or eaten whole.^{xxvi} **Use cases:** Existing startups such as Essento create insect products for human consumption (i.e. adding insects in the form of healthy and sustainable flours to existing food products, such as burger patties, pasta, bars, and shakes) in order to enrich their protein content. **Sustainability:** Edible insects are environmentally friendly due to the little space required for insect cultivation, as insects can live in high densities; for instance, two thousand crickets can be cultivated in one m².^{xxvii}

CONSUMER ACCEPTANCE	WILLINGNESS TO PAY
<p>30.7% are willing to consume insect proteins, but consumers are only willing to pay...</p>	<p>0.56x of the price that they are willing to pay for products containing animal protein.</p>

Consumer acceptance: The

acceptance levels of eating insects are still low for western consumers, compared to those in Asia, South America, and Africa, where almost 2,000 insect species are consumed in 113 countries.^{xxviii} In our study, edible insects received the lowest consumer acceptance and willingness to pay, with only 30.7% of participants willing to consume insect proteins.



Source: Shutterstock

Fermented alternative protein companies develop meat substitutes using controlled microbial growth and enzymatic conversions of major and minor food components.^{xxxix} This requires the cultivation of microbial organisms to attain more of the organism as a source of protein or to extract certain ingredients such as flavorings, enzymes, and fats to improve the nutritional value in terms of fiber and protein.^{xxx} **Sources:** Microbial organisms, also known as microorganisms, are not noticeable to the human eye and include bacteria, yeasts, and molds in the production of fermented alternative proteins.^{xxxii} **Technology:** Three primary fermentation methods exist in order to produce alternative fermented proteins:^{xxxiii} 1) traditional microbial fermentation as is used to make tempeh (fermented soybeans), cheese, and yogurt, 2) biomass fermentation utilized by companies such as Quorn and Meati,^{xxxiii} and 3) precision fermentation used by startups like Solar Foods and Formo. Fermentation typically takes place in a bioreactor, generating several tons of biomass per hour when facilities are scaled up.^{xxxiv} **Use cases:** In recent years, startups such as Prime Roots, Energy Foods, and Evocative Design have begun to develop meat substitutes from fermented fungi, a group of organisms that includes mushrooms, mold, and yeast. The Finnish startup Solar Foods produces Solein, a protein powder created using a natural fermentation process that involves only air, water, and renewable electricity.^{xxxv} **Sustainability:** Fermentation-derived protein has great sustainability benefits as it reduces GHG emissions while using less water and land. For instance, mycoprotein uses only a fraction of the agricultural land and GHG emissions that chicken, pork, or beef require.^{xxxvi} **Consumer acceptance:** Our consumer insight study revealed that fermented alternative proteins received 60.6% consumer acceptance to consume more products of this category over traditional animal meat.

CONSUMER ACCEPTANCE	WILLINGNESS TO PAY
<p>60.6% are willing to consume fermented proteins, but consumers are only willing to pay..</p>	<p>0.76x of the price that they are willing to pay for products containing animal protein.</p>

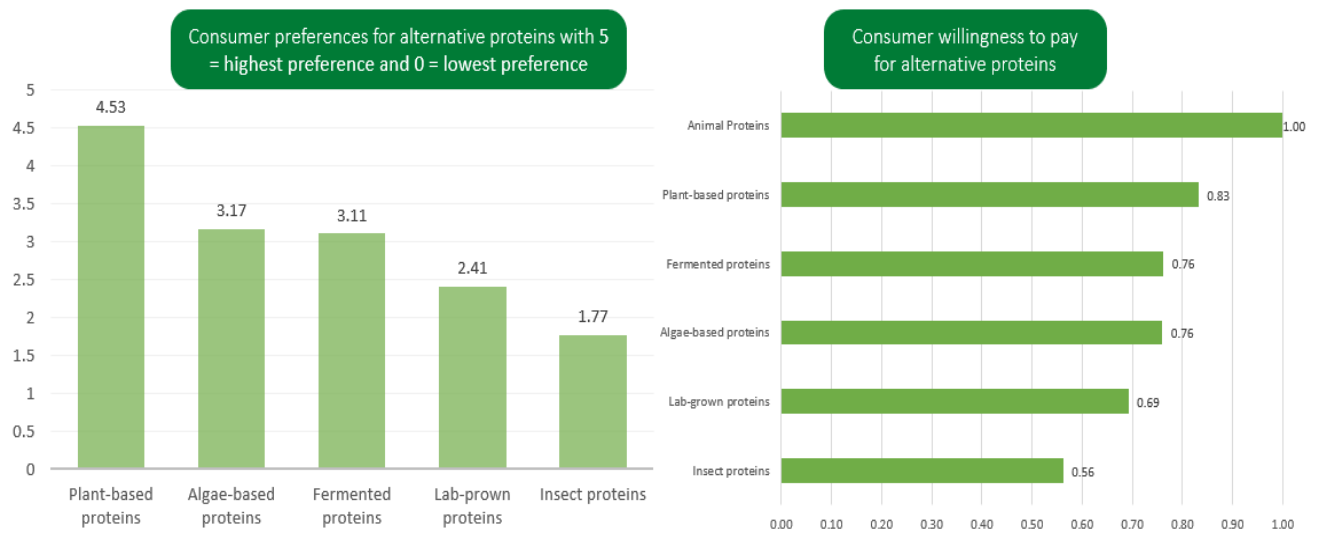
Consumers are willing to pay 24% less compared to animal-based proteins positioning fermented proteins as the alternative protein source with the second highest WTP of consumers.



The last category is represented by **lab-grown proteins** and belongs to the emerging field of cellular agriculture, which aims to make traditional livestock production unnecessary. Lab-grown proteins are also known as cultivated, cultured, cell-based, and in-vitro meat, and they come in the form of replicated animal meat, fish, seafood, dairy products, and eggs. They all describe meat grown outside of an animal (in a laboratory) with identical cellular, nutritional, and sensory characteristics.^{xxxvii} **Sources:** Growing lab-grown proteins requires stem cells from the muscle tissues of live animals, which are brought to the lab.^{xxxviii} **Technology:** Those stem cells are then cultivated and reproduced in a nutrient mix inside a petri dish. Then, the stem cells are cultivated in a bioreactor where they are able to grow and proliferate exponentially for mass production. At a certain point in this cultivation process in the bioreactor, the cells must differentiate and form either muscle, fat, or connective tissue. These three meat components are then brought together to recreate the desired piece of meat.^{xxxix} However, current technology does not completely manage to recreate the same taste as meat, as the basics of scientific meat cultivation research have been only developed in recent years. **Use cases:** At the end of 2019, this new innovative technology was first approved for the end consumer in Singapore.^{xl} Since then, dozens of start-ups have begun to produce lab-grown proteins, including beef, chicken, pork, shrimp, duck, white fish, mouse, salmon, tuna, foie gras, fish maw, lamb, kangaroo, horse, and sturgeon solutions.^{xli} **Sustainability:** The sustainability advantages of lab-grown proteins are numerous: 1) they provide edible meat without having to slaughter animals,^{xlii} 2) they do not require therapeutic antibiotics, thereby reducing health threats posed by antibiotic resistance, and 3) they cut livestock GHG emissions by 78–96% while using 99% less agricultural land.^{xliii} **Consumer acceptance:** Our survey revealed that 47% of the asked respondents would already be willing to eat lab-grown proteins over traditional meat, indicating a high potential for consumer acceptance of such novel food sources. Despite the high production costs, consumers would

CONSUMER ACCEPTANCE	WILLINGNESS TO PAY
<p>47% are willing to consume lab-grown proteins, but consumers are only willing to pay...</p>	<p>0.69x of the price that they are willing to pay for products containing animal protein.</p>

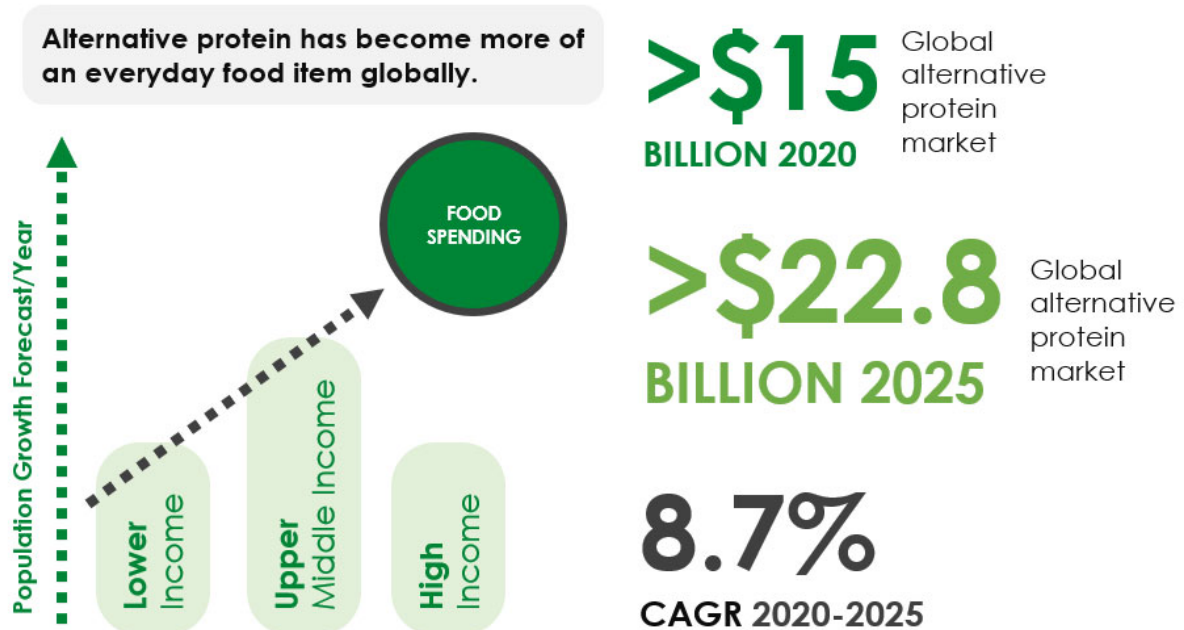
pay significantly less for these alternatives compared to meat products (0.69x).



Source: Survey of HSG FoodTech Lab in DACH area (2021), N=215

The graphic displays a comparison of consumer preferences and willingness to pay for all five alternative protein categories of our study in the DACH area, indicating that plant-based proteins have the highest consumer acceptance levels followed by algae-based and fermented proteins, which have similar acceptance rates. Interestingly, lab-grown proteins are preferred over insects. The study also shows that willingness to pay remains the highest for animal products. Thus, profit margins are highest for plant-based protein and lowest for insects and lab-grown meat.

Market opportunity of alternative proteins

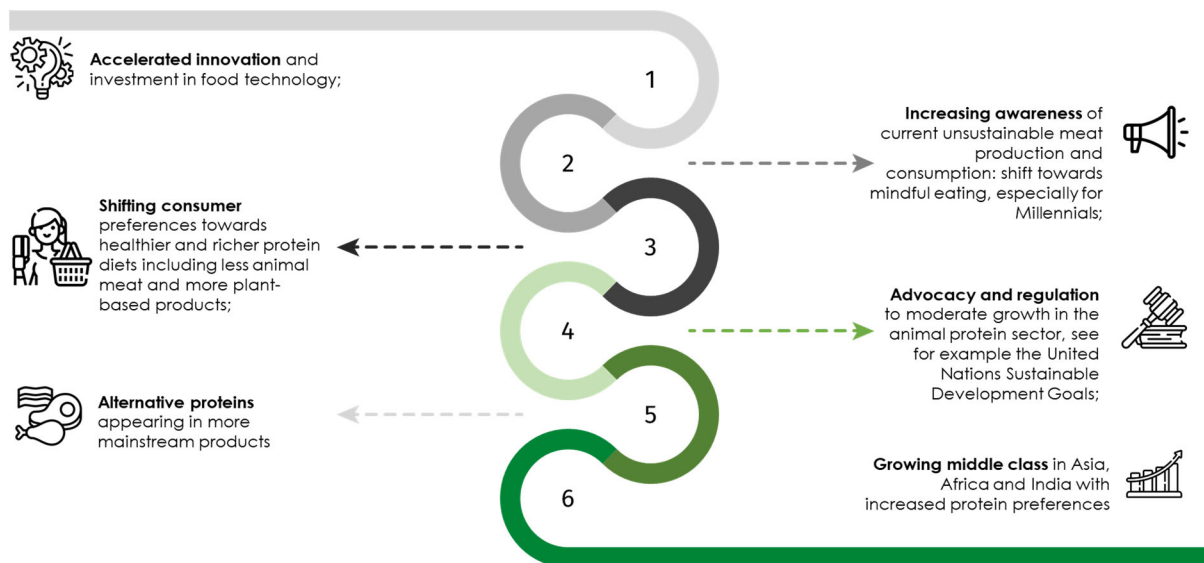


Source: Data Bridge Market Insights (2020); Global Market Insights (2020); Grand View Research (2019); Research and Markets (2020a); Statista (2021)

The overall market value, compound annual growth rates, and demand for protein ingredients have continuously grown in recent years. Based on several reports, we value the global alternative protein market at 15.04 billion USD in 2020, and the market is expected to grow at a rate of 8.67% (CAGR) from 2020 to 2025 alone.^{xliv} The estimated market value of plant-based alternative proteins was 9.69 billion USD in 2020, with an estimated CAGR of 8.07% (2020–2025).^{xlv} Furthermore, the market value of algae-based alternative proteins was estimated to be 0.77 billion dollars in 2020, with an estimated CAGR of 6.6% from 2020–2025.^{xlvi} Insect proteins show a market value of 0.33 billion USD in 2020, with an estimated CAGR of 25.1% (2020–2025) due to high growth rates in the animal consumption area.^{xlvii} The market value of fermented proteins in 2020 was 4.04 billion, with a CAGR of 8.3% from 2020 to 2025.^{xlviii} Lastly, the estimated market value of lab-grown alternative proteins was 0.22 billion USD in 2020, with an estimated CAGR of 15% from 2020–2025.^{xlix}

Six major growth drivers of alternative proteins

We see six key drivers that will shift the food system from dependence on animal proteins toward alternative protein sources:



1. Accelerated innovation and investments: Advancements in food processing technology will improve modern processing techniques such as 3D printing, shear cell technology, and extrusion methods. This will support the goal of alternative protein companies to create a product that consumers will perceive as analogous to animal products by replicating the appearance, flavor, structure, and composition of animal products. For instance, the 3D printing process allows the recreation of a muscle-like matrix through plant-based pastes. Improvements upon these techniques will result in an increased product availability of alternative protein foods with similar or even identical characteristics to their meat counterparts in the future.¹

2. Increasing awareness: A shift toward mindful eating in conjunction with increasing awareness of current unsustainable meat production and consumption is another key driver of alternative proteins. For instance, millennials are almost four times likelier than baby boomers to avoid buying products from multinational food companies.^{li} The rising popularity of Impossible Burger and Beyond Meat is one example of this shift. In fact, these demographic shifts also disrupt the ways in which food will be consumed in the future, a report from UBS global visionaries states.^{lii} As part of this shift, millennials increasingly demonstrate a preference for “mindful eating,” resulting in purchasing preferences for brands and foods that come from sustainable sources and thus a conscious engagement with food production and consumption. Consequently, due to increased awareness of sustainability, diets and preferences

shift away from animal meat to alternative proteins, opening new lucrative markets for startups, incumbents, and investors alike.

3. Shifting consumer preferences: It is estimated that approximately 48 percent of the world's population earns between \$11 and \$110 per day in purchasing power parity adjusted dollars. Most high-income countries are approaching a food consumption level close to saturation, with an average daily per capita consumption of around 3500 kcal. With consumption at such high levels, additional income does not result in further increases in calories consumed, but it may instead result in additional spending toward diet diversification, improved quality, and convenience, or toward food that satisfies shifting consumer values such as higher protein levels and healthier diets.^{liii}

4. Advocacy and regulation: Plant-based proteins are not regarded as novel foods. This means that there are no special restrictions for plant-based proteins since they are composed of protein derived from commonly eaten plants.^{liv} Lab-grown alternative proteins have not been authorized yet in the US and Europe. Singapore was the first country to approve novel cultured meat technology in 2020.^{lv} However, the European Union has identified cultured meat as a viable option for achieving long-term food sustainability goals, indicating the possibility of market access in 2022.^{lvi} Microbial fermentation has been known in the food industry for a long time, and regulatory systems are already well established in this category. Thus, many fermented microbial food cultures are not affected by specific novel food regulations in the EU and US.^{lvii} The production and commercialization of insects as foods is currently not permitted in all of the European Union. Switzerland began to allow insect foods in 2019, and they can also be purchased in the UK, Netherlands, Belgium, and Finland, as these countries have already removed regulatory hurdles.^{lviii}

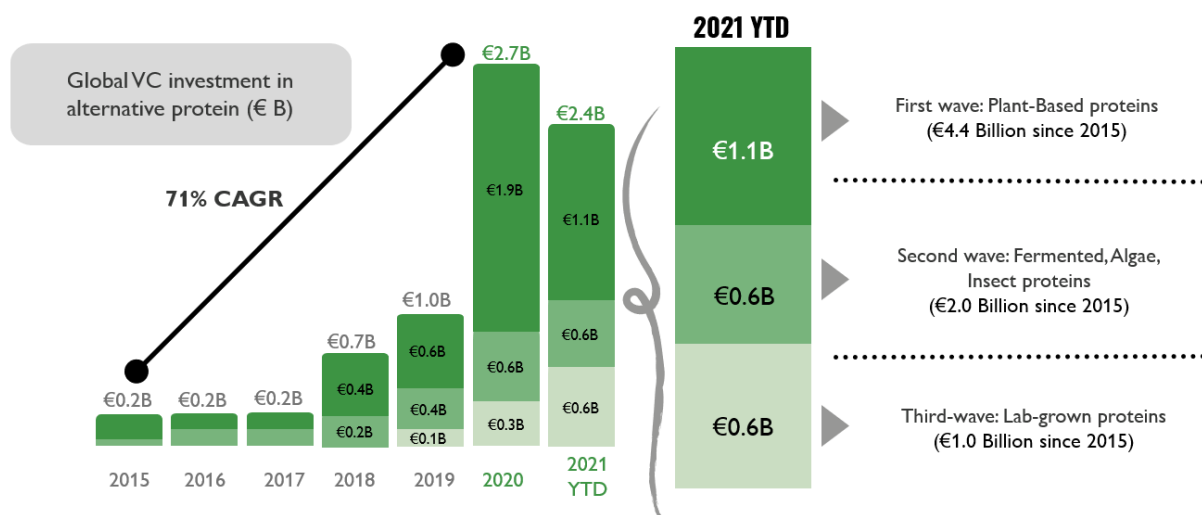
5. More mainstream applications: With the growing interest in protein worldwide, alternative protein sources will begin to appear in more mainstream applications. Food products can be fortified with protein by adding fractionated concentrates and isolates of plant-based proteins. Manufacturers may even combine different types of protein sources to maximize taste, texture, and cost while also considering consumer demand.^{lix}

6. Growing middle class: In countries with strong increases in income, such as countries in Asia, an alarming increase in meat consumption is forecasted. In fact, meat production in Asia has increased 15-fold since 1961, whereas production in Europe and USA has increased 2- and 2.5-fold, respectively. Thus, the growing middle class in Asia, Africa, and India will further accelerate the growth of the alternative protein market in upcoming years.^{lx}

Investment in alternative protein start-ups

Analysis of investments in alternative protein startups was provided in cooperation with our partner Dealroom, a global data and analytics platform.

Since 2015, venture capitalists have invested about €7.4 billion within the space of alternative proteins. The trend shows a strong increase in funding volume within the last few years. In 2020, €2.7 billion was invested in global venture-backed alternative protein startups, dominated by Impossible Foods' total increase of €455 million in Series F last year, followed by Califia Farms at €205 million, and €182 million into JUST in their growth equity funding alone. In 2021, we see that this upward trend remains intact, with an increase of €2.4 billion until Q3, with more expected to surpass last year's €2.7 billion investment.



Source: Dealroom alternative protein report (September 2021)

Investment by region

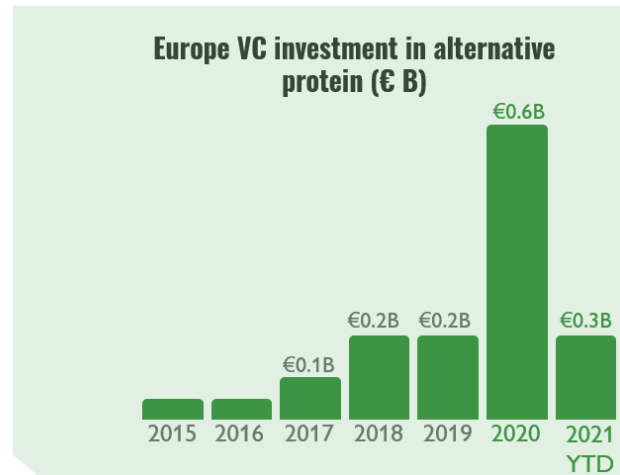
While North American companies have been the recipients of the lion's share of global investments in alternative protein (€5.2 billion since 2015), often accompanied by a fanfare of media headlines, funding volumes are constantly rising in Europe (€1.4 billion since 2015) and Asia (€0.6 billion since 2015). Investment into European alternative protein startups in 2021

was just over 0.7 billion—58% more than total funds raised over the previous three years combined.

Asia
 (€0.6 Billion since 2015)

North America
 (€5.2 Billion since 2015)

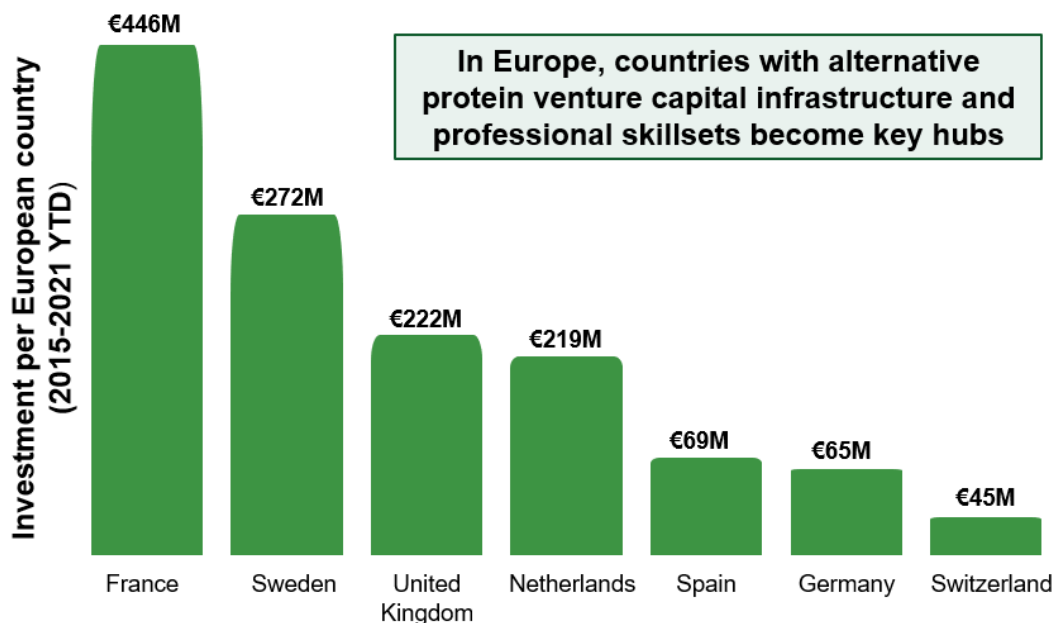
Europe
 (€1.4 Billion since 2015)



Source: Dealroom alternative protein report (September 2021)

Investment per European country 2015–2021 YTD

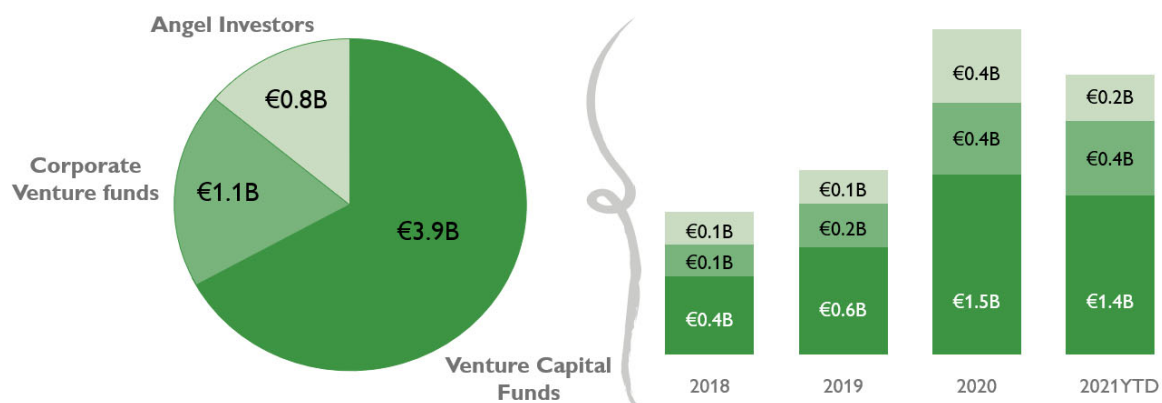
Comparing different regions in Europe, we observe that investment in alternative protein initiatives is highest in France (€446 million), followed by Sweden (€272 million), the United Kingdom (222 Million), the Netherlands (€219 million), Spain (€69 Million), Germany (65 million) and Switzerland (€45 million).



Source: Dealroom alternative protein report (September 2021)

There are several possible reasons for this disparity. Initiatives in selected European countries have led to debates among key stakeholders in academia and industry, policymakers, and consumers about protein challenges from technological, nutritional, economic, environmental, legislative, and social points of view. This has raised awareness among all actors in the value chain of the main challenges, barriers, and constraints that research on new proteins will have to tackle. Countries such as France, the Netherlands, the United Kingdom, and Sweden participate in notable collaborations with stakeholders from the industry, research institutions, consumers, and authorities, helping to identify the key areas in which specific actions are needed and providing the basis for more focused, sustainable, competitive, and consumer-oriented R&D strategies, projects, and solutions, which has boosted investments in start-ups in these respective countries.

Country	Initiative	When
France	National plant-based strategy	2020
France	The Protein France Industry Consortium	2017
The Netherlands	National Protein Strategy	2020
The Netherlands	Protein Cluster	2017
United Kingdom	Industrial Strategy Challenge Fund	2017
Sweden	National Food Strategy	2017
Sweden	Vinnova	2001



Source: Dealroom alternative protein report (September 2021)

Acquisitions and IPOs (2016–2021 YTD)

Private investors and public investors are expanding into the rapidly growing plant-based alternative protein market because of the higher returns compared to other food and beverage investment categories. Existing food and beverage companies are investing in alternative protein start-ups in an effort to expand their portfolios and product offerings to match the current market demands of specialty ingredients. Oatly represents one of the most successful food techs in the alternative protein space, having achieved consumer acceptance through their iconic branding and raising €11 billion in investments. In the near future, lab grown meats and fermented proteins are in the spotlight of investors. Recently Formo, a Berlin-based FoodTech company, closed the largest funding round in FoodTech in Europe. The raised funds of €42 million shall help start production of Formo’s animal free dairy products derived from precision fermentation.

Notable acquisitions and IPOs (2016–2021 YTD)					
Simris Alg	Daiya Foods €0.4B Otsuka Pharmaceuticals	Else Nutrition	Beyond Meat €0.03B	SavorEat €0.04B The Very Good Butchers	Oatly €11B Bio Milk €0.07B
EnviroFlight Darling International Gold&Green Foods Paulig Group	Field Roast €0.1B Maple Leaf Foods Fair Insects Protix Biosystems	Terrafertil Nestle Exo Aspire Food Group The Vegetarian Butcher Unilever	Amidori Pfeifer & Langen Before the Butcher Jensen Meat Kaslink Fazer	Peace Of Meat €0.02B MeaTech Like Meat LiveKindly Co. Violife Foods Upfield	Vivera €0.3B JBS Yam Chops €0.006B Plant&Co The Dutch Weed Burger LiveKindly Co Proti-farm Ynsect MeaTech
2016	2017	2018	2019	2020	2021

Source: Dealroom alternative protein report (September 2021)

We see several venture capital funds specialized in the investment of alternative proteins attracted by a solid trend for joint public-private speculation and new stages for innovation acceleration and market development. There is a considerable chance for a public-private intercession to help shape and speed up the alternative protein economy.

FUND	HQ	Number of Investments	Select Investments
SOSV	United States	32	Perfect Day, UPSIDE Foods, The Not Company, Clara Foods, Prime Foods, New Culture
New Crop Capital	United States	31	Beyond Meat, BlueNalu, Good Catch, Kite Hill, Atlast Food, Alpha Foods, Zero egg food
Stray Dog Capital	United States	22	Meatless Farm, Good Planet Foods, Miyoko's Kitchen, Daring Foods, SuperMeat, Wild Earth
CPT Capital	United States	19	Green Monday, Innovopro, Redefine Meats, Solar Foods, ENOUGH
Lever VC	United States	19	Heūra (Foods for Tomorrow), Mission Bards, Bond Pet Foods, Bluu Biosciences
Blue Horizon Ventures	Switzerland	18	Next Gen, Mosa Meat, LiveKindly Co, BIOMILKQ, Algama, Planted
Temasek	Singapore	17	Innovafeed, Perfect Day, V2food, Next Gen, Growthwell
Khosla Ventures	United States	17	Impossible Foods, Ripple Foods, JUST, ALOHA
Horizons Ventures	United States	16	V2food, Algama, Perfect Day, Impossible Foods, JUST
Agronomics	Isle of Man	11	Meatable, BlueNalu, New Age Meats, Legendairy Foods, Shiok Meats, Rebellyous Foods

Source: Dealroom alternative protein report (September 2021)

Conclusion

All five of the alternative protein categories described in this report provide an exciting outlook for the future. They can substantially reduce GHG emissions as well as land and water usage by providing a valuable source of food to the growing world population. The growing market volumes, consumer acceptance levels, and key drivers stated in this report are effective indicators of whether alternative proteins will be able to take over the conventional meat market in the future and tackle the grand food challenges. However, the scalability of alternative protein production methods remains a crucial question and hurdle in order to contribute to sustainable and healthy food production and consumption. Therefore, an important conclusion from the report is that, for the foreseeable future, the meat and alternative protein industries will coexist, resulting in great opportunities for synergies. There is a possibility of genuine disruption in the near future.

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