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NEWMEAT

Protein transformation:
the most important players
and processes

Consumers

Startups

Research

Politics

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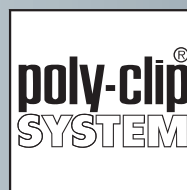
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Editorial

Constant change

Transforming our food system and the way we produce protein requires a multi-dimensional view of the market, our food culture and our interaction with the environment.

It is a blink of an eye in the history of food, our attempt to change what has evolved over centuries. The goal – to transform the global food system – is by no means innovative. Change is a continuum, even in the field of nutrition. Managing this continuum based on long-term projections is the challenge we now face.

How difficult this task is and will be becomes clear when we consider the dimensions of nutrition. It affects different cultures and economic sectors in equal measure and is an expression of our most basic human needs: Hunger and thirst. In addition, the pace of change varies around the world, with different levels of political and public support and different technologies available to build a new system. This is why we too are constantly working

towards a fixed point of enlightenment about a system in transition, and constantly searching for that one central building block – the overarching vision.

On the following pages you can read more about what the United States, the United Kingdom, Singapore and Germany have to contribute to the search for a vision and how they are shaping the global industry. Even though there is a lot going on in other parts of the world, such as Israel, Denmark and the Netherlands. On the following pages you will discover some of the key global players and governments that are showing what it takes to survive internationally.

We are always on the move, are you?

Keep on moving

Nadine Filko, Editor NEWMEAT



Nadine Filko

Photo: privat

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Board of Directors
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Supervisory Council
Andreas Lorch, Catrin Lorch,
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Court registry office
AG Frankfurt am Main, HRB 8501
UStIdNr. DE 114139662

General Publishing Director
Christian Schnücke

Editor-in-Chief
Olaf Deininger (v.i.S.d.P.)

Editorial office
Nadine Filko

Design
Ralph Stegmaier

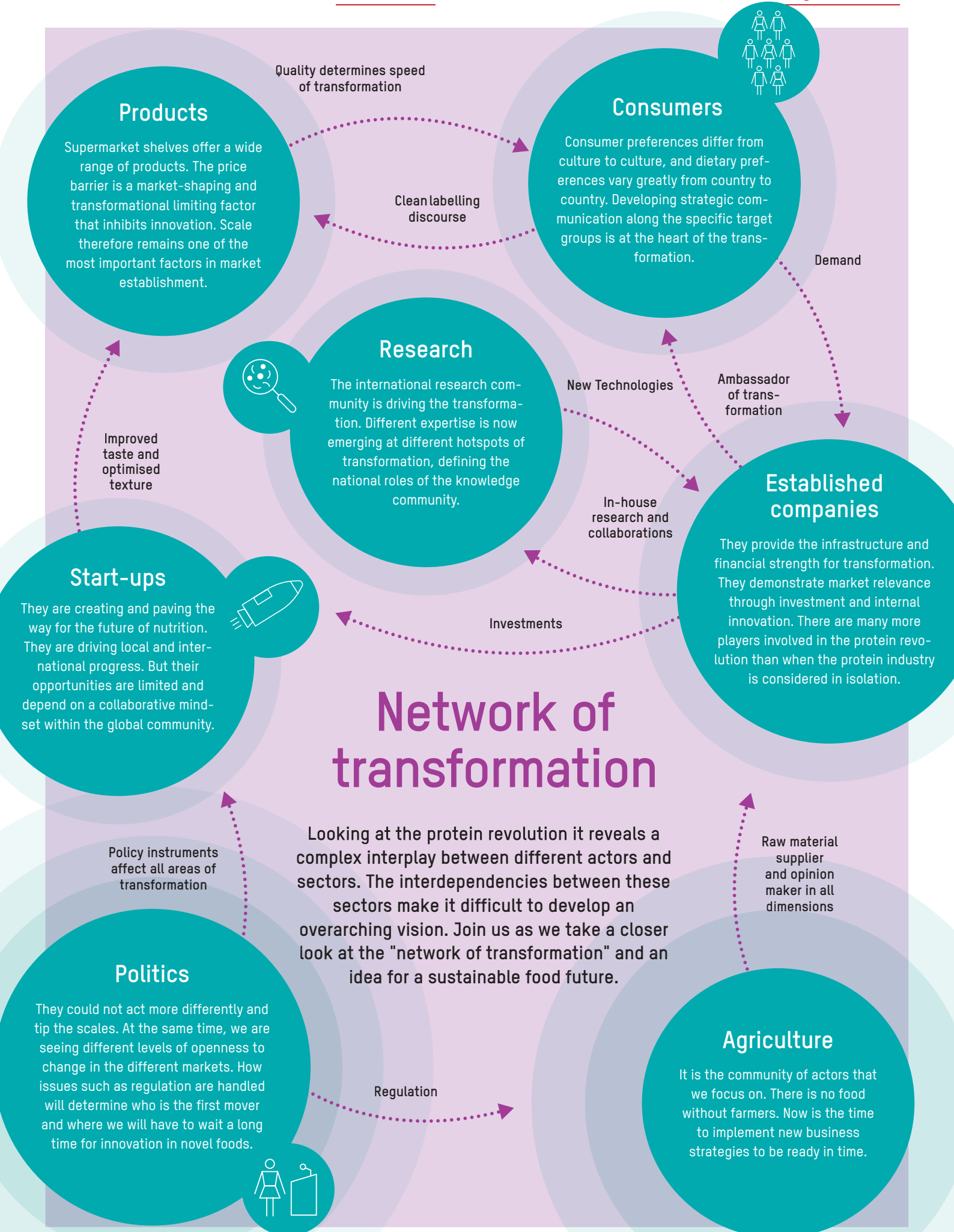
Advertising management
Christine Contzen

Guest editorial
Fabio Ziemßen

In co-operation with:
Verband für Alternative Proteinquellen e. V.
c/o Mindspace
Friedrichstraße 68
10117 Berlin
Internet: www.balpro.de
Email: dialog@balpro.de

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Germany

Proven expertise

As the global potential of the protein revolution becomes more tangible, Germany is relying on traditional engineering expertise. Where EU regulations are becoming a bottleneck for innovation, traditional core competencies are ensuring competitiveness.

Last year, the government surprised everyone by announcing that €38 million would be made available in the 2024 federal budget to promote alternative proteins. One challenge is to ensure that this money is used, says Zoe Mayer, member of the German Bundestag for Bündnis 90/Die Grünen and member of the Committee on Food and Agriculture, during a roundtable discussion for NEWMEAT magazine. Innovation in Germany is particularly evident at the engineering level. Whereas five years ago there were only a few companies involved in the production of novel food proteins, today there are more and more visionaries: companies working on a wide range of end products and developing their own mechanical equipment. With specially designed bioreactors, they could help

the international community overcome the relevant scale-up hurdles in the future. Membership of the European Union makes it even more important to develop skills far removed from the production of end products. If political efforts such as those seen in Italy, France or Austria, and manifested in the 'Culinary Alliance' of 13 EU member states, result in novel foods such as cultured meat not ultimately being approved by the PAFF Committee, focusing on markets close to the industry could become a decisive economic factor. Companies such as The Cultivated B, BLUU Seafood, Senara and Innocent Meat are doing crucial work here. In the future, the important aspect of food safety and cooperation with the agricultural sector must also be emphasised. <

Regulatory basics

Authority: European Food Safety Authority (EFSA)

Evaluation time: Unspecified

Tastings: None, except the Netherlands

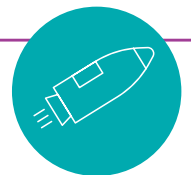
URL: efsa.europa.eu

Regulatory process: Takes place on many levels, overview on page 11

Labelling: The European Commission's Standing Committee on Plants, Animals, Food and Feed formulates specific labelling requirements in addition to the basic assessment of the "draft implementing act" of a novel food. Each food must also comply with the "Horizontal Labelling Regulation (1169/2011)", which regulates, among other things, the labelling of allergens. Specific novel food labels will be added. They will then apply in all Member States. Countries can also ask the Commission to develop further national labelling measures.



Established companies and start-ups

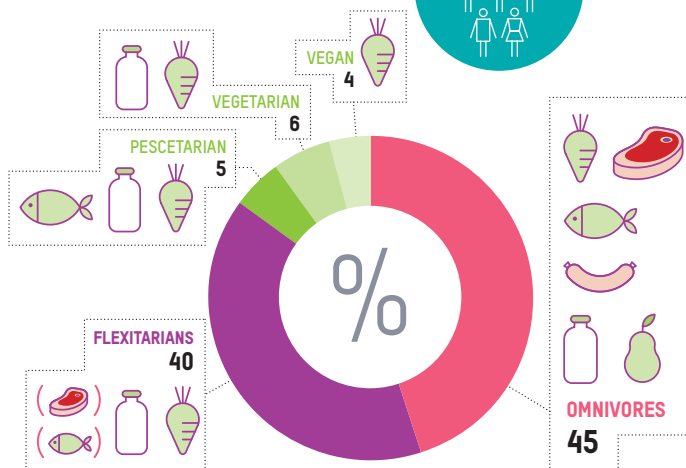


Of the 20 novel food companies in the DACH region that we were able to identify in the "Products" section of the current NEWMEAT TechMap (next page), 80% are based in Germany. Of these, around 44% are involved in cellular agriculture, around 19% in precision fermentation, around 31% in biomass fermentation and 6% in gas fermentation.

Consumers

The proportion of flexitarians in Germany has risen by 10 percentage points in the last two years. At 40%, Germany stands out in a European comparison.

Quellen: Evolving appetites: an in depth look at European attitudes towards plant based eating



Hotspot Berlin

Cells of innovation

The German capital in particular is proving to be a hotspot with a high number of novel food start-ups. Overall, however, innovation drivers can be found throughout Germany.

TechMap



Discover potential partners along the novel food chain in the DACH region and dive into the TechMap!



Formo

Foundation: 2018

Founders: Britta Winterberg, Raffael Wohlgensinger

Classification:

Precision fermentation

Investors: Grazia Equity and Happiness Capital, among others

Registered office: Berlin

URL: formo.bio



Foundation: 2018

Founder: Tanja Bogumil

Classification: Precision fermentation

Investors: Lea-Sophie Cramer and JustSpices, among others

Registered office: Berlin

URL: perfeegt.co



Foundation: 2021

Founders: George Zheleznyi, Jordi Morales-Dalmau, Eugenia Sagué

Classification: cultural fat

Investors: ProVeg Incubator and MassChallenge Switzerland, among others

Registered office: Berlin

URL: cultimatefoods.com



Foundation: 2020

Founders: Dr. Sebastian Rakers, Simon Fabich

Classification: Culture fish

Investors: Lead-Investoren LBBW VC and Sparkfood

Registered office: Berlin

URL: bluu.bio

Bosque Foods

Foundation: 2020

Founder: Isabella Iglesias Musachio

Classification: Biomass fermentation

Investors: Blue Impact Ventures and Blue Horizon Corporation, among others

Registered office: Berlin

URL: bosquefoods.com

ESENSIA FOODS

Foundation: 2022

Founders: Bruno Scocozza, Hendrik Kaye

Classification: Biomass fermentation

Investors: Big Idea Ventures

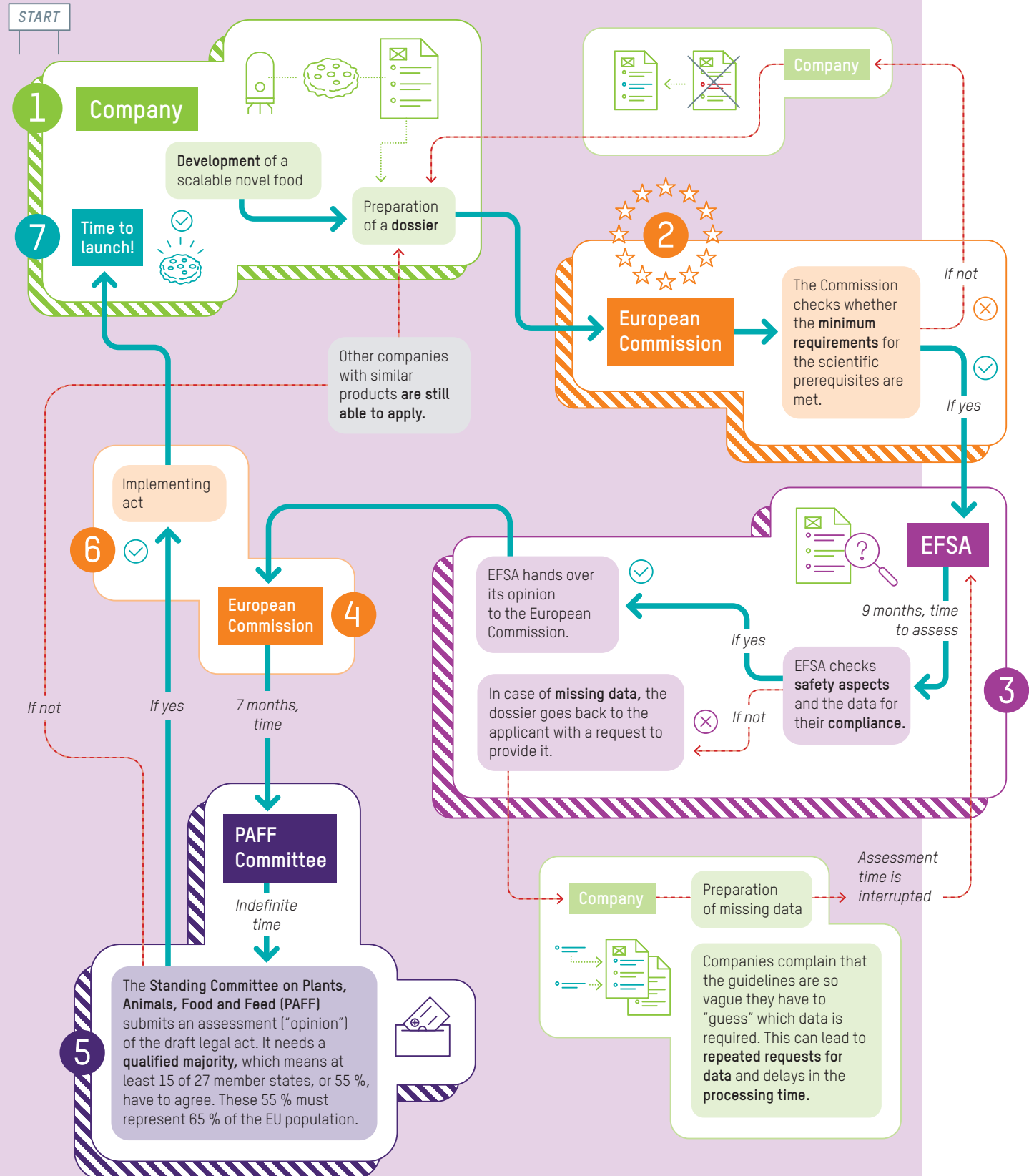
Registered office: Berlin

URL: esenciafoods.co

Novel Food

Regulatory Flow Chart

You have no idea how the regulation of Novel Foods in the European Union actually works? This chart shows the most relevant steps and obstacles ahead and highlights how there is more to it than just the EFSA.





United Kingdom

„Headroom for growth“

The people of the United Kingdom once coined the terms veganism and vegetarianism. Today, they are leading the way in the protein revolution. Not just because Europe's first cultured meat product could be on sale here.

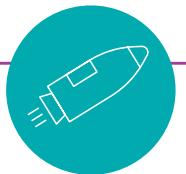
A full English breakfast produces twice as much CO₂ as a vegan breakfast. People in the UK consumed around 30 kilos of poultry, 16 kilos of pork, 11 kilos of beef and 4 kilos of sheep meat in 2022 (Statista). According to the Guardian, meat consumption has fallen by around 14 per cent since 2012. In terms of turnover, this consumption will amount to 28.19 billion euros in 2023 (Statista). This is equivalent to around 24.66 billion pounds. In the area of plant-based alternatives to meat and milk, the figure will be €964 million in 2022 (Good Food Institute Europe). This represents around four per cent of the volume of meat. Although the figures are not fully comparable due to differences in

the context of the comparison years (22/23) and the reference (meat versus meat and milk), we can still get an idea of the potential of the market. The UK is the second largest market in Europe for plant-based foods. Yet only a quarter of the population (27%) has ever eaten plant-based 'meat'. 6 per cent eat them on a daily basis (Plant Futures). According to a presentation by Indy Kaur, CEO of Plant Futures: "There is significant headroom for growth. Indeed, the data suggests that there is plenty of room for growth in terms of demand. According to the second edition of the 'Evolving appetites' study, the UK also leads Europe in this category with seven per cent of vegetarians. <



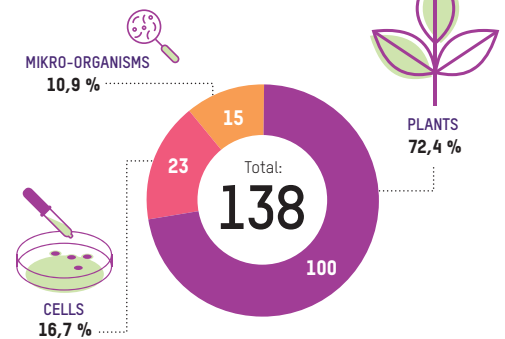
Research

UK Research and Innovation has just awarded a total of £17.4 million to 47 projects working on topics such as food quality, functional foods and new proteins. These include Adamo Foods, which is working with the University of Nottingham to improve the nutritional value of mycoprotein.



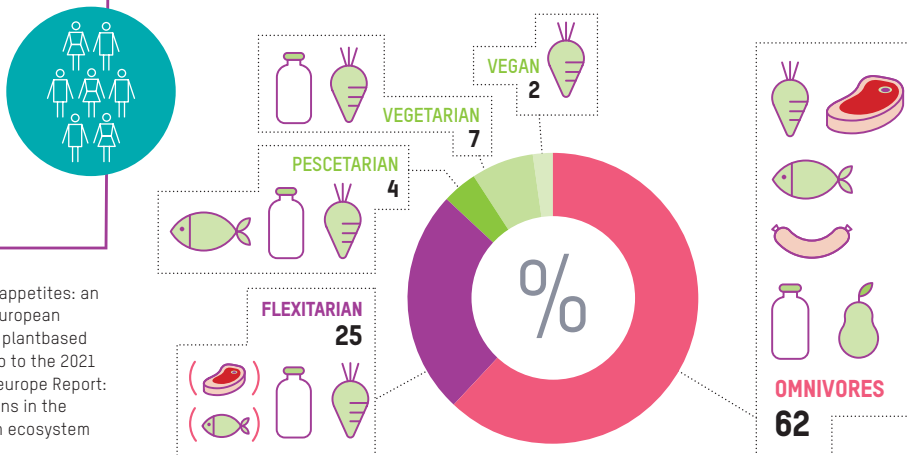
Established companies and start-ups

Alt-protein companies by origin of production



Consumers

Percentage of diet types in the UK



Sources: Evolving appetites: an in-depth look at European attitudes towards plantbased eating. A follow-up to the 2021 survey report; gfi europe Report: Sustainable Proteins in the United Kingdom An ecosystem review.



Spotlight

According to a YouGov survey, only 13 per cent of people in the UK are flexitarians. However, the category 'plant-based diet' is also offered here.

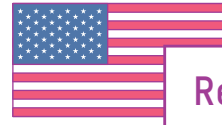
USA

A hub of global innovation

From plant-based burgers to cultured meat patties, what's served on the tech plates of the food revolution in the United States is feeding the global community.

The United States is one of the countries shaping the global alt-protein industry. Local giants such as GOOD Meat (Eat Just Inc.) and Upside Foods have already obtained a cultured meat licence, as have fermentation pioneers such as Perfect Day. Meanwhile, numerous international start-ups are looking to enter the market. It seems that the US is dominating the international discourse, not only because the FDA's collaborative approach ensures that global innovators feel well taken care of - despite the same safety standards as in other countries. German entrepreneurs are also looking to the West and the op-

portunities that the regulatory landscape holds for them. And yet, as elsewhere, there are loud voices of dissent. According to media reports, some US senators are trying to ensure that cultured meat is not included in school lunches. This is an area that is an important lever for change, both in terms of education and sustainable and healthy diets. There is also news that the Bar Crenn restaurant will no longer serve Upside Foods' cultured meat. How the mainstream industry continues to engage with the new sector and the opportunities it presents will ultimately be a key determinant of global success. <



Regulatory basics

Agency: US Food and Drug Administration (FDA), US Department of Agriculture Food Safety and Inspection Service (USDA-FSIS)
Evaluation period: Approximately one year
Sampling: permitted
URL: [fda.gov/food](https://www.fda.gov/food); [fsis.usda.gov](https://www.fsis.usda.gov)

Regulatory process: To be approved, cultured meat must first go through a pre-market consultation process with the FDA. This includes evaluation of the manufacturing process, the cultured cell material resulting from the process, including the establishment of cell lines and banks, control procedures, components and inputs. The FDA encourages companies to contact them as soon as possible. The safety of each area will then be evaluated. Following the FDA's assessment, the USDA-FSIS takes over and inspects the manufacturing facility, which must comply with government regulations and the systems in place to monitor critical control points.

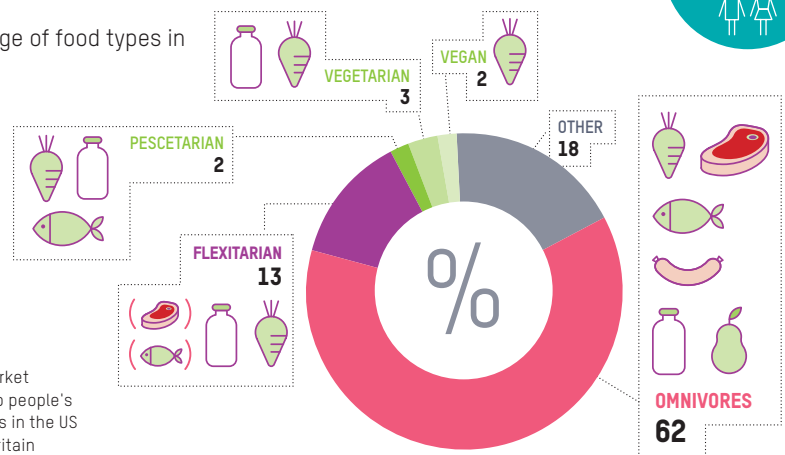
Labelling: USDA-FSIS is responsible for all types of meat covered by the Federal Meat Inspection Act or the Poultry Products Inspection Act. Cultured meat products are currently labelled as "cell-cultured".

Novel Foods

There is no official definition of novel foods in the United States. When evaluating and approving novel substances for the market, a distinction is made between food additives and GRAS (Generally Recognised as Safe) substances. In the case of food additives, the company goes through a "petition process" as part of the approval process. GRAS status can be achieved either by demonstrating a history of use prior to 1958 or through scientific procedures that prove the safety of the substances. In both cases, the company must demonstrate that the food or substance is safe when used as intended.

Consumers

Percentage of food types in the USA



Sources: Market insights into people's food choices in the US and Great Britain

Singapore

Cultivating independence

For Singapore, producing its own food is about much more than fostering innovation. For the futuristic city-state, it is about security through independence.

Singapore is leading the way, and the world is following – not quite yet. But when it comes to the future of food, many governments would do well to at least take a look at the tech city-state. It is the centre of technological development and home to the first commercially viable cultured meat. As a result, the smart city – which is smaller than the German capital – often dominates the global discourse on food innovation. Google it and you will find comparisons with Silicon Valley. It seems like the cradle of a sustainable food future. But the young state only gained independence in 1965. Now as then, this does not mean that it is self-sufficient. However, the government has managed to gradually wean itself off dependencies, for exam-

ple in the area of water supply. The "four national tabs" were developed for this purpose. The smart city also wants to wean itself off dependence on other countries for its food supply. Around 90 percent of food is imported. The four pillars of sustainable food production and a sustainable ecosystem are the establishment of business-friendly regulations, investment in research and development, the development of an efficient infrastructure and, last but not least, talent. These are all building blocks that are also part of the country's 30 by 30 strategy, which aims to produce 30 per cent of the country's food by 2030. According to a citizen survey conducted by the Singapore Food Agency, 98 per cent of Singaporeans agree with this goal. <

Regulatory basics

Agency: Singapore Food Agency (SFA)

Evaluation period: 9–12 months after receipt of the documents

Sampling: permitted

URL: sfa.gov.sg

Regulatory process: Companies wishing to place a novel food on the market must obtain prior authorisation from the SFA. As a first step, they are asked to contact the SFA as soon as possible using a simple online document. It is possible to register for bimonthly digital Novel Food Virtual Clinics to exchange ideas. After consultation with the SFA, the necessary data on the safety of the novel food (such as toxicity or allergens) are submitted. They must also submit information on the manufacturing process, including the materials used and the precautions taken to avoid safety risks. This includes a specific checklist for cultured or fermented products. A group of 11 experts then assists the SFA in the safety assessment and provides additional assurance in the evaluation of the data.

Labelling: The SFA stipulates that the packaging of cell-cultured products must bear a label such as "cultured" or "cell-based".

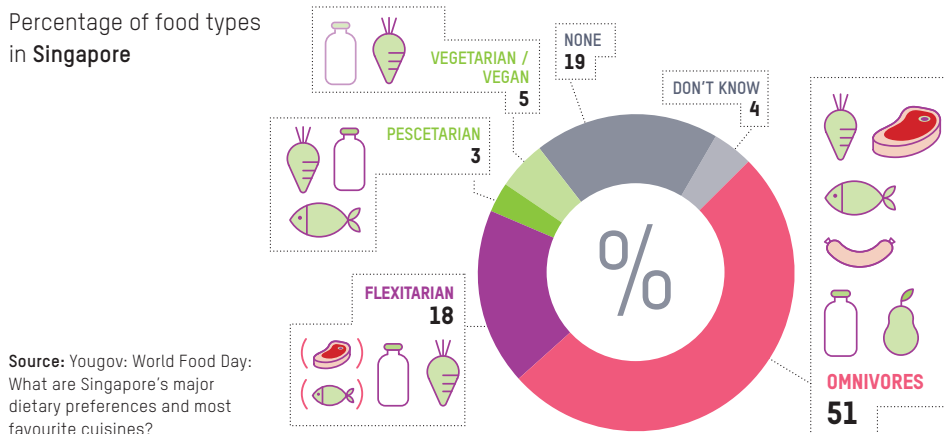


Spotlight

Despite the abundance of green spaces in Singapore, only 0.9 per cent of the futuristic city-state's land area was used for agriculture in 2019, according to Destatis. By comparison, the figure for Germany was 47.7 percent.

Consumers

Percentage of food types in Singapore





© foodfab

foodfab – we make your production facility fit for the future

How can the food processing facilities of tomorrow be designed today when such key factors as the market itself and the purchasing behavior of consumers are always changing and EU taxonomy guidelines also have to be considered? The answer is: integrally and digitally, from inside out. With a focus on the facility's core processes. As one of Central Europe's leading consultancy companies for food processing operations, foodfab is the expert partner for sustainable and integral operational and building planning.

Process optimization is the key to success

"A building for the food industry can only be successful if it optimally supports the processing technology," is the guiding principle of foodfab. Managing Director Michael Trautwein, whose 30 years of experience mean that his sectoral knowhow is second to none. As a subsidiary of ATP architects engineers, Europe's leading integrated design office, foodfab's consultancy services go far beyond mere building concepts. foodfab evaluates the entire production technology in the great-

est detail in order to optimize the specific production, processing, and distribution processes. In addition to this, foodfab's integrated cooperation with ATP permits the development of holistic solutions for long-term, economically and ecologically sustainable operations.

Integrated design with BIM for future-fit facilities

Good design brings huge potential for savings. The use of Building Information Modeling (BIM) as a digital planning tool enables the entire lifecycle of the operating facility to be depicted. This is done by creating a "digital twin," which can also be generated as a climate-friendly "ideal variant." This form of simulation makes it possible to take well-founded decisions in the areas of sustainability, energy, performance efficiency, and flexibility during the early planning phase. And this is the best prerequisite for crisis-proof production that is not only cost-effective but also incorporates key climate targets.



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Contact:

Michael Trautwein
Tel.: +49 (172) 6093 331
Mobile: +43 699 15372160
E-mail: michael.trautwein@foodfab.eu
Web: www.foodfab.eu

The most important services at a glance

Consultancy:

- > Material flow planning
- > Process technology consulting
- > Machine layout planning
- > Logistics planning
- > Climate protection planning

Realization:

- > Masterplanning
- > Factory planning
- > Production planning
- > Tender process
- > Object monitoring

Technology

Ferment of the new industry

Photo: Damir Omerovic / Unsplash

It is one of the three core pillars of the protein revolution: the fermentation industry. But what are the differences between biomass, precision, traditional and gas fermentation?

Sauerkraut, sourdough or beer - that's not what people in the new industry think of when they talk about fermentation. The scene seems abstract and the technology complex. But at its core, it has been part of human culture for thousands of years. For example, people have been using fermentation to preserve food for 9,000 years. But making new food from biomass through fermentation is also an ancient craft.

Traditional fermentation

Traditional fermentation has long been part of human cuisine. The first cheese is said to have existed 6,000 years before our time. Louis Pasteur, the inventor of pasteurisation, discovered the link be-

tween the fermentation process and living organisms. Fermentation was previously thought to be a purely chemical process. Having identified the micro-organisms responsible for desirable and undesirable fermentation (alcohol versus acid), he discovered that some micro-organisms could be killed by heating.

Modern fermentation

The way fermentation is done today, and what comes out of it - a whole new industry - is new in its aspirations and, to some extent, in its methods. Although food preservation has always been about food safety, fermentation is now taking on a different dimension and is part of a global sustainability movement. There is still unexplored potential, such as the possibility of creating a specific flavour for plant-based products. A report by the Good Food Institute suggests that the economic potential in Germany could be quite large, given the number of companies. In terms of regulation, this pillar of the protein revolution is

promising due to the familiarity of some of the technologies and processes. It is therefore not surprising to see new alliances forming around fermentation. One example is the Fungi Protein Association, which focuses on fermentation with fungi. Alongside the Fungi Protein Association are organisations such as the Precision Fermentation Alliance and Food Fermentation Europe. They all aim to make the industry, in its current form and function, a driver of the protein revolution. On the next page you can read about how the member companies produce proteins. <



1 Biomass Fermentation

Base: yeasts, filamentous fungi and microalgae

Biomass fermentation is all about speed and protein content. The base is biomass that needs to be maximised, whereas in precision fermentation, for example, a protein with a specific function is produced within a biomass, but the

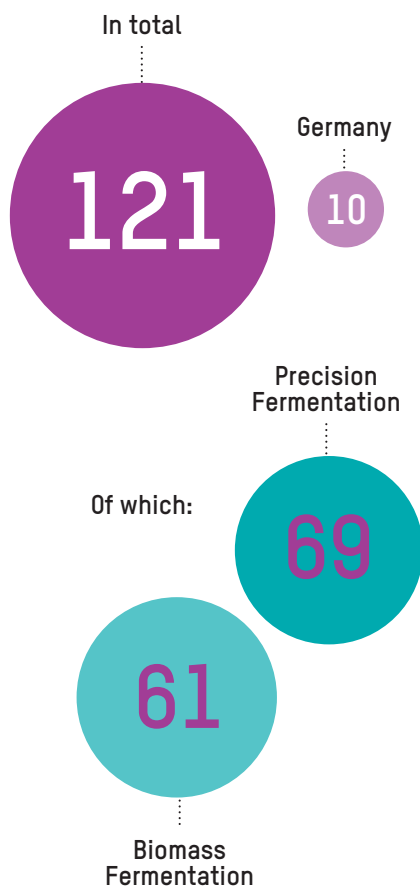
biomass itself is not the product. Microorganisms that can double their weight in a few hours are used to produce as much protein as possible. For example, mycelium is used, which is fed with by-products from the food industry in bioreactors, where it fer-

ments the by-products and multiplies. The end result is biomass. The fermentation product can be used as a stand-alone product or as an additive in the manufacture of other end products. According to the Good Food Institute's 2022 State of the Industry Report on fer-

mentation, 70 per cent of companies in the biomass fermentation sector focus on producing ingredients such as lipids or protein isolates for end products. <

Global community

Number of companies in the fermentation sector



Sources: Alternative Protein Company Database Good Food Institute, Multiple answers possible, so figures may not add up, as of 02 May 2023.

2 Precision Fermentation

Base: yeast or bacteria

Precision fermentation companies use micro-organisms to produce specific functional ingredients. The micro-organisms act as small factories. This technology has been used for decades to produce enzymes or vitamins, for example. The substances produced range from proteins and pigments to fats. A desired DNA sequence, for example from milk protein, is encoded in yeast. The yeast is fed in a bioreactor. It

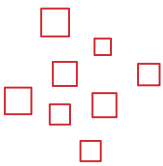
receives plant nutrients and sugars and produces, for example, casein. After feeding, the desired products are separated. In the case of casein, the yeast is separated from the milk proteins. The milk proteins obtained in this way ultimately form the basis for the production of foods such as cheese. The best-known company in Germany is Formo. <

3 Gas Fermentation

Base: Archaea

Gas fermentation is a process in which microorganisms are used to produce proteins from carbon dioxide, hydrogen, nitrogen and oxygen. At the Austrian start-up Arkeon (founded in 2021), the desired product (e.g. amino acids) is produced outside the cells and can then be harvested or, as Gregor Tegl said in an interview with "Brutkasten", isolated "in a simple purification step" and then made available to the food industry. Arkeon has devel-

oped a fermentation process around the micro-organism discovered by founder Dr Simon Rittmann that produces the amino acids. The Finnish company Solar Foods has already been given the green light for its Solein for the Singaporean market. The company is also working on a system to produce Solein in space. <



Plant Molecular Farming

Cocoon for nutrition

Long used by the pharmaceutical industry, molecular farming is experiencing a renaissance in the production of nutritional ingredients.

"Molecular farming is basically the Holy Grail. It means we can farm without using land," explains science communicator David Spencer in an interview for NEWMEAT. The technology allows companies to produce substances in plants that would otherwise only be produced at great cost, for example on the other side of the world. It is an approach that can be described as precision fermentation in a different guise: An

organism acts as a cocoon for the production of a substance.

The basics

For example, the pharmaceutical industry produces enzymes for medicines, while the food industry produces pigments or natural colourings. This is done by introducing genetic information from a foreign organism into a plant. It is reprogrammed to produce certain proteins, for example. The information that leads to the production of the desired substance can be transferred to the plant via a bacterium, for example. The aim is to produce the substances faster and with a higher yield. According

to Forward Fooding's FoodTech Data Navigator, there are around 20 companies working with this technology.

The challenges

Genetically modified organisms require regulated and careful handling. The right space must be created not only in people's minds, but also in the countryside. Social reservations and fear of technology remain two of the most important hurdles. "Further development will take time in a world that is rethinking its relationship with technology," says Spencer. <



Photo: © KI DALL-E

Whether generated by artificial intelligence or the human mind, the idea of new technologies and their connection to our food culture is still abstract. Smile, yes, but eat?

Anzeige

REAL TASTE IS A QUESTION OF TECHNOLOGY

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Forecasts

Smart Proteins in 2024



Fabio Ziemßen is a partner at ZINTINUS GmbH, a food growth fund. He is responsible for financing and supporting start-ups in the fields of alternative protein sources, clean nutrition, functional food and reducing food waste. As chairman of BALPro e.V., he is committed to networking and dialogue in the field of alternative protein sources.

Photo: METRO AG

In 2024, the alternative protein sources sector will continue to grow dynamically, driven by increasing awareness of healthy plant-based diets, the environmental impact of conventional production processes and the sustainability of food production.

In 2024, alternative protein sources will continue to grow dynamically as awareness of a healthy plant-based diet, the environmental impact of conventional production processes and the sustainability of food production increases. We will see an increasing variety of alternative protein sources, as the culinary experience takes precedence over comparability with animal-based products, and enjoyment becomes a key criterion alongside

price, not only in supplier communication but also in purchasing. In addition to established sources such as plant proteins from soy, peas and legumes, new and innovative sources are being developed through technology. In particular, advances in biotechnology and food technology are improving the efficiency of protein production. The use of a new generation of bioreactors and optimised process technologies is further improving production, re-

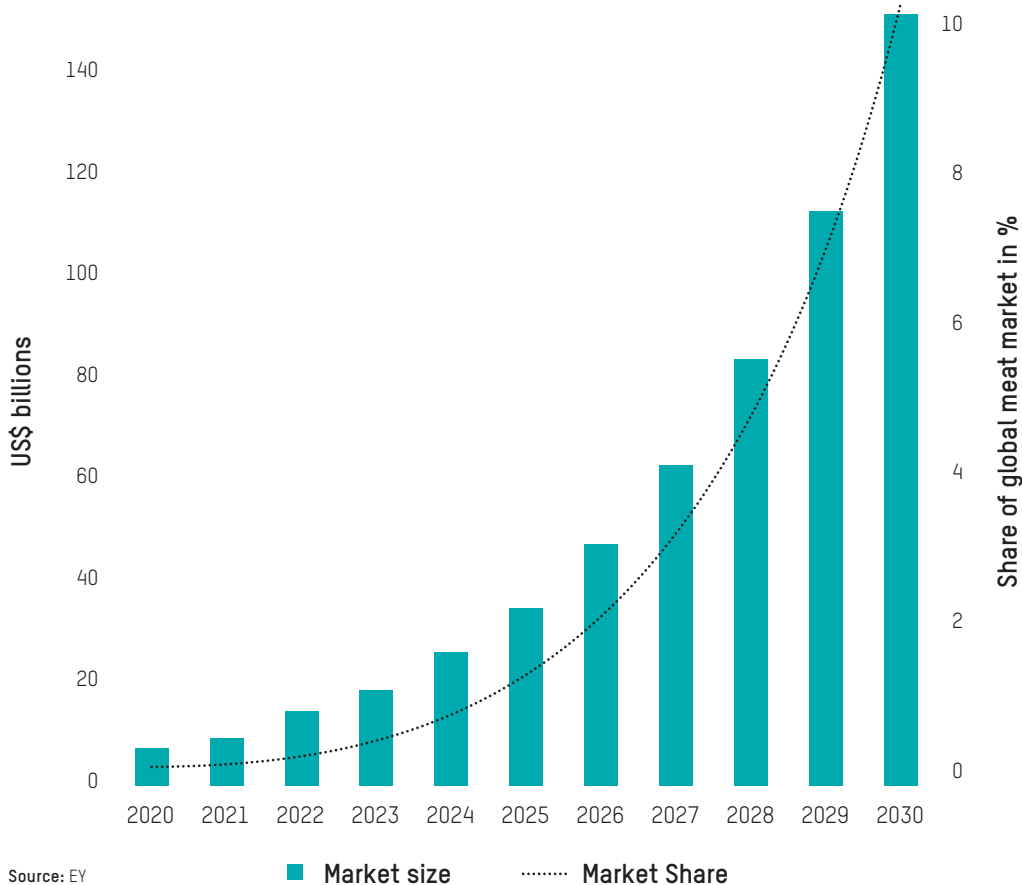
fining product applications in terms of texture and structure, and reducing production costs.

Improving product quality

An important development is the reduction of ingredients while improving product quality. This is particularly necessary to increase acceptance and mainstream integration. Alternative protein sources can be mainstreamed and accepted by a wider population if they are perceived as a primary

Growth and market share

EY's forecast shows the growth of the global alternative protein market in US\$ billion and as a percentage of the global meat market from 2021 to 2030.



The German Association for Alternative Protein Sources ...

... is committed to the value-added development and promotion of alternative proteins. BALPro was founded in 2019 and has more than 100 members, ranging from start-ups to established companies and VC units. In addition to Fabio Ziemßen, Bernd Eßer, CEO Berief Food GmbH, and Godo Röben are on the board.

URL: balpro.de

meal rather than a substitute. This can be achieved through improved availability in supermarkets, restaurants and convenience stores, as well as targeted marketing campaigns and product innovations that emphasise enjoyment and health benefits.

Price parity critical to success

The most important factor for success in the mass market, especially in the context of current macroeconomic developments, will be price parity for plant-based protein sources. It is critical to ensure the accessibility and affordability of a sustainable diet for all. The market response to a discounter's price campaign at the

end of 2023 will become clear, especially given that other retailers' own brands will be adjusted to the same price level and branded manufacturers will follow suit.

More funding for companies

In 2024, the focus will be on regulatory developments for alternative protein sources in the areas of novel foods, precision fermentation and cell cultivation. Internationally, approvals are increasingly finding their way to market, most recently in Israel with Aleph Farms. There will be more inter-European efforts and more funding opportunities for companies in transition and start-ups. Debates on guidelines and standards to

ensure the safety, quality and labelling of these products will become more concrete. This is more important than ever in the context of consumer education and increasing consumer confidence. Overall, the alternative protein sector will continue to evolve in 2024, with consumer acceptance at the forefront. <

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the newFOODeconomy division
at the dfv media group

Building Blocks: Future ProteinTech in a
Dynamic Food System

Tuesday, March 19, 2024 | 3:20 - 5:00 pm

Main Stage Responsibility in hall 9

Afterwards: Presentation of the
International FoodTec Award



Olaf Deininger, Editor-in-Chief
agrarzeitung, NEWMEAT and
newFOODeconomy
at the dfv media group

Predictive Supply Chain / Predictive Food Chain -
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