

New Food Systems case study

Precision fermentation and cultivated meat

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New food systems are required to feed a growing population [in a sustainable manner](#). By 2030, we need to return 1 billion hectares of land to nature by reducing agricultural land by 20%.¹

The Covid-19 pandemic exposed the fragility of the global food system, and the conflict in Ukraine continues to disrupt supply chains. It is vital that food systems are prepared for future shocks, which will require innovation and deployment of new technology to provide nutrition for all while respecting the planetary boundaries. These transformations are underway and innovative companies are developing sustainable solutions across the value chain.



The transition to [new food systems](#) will disrupt existing profit pools and create new ones. The resulting market is anticipated to generate annual revenues of USD 1.5 trillion globally by 2030.² In addition to those businesses directly producing new protein products, this transition will create investable opportunities in the form of companies which provide specialised enabling products and services to companies in the value chain.

Among new proteins, plant-based meat analogues are closest to reaching the mass market. However, in this thematic case study, we analyse newer business models emerging in the field of alternative proteins. Precision fermentation and cultivated meat represent two different approaches to production that are gaining traction and bear closer examination.



Conor Walsh, CFA
Lead Portfolio Manager



Pascal Menges
Head of Research & Investment Process



Matthew Watkins
Senior Analyst

¹ PBL Netherlands Environmental Assessment Agency. [Chronic Land Degradation: UN Offers stark warnings and practical remedies in Global Land Outlook 2](#). Published in 2022. Accessed in November 2022.

² LOIM analysis.

MEAT PRODUCTION: THE SUSTAINABILITY CHALLENGE

A necessary transition to new food systems is accelerating. It will profoundly alter how we produce, distribute, and consume foods.

Clearing land. Clearing land for agriculture is the leading cause of deforestation. This process negatively impacts biodiversity and releases carbon dioxide into the atmosphere. Today, about 5 billion hectares of land – roughly 5 times the size of China – are used for agriculture.³ Employing regenerative agricultural practices, including reduced soil tilling, cover cropping, and agroforestry could boost carbon sequestration in soils and reduce the need for synthetic fertiliser inputs. Fertiliser overapplication – ammonia in particular – heavily contributes to air pollution through the release of fine particulate matter across the world. Fertiliser overapplication heavily contributes to both water pollution and also to air pollution through the release of fine particulate matter across the world.

Inefficient model. Almost 80% of all agricultural land is used to produce meat and dairy products. In exchange, this 80% of land returns just 20% of global calories and 37% of protein. Farmed animal products are responsible for 83% of agricultural land use, 60% of greenhouse gas (GHG) emissions, 57% of water pollution, and 56% of air pollution.⁴

Antibiotic resistance. Industrial meat and dairy are contributing to antibacterial resistance. As much as 80% of antibiotics in the US are used to prevent infection and increase productivity in farm animals.⁵ Industrial farming practices are creating ideal conditions for the emergence of zoonotic diseases due to antibiotic overuse, high livestock density and low genetic diversity.⁶

Alternative solutions. It is estimated that every 10th portion of meat, eggs and dairy eaten in 2035 will be from alternative sources.⁷ Alternative proteins have the potential to substantially reduce energy and land use in agriculture. Cultured meat,

for example, requires less energy and 1% of the land used in conventional beef production.⁸ It is also anticipated to have significantly lower emissions than the conventional pork and poultry industries.

Evolving consumer sentiment, supportive government policy, and rapidly developing technology are all contributing to the growth of the alternative-protein sector as a means to address these sustainability challenges. As the market scales, we see rapidly decreasing production costs that will reach price parity with animal sourced equivalents. The global meat market today is estimated at USD 2 trillion. When we combine this with dairy, the addressable market for alternative solutions reaches nearly USD 2.5 trillion.

PRECISION FERMENTATION: A SUSTAINABILITY SOLUTION

Precision fermentation continues to gain momentum within the alternative proteins space, as this relatively mature technology finds new applications.

Animal free. Enzymes produced through precision fermentation have been in use for decades, and is [used to produce](#) flavoring agents, vitamins, natural pigments, and fats. This process is now being applied to the alternative-protein space, to produce proteins that replicate the desired properties of animal products but without the livestock.

Growing protein. In this process, the genetic material for the desired animal protein is integrated into an efficient host organism, which is then cultivated in fermentation tanks. The protein is subsequently separated from the host cells and purified.

Gaining traction. There are a growing number of companies that use precision fermentation. The EVERY Company produces animal-free egg protein, for example. Impossible Meat uses precision fermentation to create an ingredient called 'heme' that is responsible for the unique flavours and aromas of meat.⁹

³ Food and Agriculture Organization of the United Nations. [The State of Food and Agriculture 2021](#). Published 2021. Accessed in November 2022.

⁴ Poore, J., and Nemecek, T. [Reducing food's environmental impacts through producers and consumers](#). Published in Science, 2018. Accessed in November 2022.

⁵ World Health Organisation. [Stop using antibiotics in healthy animals to prevent the spread of antibiotic resistance](#). Published November 2017. Accessed November 2022.

⁶ Brozek, W. [Industrial Animal Farming and Zoonotic Risk: COVID-19 as a Gateway to Sustainable Change? A Scoping Study](#). Published by Sustainability in August 2021. Accessed November 2022.

⁷ (Witte, B. et al. [Food for Thought: The Protein Transformation](#). Published by Boston Consulting Group in March 2021. Accessed November 2022.

⁸ Tuomisto, H.L., and M.J. de Mattos. [Environmental impacts of cultured meat production](#). Published by Environmental Science and Technology in 2011. Accessed in November 2022.

⁹ Any reference to a specific company or security does not constitute a recommendation to buy, sell, hold or directly invest in the company or securities. It should not be assumed that the recommendations made in the future will be profitable or will equal the performance of the securities discussed in this document.

Raising capital. Companies in this space raised USD 1.69 billion in 2021, which represents a threefold increase on the amount raised in 2020.¹⁰ Fifteen known start-ups dedicated to the use of fermentation for alternative proteins were founded last year alone. Due to the riskier nature of start-up companies, however, we tend to adopt a different approach to investing in this space. We use a picks-and-shovels approach, which allows us to benefit from industry growth without exposing ourselves to idiosyncratic start-up company risk.

CULTIVATED MEAT: A SUSTAINABILITY SOLUTION

Cultivated meat represents a less-developed market that has significant capacity for growth in light of the benefits it presents over conventional animal agriculture.

Doing more with less. The process requires sourcing stem cells that are then grown in bioreactors. It is estimated that [150 cows](#) could satisfy global beef consumption using this process, as opposed to the 1.5 billion that are currently in existence today.¹¹ No animal slaughter is required at all and the production requires significantly less in the way of land and water use. It also requires no antibiotics and produces no bacterial contamination.

Supply shock. The supply chains for traditional meat products are typically long and complex. The war in Ukraine has served to demonstrate how vulnerable these are to extraneous impact and how important '[on-shoring](#)' or '[near-shoring](#)' is to minimising disruption. Cultivated meat has the potential to be less vulnerable to these supply side shocks, given it has a greater capacity for centralised production. It also presents the opportunity to reduce the high levels of greenhouse gas emissions associated with the individual stages of the [supply chain](#).

Emission reduction. Livestock production systems in particular are associated with high emissions, and have made a significant contribution to [anthropogenic climate change](#). Every stage of the chain contributes to greenhouse gas (GHG) output, including growing feed, converting land for pasture or feed production, and associated fossil-fuel-based energy generation for machinery and the manufacture of fertilisers.

Consumer adoption. Singapore became the world's first country to approve lab-grown meat [in 2020](#). The Singapore Food Agency (SFA) specifically notes that cultivated meat has the potential to mitigate some of the country's [food challenges](#), which were exacerbated by the pandemic. The world's first industrial cultured meat facility

opened in Israel in 2022 and reportedly has a daily production of 500 kilos of product. Other countries may be close behind. The [US Food and Drug Administration \(FDA\)](#) recently signed off on [Upside Foods' lab-grown meat product](#), opening the door to others.

ALIGNED COMPANIES

Companies are creating new profit pools by developing or providing solutions that drive the growth of alternative proteins. Below are examples of specialist companies in these industries. They are provided as information only and are not necessarily held in our portfolio or represent investment recommendations.

COMPANY	SOLUTION
Royal DSM	A biotechnology company investing in artificial intelligence to improve efficiency and effectiveness in developing bio-based products and production technologies.
GEA	Supplier of technologies and equipment for key process steps in vegetable-protein manufacturing.
Thermo Fisher	US biotechnology and pharmaceutical supplier that is a leading provider of cell-culture media – a key feedstock for lab-grown meat.

NON-LISTED COMPANIES

Here are examples of unlisted companies that are currently active in the alternative-protein space. Our research also extends to select opportunities that are aligned with this trend and may come to market at a later date.

SuperMeat	Owns and operates the world's first cultured meat facility in Israel.
Liberation Labs	Specialises in solutions that enable the commercialisation of precision fermentation, including purpose-built facilities that are adaptable to fit 80% or more of the alternative-protein market.
VitroLabs	A start-up that develops lab-grown leather through tissue engineering

¹⁰ The Good Food Institute. [State of the industry report: fermentation](#). Published in 2021. Accessed in December 2022.

¹¹ LOIM analysis.

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