

ALL YOU NEED TO KNOW ABOUT CELLULAR AGRICULTURE



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1. WHAT IS CELLULAR AGRICULTURE?

Changing the process, not the food

Cellular agriculture refers to the production of animal-based foods from cell cultures rather than from raising and slaughtering animals. This approach involves cell cultivation or precision fermentation to produce meat, fish, eggs, and dairy. The resulting products are identical to conventional animal products. After hunting and domesticating animals, cellular agriculture is set to become the third phase of human sourcing of animal protein.

2. WHY CELLULAR AGRICULTURE?

A multiproblem solution to the challenges of animal agriculture

By changing the production process of animal-based foods, cellular agriculture has the potential to solve some of the world's most urgent problems.

CONVENTIONAL ANIMAL AGRICULTURE

20% of greenhouse gas emissions¹

80% of agricultural land use²

At least 20% of fresh-water consumption³

Up to 80% of rainforest destruction^{4,5}

77% of soya-harvest use⁶

75% of antibiotics use in EU and US⁷

Zoonotic pandemics

The killing of 80 billion land animals⁸ and 2.3 trillion marine animals every year⁹

VS



CELLULAR AGRICULTURE

Up to 96% less greenhouse gas emissions¹⁰

Up to 95% less land use¹¹

Up to 96% less water consumption¹²

Less deforestation

No competition in developing countries between basic foods and animal feed

Less use of antibiotics

Reduced risk of zoonotic pandemics

No need to kill billions of animals every year

“Cultured meat [...] and cellular agriculture can [...] limit the pressure on finite natural resources.”

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE¹³

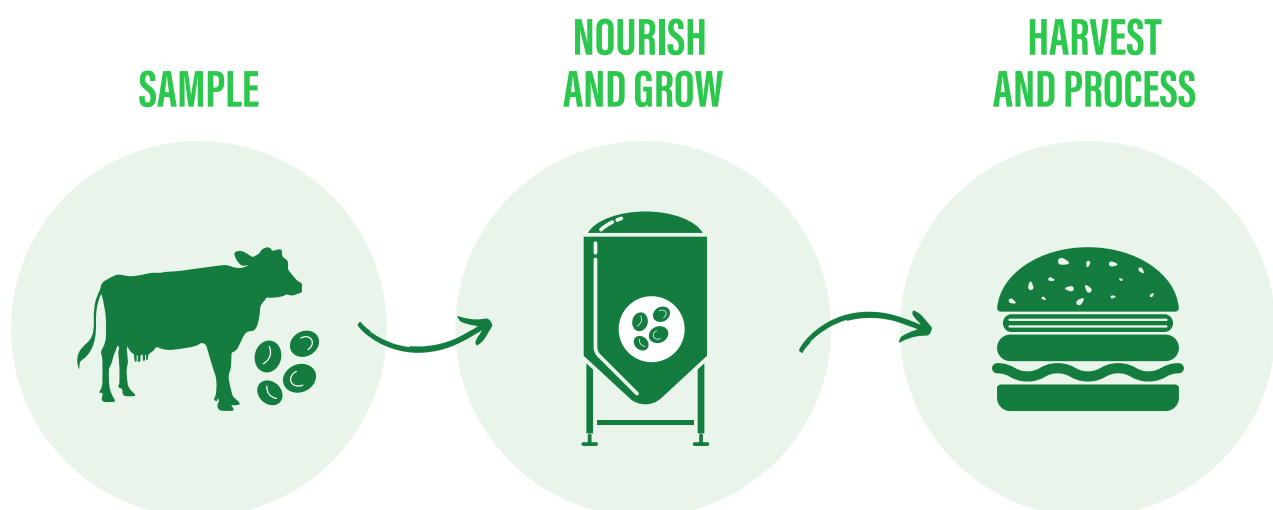
Opportunities for future-proof jobs, economic growth, and innovation leadership

Public investment in diversifying our protein supply could add US\$1 trillion to the global economy and create 10 million jobs by 2050.¹⁴ Oxford Economics has predicted that the cultivated-meat industry could add over £2 billion to the UK economy and create 16,500 jobs by 2030.¹⁵

3. HOW DOES CELLULAR AGRICULTURE WORK?

Cell cultivation: meat and seafood

In order to produce cultivated meat and seafood, cells are first sampled from animals through a painless biopsy. These cells are placed in a bioreactor and fed with everything they need to grow (nutrients, amino acids, fatty acids, vitamins, etc.) The resulting product is identical to conventional meat. The same process can be used to produce a variety of meat and seafood products.



Precision fermentation: dairy and eggs

To produce milk or egg proteins, the relevant genetic information is introduced into a culture of microorganisms, such as fungi or yeast. These microorganisms then grow milk or egg proteins in bioreactors. The proteins can then be harvested by separating them from the microorganisms. The resulting cultivated milk or egg proteins are identical to conventional animal proteins and can be used for a variety of dairy and egg products. This production process has been gaining popularity in the food industry, where it is already used to produce a variety of products such as proteins, enzymes, and flavours.

MICROORGANISMS WITH MILK INFORMATION



NOURISH AND GROW



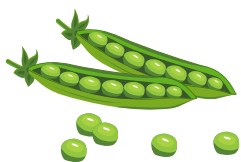
HARVEST AND PROCESS



4. WHAT IS THE ROLE OF CELLULAR AGRICULTURE?

Diversifying food supply and expanding consumer choice

From protein-rich plants to plant-based alternatives to cellular-agriculture products, there are many ways to meet the increasing demand for tasty, healthy, sustainable, and ethical food. Cellular agriculture can help to diversify our food supply and expand consumer choice: it provides foods that people know and like, and it increases variety even further through the possibility of combining plant-based and cultivated ingredients (such as a pea burger that contains cultivated fat). Broadening the solution portfolio, cellular agriculture can be respectful of people's diverse physiological and cultural needs.



PROTEIN RICH PLANTS



PLANT-BASED ALTERNATIVES



CELLULAR AGRICULTURE PRODUCTS

5. WHEN IS CELLULAR AGRICULTURE ENTERING THE MARKET?

The future of food is now

In 2020, Singapore was the first country to allow the commercialisation and consumption of cultivated meat. Since then, cultivated-chicken products have become available in restaurants and also a butchery.¹⁶ In June 2023, US regulators approved the consumption and commercialisation of cultivated meat from two companies – Upside Foods and Good Meat. This represents a significant milestone for the cellular-agriculture sector as a whole.¹⁷



Products made with fermented dairy proteins have been commercially available in the US since 2020 and in Singapore since 2022.^{18, 19}

Public sector building capacity for cellular agriculture

In 2022, the Netherlands awarded €60 million to create a national cellular-agriculture ecosystem - the largest-ever investment in cellular agriculture by a national government.²⁰

In the same year, Israel granted \$18 million to the world's largest consortium for cultivated-meat development.²¹ And Norway awarded €10 million for a five-year research project on cellular agriculture to bring sustainable meat, egg, and milk products to market.²²



More recently, the UK government funded the Cellular Agriculture Manufacturing Hub led by the University of Bath to investigate the manufacturing of cultivated meat at scale.²³

Private sector recognising the potential of cellular agriculture

The cellular-agriculture food sector has attracted over \$4 billion in investments, including from major food producers. With over 100 companies worldwide working to develop a variety of cellular-agriculture products, it's clear that the future of food is changing.



6. WHAT IS NEEDED TO ACCELERATE CELLULAR AGRICULTURE?

In order to reach its full potential, cellular agriculture requires collaboration from all stakeholders, including the private sector, government policymakers and regulators.

Three things are key for the further success of cellular agriculture:

Public investments

Collaboration between cellular agriculture startups is limited since most investment comes from the private sector. The competitive nature of this model results in siloed work and slows down overall progress. Public investments in open-access research and infrastructure development benefitting all players are crucial to speed up technological progress and market entry.

Regulatory approval

Applying the highest standards, governments and regulators need to prepare for the timely regulatory approval of cellular agriculture products in order to keep up with the rapid pace of innovation. Policy makers also need to allow established denominations (such as meat, eggs and dairy) so these products can be named as their animal-based counterparts.

Public awareness

Increasing public awareness is crucial for gaining consumer trust and support for cellular agriculture. Research shows that the more people learn about the benefits of cellular agriculture, the more interested they become in its products.²⁴

[Check our FAQ](#)

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