

EXECUTIVE SUMMARY | 2021 STATE OF THE INDUSTRY REPORT

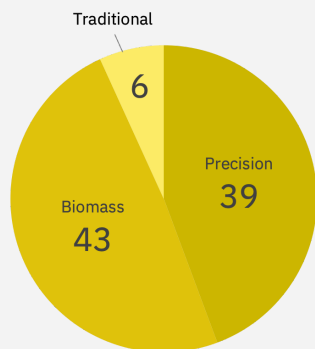
Fermentation: Meat, seafood, eggs, and dairy

Fermentation is a powerful enabling technology that is increasingly driving innovations across the alternative protein industry. In 2021, the sector continued to expand with key developments across commercial, product, investment, science and technology, and government and regulation landscapes.



Commercial landscape

Number of companies by type of fermentation



New startups. Fifteen known startups dedicated to the use of fermentation for alternative proteins were founded in 2021, along with new suppliers focused on fermentation-enabled alternative protein ingredients.

Precision fermentation. Activity in precision fermentation increased, with nine of the 15 new companies focused on precision fermentation and six focused on biomass fermentation.

Known companies. Eighty-eight known companies are now dedicated to fermentation-enabled alternative proteins, an increase of 20 percent from the number of known companies in 2020.

Business lines. At least 75 additional companies have a business line in alternative protein fermentation.



Products

In 2021, companies advanced applications of fermentation technology to develop end products and ingredients to enhance plant-based products across categories, including whole-cut meat, seafood, chicken, beef, pork, cheese, eggs, milk, yogurt, and ice cream.

Eggs. The EVERY Company, formerly Clara Foods, **launched their first animal-free egg protein, ClearEgg**, in November 2021 in partnership with Pressed Juicery.

Dairy. Perfect Day's **recombinant whey proteins** became broadly commercially available in a range of products and brands.

Fats and oils. **Cultivated Biosciences** announced they were developing a functional fat ingredient from oleaginous yeast that can be used as a high-fat component of plant-based dairy formulations. **Mycorena unveiled a new fungi fat ingredient** that releases flavor in a similar way to animal-based fats.



Investments

Investment in fermentation technology skyrocketed in 2021. Fermentation companies focused on the alternative protein sector raised \$1.69 billion—almost three times the amount raised in 2020—representing 60 percent of all-time sector funding and accounting for a third of 2021 alternative protein industry funding.

Category	2021	2013–2021	Highlights
Total invested capital	\$1.69B	\$2.81B	2021 invested capital grew 285% from 2020.
Invested capital deal count	54	161	2021's largest investments were \$350 million (Nature's Fynd and Perfect Day).
Unique investors	130 new	434	The number of new unique investors grew by 43% in 2021.
Growth-stage fundraising (Series B and above)	9	9	2021 saw the first growth-stage fundraising in the fermentation industry, including three deals >\$200 million.
Liquidity events	\$9.3M	\$1.50B	Quorn, the mycoprotein pioneer founded decades before most other mycoprotein companies and now owned by parent company Monde Nissin, accounts for the vast majority of fermentation liquidity events.



Science and technology

GFI (via its [research grant program](#)) funded three projects on fermentation-derived fat solutions using oleaginous yeast, microalgae fermentation, and lipophilic yeast.

A consortium of European companies and universities launched a three-year "**Bio-purification of plant proteins**" project to explore how fermentation can improve plant-based protein ingredients.

BioFoundries and other computational tools emerged, such as Ginkgo Bioworks **Grow with Ginkgo program** and Google DeepMind's protein-structure prediction algorithm **AlphaFold2**.

At least 11 new manufacturing facilities for fermentation were announced in 2021 across Europe, the United States, and Asia. Of these, at least eight are focused on biomass fermentation.



Government and regulation

Regulatory advances. **Motif FoodWorks**, **The EVERY Company**, and **Nature's Fynd** all received a no-questions letter from the U.S. Food and Drug Administration. Their products are generally recognized as safe (GRAS). Products include a heme protein derived from yeast, a soluble egg protein produced by yeast, and a fungi-derived protein.

Investments and funding. Israeli company Imagindairy, which uses precision fermentation to create milk proteins, received funding from the Israel Innovation Authority.



Opportunities

Fermentation firmly established itself as an indispensable third pillar of alternative proteins in 2021. Fermentation is one of the oldest technologies, yet it is being reimagined for use in the alternative protein sector at a rapid rate of innovation. Because of its vast potential in technical and product development innovation, fermentation is well positioned to exceed the sensory, nutritional, environmental, social, market, and functional paradigms of status quo proteins in today's food system. Alongside plant-based proteins and cultivated meat, fermentation can help us sustainably feed a global population of nearly **10 billion** people by 2050.

This past year, fermentation proved that it offers competitive prices and unparalleled functionality and scalability. It is poised to revolutionize the entire alternative protein industry, with spillover applications in plant-based products and cultivated meat. Fermentation can enable a new generation of proteins, fats, and other functional ingredients to create a range of alternative meat, seafood, eggs, dairy products, and more. Investors agreed, and a record amount of funding poured into the fermentation space, leading the way for even greater advances in 2022.

The alternative protein industry has just scratched the surface of the potential for fermentation-based approaches, and both consumers and existing players in the sector are eager for the innovative products and solutions that fermentation can provide.

As we look ahead, we anticipate several trends to emerge in this sector.



Fermentation will gain broader recognition for environmental and other benefits.



Computational approaches will accelerate innovation.



Hybrid products will become increasingly common.



A greater variety of sources will be explored for use in alternative proteins.



Fats, oils, and specialty dairy products made via precision fermentation will hit the market.



Products will be brought to market with increasing frequency.



Download the full report online.

About GFI

The Good Food Institute is a nonprofit think tank working to make the global food system better for the planet, people, and animals. Alongside scientists, businesses, and policymakers, GFI's teams focus on making plant-based and cultivated meat delicious, affordable, and accessible. Powered by philanthropy, GFI is an international network of organizations advancing alternative proteins as an essential solution needed to meet the world's climate, global health, food security, and biodiversity goals. To learn more, please visit www.gfi.org.