

20 State of 23 Global Policy

Public investment in alternative proteins to feed a growing world



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Leaderboard

Stars of 2023

These countries dramatically increased their investments in alternative proteins in 2023, rising above their peers:



The United Kingdom announced a new cellular agriculture research hub, funded over 20 research projects, and included cultivated meat in a national biotechnology plan.



Germany announced a €38 million program to develop alternative protein production capacity and incentivize alternative protein uptake among consumers and producers.

Leading public investment

These governments invested in alternative proteins with world-leading R&D and commercialization funding:



Canada



European Union



Denmark

Leading in regulation

These countries are leading the development of thorough, fair, and timely regulation of alternative proteins:



Israel



Singapore



United States

Powering plant-based

These countries support the development of plant-based proteins, boosting local agriculture and manufacturing:



Australia



France



New Zealand

Advancing cultivated meat and fermentation

These countries are building up biotechnology, supporting the future of food with research and infrastructure:



Finland



Israel



The Netherlands



Singapore



South Korea



United States

Countries to watch

These countries are laying the groundwork for significant investment:



Brazil



China



India



Japan



South Africa



Spain

Executive summary

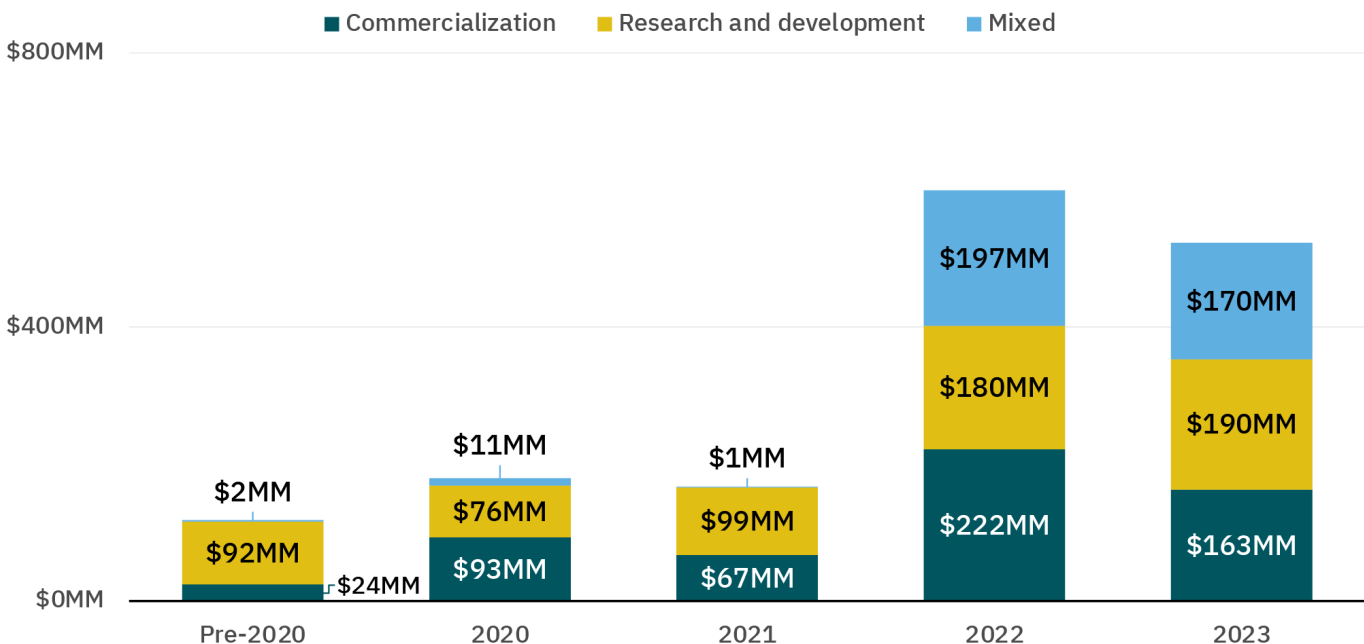
Alternative proteins enjoyed another year of impressive commitments and groundbreaking developments from governments and regulatory agencies in 2023:

- Two companies sold cultivated meat in the United States for the first time, with regulatory green lights from both the Food and Drug Administration (FDA) and the U.S. Department of Agriculture (USDA).
- Public entities across the globe stepped up their investments in developing the alternative protein sector, including in much-needed infrastructure.

Altogether, GFI estimates that newly announced global public funding for alternative proteins amounted to \$523 million in 2023, for an all-time investment total of \$1.67 billion.

Of 2023’s total, governments announced \$190 million for research and development, \$162 million for commercialization, and \$170 million for initiatives that mixed elements of both.

Figure 1: Yearly announcements by type



This level of investment represents continued growth in support for alternative proteins across the globe. While the total dollar value of newly announced funding is a slight decrease from 2022's approximately \$600 million,¹ the geography of alternative protein support has expanded with a new cohort of governments announcing large, multi-year packages in addition to 2022's ongoing supporters.

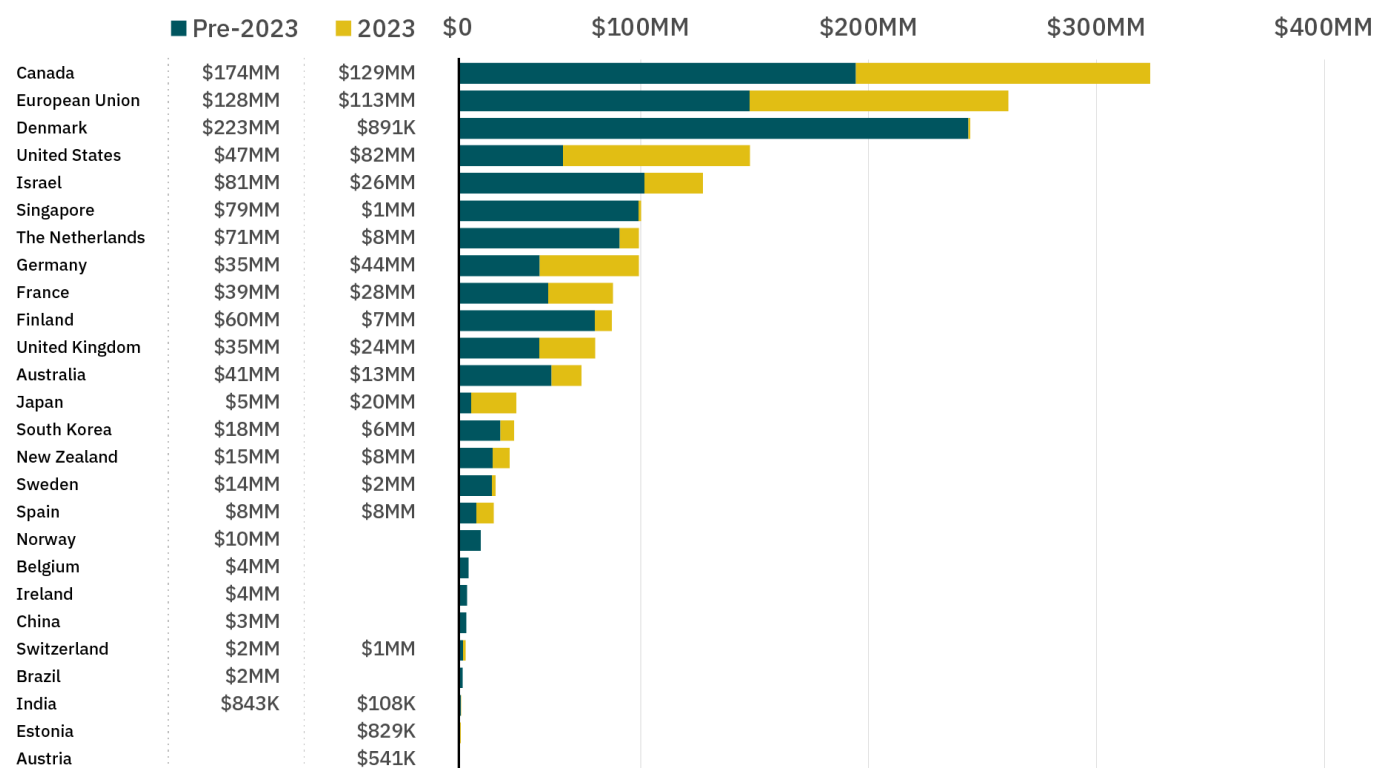
The most notable new investments in 2023 came from North America and Europe, with multiple funding packages in the tens of millions of dollars for alternative protein research and commercialization.

With the announcement of another CAD \$150 million (\$112 million) for Protein Industries Canada, a public-private partnership supporting the country's plant-based protein sector, Canada cemented its

status as the world leader in known funding for alternative proteins in both 2023 and cumulatively. Major funding packages were also announced by the European Union, Germany, and the United Kingdom.

These topline figures include the entire value of a multi-year program in the year it was announced, so ongoing projects announced prior to 2023 are not reflected in 2023's topline figure. For this reason the Asia Pacific region is underrepresented in this year's annual figures, though major research projects in Singapore and elsewhere are ongoing. Further, major funders in the region including China and Singapore do not share complete information on research funding publicly. We estimate that the region, with leadership by Australia, Singapore, and Japan, continued to be active and well represented in the field in 2023.

Figure 2: Total and 2023 public funding by government



**The European Union funds R&D and development grants independently of its member countries and is considered a separate funder in GFI analysis.*

¹ Though the 2022 State of Global Policy Report found that \$635 million had been announced in 2022, the subsequent retraction of a large investment from Australia, revised currency conversion methodology, and the addition of previously unreported funding has resulted in our new total for 2022 being approximately \$600 million.

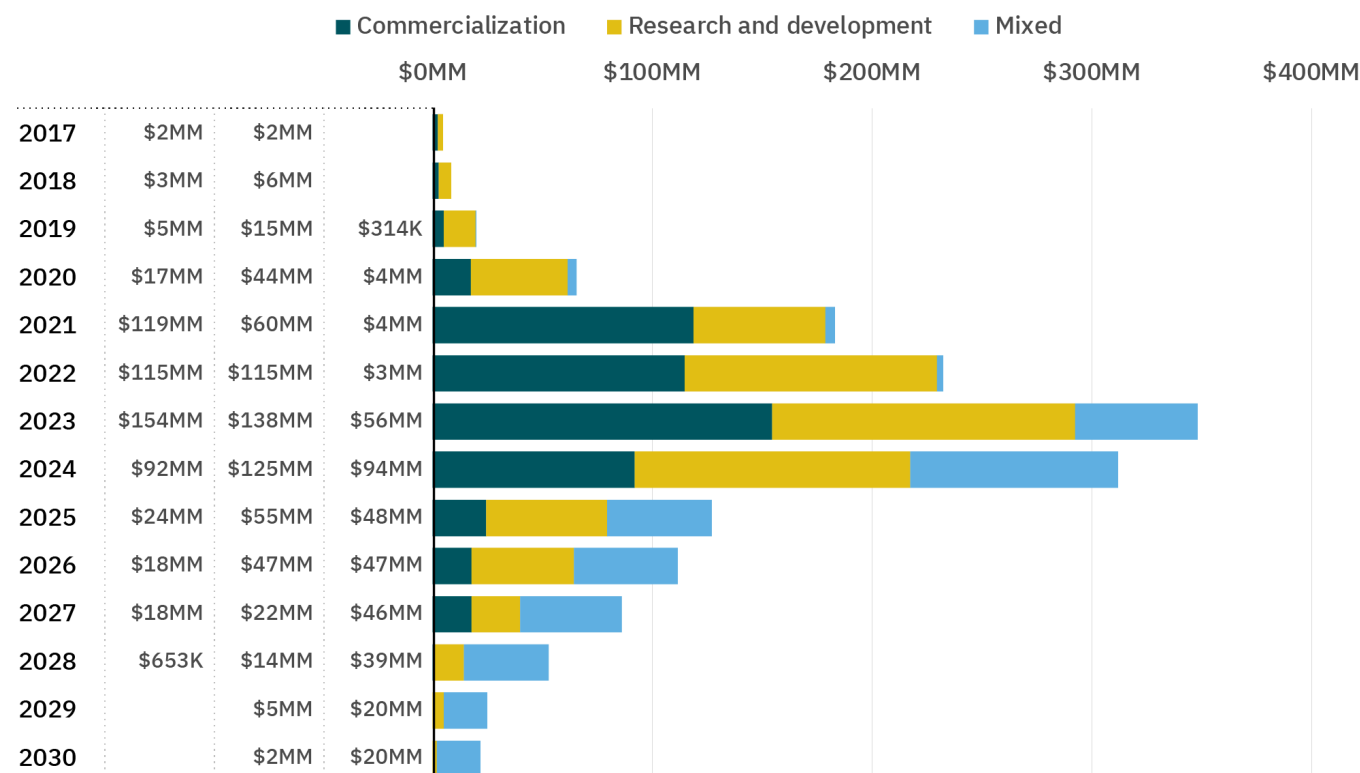
In 2023, governments increasingly turned toward alternative protein technology as a source of future jobs and economic potential, pushing forward new biotechnology policies which prominently feature alternative proteins:

- The United States White House published a [Bold Goals for U.S. Biotechnology and Biomanufacturing](#) report that highlighted alternative proteins as a necessary technology.
- The United Kingdom’s £2 billion (\$2.5 billion) [National Vision for Engineering Biology](#) included, among other topics, recommendations to invest in cultivated meat research, development, and infrastructure.
- India’s Ministry of Science and Technology announced a [National Biomanufacturing Policy](#) that includes alternative proteins as a key pillar and recognizes their capacity to support “employment, economy and environment.”

But governments also continued to invest in alternative proteins as a climate and food security solution, touting their positive environmental impacts and the necessity of adapting food systems to a changing climate:

- The European Union earmarked €50 million (\$54 million) to advance the development and scaling-up of food from microorganisms. This covers algae and precision fermentation capacity, with the latter aiming “to improve the sustainability, efficiency, and resilience of the European food supply chain.”
- The United Kingdom allocated millions of pounds of funding for 16 alternative protein research projects under its “low emissions food systems” program.
- The regional government of Catalonia in Spain established a Center for Innovation in Alternative Proteins through the Department of Climate Action, Food and Rural Agenda.

Figure 3: Estimated annual disbursements past and committed

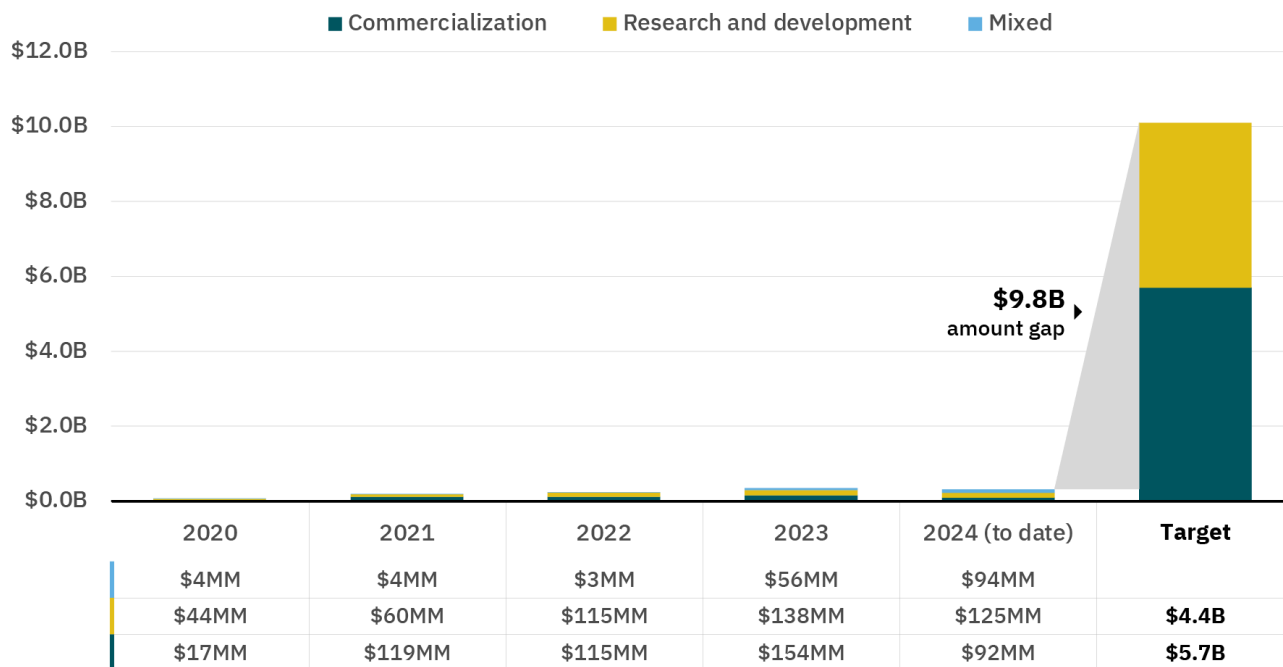


To reap the full benefits of alternative proteins, including up to 9.8 million jobs, \$1 trillion in economic value, and benefits for the climate, food security, and global health, a [Global Innovation Needs Assessment](#) found that governments must invest \$10.1 billion in alternative proteins on an annual basis. Though new announcements boosted prospects for future investment, the estimated \$348 million spent in 2023 satisfies less than four percent of this need.

Despite alternative proteins' benefits for people and the planet, 2023 also brought challenges to producers' rights to create, sell, and advertise alternative proteins on the free market:

- The governments of Italy and Uruguay banned the production, marketing, and sale of cultivated meat. Other governments considered such bans, though none were enacted.
- Labeling restrictions largely remained in place in 2023. Some governments proposed new restrictions or upheld prior restrictions, while others loosened or dropped them.

Figure 4: Estimated public disbursements compared to Global Innovation Needs Assessment (GINA) target*



Note: In this report, GINA refers to the [Global Innovation Needs Assessment for Protein Diversity](#), published by ClimateWorks Foundation and the U.K. Foreign, Commonwealth & Development Office in 2021.

Ensuring a level, fair playing field for alternative proteins in the global market is essential to delivering the economic, climate, and food security benefits they bring.

Finally, major multinational organizations began to highlight alternative proteins as a solution to global challenges in 2023:

- The UN Environment Programme (UNEP) published a [landmark report on alternative proteins](#), assessing not only their benefits to the environment, social systems, and food security but also how governments can, and should, support their development.
- The United Nations Food and Agriculture Organization (FAO) and World Health Organization (WHO) launched a publication describing food safety mechanisms for cultivated meat and dairy, including recommendations and case studies.

- COP28's Food Day provided an opportunity for alternative proteins to shine, with two-thirds of the catered food plant-based and 159 countries agreeing to include food systems in their revised climate plans.
- More than 200 non-state actors put forth a [Call to Action](#) outlining a collective vision of solutions that sit at the intersection of food, nature, and climate, including "transitioning to more diversified sources of protein" as a priority area.

Overall, government support for alternative proteins continued to expand and diversify in 2023. Governments began strategic and cohesive action plans to develop and support alternative proteins, and interest from the research community and startup ecosystem prompted individual government grants, calls, and awards in the area. However, even more support is necessary to deliver the benefits that alternative proteins promise.

For more information on how policymakers can support alternative proteins, reach out to GFI's global policy teams at gfi.org/global.

Meeting the moment

Governments need to invest \$10.1 billion in alternative proteins on an annual basis to realize their economic and climate benefits.

Annual funding in 2023 met less than four percent of this need.

Figure 5: 2023 disbursed funding compared to the annual GINA target



Which alternative proteins are governments supporting the most?

In 2023 governments announced approximately:

- \$189 million for plant-based foods.
- \$181 million for fermentation.
- \$40 million for cultivated meat.
- \$112 million for combinations of these.

This breakdown represents a significant increase in public funding for fermentation R&D and commercialization, recognizing the versatile technology's benefits for the food system and other industries. The proportion of funding going to plant-based and cultivated meat is roughly in line with prior years.

While government support has increased for all pillars of the alternative protein sector, public funding for cultivated meat noticeably lags behind

plant-based and fermented proteins. This discrepancy, as shown in Figure 6, is largely due to a lack of funding for commercialization. While governments are increasingly supporting plant-based protein development and fermentation facilities, there has been less support for constructing cultivated meat facilities and product development, both critical components of overcoming the technological valley of death.

This is an opportunity for policymakers to fill a specific gap in support for alternative proteins and biotechnology. While China's policies under the 14th Five-Year Plan for Bioeconomy Development are understood to meet some of this need, contributing to the country's favorable cultivated meat commercialization landscape, lack of similar support in other regions slows the sector's development. **Policymakers should consider programs to build cultivated meat facilities and develop products for market.**

Figure 6: All-time investment by platform and type

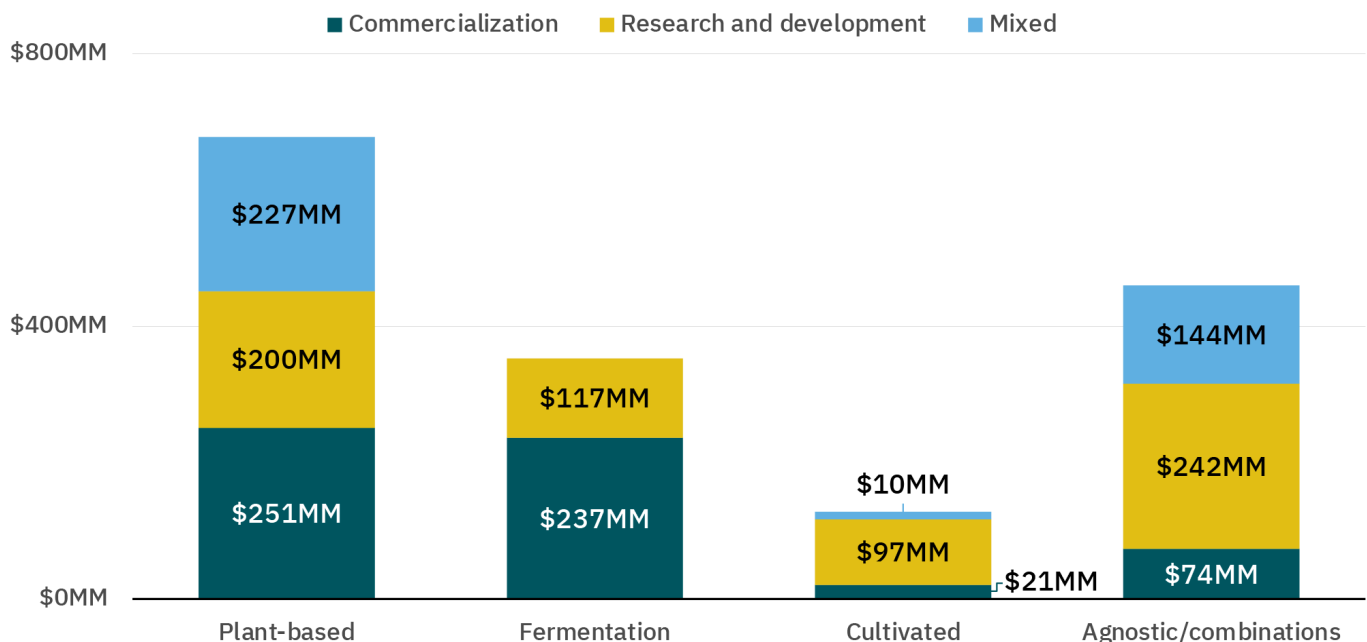
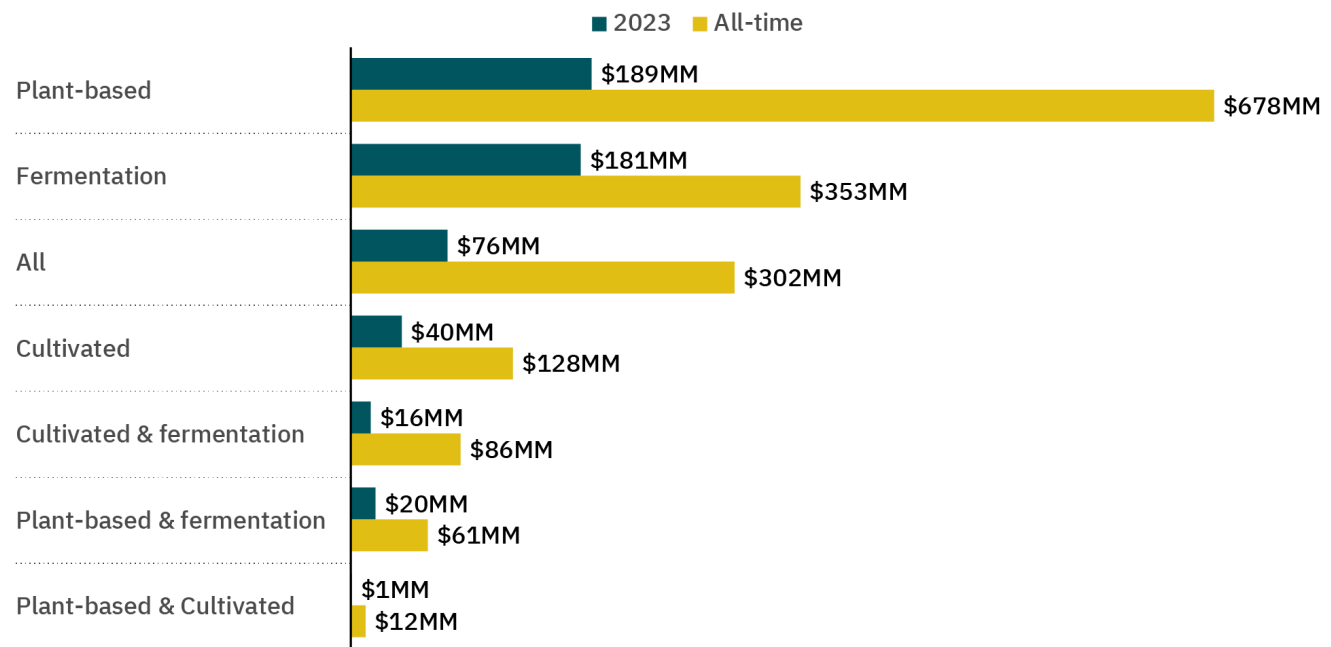


Figure 7: 2023 announced funding by platform



Unless otherwise noted, data presented in the various tables and figures in this Report is derived from GFI's Research Grants Tracker and independent research by GFI's global affiliates. See the table at gfi.org/globalpolicy for more information.

About GFI's State of the Industry Report series

GFI's State of the Industry Report series is our annual alternative protein sector deep-dive. The series compiles business developments, key technologies, policy updates, and scientific breakthroughs from around the world that are advancing the entire field. This year's reports include:

Cultivated meat and seafood

Fermentation: Meat, seafood, eggs, and dairy

Plant-based meat, seafood, eggs, and dairy

Global policy: Public support, regulation, and labeling

This report covers government support and regulation of alternative proteins in regions where the Good Food Institute (GFI) has a focus. It is comprehensive through the end of 2023, with a distillation of global highlights from the first six months of 2024 (page 12). GFI's teams collaborate extensively on every report, and some material appears in multiple reports. For detailed information on government policy and regulatory actions before 2023, please see GFI's 2022 and 2021 State of Global Policy Reports. All dollar amounts in this report are U.S. dollars unless indicated otherwise.

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Newsletters | GFI's suite of expertly curated newsletters puts timely news, insights, and opportunities right in your inbox. Check out gfi.org/newsletters to find the ones most suitable for your interests.

Monthly seminar series | Each month, we host [online seminars](#) with leading experts from around the world: The *Business of Alt Protein* series is geared toward a commercially focused audience on topics related to starting and scaling a good food business. The *Science of Alt Protein* series addresses a technical audience and focuses on cutting-edge research developments that enable alternative protein innovation.

This State of Global Policy Report, and all of GFI's work, is made possible by gifts and grants from our global community of donors. If you are interested in learning more about giving to GFI, please visit [here](#) or contact philanthropy@gfi.org.



Alternative protein support by country:

Americas

While the three main alternative protein players in the Americas—Canada, the United States, and Brazil—remained dominant in 2023, all three boosted support for alternative proteins over the course of the year. Canada held fast to the title of world leader in alternative protein support by reinvesting in their plant protein research and commercialization program, while precision fermentation and cultivated meat received more attention in the United States and Brazil. Across the hemisphere, alternative proteins were increasingly hailed as a key supporting technology in agriculture, biotechnology leadership, climate change mitigation, defense, and economic development.

Brazil

Public funding

Despite a new government at the end of 2022, Brazil's public funding remained steady in 2023. The federal government continued a previously announced research project to develop a hybrid plant-based and cultivated sausage at Brazilian state research agency Embrapa, while at the sub-national level, the state government of Paraná began an initiative called New Research and Innovation Arrangement in Alternative Proteins (NAPI-PA), which helps local universities develop cultivated meat capabilities, including acquiring bioreactors and other equipment.

While no new funding for alternative proteins was announced in 2023, the new government's prioritization of sustainability, the green economy, and low-carbon agriculture bodes well for the field. The government commanded a strong position in multilateral fora such as COP28, playing a role in the inclusion of food system reform in official statements and declarations on the world stage (See "COP28," page 40).

Regulation

Brazil's government made progress on regulations in 2023, taking steps toward clarifying and revising its regulatory process for plant-based, cultivated, and fermented alternative proteins.

In December 2023, the National Health Surveillance Agency (Anvisa) updated Brazil's regulations for novel foods and ingredients, including defining safety procedures for cultivated and fermentation-enabled meats. Successive stages of the regulatory process fall under the Ministry of Agriculture (MAPA), including product registration regulations, labeling rules, identity and quality standards, and manufacturing inspections.

MAPA also released a draft regulation authorizing companies to use meat and dairy terms on plant-based labels, so long as they specify that the products are plant-based. Public consultation began in July 2023, and public hearings will be held throughout 2024. These regulations must comply with specific identity and quality standards defined by Anvisa. In 2023, Anvisa announced that these standards will be the subject of further technical studies through the 2024-25 Regulatory Agenda.

Table 1: Progress on Brazilian regulation by type of product and stage of regulatory path to market:

Regulatory Framework	Plant-Based	Cultivated	Fermentation
Approval regulations (food safety - Anvisa)	Already exists	RDC 839/2023	
Identity and Quality Standards (Anvisa or MAPA)	Included in Anvisa's Regulatory Agenda 2024-25	To be addressed in 2024 - MAPA	To be addressed in 2024 - MAPA
Labeling regulations (MAPA)	MAPA's Public Consultation on 2023 Public hearings expected for 2024		
Product registration regulations (MAPA + Anvisa)			
Inspection of production plants (MAPA)	Already exists		

Canada

Public funding

By far the world leader in public funding for plant-based protein, Canada has invested hundreds of millions of Canadian dollars in its domestic industry through Protein Industries Canada (PIC), a supercluster of companies, research institutions, and nonprofits working on every aspect of plant-based proteins from crop development to product marketing.

In early 2023 the federal government renewed PIC's funding for the next five years to the tune of CAD \$150 million (\$110 million), bringing the country's total committed funding to CAD \$353 million (\$260 million) from 2018 to 2028.

Canadian public funding also supported multiple research projects at the University of Saskatchewan seeking to perfect proteins made from pulses, legumes, and oilseeds—all Canadian agricultural specialties. In 2023, the government supported a research project at the University of Saskatchewan evaluating canola meal, a sidestream of Canada's robust canola sector, as a feedstock in fermentation applications, demonstrating how alternative proteins can create new sources of value for existing agricultural resources.

Finally, Protein Industries Canada collaborated with British innovation agency Innovate UK on a £6.5 million (\$8 million) Plant-based Protein Innovation fund supporting bilateral research projects and commercial partnerships between the two countries.

In the first tranche of funding from 2018 to 2023, Protein Industries Canada co-invested \$173 million into 55 projects. The initial investment leveraged \$304 million in private investment, created 303 IP assets, helped companies leverage a further \$234 million in follow-on investment, and is expected to contribute \$15 billion in GDP and create 10,800 direct and indirect jobs by 2031 – meeting or surpassing every target set out by the program.

Protein Industries Canada press release

Regulation

In October 2023, the Canadian Food Inspection Agency (CFIA) updated its guidance on “simulated” meat and poultry products, which include plant-based meats. CFIA clarified that while it is permissible for plant-based products to use meat-like descriptive terms such as “burger,” “sausage,” or “jerky,” the foods must not resemble a meat or poultry product and must not be likely to be mistaken for a meat or poultry product, discouraging the most advanced and innovative alternative protein products from successfully reaching consumers. Canada's “simulated” meat and poultry regulations also continue to impose labeling and nutrient

content restrictions on plant-based meat products that are deemed to resemble meat or poultry products.

In August 2023, Chicago-based company Nature's Fynd received authorization from Health Canada, the Canadian federal department responsible for national health standards and policy, to commercialize its novel fermented fungi called “Fy” through the agency's novel food safety assessment.

Health Canada's Food Directorate also has jurisdiction over cultivated meat. The Canadian government has indicated its intent to regulate cultivated meat under its existing novel foods regulation rather than

considering a new regulatory approach. This authorization will require companies to submit a premarket proposal with detailed information about the product. A 2023 [report](#) on the acceptance of cultivated meat in Canada stated that as Canadian regulators re-evaluate the framework for cultivated meat and consider whether to create specialized regulations, the introduction of cultivated meat products may experience delays coming to market.

United States

Public funding

The United States, which has long lagged in its support for alternative proteins, significantly stepped up investment in both research and commercialization in 2023. With a focus on fermentation technology as a tool to support the agricultural sector, biotechnology leadership, and national defense, the United States leveraged both R&D and business development programs in support of alternative proteins science and production.

In February 2023, the Defense Advanced Research Projects Agency (DARPA) of the Department of Defense announced that work had begun through its [Cornucopia program](#), which seeks to “create a variety of healthy new microbial-based foods using three ingredients—air, water, and electricity—with minimal or no supplementation.” With [one of the four projects](#) funded at \$10.4 million over four years, GFI estimates this DARPA funding to advance

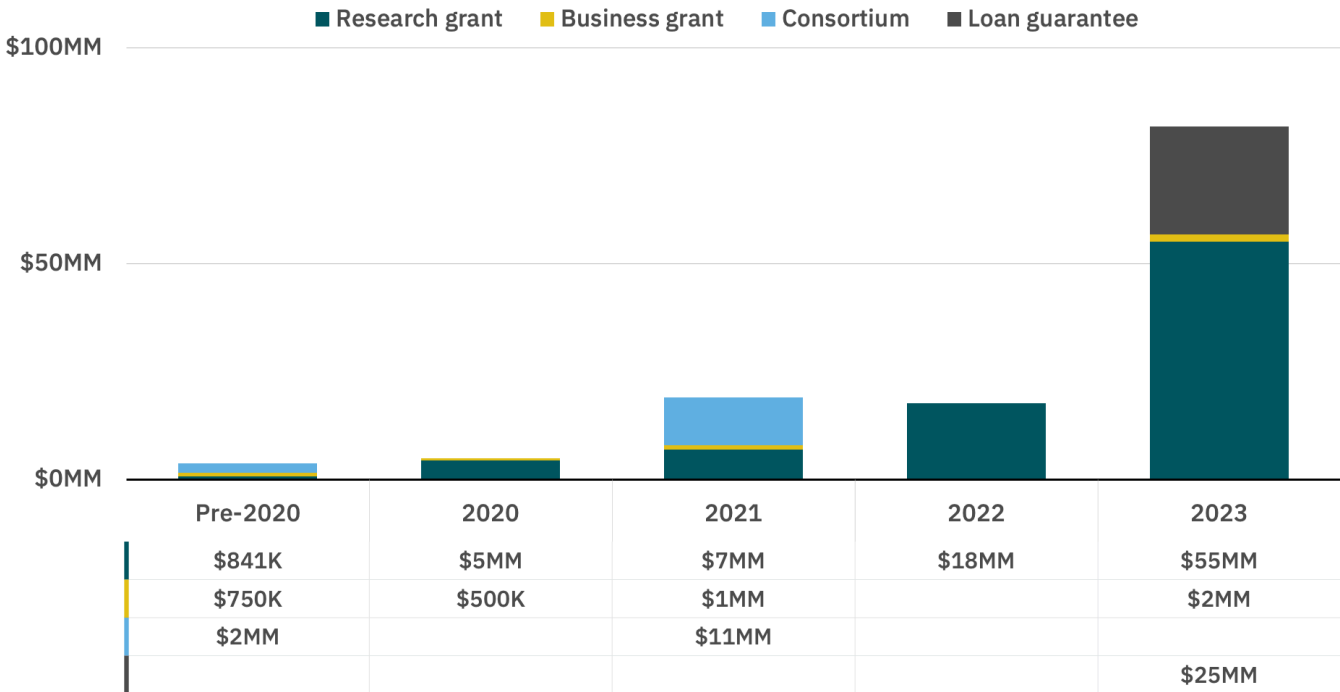
fermentation research to be around \$40 million—nearly matching the United States’ all-time investment in alternative proteins.

In March 2023, the Biden Administration released a [Bold Goals for U.S. Biotechnology and Biomanufacturing](#) report that proposed supportive policies for the domestic biotechnology sector. Alternative proteins were included in chapters from the Department of Agriculture (USDA) and Department of Energy, both of which called for more research on alternative proteins, public-private partnerships, and an ecosystem of agriculture-focused biomanufacturing facilities. In July 2023, the White House released a [Building the Bioworkforce of the Future](#) report that called out precision fermentation explicitly.

This initiative aims to ensure that cutting-edge products resulting from biotechnology invented in the United States are manufactured in the United States. By doing so, we will create jobs at home, build stronger supply chains, and lower prices for American families.

The White House “Building the Bioworkforce of the Future” report

Figure 8: United States public investment by type of investment



Increased public investment in alternative proteins quickly followed, including much-needed support for increasing U.S. fermentation capacity. Precision fermentation startup Liberation Labs received a \$25 million loan guarantee from USDA to accelerate construction of a commercial-scale facility in Richmond, Indiana, which is expected to create local manufacturing jobs and a new market for the state’s corn crop.

The Department of Commerce, meanwhile, designated the Illinois Fermentation and Agriculture Biomanufacturing (iFAB) Tech Hub as one of 31 Regional Innovation and Technology Hubs, with the opportunity to apply for a further grant of \$50 to \$75 million. Led by the University of Illinois Urbana-Champaign, the iFAB Tech Hub aims to scale precision fermentation to convert underutilized corn feedstocks into alternative proteins and food ingredients. In late 2023, the Department of Energy’s Industrial Efficiency and Decarbonization Office announced plans for a funding opportunity to decarbonize critical industries, subsequently issued in early 2024, listing alternative protein production as a specific area of interest. Multiple agencies also

allocated a number of small business grants to companies across the ecosystem.

The United States also leveraged its significant research capacities towards innovating in alternative proteins. An almost-\$1 million grant from the National Science Foundation funded a collaboration between the Tufts University Center for Cellular Agriculture and a plant-based food startup to evaluate hybrid cultivated/plant-based products, for example. (“Cellular agriculture” is a term that usually refers to cultivated meat and also can include precision fermentation and non-food applications like silk made without spiders.) USDA’s National Institute for Food and Agriculture funded research projects to breed high-protein faba at Virginia Tech, develop plant-based seafood at North Carolina A&T State University, and train future food scientists at California Polytechnic University. Meanwhile, in-house alternative protein research at dozens of USDA’s Agricultural Research Service labs continued, funded annually by Congress.

Much of the United States’ research focused on priorities beyond food for regular consumption, too,

considering intriguing angles of new food products. The Department of Energy’s Advanced Research Projects Agency (ARPA-E) awarded \$1.7 million to Umaro Foods, a California-based startup that makes plant-based protein from seaweed, to evaluate how processing its seaweed could sustainably produce valuable rare earth elements and platinum group metals—in addition to delicious and healthy food. Meanwhile, New York-based Air Company, Finland-based Solar Foods, and Sweden-based Mycorena made it to the final round of NASA’s Deep Space Food Challenge, with Air Company receiving \$150,000 toward their work on gas fermentation in closed-loop environments.

At the state level, the government of North Carolina awarded a research loan to cultivated fish company Atlantic Fish Co. through the North Carolina Biotechnology Center, an initiative of the state’s Department of Commerce. Similarly, the Maryland Stem Cell Research Fund awarded a grant to Phycin, a local company making cell culture media from algae.

At the local level, New York City cut its food-related greenhouse gas emissions by 36 percent simply by making plant-based meals the default (but not the only option) at the city’s 11 public hospitals, with cost savings of 59 cents per tray and a patient satisfaction rate above 90 percent.

Regulation

Federal regulations

Cultivated meat

In early 2023, Good Meat became the second company after Upside Foods to complete the FDA premarket consultation process. In June 2023, both Upside Foods and Good Meat obtained landmark grants of inspection and label approvals from USDA. Having completed both FDA and USDA regulatory processes, the companies sold their cultivated chicken products in the United States, marking a decisive moment in the history of food and agriculture.



UPSIDE Foods’ cultivated chicken. Photo credit: UPSIDE Foods

All cultivated meat producers must register their facilities with FDA, and companies producing cultivated livestock or poultry meat or catfish must also obtain a grant of inspection from USDA. To complete the FDA’s premarket consultation process, companies submitted data and information to the agency documenting the product’s safety and production process. FDA informed the companies that it had no questions or concerns about the safety of their products. FDA’s responses and additional information regarding their consultations with Good Meat and Upside Foods are available on the agency’s website.

After completing FDA’s premarket consultation process, the companies applied for a grant of inspection (GOI) from the USDA Food Safety and Inspection Service. Before issuing the GOI, USDA performed a comprehensive review of production facilities to verify that cultivated meat products are safe, wholesome, and unadulterated. USDA also reviewed proposed product labels. Upside Foods and Good Meat’s successful completion of both the FDA and USDA regulatory processes made the United States the second country in the world, after Singapore, to authorize the production and sale of cultivated meat.

Neither FDA nor USDA has published labeling requirements for cultivated meat products, but both agencies have solicited public comments on labeling and nomenclature (the terminology used to refer to

the category—e.g., “cultivated meat”). While the rulemaking process for cultivated meat labeling is underway, USDA has approved labels on a case-by-case basis. For now, Upside and Good Meat’s labels, which are seen only by restaurant staff, use the term “cell-cultivated chicken.” FDA does not approve labels, but will exercise enforcement authority if regulators become aware of improperly labeled foods.



Panelists at the Good Food Conference, September 2023. From left to right: California State Assemblymember Ash Kalra, USDA Deputy Under Secretary for Research, Education, and Economics Sanah Baig, DOE Chief Scientist of Bioenergy Technology Jay Fitzgerald, *Food Fix* Editor-in-chief Helena Bottemiller Evich.

Plant-based

In February 2023, the United States Food and Drug Administration (FDA) released [draft guidance](#) on plant-based milk labeling. The nonbinding guidance recommends that plant-based milk labels clearly state the plant source of the milk, such as “soy milk” or “cashew milk.” The guidance acknowledges that plant-based milks are not trying to convince consumers that they are the same as dairy milk, and that consumers are not confused by the use of the word “milk” on plant-based products. Rather, using the term “milk” on plant-based labels helps consumers understand the taste, texture, and uses for those beverages. The FDA guidance, however, also needlessly recommends adding nutritional statements to plant-based milk products that compare them to cow’s milk, despite the fact that FDA does not have nutritional standards for cow’s

milk and plant-based milk products (like all packaged food products in the United States) already include a Nutrition Facts Panel on their labels.

Although the draft guidance is nonbinding and does not have the force of law, it reflects FDA’s thinking on the laws and regulations it may eventually implement. Companies often interpret FDA guidance as similar to regulations and are unlikely to risk noncompliance. FDA accepted public comments on the draft guidance through July 31, 2023, and has yet to issue updated guidance or any response to the comments.

Fermentation

In the United States, FDA has regulatory authority over fermentation-enabled foods, and companies can follow two regulatory pathways to ensure their fermentation-derived foods and ingredients can be sold in the United States. The first is a food additive petition, a lengthy petition process requesting a regulation to allow specific uses of the ingredient or additive. The second pathway is establishing the GRAS status of an ingredient, meaning the ingredient is already “generally recognized as safe” among qualified experts under its conditions of intended use. In recent years, the majority of fermentation companies in the United States have elected to take this second pathway. In February 2023, Israeli precision fermentation company Remilk received a GRAS [“No Questions” letter](#) from FDA regarding whey protein produced by the microbe *Komagataella phaffii*.

State regulations

Some states censor plant-based or cultivated product labels, either banning terms such as “burger” or “sausage” or compelling language such as “lab-grown” or “lab-created” in a specific font size. Many of these laws have been challenged in court or amended to include safe harbor provisions to clarify that conventional meat and dairy terms can be used on alternative protein products along with appropriate qualifiers.

- In **Louisiana**, a court took action on a lawsuit brought by GFI and co-counsel Animal Legal Defense Fund (ALDF) on behalf of Tofurky, which

argued that the state’s label censorship law violates the First Amendment right to freedom of speech and the Fourteenth Amendment right to due process. In April 2023, a federal appeals court upheld the law on narrow grounds, interpreting it to apply only to alternative protein companies that intentionally try to mislead consumers about the nature of a product.

- In **Missouri**, a federal district court declined to grant Tofurky and GFI a preliminary injunction (a halt on enforcing the law while the case is pending) on the grounds that Missouri’s label censorship law was not likely to apply to Tofurky’s product labels. In 2021, a federal appeals court upheld this ruling. As of the end of 2023, the case had returned to the district court.
- In **Oklahoma**, ALDF brought a new challenge to the state’s label censorship law on behalf of plaintiffs Tofurky and the Plant Based Foods Association after a district court denied a motion to prevent enforcement of the law. The new complaint argues that Oklahoma’s law is vague, overly burdensome, unconstitutional, and is preempted by federal law. As of the end of 2023, the case remains pending in the district court.

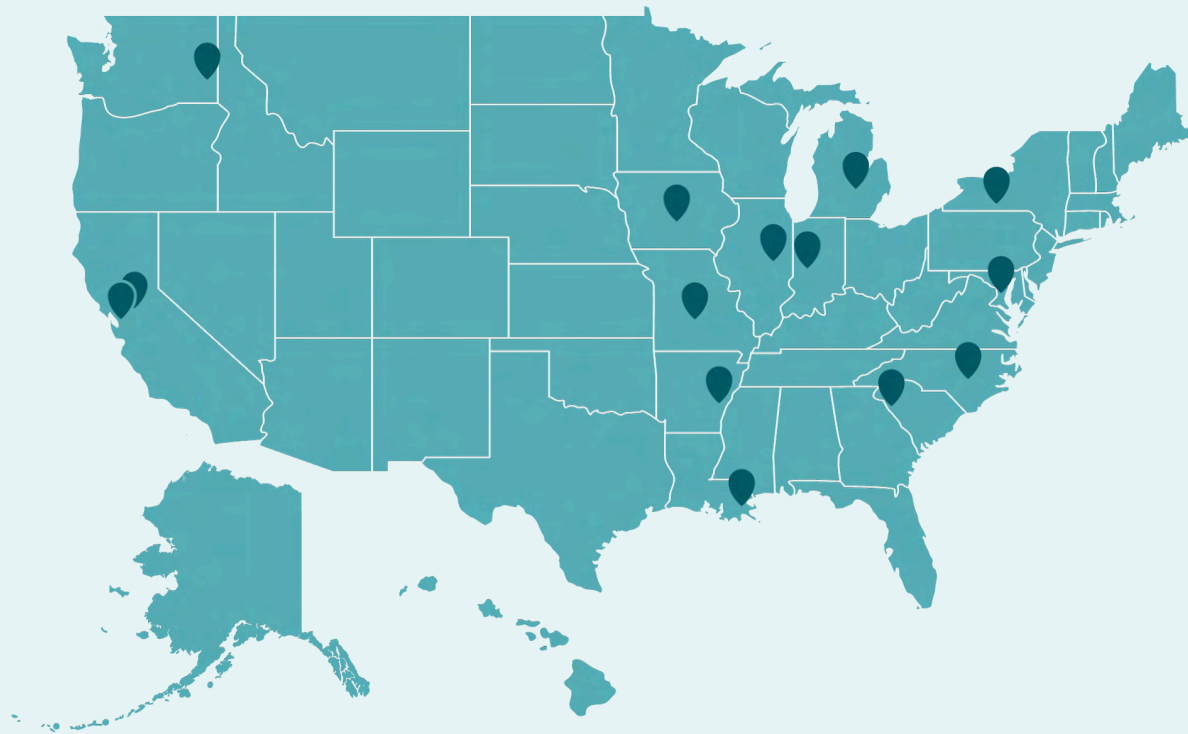
- In **Texas**, GFI and co-counsel ALDF challenged the state’s 2023 label censorship law on behalf of plaintiff Tofurky. The complaint argues that Texas’s law is vague, unreasonably burdensome, preempted by federal law, and unconstitutional under the First Amendment right to freedom of speech. This litigation is pending in the district court.

In 2023, **Texas** introduced a bill that would ban the production, sale, and distribution of cultivated meat products altogether. The bill failed to pass, but GFI and other groups are continuing to monitor proposed legislation.



GFI’s State Legislative Specialist, Drake Jamali, testifying on the Texas label censorship bill.

Figure 9: Map of Alternative Protein Research at USDA Agricultural Research Service facilities



Congressional funding for alternative protein research funds operations in 13 states, supporting the development of new crops, products, and technologies, as well as jobs and economic value, through USDA's Agricultural Research Service hubs across the country.

Uruguay

The government of Uruguay, through a quiet amendment to a budget bill passed in October, banned the “importation, manufacture and commercialization” of cultivated meat for human consumption in the country for a period of five years. For more information, see “Bans and Restrictions” under “Types of Policies” on page 41.



Asia Pacific

Governments in Asia Pacific broadened support for alternative proteins in 2023. Policymakers increasingly recognized the strategic and economic edge that alternative proteins offer, adapting regulatory processes for novel foods and investing in domestic biomanufacturing and research hubs. While Singapore, Australia, and likely China had previously held a commanding regional lead in alternative protein investment, in 2023 several more countries, including Japan and South Korea, stepped up support for the developing field.

Australia and New Zealand

Public funding

Australia

In 2022 Australia's plant-based protein sector was positioned to be one of the best-supported in the world—second only to Canada—due almost entirely to the federal government's announcement of a AUD\$113 million (\$82.8 million) grant for the construction of three state-of-the-art pulse protein facilities in collaboration with Australia's largest meat company. In 2023, the new government rescinded this grant and seven other projects, setting back Australia's progress in developing a world-class plant protein industry. The government stated that the rescission of the eight grants was due to a long delay between the announcement and enactment of the grants, which led to the projects no longer being eligible for funding. No specific information on the Australian Plant Proteins project was given, and the future of the collaboration – including the AUD \$65 million (\$47.7 million) grant from South Australia – is unclear at the time of publication.

In 2023, however, four of Australia's six state governments took action to boost their local alternative protein industries, stepping up to support farmers and food producers with targeted public investments. The government of Western Australia, for example, allocated AUD \$5 million (\$3.3 million) to support the construction of a factory that will produce oat milk enriched with lupin protein, both from locally-grown crops.

The other three governments, in addition to Australia's federal government, made exploratory investments in precision fermentation technology and capacity, noting that Australia is well-positioned to benefit from its use in food applications. The federal government provided AUD \$5.8 million (\$3.9 million) in funding to Nourish Ingredients, an Australian producer of precision-fermented fats, while the investment arm of the state of Victoria invested AUD \$6 million (\$3.8 million) in Eden Brew, a maker of

animal-free dairy, securing a commitment from the company to locate their new headquarters and future production in Victoria.² The state of Queensland began a feasibility study on building a AUD \$300 million (\$210 million) Future Foods BioHub to provide large-scale contract development manufacturing capacity in fermentation, and New South Wales allocated AUD \$2.2 million (\$1.6 million) for the Alternative Protein Application Centre that will develop large-scale processes and conduct R&D on all pillars of alternative proteins, including fermentation, cultivated meat, and plant-based foods.

New Zealand

The New Zealand government's Endeavour Fund, a competition for innovative research funding run by the Ministry of Business, Innovation and Employment, awarded funding to two alternative protein projects in 2023. Almost NZD \$12 million (\$7 million) is allocated to a project called "Plant-Based Food Ingredients: a Systems Approach to Sustainable Design," which will develop alternative protein products made from domestic crops such as green peas, oats, and hemp.

Our aim is to support the arable crop processors of Aotearoa. We want to inspire entrepreneurs in the emerging proteins sector to become successful international suppliers of high-value plant-based food ingredients.

AgResearch senior scientist Alistair Carr

Another NZD \$1 million (\$585,000) will support research on cultivated meat technology and scaling, specifically to develop scalable technologies to maintain quality and safety in large volumes. Both research programs will be carried out by AgResearch, New Zealand's Crown Research Institute responsible for agricultural research.

² GFI calculates U.S. dollar figures based on the average exchange rate on the date of the project's announcement or commencement. This results in the AUD\$5.8 million grant in July converting to a slightly larger figure in USD than the AUD\$6 million grant in October.

Regulation

Australia and New Zealand jointly regulate new foods, including cultivated meat products, under their existing Novel Foods Standard. To gain premarket approval for a cultivated meat product, a company must submit an application to Food Standards Australia New Zealand (FSANZ).

In early 2023, Vow Foods became the first cultivated meat company to apply for regulatory approval in Australia and New Zealand. In December 2023, FSANZ concluded its scientific risk assessment of Vow's application and moved on to conduct the first of two rounds of public consultation.

In its first call for public input, published in mid-December 2023, FSANZ proposed that cultivated meat products be labeled as "cell-cultured." The first public consultation process allowed the public six weeks to provide input on Vow's cultivated quail product, with all non-confidential comments posted on FSANZ's website.

As to precision fermentation, the Food Ministers' Meeting (FMM) has accepted that the existing Food Standards Code and labeling requirements in place across Australia and New Zealand are well-equipped to regulate precision fermentation products. The code requires pre-market approval under the novel foods standard. The FMM will continue to monitor the need for additional standards based on the number and types of applications for pre-market approval received.

Labeling requirements for plant-based alternative proteins are under consideration in Australia. In April 2023, the industry group Alternative Proteins Council (APC) responded to an Australian Senate inquiry's recommendation to censor plant-based meat labels by publishing updated Industry Guidelines for the Labelling of Meat Alternative Products in Australia and New Zealand. These guidelines recommend clear ingredient qualifiers (e.g. "plant-based") while permitting meaty terms.

In August 2023, the APC developed an equivalent set of guidelines for plant-based dairy. Both sets of guidelines are voluntary.

China

Public funding

The Chinese government has a history of investing in emerging technologies such as solar panels, lithium batteries, and electric vehicles, and alternative proteins are proving to be no exception. The alternative protein industry sees positive developments in China fueled by a three-year R&D project begun in 2021 that includes cultivated meat research and the Ministry of Agriculture and Rural Affairs' five-year plan, which serves as a blueprint for strengthening innovation in alternative proteins and other emerging technologies.

After cultivated meat was included in China's 14th Five-Year Plan for Bioeconomy Development in 2022, the country has "offered generous incentives to industry players," per reports, including by ensuring that the cost of crucial equipment like bioreactors stays low. The exact value and nature of this support is not public, but China's cultivated meat industry has grown amid an environment that is lower-cost than in Europe and the United States.

Regulation

Coming out of a 2022 meeting among U.S. and Chinese government officials, China's National Center for Food Safety Risk Assessment (CFSA) committed to actively promote the safety assessment of cultivated meat. CFSA has also established a special group to focus on the regulatory framework for cultivated meat in China. The group began meeting in 2023 and held events on cultivated meat safety assessment and development topics, including a roundtable discussion with the Food and Agriculture Organization (FAO) of the United Nations.

India

Public funding

In July 2023, India's Department of Biotechnology (DBT) under the Ministry of Science and Technology announced a National Biomanufacturing Policy, which includes alternative proteins as a key pillar and recognizes their capacity to support "employment, economy and environment." The DBT formed a dedicated Expert Committee on alternative proteins comprising scientists, entrepreneurs, policymakers, and nonprofits, including GFI India.

The Department of Science and Technology (DST) of the Ministry of Science and Technology created a funding program to promote millet as a raw material for the plant protein industry. Two alternative protein proposals were shortlisted; one, related to plant-based egg alternatives derived from millet, has been approved by the government with a budget of ₹89,30,000 (\$107,919) over two years.

The Biotechnology Industry Research Assistance Council (BIRAC), a nonprofit body set up by the DBT, announced an invitation for expressions of interest in public-private partnerships to build biotechnology-enabled co-manufacturing hubs. The proposed facilities will give startups and researchers access to pilot-scale infrastructure and integrated process spaces to allow for faster research and commercialization of biotechnology products, including alternative proteins.

At the sub-national level, multiple states included alternative proteins in their strategies to boost their economies, create jobs, and develop advanced biotechnology capabilities:

- In April 2023, Tamil Nadu published a plan to become a trillion-dollar economy by 2031. It included developing the protein value chain, and specifically alternative proteins, to achieve economic growth.
- In December 2023, Karnataka launched a draft Biomanufacturing Policy, which included developing plant-based meats to encourage further research and entrepreneurship.

Regulation

In 2023, the Food Safety and Standards Authority of India (FSSAI) granted pre-market approval to an algal protein powder from Reliance that utilizes biomass fermentation under the Approval for Non-specified Food Regulations. The FSSAI had previously granted prior approvals to Perfect Day's non-animal whey protein that utilizes precision fermentation and mycoprotein derived from *Fusarium venenatum* in 2022.

India currently censors plant-based dairy labels. In 2023 the FSSAI issued an enforcement advisory to enforce this ban particularly for plant-based ghee and butter products.

Japan

Public funding

In February 2023 Japan's Prime Minister Fumio Kishida announced his support for cultivated meat and fermentation-derived proteins:

Foodtech, including cellular foods, is an important technology from the perspective of realizing a sustainable food supply. We have to support efforts that contribute to solving the world's food problems.

Prime Minister Fumio Kishida

The government has subsequently pursued policies that support cultivated meat development, including a ¥1.87 billion (\$13.1 million) grant to a Japanese cultivated meat company Integriculture and a small business grant of ¥917 million (\$6.5 million) to Umami United, a Japanese startup making plant-based eggs, to help with product development and expansion into the U.S. and European markets.

Cell-culture technology doesn't just change how we source traditionally animal-derived ingredients, it also enables us to unlock nutritional and functional power that was previously inaccessible.

IntegriCulture CEO Yuki Hanyu

In November 2023, Japan's New Energy and Industrial Technology Development Organization (NEDO) accepted a joint proposal from three companies for research and development on cultivated wagyu beef. The companies will research cultivated meat development, scaling, and commercialization under NEDO's program for the development of innovative biomanufacturing technologies. Any public funding for the project is not disclosed.

Regulation

In February 2023, Japan's Ministry of Agriculture, Forestry, and Fisheries announced a "Vision of Promoting Food-tech" with an associated roadmap that includes cultivated food products, which built on a 2022 announcement signaling Japan's intent to study regulatory pathways for cultivated meat.

In 2023, the Japanese Association for Cellular Agriculture (JACA), an industry organization that works closely with the Japanese government, and the Asia-Pacific Society for Cellular Agriculture (APAC-SCA) collaborated on a Memorandum of Understanding aimed at boosting the growth of cellular agriculture across Japan and the broader Asia Pacific region. Through this agreement, JACA will have access to a global cultivated meat network including trade organizations in North America and Europe, and APAC-SCA will have an increased role in guiding regulatory processes in Japan.

Singapore

Public funding

Singapore, the regional leader in alternative proteins, continued investment in research and development through the SGD \$165 million (\$117 million) Singapore Food Story 2.0 research program. Two of the four pillars of this program, "Future Foods" and "Food Safety," are relevant to alternative proteins.

In 2023 Enterprise Singapore, a government agency focused on small and medium businesses, launched a Food Technology Program to help Singapore-based food technology startups, specifically those in plant-based alternative proteins, enter the market in mainland China. Further, new work visa rules will prioritize applications from alternative protein food scientists:

As Singapore moves to capture new economic opportunities, firms will require access to skilled talent to fill these jobs. As a country with little or no resources, talent is our only resource and talent acquisition is an offensive strategy for us.

Tan See Leng

Minister for Manpower and Second Minister for Trade and Industry

Regulation

Since becoming the first nation to approve the sale of a cultivated meat product in 2020, the Singapore Food Agency (SFA) has approved multiple forms of cultivated chicken products from the same company, Good Meat. In early 2023 the SFA approved the use of serum-free media in the production of Good Meat's products.

As of 2023, Singapore is continuing to work on a Food Safety and Security Bill that will offer even greater clarity about regulatory frameworks for novel foods such as cultivated meat. The bill has been in the works since 2021, and is expected to be finalized by the end of 2024.

Selected Singapore Food Story 2.0 research projects relevant to alternative proteins

While Singapore does not publicly disclose the amount of funding it dedicates to individual program areas, the number of known research projects focusing on alternative proteins indicates a high level of support from government research funders and universities.

- A Multidisciplinary Screening Platform for Functional Proteins for Alternative Foods (Singapore Institute of Food and Biotechnology Innovation (SIFBI), Bioinformatics Institute (BII))
- A Systematic Approach to Species Selection and Serum-Free Growth Media and Hydrogel Refinement for Cultured Seafood (Nanyang Polytechnic (NYP), Umami Meats)
- Characterization and Evaluation of Protein Hydrolysate Supplements as Serum Alternatives in Cultured Meat Production (Bioprocessing Technology Institute (BTI))
- Creating a Commercially Feasible Platform for Cultured Meat Production (Institute of Molecular and Cell Biology (IMCB))
- Decellularized Plant and Fungi Scaffolds for Structured Meat Production (BTI; Nanyang Technological University (NTU), The Moscow Sechenov Medical University)
- Develop a Platform for Immortalized Cell Line Media Development for the Production of More Affordable Cultured Meat (BTI)
- Developing A Scalable Method for Fiber-Directed Differentiation of Muscle Cells (SIFBI)
- Engineering Manufacturable Growth Factors for Cultured Meats (Singapore Institute of Technology (SIT); BTI)
- Food Protein from Algae – Integrated Bioprocess Approach to Sustainable Living (SIFBI; Institute of Chemical and Engineering Sciences (ICES); BII; Sophie's BioNutrients)
- Functionalisation of Plant Proteins by Physicochemical Methods to Improve Food Applications (SIFBI, Massey University)
- GRAS Platform for Food Protein Production and Screening: A Sweet Concept (IMCB; SIFBI)
- Highly Efficient Microbial Methane Conversion for Single Cell Protein Production under High Pressure (National University of Singapore (NUS); NTU)
- Low-cost, Edible Fibre Supports, for the Expansion and Differentiation of Myoblasts in Suspension Bioreactors (Institute of Materials Research and Engineering (IMRE), SIFBI)
- Marine Algae Proteins: Isolation, Assessment and Optimisation for Direct Incorporation in High Value Foods (Wintershine Asia, SIT, SIFBI)
- Modification of Brown Rice Protein Isolate Using Microbial Transglutaminases: Functional Property Enhancement and Nutritional Evaluation, A/Prof. Du Juan, SIT; NTU. Collaborator: BTI.

South Korea

Public funding

In October 2023 the national government of South Korea released a national plan for plant-based foods, including a research center and an initiative to develop plant-based proteins from domestic crops.

In February 2023, South Korea's North Gyeongsang Province led a 28-member Memorandum of Understanding calling for the advancement of the cellular agriculture ecosystem in South Korea and informally creating a cellular agriculture cluster comprising companies, universities, and city governments. The province also established a regulation-free zone in which companies can showcase proof-of-concept prototypes, as well as a 9 billion won (\$6.7 million) North Gyeongsang Cellular Agriculture Industry Support Center, which opened in March 2023 in a ceremony at which the world's largest cultivated meat prototype, weighing in at 10 kilograms (22 lbs), was unveiled by Tissen Biofarm, a cluster member.

Regulation

In November 2023, South Korea's Ministry of Food and Drug Safety (MFDS) published Alternative Foods Labeling Guidelines for plant-based products. The guidance prohibits terms such as "beef" and "milk." The guidance does, however, permit the words that describe the nature of the product such as "hamburger" or "bulgogi," ensuring that terms such as "plant-based hamburger" or "bulgogi made from soybeans" are permissible.

South Korea's regulatory structure allows for cultivated meat R&D and tasting events, but until recently did not have an established process for the commercial production and sale of cultivated meat products. The MFDS and the Ministry of Agriculture, Food and Rural Affairs (MAFRA) are responsible for granting regulatory approvals for cultivated meat products, with MAFRA regulating the upstream supply chain (such as cell collection) and MFDS regulating the final product. In July of 2023, MFDS

made amendments to the Enforcement Rule of Food Sanitation Act that made it possible for cultivated meat and seafood to be considered for pre-market authorization through the novel foods approval process, resulting in an early 2024 announcement that the agency was formally accepting applications for these products (See "A look at 2024," page 48).

Thailand

Public funding

Thailand's Program Management Unit for Competitiveness (PMU-C), a government agency dedicated to research funding, oversees a fund for innovation and research with the goal of improving competitiveness by fostering joint investment from the public and private sectors to develop high-value goods and services for the global market. PMU-C focuses on seven industrial areas, including "Functional Ingredients and High Valued Agricultural Products and Health Foods."

The PMU-C has supported several ongoing alternative protein research projects, though information about funding for individual projects is not publicly available. The Program Management Unit for human resources, institutional development, research and innovation (PMU-B) has also recently funded fundamental research on cultivated meat.

Regulation

Thailand has started working on a cultivated meat regulatory framework, with the National Science and Technology Development Agency (NSTDA) project team leading the framework development. The NSTDA held two experts-and-stakeholders meetings in August and November 2023 to present the draft framework based on guidelines used in the United States and Singapore in addition to Thailand's existing novel food regulation. The draft was submitted to the Thai FDA in January 2024 and is currently under review.



Europe

European countries continue to move at different speeds on alternative protein funding and support. Some countries across Europe, and in recent months the European Union, have deprioritized policies intended to improve sustainability in agriculture. At the same time, European countries are increasingly focused on food security and strategic autonomy, for which alternative protein sources often play an essential supporting role. This shift is reflected in the types and targets of funding made available for alternative proteins.

European Union

Public funding

On the EU level, alternative proteins rose in prominence among the European Union's research and economic development programs, presenting solutions to a wide range of issue areas. While EU policymakers boosted public funding for alternative proteins R&D and commercialization efforts through environmental and sustainability drives, they also increasingly did so through funds for regional and economic development, food security, and technological advancement, making the European Union one of the broadest supporters of alternative proteins across product types, production stages, and issue areas.

The European Union's 2023/24 Horizon Europe work package included €25 million (\$26.4 million) for FEAST, a multi-stakeholder project that will work to determine the socioeconomic, environmental and health impacts of cultivated meat. This program will include projects to reduce the cost of infrastructure and raw materials for cultivated meat production, address the organoleptic properties of microbial protein, and assess the impact of novel protein sources on food systems.

The European Union has also been a leading supporter of fermentation technology through various funding measures. The Circular Bio-based Europe Joint Undertaking continued to support the industry with a €14 million (\$15 million) grant to a company building an alternative protein biomass fermentation facility in France. The European Innovation Council (EIC) awarded €5.5 million (\$6 million) from the Pathfinder program to a consortium led by Finnish food tech company Solar Foods to produce whey protein from hydrogen via precision fermentation. Finally, in late 2023 the European Union announced €50 million (\$54.9 million) to assist startups in scaling up the production of food from precision fermentation and algae as part of the EIC Work Programme 2024.

Among other research priorities, as part of an ongoing effort to lift up algae as a resource, the

European Union's European Maritime and Fisheries Fund has continued funding a €2 million (\$2.2 million) "Seafood Alg-ternative" project to develop alternatives to seafood derived from microalgae and other sources.

Regulation

Cultivated meat

The European Commission regulates cultivated meat as a novel food, meaning that before a cultivated meat product can be sold in the European Union, it must be approved by regulators in a process governed by the Novel Foods Regulation. The European Commission and representatives from the EU member states have the authority to grant final approval of a product after evaluation from the European Food Safety Authority (EFSA). If granted, the approval would apply across all 27 EU member states.

Countries in the European Union can lawfully permit cultivated meat tastings before products are approved. In July 2023, the government of the Netherlands announced the creation of a Code of Practice to enable pre-market tastings for cultivated meat and seafood. This groundbreaking agreement makes the Netherlands the first EU country to allow pre-approval tastings of cultivated meat.

Fermentation

In the European Union, companies must secure premarket authorization for new fermentation-derived ingredients. As with cultivated meat, once the European Commission and representatives from EU member states approve a product, the approval applies across all 27 EU countries.

In early 2023, the European Commission approved MycoTechnology's novel food application for FermentIQ, a pea and rice protein product fermented by shiitake mushroom mycelia. Nature's Fynd, Solar Foods, Perfect Day, and The Protein Brewery (among others) have also submitted novel food applications to the European Union. Additionally, the European

Union has been assessing Impossible Foods' soy leghemoglobin as both a genetically modified food and a food additive. As part of this assessment process, the EU required Impossible Foods to conduct a dietary study, the results of which were made publicly available on October 10, 2023.



Symbol indicates EU member

Austria



As part of a growing trend of international collaboration on alternative proteins, the research and innovation agencies of Sweden and Austria, in collaboration with the cross-border EU funding program Eurostars, co-funded a €1.5 million grant to Austria-based Revo Foods and Sweden-based Mycorena to jointly develop a 3D-printed mycoprotein prototype. This emerging model of bilateral research partnerships helps develop not only individual products, but also research and business ties between participants and their governments.

Czechia



One way in which policymakers can support alternative proteins is by analyzing and correcting existing policies that disincentivize consumer uptake, especially fiscal mechanisms that can artificially inflate alternative protein prices. In 2023, Czechia's Ministry of Finance accepted a proposal to reduce the VAT tax on plant-based milks to be equal to the tax on animal milks, eliminating an unnecessary barrier to price parity and making alternatives more widely available to consumers.

Denmark



The regional leader in plant-based foods, Denmark followed 2022's announcement of the world's largest fund for plant-based foods with the world's first National Action Plan for Plant-Based Foods, including increased funding for research and development. The first round of applications for the country's previously-announced \$195 million plant-based fund, Plant Foundation, received "overwhelming" interest with over 100 applications from industry, startups, and research centers in the fund's first year.

Estonia



The Estonian Business and Innovation Agency, a government-funded institution supporting entrepreneurship, awarded a €760,000 (\$830,000) grant to Gelatex, a materials company that uses a technique called halospinning to create edible nanofibers that can be used as scaffolding for cultivated meat.

Finland



Finland continued to demonstrate enthusiasm for alternative proteins in 2023 and expanded its public support from fermentation to plant-based alternative proteins as well. Business Finland, a government entity for innovation funding and trade, travel, and investment promotion, supported local fermentation startup Solar Foods through the construction of two facilities and an international debut on the Singaporean market with millions of euros in investments and grants. Finland continued its support for alternative proteins more broadly in 2023 by funding two research projects at the VTT Technical Research Centre of Finland: a €5 million (\$5.3 million) project to advance the science of microbial fermentation and a €3 million (\$3.2 million) project to build plant-based protein supply chains.

Compared to our present highly centralized food supply chains the project aims for improved food security by new local value chains and resilient ecosystems that can also revitalize rural areas via local farmers and industry.

Emilia Nordlund

RETHINK project lead, VTT

Thanks in large part to the significant early investment from Business Finland, Solar Foods secured several prestigious awards in 2023, including the aforementioned EIC Pathfinder grant to explore precision-fermented milk and placement in the final round of the United States National Aeronautic and Space Administration (NASA) Deep Space Food Challenge.



France

Public funding

France was not far behind Europe's leaders in 2023, supporting the country's plant-based protein sector through business grants and investments, as well as funding several initiatives to research new proteins from plants, algae, and microbes and to scale up domestic plant protein processing and commercialization. French pulse crop producers stand to benefit from products developed through the country's multi-million euro research projects to innovate in the sector, as well as from greater volumes of plant-based alternative proteins produced as a result of growing commercial capacity. In late 2022, the government awarded €7.4 million (\$7.9 million) to help French company Umami purchase and retrofit an agricultural production facility outside Strasbourg as part of its "Première Usine" ("First Factory") program, which helps pioneers of new technologies establish commercial viability at an industrial scale. In 2023, after

Umami's successful commencement of nationwide distribution, the French government led a funding round to further scale up production and launch its whole-cut plant-based products in the United States.

Regulation

Attempts to censor "meaty" terms (e.g., "sausage," "steak," or "bacon") on plant-based products have been made in France over the past several years. In 2022, a law enacted by the French government banning such terminology was suspended by the court system, and in 2023 the government introduced a slightly less restrictive version of the law.



Germany

Public funding

Public funding for alternative proteins in Germany was significantly expanded in 2023. The Office of Technology Assessment at the German Bundestag presented a report on cultivated meat to the German parliament in early 2023. The report describes the potential of cultivated meat for climate, environmental, and health protection and emphasizes that Germany needs to invest significantly more in both public research to overcome technical challenges and commercialization to drive innovation.

Over the course of the year, Germany has increased investment in alternative proteins: The Federal Ministry of Food and Agriculture (BMEL) evaluated a call for research on alternative proteins and funded projects in the areas of cultivated meat, fermentation-enabled, and plant-based foods. As part of this call for research, Germany is investing up to €18.1 million (\$20.4 million) in alternative proteins, including cultivated seafood, between 2023 and 2027. These investments include a €500,000 (\$547,000) grant to Kynda, a German mycelial biomass fermentation company, and funding for a new research project in Germany to research not only ways of creating cultivated fish products but also their potential uptake and acceptance among consumers.

In November, the Budget Committee of the Bundestag announced €38 million (\$41 million) in

federal funding for a sustainable protein transition in 2024, including funding for innovating in alternative protein production, promoting the nutritional value of alternative proteins, and aiding farmers and companies in transitioning from animal agriculture to plant-based, cultivated, or fermented protein production. As in Czechia, German policymakers from the SPD and Green parties called for the VAT rate to be equalized for plant-based milks compared to animal milks. As of publication, the VAT tax rate for plant-based milk is 19 percent, compared to 7 percent for conventional milk – more than double

the taxation rate. The initiative will be considered by the governing coalition as part of the deliberations on the Annual Tax Act 2024.

Ireland

The government of Ireland also supported research on plant-based foods, with the Department of Agriculture, Food, and the Marine awarding over €1 million (\$1.1 million) to a project at the University College Cork and Technological University Dublin to evaluate fermentation as a tool in plant-based food processing.



Alternative protein policies supporting farmers across Europe

Denmark

In 2022 Denmark became the first country to develop a cohesive strategy for offering subsidies to producers of plant-based proteins specifically. The country will pay 580 million kroner (\$85.9 million) over five years to Danish farmers that grow protein-rich crops for human consumption, increasing the domestic supply and export capacity of the Danish market and incentivizing a shift to crops that are often better for the environment, soil health, and local ecosystems.

Germany

At the end of 2023, Germany announced €20 million to help farmers produce crops for plant-based and fermentation-based alternative proteins. Meat consumption is falling to record lows in the country, with more Germans adapting their diets to a changing climate. This program makes it easier for agricultural producers to take part in a growing market for plant-based foods.

Italy

In 2023, policymakers in Italy passed a law to ban cultivated meat and restrict plant-based meat by censoring meaty terms, such as “salami” or “steak,” on plant-based labels. While the law is currently in

place as of publication, due to a technical violation of EU procedure the law may in the future be declared unenforceable by national courts. For more information, see “Bans and restrictions” under “Types of Policies,” page 41.

Norway

Norway's research agency NOFIMA continued several research projects in 2023 that include alternative proteins in their scope, including project [SUSHEALTH](#) to innovate sustainable new foods, [FoodForFuture](#) to better understand consumer preferences around new food technology, and [PRECISION](#) to develop biotechnology for food and agriculture. In 2023, [researchers from Norway and the Netherlands](#) funded by PRECISION published an article demonstrating the successful replication of bovine cells for 38 days using serum-free media. This approach highlights the potential to enhance cultivated meat's cost-effectiveness and increase yields while moving away from animal-derived components.

Spain

Public Funding

In early 2023 the Spanish Institute for Foreign Trade (ICEX), which has previously supported cultivated meat with grants for research and development, released their annual [FoodTech in Spain](#) report. The report featured a section on alternative proteins and how Spain can benefit from the growth of the sector:

Overfishing, harmful catching practices, pollution, and habitat destruction are threatening the future supply of seafood. As people become more conscious of the impact it has on the planet, innovation in the alternative seafood sector is much needed, and Spanish players are already part of it.

ICEX's FoodTech in Spain Report, page 31

Additionally, a Spanish startup was awarded a €335,000 (\$368,000) grant to develop [low-cost mycelium biomass as a meat alternative](#) through a public-private partnership supporting research on new technologies.

On the sub-national level, Catalonia invested €7 million (\$7.32 million) in a [Center for Innovation in Alternative Proteins \(CiPA\)](#), which will help alternative protein businesses in plant-based and fermentation-derived foods scale up production. The Center will be based in various sites across the region and is co-funded by the region's Department of Climate Action, Food and Rural Agenda.

Sweden

Sweden participated in two multilateral funding opportunities in 2023. Swedish innovation agency Vinnova participated in the aforementioned €1.5 million [joint mycoprotein grant](#) with Austria. Uniting researchers and companies from multiple countries, a four-party opportunity co-funded by Israel, Singapore, and Switzerland [called for research proposals](#) to co-develop plant-based, cultivated, or fermented alternative proteins:

Collaborations in the field of alternative proteins can increase sustainable food production, strengthen corporate competitiveness, provide new job opportunities, and develop future skills supply. It might enable increased export opportunities as well as a higher rate of self-sufficiency, resilience, and preparedness.

Food tech call on alternative proteins for R&D and innovation projects between Sweden, Israel, Switzerland and Singapore

Switzerland

Public funding

In addition to participating in the joint call for proposals with Sweden, Israel, and Singapore above, Switzerland funded several research projects concerning alternative proteins throughout 2023 through the Swiss National Science Foundation.

Regulation

Switzerland is not a member of the European Union and maintains a separate process for regulating food products, including novel foods. In July 2023, Israel-based company Aleph Farms submitted the first-ever application to sell cultivated meat in Europe to Swiss regulators. The submission on Aleph's cultivated beef was part of the company's collaboration with Migros, Switzerland's largest food enterprise. According to research conducted jointly by Aleph Farms and Migros, 74 percent of Swiss consumers have indicated an openness to trying cultivated meat.

The Swiss regulatory process is similar to the EU in that it includes a robust, evidence-based process for determining novel food safety. Companies such as Aleph Farms must apply for authorization from the Federal Food Safety and Veterinary Office (FSVO) by submitting a safety dossier. The process includes a safety assessment and extensive toxicological studies, and is expected to take at least 12 months. The Swiss FSVO provides a template for applications to help companies navigate the process.

The Netherlands



Public funding

The Netherlands continued to be a world leader in supporting alternative proteins through its Cellular Agriculture Netherlands program, and in 2023 further awarded €1 million (\$1.1 million) to a group of companies and academics to research the scalability and cost-effectiveness of producing collagen and elastin through precision fermentation.

Regulation

The Health Council of the Netherlands presented an advisory report to the Dutch government in 2023 recommending policies to guide the population to adopt an increasingly plant-based diet.

As mentioned above, in July 2023, the Netherlands became the first EU country to enable pre-market tastings for cultivated meat and seafood.

United Kingdom

Public funding

The United Kingdom became a major player in the alternative proteins space in 2023 with an early-year allocation of £12 million (\$15 million) for a new Cellular Agriculture Research Hub at the University of Bath, to be led by GFI grantee Dr. Marianne Ellis. This major commitment was followed by another estimated £7.8 million (\$9.8 million) for sixteen research projects on alternative proteins through a program supporting low-emission food production systems. (Of the 16 projects, seven addressed cultivated meat, six fermentation, and three plant-based proteins.)

The country additionally supported its domestic industry through business grants, including a \$2.5 million grant to a growth media startup through Innovate UK's EIC Accelerator program, helping the company begin construction on a production facility. Two fermentation technology companies and four plant-based protein companies were selected through Innovate UK's Better Food for All competition.

Further speaking to the UK's collaboration across the research and business ecosystems, the Biotechnology and Biological Sciences Research Council teamed up with Innovate UK to announce up to £15 million (\$19 million) for an Alternative Proteins Innovation and Knowledge Centre to be established over the next five years. Innovate UK also funded a two-year project to derive plant-based protein from amaranth leaves, which are easy to grow in vertical farming operations.

Finally, in December 2023 the United Kingdom released a [National Vision for Engineering Biology](#) which outlines a £2 billion (approximately \$2.2 billion) investment in research, development, and infrastructure in the bioeconomy, including in gene therapies, vaccines, pharmaceuticals, chemicals, fuels, and food. The strategy highlights the cultivated meat and fermentation sectors specifically, stating that alternative proteins can address climate and food security goals.

On the national level, the government of Wales supported a [project on hydrogen-based biomass fermentation](#):

It is hoped that the development of this project will increase the economic prospects of Wales and improve the environmental wellbeing through the transition into a greener economy.

Gethin While

Head of Smart Living at the Welsh Government

Regulation

In summer 2023, the UK Food Standards Agency (FSA) received its first two applications for cultivated meat products from Israel's Aleph Farms and Oxford-based Ivy Farm. While the United Kingdom has thus far retained the EU novel food regulation despite its exit from the European Union, in 2023 the FSA issued [new guidance for businesses](#) in England and Wales working on cultivated meat products, which it refers to as “cell-cultivated products.” In the United Kingdom, cultivated meat products will require premarket authorization from the FSA and Food Standards Scotland using its [regulated product application service](#).

Similar to cultivated meat, fermentation companies seeking to sell their products in the UK will need to apply for authorization from the FSA. The FSA provides [general guidance](#) on how to submit novel food applications.

At present, the United Kingdom is considering changes to its novel food regulations that could affect product approvals for cultivated meat, fermentation and some novel plant-based products. A 2023 [report](#) from Deloitte commissioned by the FSA outlined a roadmap for UK regulators to improve the regulatory processes for novel foods. The UK government response to this report was positive, acknowledging that technological advances are accelerating the development of novel foods (including products of fermentation) and that this industry represents a commercial and economic opportunity for the UK. Reforms are being considered by the UK government in Spring 2024.



Middle East and Africa

Alternative proteins offer many opportunities for policymakers in the Middle East and Africa to develop new protein sources, promote domestic economic development, and mitigate the worst effects of climate change and geopolitical disruptions, as evidenced by the growing support for the sector from the regions very north to very south. The United Arab Emirates promoted alternative proteins on the world stage through their presidency of COP28 in Dubai, while Israel continued to invest heavily in the sector as a driver of innovation and food security. In 2023, South Africa became the first African country to make a public investment in an alternative protein company, leading the development of new food sources with a smaller footprint.

Israel

Public funding

Israel maintained strong leadership in support for alternative proteins, funding more research and commercialization efforts domestically and internationally. In June 2023, the government awarded previously-announced funding of NIS 50 million (\$14 million) to build a precision fermentation contract development manufacturing organization (CDMO), lowering the cost of pilot- and demonstration-scale equipment and expertise for emerging startups. Additionally, Israel announced a new human capital program to cultivate expertise in alternative proteins and food technology, fueling the country's research ecosystem and developing the workforce. The Israel Innovation Authority also renewed a joint research grant program with GFI Israel for the second year in a row, offering research funding for projects aiming to improve the sensory qualities or production methods of alternative meat, dairy, and seafood products.

Israel championed international alternative protein collaborations in 2023, embarking on multiple bilateral and multilateral efforts to co-develop new products and technologies with other nations. The first, a joint effort of the Singapore Israel Industrial R&D program (SIIRD), provided funds from both countries to a company from each to work together on a 3D-printed cultivated grouper prototype, which was unveiled in 2023. The Binational Industrial Research and Development (BIRD) Foundation, a collaboration between Israel and the United States, jointly awarded \$1 million to Israel's Oshi and the United States' The Better Meat Co. to produce mycoprotein-based salmon filets. Israel also participates in the aforementioned multilateral effort with Sweden, Switzerland, and Singapore. All follow similar models, providing joint funding for initiatives that develop not only products but also research and business ties between participants and their governments.

Regulation

In April 2023, Remilk received the first regulatory approval of its kind in Israel to market and sell products containing the company's precision fermentation-derived milk protein. The regulatory approval was granted by Israel's Ministry of Health, and came after Remilk had already received regulatory approvals in the United States and Singapore.

South Africa

Public funding

In 2023, the government of South Africa allocated what may be the first public investment in precision fermentation on the continent, with a grant of ZAR 11 million (\$700,000) to South African startup De Novo Foodlabs towards their development of precision-fermented dairy proteins.

Regulation

In 2022, South Africa announced that it would enforce censorship of "meaty" terms such as "burger" and "nugget" on plant-based products. However, in 2023, the Johannesburg High Court halted enforcement of the ban to allow plant-based food manufacturers to continue to sell their products until May 2023. No enforcement actions were taken in 2023.

In an additional victory for plant-based labeling in South Africa, Fry Family Foods won an appeal initiated in 2022 against the Food Safety Agency (FSA) and Red Meat Industry Forum (RMIF) regarding a directive issued by the FSA declaring the naming and labeling of six of Fry's products to be in contravention of South Africa's plant-based meat labeling restrictions. After, the Appeal Board ruled in August 2023 that the Department of Agriculture, Forestry, and Fisheries should develop regulations specifically for alternative meat products.

United Arab Emirates

The U.A.E. hosted the Conference of the Parties (COP28) to the UN Framework Convention on Climate Change in December 2023, using the global platform to highlight the role of agriculture and food systems in climate change and to advocate for alternative proteins as one of many necessary solutions to a warming planet. The conference was the first to feature a “1.5 °C-aligned menu,” with plant-based foods from producers across the globe comprising two-thirds of the provided meals. Additionally, the U.A.E. used their presidency to spearhead the Emirates Declaration on Sustainable Agriculture and Food Systems, through which 159 countries committed to addressing emissions from food systems (see “COP28” on page 40).

The country also enjoyed the opening of their first two plant-based meat factories, which were unveiled in spring 2023 in Dubai and Abu Dhabi. Minister of Climate Change and Environment Mariam bint Mohammed Almheiri attended both openings, speaking to the government’s support for the expansion of alternative protein sources.

The new 100% plant-based meat factory supports the UAE’s Food Security Strategy and our mandate to mitigate the impact of climate change. The opening of this innovative new facility also supports our efforts to protect the country’s ecosystems and enhance its food and water security and diversify our food sources.

Mariam bint Mohammed Saeed Hareb Almheiri

U.A.E. Minister of Climate Change and Environment

Global cooperation and coordination

Codex Alimentarius Commission

The Codex Alimentarius (“Food Code”) Commission is an international body jointly run by the United Nations Food and Agriculture Organization (FAO) and the World Health Organization (WHO). It includes 188 member countries and the European Union as well as many official observer organizations, including GFI. The Commission promulgates voluntary standards and guidelines for food safety and trade.

In April 2023, the Codex Secretariat issued a circular letter seeking comments from member countries and observers on specific topics that would require the development of a Codex standard related to new food sources and production systems (NFPS), which includes alternative proteins.

The circular letter also sought comments about the appropriate procedural methods within Codex to address NFPS. Members and observers, including GFI, commented on whether the current Codex procedural mechanisms were appropriate to address NFPS issues and raised aspects relevant to NFPS standard-setting that had not yet been considered by the Commission.

The topic of NFPS was discussed at the 46th convening of the entire Commission (CAC46) in December 2023, and it was decided that current Codex procedural mechanisms were sufficient to address any future NFPS issues that may arise. Several Codex members indicated an interest in submitting specific proposals for new work related to NFPS in the future.

Food and Agriculture Organization (FAO)

In November 2023, the United Nations Food and Agriculture Organization (FAO) hosted the Food Safety Foresight Technical Meeting on New Food Sources and Production Systems in Rome. The main objective of the meeting was to evaluate food safety issues associated with innovative food sources, including new alternative proteins.

The meeting concluded that the food safety implications for plant-based foods vary depending on the plants utilized and how they are harvested, stored, transported, and processed. The meeting also noted that the food safety risks present in plant-based foods can likely be mitigated through proper labeling, consumer education, and other regulatory mechanisms. On precision fermentation, the meeting’s conclusions described how this technology has been around for decades and is now being used to produce innovative food technology. As such, the safety considerations and regulatory landscape for new products created with precision fermentation should be continuously monitored by companies to keep up with evolving regulatory requirements.

The FAO and the World Health Organization (WHO) released a publication titled “Food Safety Aspects of Cell-Based Foods” in April 2023. The publication describes relevant issues related to the terminology, development, safety, and sustainability of alternative proteins. It also describes available resources and activities concerning alternative proteins at the global level and tips for authorities to consider to align on regulatory requirements. The publication includes the results of an FAO-led expert consultation held in Singapore in November 2022. With the report, FAO released a fact sheet summarizing its findings.

COP28

At COP28, 159 countries, including the United States, China, the European Union, and Brazil, signed the Emirates Declaration on Sustainable Agriculture and Food Systems, committing to addressing emissions from food systems in their 2025 Nationally Determined Contributions (NDCs). While the declaration does not mention alternative proteins outright, supporting alternatives to animal agriculture will be necessary to keep the world within 1.5°C of warming.

A report from the United Nations Environment Programme (UNEP), released at COP28 in Dubai, assembled a strong list of potential actions governments could take individually and in concert. In a section on multilateral cooperation, the report suggests that governments embark on bilateral and multilateral research efforts, evaluate and revise trade policy to be more supportive, develop international food safety standards, and collaborate with development finance institutions to build capabilities worldwide.

Types of policies

With growing interest in alternative proteins and increasing attention to developing the sector, governments around the world enacted more kinds of policies in 2023 than ever before.

The free market will ultimately decide alternative proteins' fate. Entrepreneurs are betting that alternatives to animal products can deliver global health, food security, sustainability, and economic benefits when they taste better and cost less than their conventional counterparts, prompting consumers to voluntarily choose new products. However, policy can speed progress. Recent upticks in renewable energy capacity, electric vehicle sales, and battery production, as well as those of once-nascent industries such as semiconductors and internet connectivity, are attributable to government policies that increase production and accelerate market uptake of important new technologies.

Importantly, dividends from alternative proteins succeeding in the marketplace will accrue largely to the countries whose governments invest early.

Research grants

Governments most often support alternative protein development through research grants. The first supportive policies for cultivated meat and fermentation came in the form of research grants from public institutions. Beginning in 1998 with a United States NASA project on feeding astronauts high-quality meat and seafood in space, and breaking into the mainstream with the Netherlands' project to develop the first-ever cultivated hamburger, public research on cultivated meat has yielded a steady stream of breakthroughs. In recent years, governments have also expanded research into precision and biomass fermentation for food, especially in service of developing circular economies, making the most of domestic resources, and improving food production capabilities in space, famine, and defense.

Governments are uniquely positioned to support alternative protein research. Many scientific breakthroughs are the result of basic research (also known as “blue skies research”) in which researchers explore topics without knowing their potential applications in advance. This kind of research is difficult for private companies to afford, but when funded or performed by governments has led to massively important inventions including GPS, Wi-Fi, countless medicines and therapies, and, in 2005, the soy protein extrusion technology behind the groundbreaking Beyond Meat. Further, by providing open-access results to the sector as a whole, public research can advance the entire industry rather than benefiting individual actors.

The European Union is the world leader in alternative protein research, having spent approximately \$140 million on research projects to date, of which over \$40 million was announced in 2023. The European Union's commitment to moving the science of alternative proteins forward applies across all platforms, from developing fermentation processes to create protein from agricultural sidestreams to studying cultivated meat and its potential to improve sustainability, food security, and the economy. Not far behind is Canada, which has invested about \$64 million to date in research on plant proteins in order to create a new market for Canadian crops, primarily through the Protein Industries Canada program and at the University of Saskatchewan. Singapore likely rounds out the top three global research funders through its Singapore Food Story 2.0 research program, which prominently includes alternative proteins as part of its \$117 million agenda.

In 2023, open-access research funded by the government of Norway revealed that researchers were able to successfully expand bovine cells for up to 38 days under serum-free conditions in a lab-bench bioreactor. This breakthrough speaks to the importance of publicly-funded R&D in achieving results that can advance the entire field. Similarly, the California State Legislature has supported three alternative protein projects across the UC system,

including an open-access research lab at the University of California, Los Angeles, which yielded breakthroughs in cultivated meat scaffolding, bringing down production costs and timelines.

Bilateral research grants

In late 2022 and throughout 2023, governments began pursuing joint research projects to advance the science of alternative proteins, typically pairing one startup from each participating country to work toward a set goal. Conducted through existing bilateral research organizations such as the Singapore Israel Industrial R&D Foundation (SIIRD), this model of multinational partnership facilitates networking between researchers and entrepreneurs across strategically important borders.

In 2023, the first of these alternative protein partnerships revealed its results: thanks to SIIRD's contribution of \$1 million for an open-access research project between Singapore's Umami Bioworks, a cultivated seafood company, and Israel's Steakholder Foods, a pioneer of 3D-printed cultivated meat, the two companies were able to produce a 3D-printed cultivated grouper prototype.

Consortia and research hubs

Governments moving beyond individual research projects and committing to developing alternative proteins in a systematic, multidisciplinary way can also turn to research hubs and consortia as key drivers of science. Centers of alternative protein research like the Cultivated Meat Consortium in Israel can unite researchers, companies, policymakers, and experts in other fields under one roof, enabling collaboration and accelerating the field through multiple lines of inquiry. These programs can house multiple research projects, and serve not only to uncover new findings but also to educate, train, and connect new entrants to the field.

Several governments announced funding for new research hubs in 2023. In the United Kingdom, U.K. Research and Innovation (UKRI) announced £12 million (\$15 million) to found the Cellular Agriculture Manufacturing Hub (CARMA) at the

University of Bath. Over the next seven years, CARMA will unite entrepreneurs and researchers from multiple fields to investigate how to manufacture cultivated meat at scale.

Similar research hubs were announced in Spain and South Korea in 2023. These consortia of research, entrepreneurs, students, and policymakers will accelerate the pace of innovation and position these jurisdictions to lead the world in alternative protein science and manufacturing.

Commercialization support

In addition to improving the sensory qualities of alternative proteins and new methods of producing them inexpensively and sustainably, policymakers are supporting product commercialization—the process of bringing alternative protein products to market. This support enables products to hit the market at fair, competitive prices on a timeline that supports global climate, sustainability, and human development goals.

Grants

The most common and direct form of public support for commercialization is through nondilutive business grants: the direct transfer of funding from public entities—typically business development agencies or departments tasked with supporting the food sector—to startups working to scale up their operations. These grants allow startups flexibility in pursuing development, whether building capacity or expanding to new markets, and can greatly accelerate progress.

Finland is a global leader in business grants for alternative proteins. Business Finland, the government agency in charge of trade and investment promotion, has allocated multiple business grants to alternative protein companies developing products and building facilities in the country, including a 2022 grant of €34 million (\$36 million) to Solar Foods to accelerate the completion of one gas fermentation factory and allow for the construction of a second.

Governments that offered business grants to alternative protein companies in 2023 include Japan, Canada, Australia, Estonia, Germany, and the United Kingdom.

Financing: investments, loans, and loan guarantees

Governments are also increasingly supporting alternative protein development and deployment through financing, offering investments, loans, and loan guarantees to companies as they pursue expansion. These mechanisms are important since government investment is often followed by private investment and financing.

Investments

Governments with investment agencies or sovereign wealth funds can support domestic alternative protein companies through participating in investment rounds,

reaping the benefits of companies' success through equity while signaling that alternative proteins align with national goals.

Governments can also leverage these investment mechanisms to pursue domestic priorities such as food security and economic growth. In 2022, for example, the Oman Investment Authority formed a joint venture with United States-based MycoTechnology to build a facility that will use Oman's supply of dates as a feedstock for mycelial fermentation. The venture announced that the facility in Oman would begin construction in the third quarter of 2023.

Similarly, Breakthrough Victoria, the investment arm of the Australian state of Victoria, invested \$6 million (\$3.8 million) in Eden Brew, a maker of animal-free dairy, and in doing so secured a commitment to locate the company's new headquarters and future production in Victoria.

Oman imports a huge percentage of its food, and we started talking during the pandemic when they were looking for a solution to food security. The whole project is around doing everything domestically to produce super high-quality food, diversify the economy, and create jobs and opportunities. This facility will not only supply the GCC area but will also export to India.

Alan Hahn

CEO of MycoTechnology

Loans and loan guarantees

Securing private financing for expansion, including for construction projects, can be difficult for emerging technologies, especially during an investment downturn like the one that characterized most of 2023. Governments are well-positioned to help companies through loans and loan guarantees, because government investment often results in many times more follow-on private financing than the initial public outlay.

In 2023, the government of North Carolina awarded a business loan to cultivated fish company Atlantic Fish Co. through the North Carolina Biotechnology Center, an initiative of the state's Department of Commerce. Past loans have come from Canada, Finland, and the European Union. Loan guarantees are another vehicle for spurring investment, leveraging the government's credibility to match private lenders and borrowers at minimal public outlay.

Contract development and manufacturing organizations

Many companies in the alternative protein space are constrained by production capacity, with most geographies limited in how much equipment exists for producing plant-based foods, cultivated meat, or fermented products. Elsewhere in the food sector, companies looking to test a new product or scale up its production might utilize the services of a contract development and manufacturing organization (CDMO), which houses equipment, employs skilled operators, and unites laboratories, pilot plants, and office space under one roof. Such facilities are scarce for alternative protein companies, however, forcing them to build their own equipment and hire their own specialists at great expense.

Governments can quickly close this gap by creating or supporting the development of alternative protein CDMOs, which are often self-sustaining once constructed. The Bio Base Europe Pilot Plant (BBEPP) in Belgium, near the border with the Netherlands, was created and constructed in 2013 with funds from local governments in both countries and EU regional development funds. With equipment that supports fermentation and cultivated meat production, as well as bio-based plastics, fuels, and medicines, BBEPP has provided equipment, space, and dramatic savings for over 150 companies to date. Further, the CDMO broke even during its first year of full operations in 2013 and now supports over 180 staff members.

More recently, the government of Israel set aside \$14 million for a CDMO focused on precision fermentation in late 2022 and announced that a contract had been awarded for its construction in mid-2023. Several CDMOs operate in Singapore through Nurasa, a wholly owned company of Singapore's sovereign wealth fund, including the Cremer Sustainable Foods Facility, a plant-based CDMO co-founded by Nurasa and Germany-based food company Cremer, and ScaleUp Bio, a precision fermentation CDMO co-founded with U.S.-based

food company ADM. In the United States, the North Carolina Food Innovation Lab, which is located on the research campus of N.C. State University and funded by state legislative appropriations, works with plant-based food startups to test new products and production techniques.

Fiscal policies

Equalized tax rates

Policymakers should not only assess new policies that might advance alternative protein development, but also analyze the policy landscape for existing roadblocks to consumer uptake that they can help reduce. A good example of this is Value Added Taxes (VATs): employed in many countries across the world, VATs are sales taxes assessed by governments on individual product categories. Standard VAT rates apply across categories, while reduced rates may be applied depending on domestic priorities.

Many tax authorities have traditionally applied a reduced VAT rate to animal products, including animal-based milk, while applying a higher standard rate to other foods, including plant-based milks. This results in alternative proteins having a higher price at the point of sale, discouraging uptake by consumers. In light of this discrepancy, multiple countries have taken action to equalize tax rates for alternative proteins. Brazil was among the first, in 2022, to reduce its tax rate on alternative milks to zero, matching the tax rate for domestically produced cow's milk.

In 2023, the government of Czechia accepted a suggestion to lower the VAT on plant-based milks from the standard 21 percent to the reduced rate of 12 percent, equal to animal milks, and Spain temporarily zeroed the VAT on many food products, including both plant-based and animal milks, in an effort to lower food prices. If the Spanish policy expires, the VAT will return to 4 percent for animal milks and 10 percent for plant-based milks.

In Germany, Members of Parliament from the SPD and Green parties issued a call to reduce the VAT on plant-based milks from the 19-percent standard rate to the seven-percent rate at which conventional milk is taxed. These policies help to reduce consumers' barriers to trying and regularly purchasing plant-based milks, help governments incentivize a shift to more sustainable food systems, and ensure that lactose-intolerant citizens and those with meat, egg, or dairy allergies have equal access to healthy food.

Subsidies for alternative protein production

Several governments have implemented or proposed fiscal policies that provide subsidies to farmers that grow protein-rich crops to help increase the domestic supply or to livestock producers interested in switching to plant or mushroom farming.

In 2022 Denmark became the first country to develop a cohesive strategy for offering subsidies to producers of plant-based proteins specifically, announcing 580 million kroner (\$85.9 million) over five years to pay bonuses to Danish farmers that grow protein-rich crops for human consumption. At the end of 2023, Germany announced a large package of funding for developing alternative proteins, including about €20 million to promote the production of plant-based, cultivated, and fermented alternative proteins.

Tax breaks for new facilities

In addition to providing direct financial support to construction projects, governments frequently offer tax breaks and other incentives to companies looking to build new facilities and hire a workforce in their jurisdictions. These incentives allow states and governments to compete for business and reap the benefits of business-friendly environments.

Workforce development

In 2023 Singapore became the first country to adopt an immigration policy specifically concerning alternative proteins. As part of a push to bring new talent to the country, Singaporean officials

announced 27 jobs that will receive “bonus points” towards their visa applications, one of which is alternative protein scientist. Singapore has been a world leader in supporting alternative protein R&D, and this new initiative in immigration policy highlights the country's innovation in developing supportive alternative protein policy through a whole-of-government approach.

In 2023 Israel also invested in an alternative protein workforce with a new human capital program that will cultivate expertise in alternative proteins and food technology, fueling the country's research ecosystem and developing a workforce for a future food system. Three organizations were awarded funds through the program to advance workforce development in alternative proteins. The Hebrew University of Jerusalem will train students for specialized positions in the areas of cultivated meat, fermentation, and more; Elevation Food Techies and the Israel AgriFood-Tech Valley will build cross-sector collaboration on new professions; and Technion–Israel Institute of Technology launched an Innovation and Entrepreneurship program in food technology and biotechnology for academics in relevant professions or individuals with experience in the field.

National plans

A whole-of-government approach to developing new technologies can yield faster results, reduce incoherencies and inefficiencies in policy, and promote cooperation across agencies. In recent years, several governments have adopted two types of national plans that affect alternative proteins: plans to boost the consumption of plant-based foods and plans to accelerate and develop the biotechnology sector.

The first two national plans to promote a transition to plant-based foods were passed in 2023 by the governments of Denmark and South Korea. Though Denmark's plan focuses on all plant-based foods, including whole fruits and vegetables and organic products, and South Korea's plan focuses more specifically on plant-based meat and dairy, both were adopted in part to develop a thriving export industry. In Denmark, which doubled its plant protein production from 2017 to 2022, the

unanimously-passed plan will provide incentives not only for farmers to grow protein-rich crops but also for chefs to produce more plant-forward dishes, influencing both supply and demand to bolster the nascent sector. South Korea's national action plan will also work to boost the agricultural sector, with elements of the plan supporting the use of domestic crops in plant-based alternatives, promoting their uptake among consumers, and developing the export market for protein-rich crops.

We can see that the market is growing, in Denmark we are not only farmers but also businessmen.

Jacob Jensen

Danish Minister of Food, Agriculture and Fisheries

In light of the growing potential of biotechnology to revolutionize sectors of the economy as diverse as agriculture and materials, fuels and pharmaceuticals, and medicine and defense, governments are also rapidly developing and implementing national action plans to spur research, develop technology, attract talent, and build capacity through infrastructure and support. These biotechnology plans streamline government policy and identify roles for individual agencies within the government.

In 2022, China became the first country to announce a national biotechnology plan that specifically identified alternative proteins as an area of interest. The 14th Five-Year Plan for Bioeconomy Development, announced in May 2022, aimed to “develop synthetic biology technology, explore new foods such as synthetic protein, realize iterative upgrading of the food industry, and reduce the pressure on environmental resources brought about by traditional animal agriculture.” While the exact amount and nature of China's support for the industry is not publicly known, the government's policies since then have resulted in lower costs for bioreactors and scaling up for China's cultivated meat industry.

At the end of the day, producing in China means having that infrastructure at a relatively lower cost and this is a key advantage. It's really going to be about leveraging that supply chain and going overseas, that's the story as we see it.

Ziliang Yang

CEO of Shanghai cultivated meat company CellX

Bans and restrictions

Not all government policies concerning alternative proteins are positive. While the majority of governments that have engaged with alternative proteins have supported the sector, investing in alternative proteins and all the numerous benefits that go with them, some governments have gone the other way. These policymakers have proposed two kinds of oppositional policies: censorship of labels or advertising and bans of the production and sale of alternative proteins.

Policies that restrict or ban alternative proteins will have negative impacts across the economy. Cultivated meat, for example, is far from the only product of biotechnology that promises a safer and more prosperous future – biofuels, bioplastics, and biotechnology-produced foods, medicines, and textiles are being developed alongside cultivated meat in many of the same facilities and research hubs. Banning cultivated meat will reduce the size and strength of domestic job markets and prompt innovators in these fields to reconsider doing business in a proven hostile environment.

Governments that support consumer choice should not pursue bans or restrictions on alternative proteins. Citizens have a right to choose the foods they want to feed themselves and their families, especially when it comes to personal tastes, values, and health. Most governments have regulatory processes that ensure that food is safe for consumption and that producers do not intentionally mislead consumers. Any considerations beyond

those are best left to private citizens. Efforts to eliminate consumer choice through bans, or by restricting producers' ability to communicate with consumers in labeling their product clearly, infringes on peoples' freedom to decide for themselves.

And while the global community works best when it works together, governments are also moving quickly to develop a competitive edge in biotechnology (See "National Plans" above). Banning or restricting alternative proteins throttles innovation in this and related sectors, allowing other countries – and often strategic adversaries – to leap ahead. While alternative proteins promise to support the entire global community in its goals for a prosperous, healthy, and food-secure future, governments that ban alternative proteins from going to market risk losing the gains from innovation to foreign actors.

In 2023, Italy became the first country to ban cultivated meat. Because of restrictions in laboratory settings, Italian biotechnology research has come to a halt, with researchers suspending operations and Italian startups looking to relocate. But the ban hurts consumers most of all – [a survey of Italians](#) found that 55 percent would try cultivated meat and 75 percent believe it will be necessary for building a more sustainable food system. Until this ban is reversed, Italian consumers will no longer have the freedom to try it for themselves or take action to reduce their environmental footprint. It may also prove to be unenforceable due to a technical violation of EU procedure.

The government of Uruguay also banned cultivated meat in 2023, through a quiet amendment to a budget bill passed in October. The law prohibits the "importation, manufacture and commercialization" of cultivated meat for human consumption in the country for a period of five years. Though the law does allow R&D, it hinders the commercialization of alternative proteins. Entrepreneurs in Uruguay now have no incentive to build the facilities, infrastructure, and local talent to support a future industry. Even if allowed to expire in five years, other supportive governments in the region, including neighboring Brazil, will by then have a permanent and insurmountable head start. Ultimately, as with Italy's ban, the ban on cultivated meat in the marketplace robs Uruguayans of their right to choose their own food and to enjoy the benefits of a promising future industry.

Italy and Uruguay were the only governments to ban cultivated meat through the end of 2023, and only the second and third governments to ban an alternative protein product after Türkiye, which in 2022 banned plant-based cheese. In 2023, the governments of Romania and Paraguay passed bills to ban cultivated meat through at least one legislative body. As of publication, the law has been codified in Paraguay and the bill in Romania is pending approval.

A look at 2024

Australia

With AUD \$3.9 million (\$2.5 million) in investments from the Australia and Queensland governments, the Queensland University of Technology Mackay Renewable Biocommodities Pilot Plant will be upgraded into a “state-of-the-art food-grade compliant facility which will enhance Australia’s ability to produce novel food ingredients” through precision fermentation.

Germany

In January 2024, the German federal government adopted its new National Nutrition Strategy, which sets out the goal of a more plant-focused diet. Among other things, the strategy emphasizes the role of plant-based meats and dairy, announces a protein strategy for Germany and a research focus on alternative proteins.

Ireland

The governments of Northern Ireland and the Republic of Ireland announced €9 million (\$9.8 million) to help build a circular food system through the Shared Island Bioeconomy Demonstration Initiative. The initiative will support projects that use biotechnology to develop protein and other resources.

Israel

In January 2024, Israeli cultivated meat company Aleph Farms received regulatory approval from the Food Risk Management Department within the Ministry of Health to sell cultivated steak in the country, making Israel the third country to allow the sale of cultivated meat and marking the world’s first approval of cultivated beef. The company’s steak product had been deemed kosher by Israel’s chief rabbi in 2023 and is expected to be sold in restaurants by the end of 2024.

Lithuania

The Lithuanian government signed a first-of-its-kind Memorandum of Understanding (MoU) with EU trade association Cellular Agriculture Europe committing to boosting collaboration and supporting the development of the country’s cellular agriculture ecosystem.

Singapore

The Fatwa Committee of the Majlis Ugama Islam Singapura (MUIS)—the sole entity with legal authorization to issue halal certificates in Singapore—announced that under certain conditions, cultivated meat consumption can be permissible as halal.

Australia’s Vow Food became the second company to receive regulatory approval for cultivated meat in Singapore in April 2024. Their first-of-its-kind product, Quailia, is made with cultivated Japanese quail cells.

South Korea

South Korea’s food regulator formally announced that they are accepting applications for cultivated meat products through its novel foods approval process.

Spain

Catalonia’s regional government has awarded €12 million to build a new alternative protein scale-up plant, offering companies opportunities to de-risk the research needed to bring their innovations to market.

United States

The Department of Energy (DOE) and the Department of Defense (DOD) announced public funding opportunities relevant to alternative protein

companies. DOE released a [Funding Opportunity Announcement](#) to award several proposals in the Food and Beverage industry up to \$7 million each—with alternative proteins specifically highlighted. Meanwhile, DOD announced a [new funding opportunity](#) for U.S. companies, including alternative protein companies, to apply for biomanufacturing production facility grants. DOD highlighted food as one of their five defense priority areas and expects to award 30 proposals with up to \$2 million each to produce a business and technical plan. A select group of proposals will have the opportunity to secure follow-on funding.

Florida, United States

In early 2024 the state government passed a law banning cultivated meat in Florida despite strong opposition from entrepreneurs, researchers, and national security experts. While the legislature was persuaded to limit the ban to cultivated meat manufactured for sale, likely preserving the foundational research carried out by NASA and Florida’s research universities, the law is expected to hamper the state’s bioeconomy and deprive Floridians of the right to freely choose their own food.

Illinois, United States

The governor of Illinois announced that the state and private partners jointly invested \$680 million in the [Illinois Fermentation and Agriculture Biomanufacturing \(iFAB\) Tech Hub](#), which in 2023 received federal designation as a Regional Innovation and Technology Hub from the Department of Commerce. The Hub will apply for up to \$75 million in federal funding, to be announced in summer 2024.

Missouri, United States

The district court considering GFI and Tofurky’s case against Missouri’s plant-based label censorship law determined that the law applies only to labels that are inherently misleading, and that labels that include qualifiers like “plant-based” in conjunction with meaty terms adequately inform consumers of the nature of the product. This result is a win for producers and consumers of plant-based products in the state, who can continue buying and selling plant-based products using familiar, informative, and truthful labeling.

Conclusion

In 2023, governments rallied an impressive round of commitments for alternative proteins, employing new policy mechanisms and developing new programs to support both research and development and commercialization in the field.

As the world looks to the rest of 2024 and beyond, governments increasingly recognize alternative proteins as irreplaceable elements of climate change mitigation, environmental stewardship, and economic development, as well as key value-adds to the broader agricultural and biotechnology sectors of which they are a part. Governments investing in their future jobs, economies, food security, environmental well-being, public health and more are beginning to include alternative proteins on their agenda.

But while governments and global institutions recognized alternative proteins' potential much more firmly and explicitly in 2023 than ever before, the global community has plenty of ground to cover before alternative proteins can deliver on the benefits they promise.

To realize their full potential, governments must invest \$10.1 billion on an annual basis into R&D and commercialization – a thirtyfold increase from 2023, but just a fraction of the world's spending on electric vehicles, renewable energy, and other crucial technologies. By making public investments on par with other strategic priorities, policymakers can greatly accelerate the pace and scale of protein innovation and position their governments as leaders in a future industry.

Notes on methodology

The State of Global Policy Report primarily tracks funding announcements, calculating the dollar value of announced funding and supportive policies on an annual basis. While the report separately tracks the estimated disbursement of funds by year, dividing the total amount of the funding by the years it is active (if known), the country totals reported include both past, spent funding and future, committed funding unless otherwise noted.

Currency conversions to USD are calculated by the average exchange rate on an indicated date, typically the date of the announcement or the project's start date, whichever is earlier (or whichever is known). If no dates are known, the conversion is calculated on the first day of the known month or year of the investment. This results in some discrepancies in the U.S. dollar value of funding items and country totals reported in the 2022 State of Global Policy Report.

Loans, loan guarantees, dilutive investments, and other funding arrangements in which governments may expect complete, partial, or equity-derived reimbursement are nevertheless calculated as the full monetary value of the loan or loan guarantee. These types of funding arrangements provide both tangible and intangible value to the alternative protein ecosystem even when eventually recouped by funders. Governments also often set aside the entire amount of a loan guarantee while the funding arrangement is active, representing a temporary government outlay even when no transaction ultimately takes place.



About the Good Food Institute

As a nonprofit think tank and international network of organizations powered by philanthropy, GFI works alongside scientists, businesses, and policymakers to make alternative proteins as delicious, affordable, and accessible as conventional meat. In Asia Pacific, Europe, Brazil, India, Israel, and the United States, our teams are mobilizing the international community to use markets and technology to replace harmful practices with ones that are better for the climate and biodiversity, food security, and global health.

We focus on three programmatic priorities:



Cultivating a strong scientific ecosystem

GFI develops open-access research and resources, educates and connects the next generation of scientists and entrepreneurs, and funds research that benefits alternative protein development.



Influencing policy and securing government investment

GFI's policy teams ensure that alternative proteins are a part of the policy discussion about food security, climate change mitigation, and global health. In every region where we have a presence, we advocate for government investment in alternative proteins and are paving the way for the approval of novel proteins such as cultivated meat.



Supporting industry to advance alternative proteins

GFI's corporate teams are replicating past market transformations and partnering with companies and investors across the globe to drive investment, accelerate innovation, and scale the supply chain—all faster than market forces alone would allow.

Appendix

Public funding tables

The tables below summarize all public funding known to GFI, providing a snapshot of the state of public support for alternative proteins as of the end of 2023. For an itemized list of the individual grants, investments, and budget items included in these totals, please see the data table on GFI's [State of Global Policy](#) web page.

The topline totals below include global government funding for alternative protein research and private sector incentives across all three alternative protein production platforms, from the earliest known projects through the end of 2023. They include research grants for universities, companies, and consortia, as well as in-house research conducted by

government agencies. They also include funding for commercialization including business grants, loans, loan guarantees, and investments.

While the information in GFI's dataset is as comprehensive as possible, some funding is certainly missing. State-owned investment funds and enterprises, which are especially relevant to Asia and the Middle East, can be opaque. For instance, the total amount Singapore's government has set aside for alternative proteins is not public. Likewise, smaller amounts of local and state-level funding (across different German or Chinese regions, for example) are not widely reported.

Announced global public funding by jurisdiction

Funder	All-time announcements	2023 announcements
ALL*	\$1,665,897,884	\$522,977,677
Australia	\$53,734,796	\$13,138,549
Austria	\$540,649	\$540,649
Belgium	\$4,001,486	\$0
Brazil	\$1,620,057	\$0
Canada	\$303,270,434	\$129,196,422
China**	<i>Unknown</i>	<i>Unknown</i>
Denmark	\$224,353,995	\$891,495
Estonia	\$829,308	\$829,308
European Union	\$240,978,675	\$113,433,700
Finland	\$67,045,735	\$7,442,410

Funder	All-time announcements	2023 announcements
France	\$67,612,856	\$28,431,330
Germany	\$78,951,135	\$43,641,009
India	\$950,518	\$107,919
Ireland	\$3,548,700	\$0
Israel	\$84,040,839	\$25,665,989
Japan	\$25,106,831	\$19,769,261
New Zealand	\$22,292,521	\$7,609,355
Norway	\$13,511,031	\$0
Singapore***	Est. \$79,900,785	Est. \$1,074,760
South Korea	\$24,200,000	\$6,000,000
Spain	\$15,328,196	\$7,759,348
Sweden	\$16,036,249	\$1,615,409
Switzerland	\$2,866,093	\$1,074,760
The Netherlands	\$78,977,310	\$8,462,790
United Kingdom	\$59,685,629	\$24,414,278
United States	\$127,573,952	\$81,878,936

**This figure includes information provided confidentially to GFI on public funding, including from governments not listed in this table, and may not equal the sum of the listed subtotals.*

***China does not disclose information on public funding, though market conditions indicate likely government investment in alternative proteins.*

****These funding totals from Singapore are estimates based on information available to GFI and are likely undercounting the total public investment in alternative proteins.*