2024

State of Alternative Proteins

A global glimpse at the state of the industry

gfi / Good Food Institute®

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Editor's note

Alternative protein innovation and the future of food

What will the future of food look like? If you scan through the following pages, you might conclude that it will look like animal-free cheese on artisan pizza or plant-based omelets on the breakfast table as the norm, not the exception. But while the societal benefits of shifting toward alternative proteins are now clearer than ever before—this food future is not inevitable.

Meat consumption worldwide is projected to rise by at least 50 percent by 2050 from 2012 levels. Given finite land and water, we're unable to scale up existing meat production indefinitely. So what is one agricultural innovation that can diversify meat production, help meet growing demand, and scale similarly to renewable energy? Alternative proteins—the meat consumers know and love, made far more efficiently, and with a lighter footprint.

This 2024 State of Alternative Proteins report is new this year. You may already be familiar with our State of the Industry reports, an annual series that provides an in-depth look at the year's developments in cultivated meat, fermentation-enabled proteins, plant-based meat, and global policy. This report is a bit different: we're looking across the entire alternative protein field and zooming in to read between the lines, sharing stories about the people and places who are bringing this innovative work from theory to reality. In the following pages, you'll read about chefs embracing alt proteins, researchers discovering new pathways to taste and price parity, and industry innovators propelling the field forward. You'll also find consumer insights, regional takes, and opportunities to dig deeper, all adding up to a global snapshot of the alt protein ecosystem in 2024 (and beyond).

At GFI, when we envision our food future, we see more and better choices for consumers, not fewer. We see meat eaters filling their family dinner tables with delicious plant-based, fermentation-enabled, and cultivated options without sacrificing taste or cost. We see more reliable supply chains, future-resilient jobs and livelihoods, cleaner air and water, and fewer risks to public health. Simply put? We see a future where diverse foods satisfy consumer expectations on flavor, nutrition, affordability, and sustainability. Read on for stories of people from around the world working to create this future of abundance—a future of foods that benefit personal, public, and planetary health. Much work lies ahead—we're so glad you're here and on this path with us.

–The GFI team

The alternative protein ecosystem

Where we've been:

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Zoom in on one lab in Illinois, the Illinois Fermentation and Biomanufacturing hub, to learn about how underutilized corn feedstocks can be converted into high-value proteins (pg. 18).

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Ultraprocessed foods

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Alt proteins and strengthening national security

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2024: At-a-glance

In a year marked by global political change, extreme weather, and food system stresses, one truth came into focus: innovation is critical to our food future. Three themes stood out.

Feeding more people in far better ways

The alt protein ecosystem is helping do exactly that, even in a challenging funding environment.

AI and cost reduction: Companies partnered to utilize AI to develop processes and technology to reduce the cost of cultivated meat. Others agreed to codevelop equipment.

Approaching taste parity: According to 2024 sensory research by NECTAR, the average plant-based nugget tested has already achieved taste parity with its animal-based counterpart.

Process optimization: Biomass and precision fermentation companies partnered with technology, equipment, cultivated fat, and diversified food companies to reduce costs and optimize processes.

Expanding consumer choice

Food freedom unites folks with different perspectives: momentum for more and better choices for consumers is building.

State bans: Across 12 states in the U.S., 14 bills to ban cultivated meat were introduced. All but two failed to pass.

On labeling: In the U.S., the Food and Drug Administration released draft guidance (January 2025) on labeling: plant-based food labels can include the names of animal-derived foods, as long as labels are not misleading.

R&D investment: South Korea, Japan, Singapore, and New Zealand funded public and private research to advance cultivated meat science.

Protecting our planet and public health

A year of extreme weather and heightened pandemic risk further underscored the need to diversify protein.

Funding and emissions: Food, agriculture, and land use was only 8% of venture funding in climate tech in Q4 2023 through Q3 2024, despite comprising 22% of global emissions.

Impact of alternative proteins: In 2024, the World Bank published *Recipe for a Livable Planet*, which examined 26 of the agriculture, forests, and food sector's most promising emissions mitigation interventions. The analysis ranked a shift toward alternative proteins second for technical climate mitigation potential, at 6.1 $GtCO_2$ eq per year—six times the equivalent of eliminating air travel worldwide.

Industry

Global demand for meat and seafood continues to grow. To meet that demand, we must diversify the food supply.

In 2024, industry stakeholders were hard at work producing food more efficiently, with fewer harms and more benefits. The alternative protein ecosystem progressed over the year with expanded production capacity, new innovation hubs, and the launch of new products from plant-based whole-cut steaks to chicken breasts. The deep-dive details on the year's progress can be found in our 2024 State of the Industry reports. Read on for a snapshot of how the field is evolving and the people and places behind this progress.

What makes consumers tick?

- **Not all consumers are created equal:** Consumers are interested in alternative proteins for various reasons: taste, health, nutrition, sustainability, and more. GFI's U.S. plant-based meat consumer segmentation identified six distinct groups with varying needs and attitudes toward plant-based meat that present unique opportunities to grow consumption.
- **Price concerns:** Across several Southeast Asian countries, 44% of consumers said they would eat more plant-based meat if it were more affordable. Consumers in other regions expressed similar sentiments.
- **Expanding alternative protein perceptions:** Across several European countries and the U.S., almost 50% of consumers said they are open to trying precision fermentation-enabled products, but educating consumers is key to unlocking demand.

Photo credit: Plant Sifu, a brand by Good Food Technologies

2024 by the numbers

The largest deals of 2024

$100 million

Meati, fermentation

$54.6 million

Prolific Machines, cultivated meat

$43 million

Heura, plant-based

Total investments in alternative protein companies, 2024

$651 million

fermentation

$139 million

cultivated meat and seafood

$309 million

plant-based

New partnerships

At least **45** new partnerships were formed in the cultivated meat, fermentation, and plant-based fields.

Plant-based sales

United States

According to SPINS, retail sales totaled **$8.1 billion** in 2024, more than twice the figure from 7 years ago. Versus 2023 levels, sales were down 4% in dollars and 5% in units.

Global

According to Euromonitor, retail sales totaled **$28.6 billion**, up 5% for plant-based meat, seafood, milk, yogurt, ice cream, and cheese.

A moment for plant-based eggs

As bird flu spreads, conventional egg prices in the U.S. are soaring and supply is plummeting—sparking an opportunity for alt proteins.

U.S. consumers, already frustrated with rising food prices, often found empty egg shelves at the grocery store in early 2025. Conventional egg prices hit record highs (up 53 percent between January 2024 and January 2025), and reliable supplies hit new lows. Stores placed limits on how many cartons could be bought at any one time, and some restaurants began adding surcharges for eggs. The fragility of our current food system has been exposed, one empty egg shelf at a time.

So how do consumers react when shelves are bare and shoppers are still looking for something to put on the breakfast table or in their cake batter? One consequence of soaring conventional egg prices was an increase in demand for plant-based eggs. Eat Just shared that Just Egg's sales grew five times faster in January 2025 alone than in the prior year.

The lack of availability of conventional eggs broadened the horizon for consumers to choose plant-based options, and the data speaks to how they're reacting: 56 percent returned to buy more in 2024 (an increase from 44 percent in 2022), according to SPINS data.

Are plant-based eggs now poised to capture more of the market? With conventional egg prices projected to rise by another 20 percent in 2025, the table is certainly set for innovations like plant-based eggs to play a significant role in future-proofing supply chains while providing delicious options for protein—reliably stocked at the supermarket.

Photo credit: Eat Just

Market trends

- **Spike in Just Egg sales**: A total of 91% of households purchasing Just Egg are reportedly not vegetarian or vegan, demonstrating the product's widespread appeal.
- **Zooming out:** Retail dollar sales of plant-based eggs in the U.S. grew by 11% between 2021 and 2023, and were up another 2% in 2024, according to SPINS.
- **Who buys eggs**: A total of 93% of U.S. households purchased conventional eggs in 2024, according to SPINS, revealing a significant opportunity for plant-based companies.

Dig deeper: Global insights and consumer research

- **Willingness to try**: GFI Europe/Accenture research (France, Germany, Spain, UK, U.S.) found that one in five participants indicated they would purchase precision fermentation egg products to prepare at home.
- **Global prices**: Green Queen reported that since 2019, egg prices have doubled in South Africa and ballooned by 50% to 90% in other places around the globe, including Europe, India, and Brazil.
- **Global demand**: Data Bridge Market Research is predicting that the plant-based egg market will grow by 40% annually in Europe and 73% annually in Asia.

Photo credit: Eat Just

Innovation at an artisan pizzeria

How one chef, known nationwide in the U.S. for her pizza, is finding inspiration in dairy-free cheese.

Chef partnerships play a pivotal role in the successful launch of new alternative protein products. As the bridge between suppliers and consumers, chefs have the unique ability to highlight an ingredient's potential, showcase its flavor, and communicate its benefits in ways that encourage consumer trial. Their credibility and culinary influence make them trusted advocates for food innovations.

When introducing an unfamiliar ingredient, such as a precision fermentation-derived protein, having the right culinary influencers is essential. A prime example is New Culture, a precision fermentation company who is partnering with renowned LA chef Nancy Silverton to debut its animal-free mozzarella.

Silverton is a cheese expert and enthusiast, and this collaboration marks the first time Silverton is incorporating a nondairy cheese into her restaurant's menu. Reflecting on the product, she shared, "I've always believed that a substitute should be just as spectacular as the original. When I tried New Culture cheese, I was surprised and excited by the integrity of the product and felt it truly met our standards."

This partnership exemplifies the growing integration of alternative proteins into diverse culinary landscapes, where chefs play a leading role in driving innovation and advancing sustainability through their menus.

— Marika Azoff, GFI Corporate Engagement Lead

Photo credit: New Culture

Consumer insights

- **Consumers are open**: A minority of U.S. consumers are familiar with precision fermentation-enabled dairy today, but many are interested (39% find it "very" or "somewhat" appealing). More education is needed to help consumers understand this category.
- **Health is a key driver**: Health is a key driver of interest in precision fermentation-enabled dairy, with almost half (48%) of U.S. consumers saying it is the top reason they would try the products.
- **Names matter**: "Animal-free" is the top naming option for precision-fermented dairy in terms of appeal and differentiation, but more options may be necessary to reflect differing consumer perceptions and motivations.

Photo credit: New Culture

In the media: 2024

Key trends: Consumer adoption, market growth, and major investments

"Our World is Poised for Transformation": Jeff Bezos Pledges $60 Million to Build a Plant-Forward Food System

This *VegNews* headline (March 15, 2024) highlights growing confidence from high-profile investors in the alternative protein ecosystem, reinforcing the sector's role in combating climate change and driving a more sustainable food system. Jeff Bezos' $60 million pledge underscores the industry's progress in scaling plant-based and cultivated meats while addressing key cost and quality challenges.

NEW TENDER FOOD CEO HAS BOLD PLANS FOR EXPANDING SOMERVILLE STARTUP

This *Boston Globe* story (December 9, 2024) explores the role of American businesses in building a more sustainable food system. With former Oatly president Mike Messersmith as CEO, Tender Food is scaling its innovative plant-based meat beyond Massachusetts. Its new commercial facility, competitive pricing, and 2025 funding plans highlight the plant-based sector's resilience and potential for growth.

Photo credit: Dream Factory and Moving Mountains Foods

From lab to plate: a six-course banquet featuring no-kill dim sum and steak frites

This Guardian article (February 25, 2024) walks through a hypothetical future six-course meal, featuring a range of cultivated meat and precision fermentation products. It applies a culinary lens to alternative protein innovations, noting their potential to provide more climate- and animal-friendly options for meat eaters.

The funky mold turning food waste into culinary delights

Though using "mold" in the description of an alternative protein may not be the most flattering, the trend of turning food waste into innovative, sustainable ingredients is growing, as this *Grist* piece reports (November 8, 2024). This mold transforms discarded materials into high-protein products, offering a cost-effective way to scale alternative proteins, reduce food waste, and address environmental concerns.

What did the headlines miss about alt proteins in 2024?

A motivated industry focused on the long game.

Headlines matter. While the alternative protein industry sees its fair share of stories covering market growth and major investments, it also sees some misleading headlines. One misleading headline can paint an inaccurate or incomplete picture of a nascent industry.

So how do we read between the lines? GFI's Substack, *Alt Protein Planet*, included a round-up that captures many industry milestones that flew under the radar in 2024.

Dig deeper to learn more about:

Diversifying protein

How governments around the world showed their support for diversifying meat production in 2024.

Funding bright spots

In a challenging funding environment, companies like Meati, Plantible, and Evocative secured substantial funding.

Facilities are expanding

At least 46 alternative protein facilities (four cultivated meat, 16 fermentation, and 26 plant-based) launched, expanded, or were announced in 2024, contributing to economic growth around the world.

We also highlight some standout articles in 2024 from outlets like *The New York Times*, *Fast Company*, *Vox*, and more.

Photo credit: Meati Foods

How plant-based meat is different from most UPFs

Not all ultraprocessed foods are created equal.

Much of the recent public debate around plant-based meat focuses on the nutritional value of ultraprocessed foods (UPFs). Attention-grabbing headlines have conflated the level of processing a product undergoes with its healthiness. Some argue that because plant-based meats are more processed than, say, whole legumes, they must be unhealthy. A closer look reveals that not all UPFs are created equal.

Though consumption of some UPFs has been linked to increased risks of adverse health outcomes like cardiovascular disease and high cholesterol, this association is driven largely by ultraprocessed foods like chips, candy, and sweetened beverages.

Plant-based meats are not only better choices than those UPFs, they are also generally much more nutritious than their animal-based counterparts, with less saturated fat, no cholesterol, more dietary fiber, and zero antibiotics or hormones. In other words, unlike other UPFs, plant-based meats are healthier than the foods they were designed to replace.

This January, GFI hosted a webinar with Dr. Michael Greger of NutritionFacts.org focused on interrogating assumptions around ultraprocessed foods. Dr. Greger makes the case for a more nuanced view, going beyond the headlines to recognize the tangible nutritional benefits of plant-based meat products.

Check out Dr. Greger's webinar to dig deeper on several topics:

How are UPFs categorized?

Identify the 16 factors used in the ultraprocessed foods classification system and how plant-based meat stacks up against animal meat in each category.

What are the takeaways from scientific studies?

Learn about studies comparing the health impacts of animal-based meat to plant-based meat, including the randomized controlled trials that showed how partially substituting conventional meat with plant-based meat could save thousands of lives a year and billions of healthcare dollars.

How can plant-based meat help address certain health risks?

Understand the value of plant-based meat in circumventing health risks associated with consuming animal-borne pathogens.

APAC emerges as a future food epicenter

The protein innovation ecosystem is growing in Singapore and beyond.

In his final speech before passing the torch, Singapore's outgoing prime minister Lee Hsien Loong struck an optimistic tone. Following years of government investments into the city-state's protein innovation ecosystem, young Singaporeans could now take up careers that "did not even exist in their parents' generation," he said, including as novel food biotechnologists, which "means you take a plant and you make it look like Wagyu beef."

Mr. Lee had good reason to celebrate. While Silicon Valley startups dominate the headlines, Singapore has quietly invested 24 times more into protein innovation than the United States as a percentage of GDP, creating a world-class R&D ecosystem in one of the planet's fastest-growing regions.

In collaboration with GFI APAC, local universities now offer a wide array of alternative protein workforce-development programs, and government officials have created first-of-a-kind templates on everything from novel-food regulatory approval frameworks to halal standards for cultivated meat.

The Lion City is not alone. Across Asia, countries are investing in R&D and manufacturing infrastructure that could thrust the alt protein sector into commercial viability—pulling from the proven playbook used to scale up solar energy and electric vehicles. South Korea is expected to issue its first cultivated meat approval this year, and Thailand is hot on its heels: China just opened its first alt protein innovation center in Beijing; Malaysia's prime minister commissioned a cultivated-meat industry feasibility study; and GFI is leading efforts to coordinate regional regulatory frameworks, so that startups can simultaneously roll out products in multiple markets.


Eating more plant-based foods and cultivated meat products could have large environmental benefits.

In Asia, alternative proteins are the new clean energy

Just as renewables are central to satisfying soaring energy demand, there is enormous economic opportunity in producing protein more efficiently. As our planet warms, countries will need innovative ways to make more meat with fewer resources—and Asia is once again laying the groundwork to sell the world what it needs.

— Ryan Huling, GFI APAC Senior Writer

Policy

Governments around the world are investing in alternative proteins as new ways of diversifying the food supply.

In 2024, governments increasingly recognized that diversifying protein adds resilience to our food system and can strengthen food security. While milestone moments, including the United States' iFAB Tech Hub and India's Bio-RIDE biotechnology development plan, were noteworthy points of progress for food innovation and biotechnology, challenges remain–especially in regard to preserving consumer freedom of choice. The deep-dive details on the year's progress can be found in our 2024 State of the Industry reports, but read on here for a snapshot of the year's most notable moments and an inside glimpse at iFAB in Illinois, the connection between cultivated meat and national security, and more.

Global progress

- **Milestone public investment in India:** The government of India allocated INR 9197 Crore ($1.1 billion) through 2026 under Bio-RIDE, a component of the BioE3 policy with smart proteins (alternative proteins) as one of the six key thematic sectors.
- **Surge in U.S. public support:** The Department of Commerce awarded a $51 million grant to the University of Illinois Urbana-Champaign to establish the first lab-to-product innovation hub in the U.S. for precision fermentation, matched by significant state and private investment.
- **Cultivated meat can be halal:** Singapore's Islamic Council made the landmark announcement that cultivated meat may be deemed permissible as halal.

Photo credit: GOOD Meat

Labeling and regulatory milestones

- **Chile:** In January 2024, a valuable precedent for plant-based products in Chile was set when the Chilean Court of Appeals at Valdivia dismissed a lawsuit that sought to prevent Chilean plant-based dairy company NotCo from using the term "milk" on their plant-based beverages.
- **Europe:** In November 2024, the European Food Safety Authority Panel on Genetically Modified Organisms found Impossible Foods' soy leghemoglobin to be safe for consumption. It is now pending final approval by the European Commission and the EU member states.
- **United States:** In January 2025, the Food and Drug Administration released draft guidance stating that plant-based food labels can include the names of animal-derived foods, as long as the labels are not misleading.

Impediments to the free market

- **United States:** Bills to ban cultivated meat were introduced across 12 states in 2024; all but two failed to pass. In March 2024, Florida's legislature became the first in the country to vote to ban cultivated meat, with the governor signing the bill into law on May 1 (litigation challenging the ban is ongoing). In May 2024, Alabama enacted its own ban on cultivated meat.
- **Europe:** In July 2024, Hungary introduced draft legislation to ban the production and marketing of cultivated meat, which was met with opposition from other member states and the European Commission when it was submitted to the cross-EU legislative scrutiny procedure.
- **South America:** In April 2024, Paraguay's National Congress passed a law banning the production, import, and export of food obtained by animal cell cultivation in the country. In Brazil, two bills were presented at the state level seeking to ban the use of nomenclatures associated with animal products by plant-based products. One was rejected (in the state of Mato Grosso) and the other was vetoed by the governor after approval by the Assembly (in the state of São Paulo).

How food biomanufacturing can build local economies

In Illinois, a tech hub is creating jobs and economic value for the region–uniting scientists, farmers, and manufacturers along the way.

My grandfather used to say that any job is easy as long as you have the right tool. When I look around at our food system right now, we have a big job in front of us with rising prices and unpredictable supply chains.

Perhaps the most promising tool is food biomanufacturing—using our biological resources to produce foods and proteins that we eat every day. We can learn from industries like regenerative medicine and biotech, adopting similar techniques to diversify and complement our current food system.

But it's not just about innovation. How do we make sure it is the right tool for the job? How do we incorporate the technologies into our communities?

Dr. Beth Connerty at the University of Illinois is attempting to answer these questions. Her lab at the Illinois Fermentation and Agricultural Biomanufacturing Hub (iFAB) is working to bolster the food system, support small businesses, and create new economic opportunities—all within a 51-mile radius in Central Illinois.

iFAB has received over $50 million in public investment to scale up precision fermentation in the region—to convert underutilized corn feedstocks into high-value proteins, ingredients, materials, and chemicals. As these new industries expand, they could become a major part of the local economy. Dr. Connerty recently told GFI, "Regional innovation and place-based economic development are crucial to engaging a wider faction of the local workforce."

The iFAB team is designing the system to complement the region's biggest assets: corn farmers and food producers. "In addition to creating jobs for trades, operators, and engineers, building the biomanufacturing economy provides a market for local agriculture," Connerty noted. iFAB is working alongside regional stakeholders from the university, ADM, and Primient to create a vision that benefits rural workers and growers.

These biotechnologies can be tailor-made for the crops and resources of that region. iFAB is the right tool for Central Illinois, but other regions will require other tools. In 2025, I will be tracking regional bioeconomies across the United States, like cellular agriculture in North Carolina, upcycling food waste in the Northern San Joaquin Valley, and producing food with microorganisms at the University of Nebraska.

– Curt Chaffin, GFI Senior Fellow, Regional Bioeconomies

Photo credit: SeventyFour/Shutterstock.com

In the media: 2024

Key trends: Policy battles and regulatory shifts in an evolving food landscape

> Why cultivated, or lab-grown meat, is not only safe, and ethical, but also a smart way to create protein

This *Toronto Star* headline (May 30, 2024) reinforces the safety, ethics, and efficiency of cultivated meat while countering skepticism and misinformation. Framing cultivated meat as a "smart" solution supports broader acceptance and potential regulatory advancements.

Photo credit: UPSIDE Foods

> LAWSUIT ATTACKS FLORIDA'S LAB GROWN MEAT BAN AS UNCONSTITUTIONAL

This *WIRED* headline (August 13, 2024) highlights the legal battle over cultivated meat's future in the United States, which could impact market access, consumer choice, and regulatory pathways for cultivated meat nationwide.

> **Asia's embrace of cultivated meat will bring industry leadership**

A column for *Nikkei Asia* (April 7, 2024) articulates how Asian innovation hubs have attracted global alt protein startups thanks to proactive government investments and clear pathways to market. APAC countries are sprinting toward a more secure food future, "guided by the firm belief that scientific innovation is not only beneficial to feeding future generations, it might be the only thing that can."

Photo credit: xuanhuongho/Shutterstock.com

> **New technologies can improve the resilience of Canada's food system**

This *Financial Post* headline (November 27, 2024) elevates how food innovation, including plant-based and cultivated meat technologies, can reduce Canada's reliance on traditional supply chains, lower environmental impact, and create a more resilient system in the face of climate change and global disruptions.

Alt proteins: a tool for national security

Food security is a national security issue.

To better understand the connection between food security and national security, our Substack *Alt Protein Planet* featured a discussion between GFI director of policy and government relations Pepin Andrew Tuma, and Wildtype CEO Justin Kolbeck. The two discussed why the U.S. government should support cultivated meat and seafood to strengthen national security.

"Politics should not stand in the way of [the U.S. Department of Defense's] plans to research and develop food system solutions. It simply makes no sense to stifle innovation on promising technologies with potentially enormous stakes."

— Pepin Andrew Tuma, GFI Legislative Director

Here's the context: In recent years, climate extremes, disease outbreaks, conflicts, and market volatilities have exposed vulnerabilities to our agricultural system, disrupting the ability to safely and securely grow, produce, and deliver food. While the United States is well-positioned to lead on alternative proteins, a move that will build a more resilient protein supply chain, policymakers are not always on the same page about the potential of alternative proteins.

Justin Kolbeck, former U.S. Foreign Service Officer and current CEO of Wildtype, saw this firsthand in Afghanistan: "While I was working with U.S. troops and Paktika's provincial governor to provide critical services there, I witnessed the calamitous impact of war on local food supplies. I realized just how fundamental a reliable and secure food system is to national security goals—whether in Afghanistan or back home in the United States."

Dig deeper in this conversation to learn more about:

The impact of food innovations

Cultivated meat and seafood can enable small-scale, localized food production at military bases, on submarines, and even on space missions.

Beyond national security benefits

Beyond defense-related applications, benefits of cultivated meat and seafood include expanded consumer choice, increased supply chain resilience, and reduced dependence on imports.

Leadership in agriculture research

If cultivated meat research and development were to be limited, it would take a valuable tool out of our toolbox to feed our country efficiently.

Public investment report: 2024

Wins at the global, state, and local levels that had our social audiences digitally cheering.

Global

The UK government committed to investing £15 million in an innovation hub to accelerate the commercialization of plant-based, cultivated, and fermentation-enabled foods.

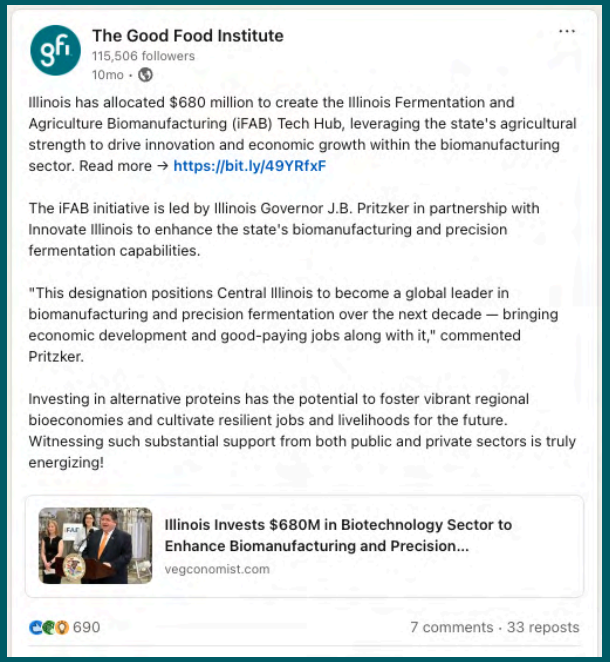
The EU, as part of the European Innovation Council's Work Programme 2024, announced it is investing €50 million to assist start-ups in scaling up the production of food from precision fermentation and algae.

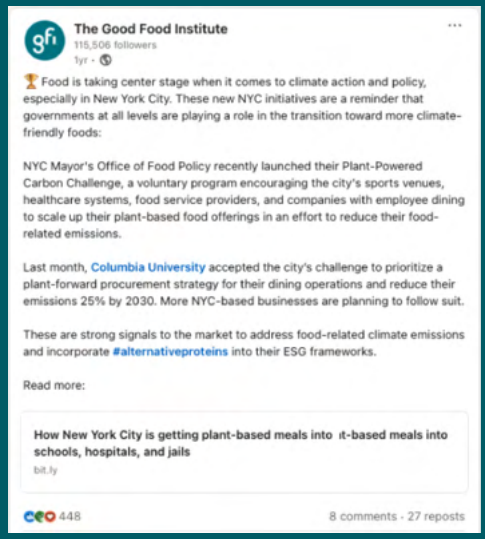
State

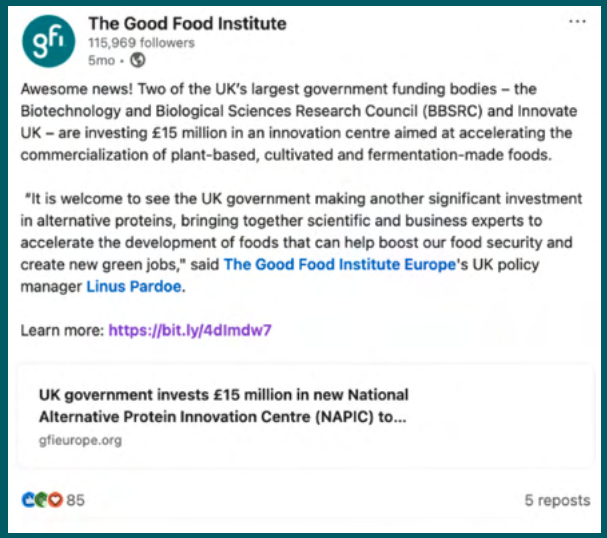
Last March, Illinois announced that it had allocated $680 million to create the Illinois Fermentation and Agriculture Biomanufacturing (iFAB) Tech Hub, leveraging the state's agricultural strength to drive innovation and economic growth within the biomanufacturing sector.

Local

In early 2024, the NYC Mayor's Office of Food Policy launched their Plant-Powered Carbon Challenge, a voluntary program encouraging the city's sports venues, healthcare systems, foodservice providers, and companies with employee dining to scale up their plant-based food offerings in an effort to reduce their food-related emissions.







Science and technology

We can't keep growing our food supply with our finite land and water resources.

The World Resources Institute refers to this fact as the "global land squeeze," leading to increased competition over finite land and water, greater emissions, and unprecedented biodiversity loss. Alternative proteins use far less land and water, and in 2024, the science and research ecosystem for alternative proteins took significant strides forward to creating a better food future.

The deep-dive details on the year's progress can be found in our 2024 State of the Industry reports, but read on here for a snapshot of the year's most notable moments including research ecosystem expansion plus a glimpse into the environmental benefits of plant-based meat, a look ahead at the Gordon Research Conference, and more.

2024 milestones

- **Research ecosystem expansion**: The Bezos Earth Fund pledged $90 million to three Bezos Centers for Sustainable Protein at North Carolina State University, Imperial College London, and the National University of Singapore, which will bring stakeholders together across disciplines to develop and commercialize alternative proteins.
- **Global innovation hubs**: In 2024, global innovation in alt proteins continued to expand at dedicated hubs including the Alternative Protein Technology Innovation Center of the China State Administration for Market Regulation, the UK's four dedicated alternative protein research centers, and India's IKP Knowledge Park's Centre for Smart Protein and Sustainable Material Innovation.
- **Shared manufacturing facilities**: In 2024, The Cultured Hub in Switzerland opened its doors, FermboxBio/BBGI partnered with Aleph Farms to co-manufacture products in Thailand, and Tufts University received a $2.1M grant from Massachusetts to establish pilot scale-up facilities on campus.

By the numbers

Plant-based

- **More than 70%** of the literature on plant-based meat was published after 2015, and more than 50% after 2020, demonstrating that scientific discovery and research in the field is growing—and fast.

Cultivated meat

- The cultivated meat industry has made remarkable strides in reducing input costs, culminating in the latest data from 2024 showing media costs **dropping by over 99%** from a pharma-grade baseline, driven by key ingredients being derived from affordable, food-grade alternatives.

Fermentation

- Global fermentation alternative protein patents have surged over **6500%** in 10 years to over 2,400 unique filings and 1,000 patent families, with most in biomass fermentation and a jump in precision fermentation.

What are the environmental benefits of plant-based meat?

Let's take a closer look at the most comprehensive, open-access life cycle assessment (LCA) to date.

Using real-world supply chain data, GFI's 2024 ISO-certified study confirms that plant-based meats offer significant environmental benefits over conventional meat—regardless of how it is made. Plant-based meat has an 89 percent lower environmental impact than animal-based meat. Here's how that breaks down:

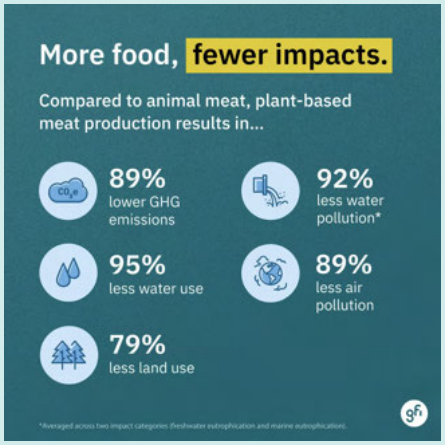
- **91%** lower impacts than beef
- **88%** lower impacts than pork
- **71%** lower impacts than chicken

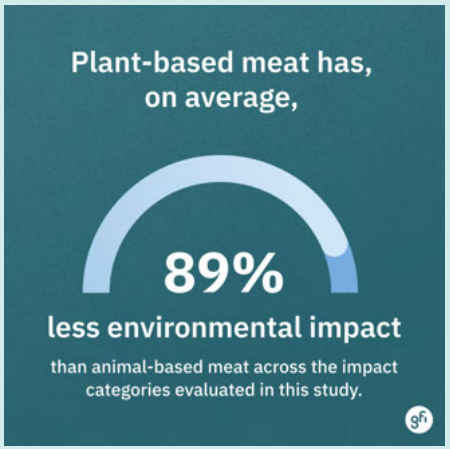
Plant-based meat production requires significantly less land, water, fossil fuels, pesticides, and fertilizers compared to animal meat.

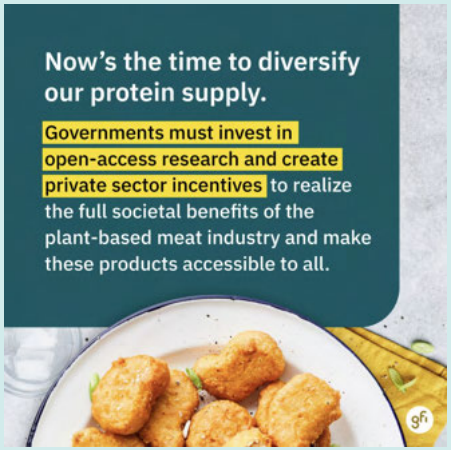
Diversifying the protein supply to include more plant proteins that rely on fewer inputs and resources can boost efficiency, reduce staple crop prices, and make the global food system more resilient to supply chain disruptions.

"This study shows just how significantly plant-based meat can reduce our food system's environmental impacts—no matter how it's made. By requiring fewer resources while producing more food, plant-based meat helps build a more resilient and efficient food system. Now is the time to invest in innovation and scale the industry to make plant-based meat more affordable and accessible for all."

— Nikhita Mansukhani Kogar, PhD, GFI Senior Lead Scientist







Looking ahead: Gordon Research Conference January 2026

Alternative protein research is gaining momentum in the scientific community.

Alternative protein technologies are no longer living on the fringes of the scientific community. While there are no doubt many challenges left to explore and resolve, scientists are increasingly coming to appreciate both the technical complexity and tremendous societal potential underlying these technologies.

The task of biomimicking meat is enormous. It's ripe with interesting scientific and engineering challenges, and success is not at all a given. What we do know, however, is what we see and hear from the scientists themselves: these problems are tractable enough to try. Given the challenges we face as a society that relies on animals for food production, we'd better put the world's best and brightest to the task.

In 2024, a group of four scientific leaders—David Kaplan, Mette Lubeck, Amy Rowat, and Girish Ganjyal—put forth a successful proposal for a new Gordon Research Conference (GRC) focused on plant-based, cultivated, and fermentation technologies. GRCs are known to be among the most prestigious and intimate conferences for academic sub-fields, with many researchers pointing to them as the most impactful and meaningful experiences of their careers. The Gordon Research organization is also highly selective, focusing on vital, emerging areas of science that can generate significant interest across the international scientific community.

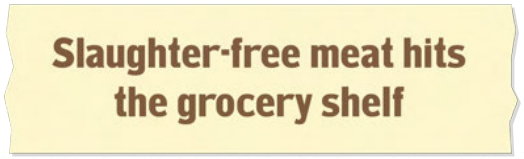
Beginning in 2026, and every two years thereafter, a GRC focused on "Foods of the Future: Science and Engineering Approaches" will assemble hundreds of brilliant minds from the global research community to talk alternative protein science with their peers. This milestone is not only a significant demonstration of the central importance of alternative proteins, but additionally a mechanism for expanding and connecting the academic community.

Future iterations of this GRC may include Gordon Research Seminars, which focus on opportunities and networking for junior researchers. We expect these future foods GRCs to build momentum and a sustained community for alternative protein science, serving as an invaluable convening for academics to share their most cutting-edge, unpublished work and learn from their colleagues.

— Amy Huang, GFI Senior Associate Director of Scientific Ecosystems, and Bianca Datta, PhD, GFI Scientific Partnerships Manager

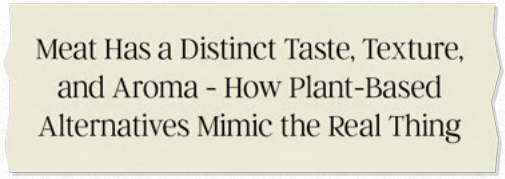
In the media: 2024

Key trends: scientific strides and technological breakthroughs

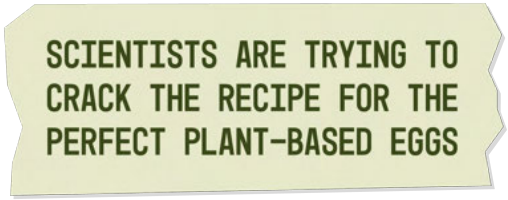


This *Nature Biotechnology* headline (August 7, 2024) covered the grocery store debut of cultivated meat, a game-changing technology with the potential to reshape consumer perceptions of where we get our meat. It also underscores the importance of forward-thinking regulatory frameworks, like Singapore's, to facilitate the integration of alternative proteins into existing food systems.

This *PRX The World* headline (August 8, 2024) explains how cultivated seafood, like Israeli company Forsea's cultivated eel, eliminates the need for intensive aquaculture and antibiotics, which contribute to antimicrobial resistance and zoonotic disease risks.



This *Discover Magazine* headline (November 28, 2024) highlights the advancements food scientists have made by using proteins, fats, emulsifiers, and Maillard reactions to create plant-based meat that mimics the taste, texture, and aroma of traditional meat, addressing a key barrier to consumer adoption.



This *Smithsonian* headline (December 2, 2024) shows food scientists' ongoing efforts to improve plant-based egg substitutes by addressing key challenges like replicating egg functionality and enhancing nutrition and taste. By solving these issues, the alternative protein industry can significantly impact food production and reduce environmental footprints.

Photo credit: AcreMade

Alternative proteins: on the global health agenda

Folks want to know they can feed their families despite emerging public health threats that impact our food system (like zoonotic diseases and antibiotic resistance). Around the world, these threats not only destabilize food supply chains but also cause and contribute to millions of preventable deaths and can be extremely costly to taxpayers and governments.

While outbreaks of avian flu are not a new phenomenon, over the years, the situation has intensified. Since April 2024, over 90 million birds have been affected (birds affected is defined as "number of birds on confirmed infected premises"). In August 2024, we wrote a piece to call attention to the rising cases of bird flu in the United States and the need for alternative proteins to help stabilize our food supply. Since then, the U.S. experienced its first human death from H5N1.

The inevitability of a future where antibiotics don't work or another zoonotic disease outbreak emerges hinges on us doing nothing differently. Even without considering public health, the economic case for reimagining protein production is compelling. We are already seeing the economic implications of bird flu unfold on the shelves of grocery stores, with egg shortages and skyrocketing prices. We have tools to help us change the status quo of food production. One of those tools is alternative proteins.

Plant-based, fermentation-enabled, and cultivated meats are not susceptible to animal diseases and do not contribute to pandemic risk because they do not require the use of live animals. Alternative proteins can help prevent future pandemics by decoupling food production from the conditions associated with zoonotic disease transmission. The alternative protein industry is demonstrating that it's ready and willing to respond to modern threats with modern solutions.

Investing in this growing sector ensures that our food systems remain robust and adaptable for generations to come.

Dig deeper into our Substack to learn more about:

- **How do we mitigate the risks our current food system poses?**

  Hint: it's not more of the same old, business-as-usual food production.

- **What percentage of emerging infectious diseases come from animals, wild and domestic?**

  Around 60%.

- **Why is the widespread overuse of antibiotics–both in humans and farmed animals–a major concern?**

  For one, antibiotic-resistant superbugs.

What's trending on social?

These topics piqued the interest of our audiences on U.S. socials.

Fermentation everything

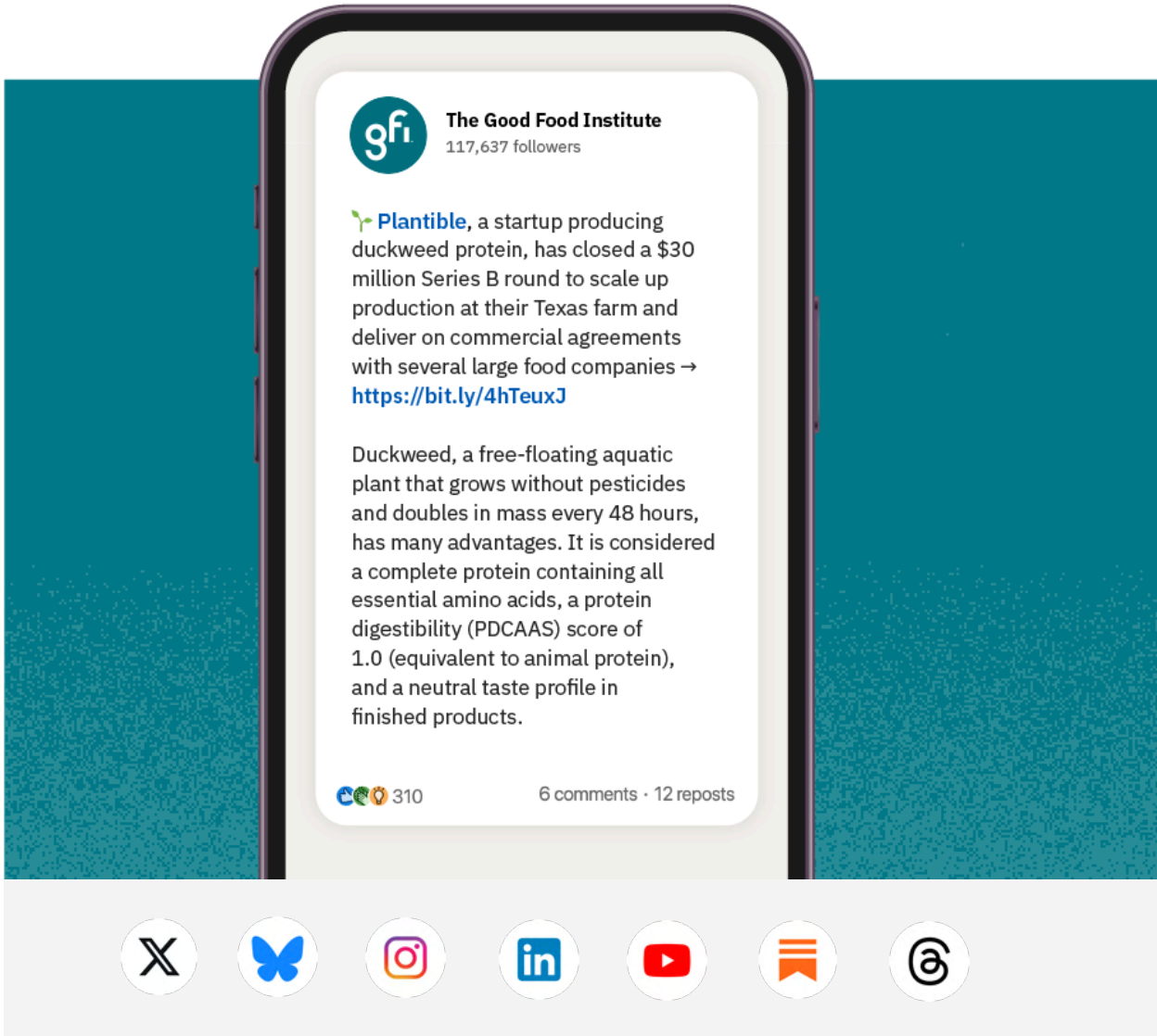
From deep technical analyses on precision fermentation to products that taste and function like their conventional animal-based counterparts, fermentation-enabled protein captured the most social engagement on our channels in 2024. Discover more:

- Precision fermentation peer-reviewed article
- GFI's 2023 sidestreams analysis
- 2023 fermentation manufacturing report

Aquatic plants/seaweed & algae

There's an ocean of opportunity in alternative protein sources if we look beyond the terrestrial, it just takes a little ~~digging~~ diving. Discover more:

- Substack: An ocean of opportunity for alt proteins
- Scientists utilize cyanobacteria to innovate meat-like strands for sustainable proteins



Advancing the alt protein ecosystem

Thanks to our global community of donors, GFI operates in key regions around the world to advance protein innovation, focusing on three programmatic priorities: cultivating a strong scientific ecosystem, emboldening public investments in alternative proteins, and encouraging the private sector to prioritize alternative proteins. Much of our work spans years, with progress in one year making possible more in the next:

We're creating a future food workforce, ready and motivated to diversify protein production

- GFI developed an alternative protein ecosystem map to allow users to see and interact with geographical hotspots of alternative protein activity around the world.
- GFI APAC developed a comprehensive, global careers pathway map designed for university students, recent graduates, and career switchers interested in entering the alternative protein field.
- GFI saw significant global expansion of Alt Protein Project chapters, empowering students and faculty to embark on research into alternative proteins.

We're clearing a path to market and protecting consumer choice

- Teams across the globe (U.S., India, Europe, and Brazil) conducted extensive research to learn more about consumer understanding of and sentiment around various alternative protein types.
- GFI India collaborated through strategic partnerships to support the launch of two industry hubs in India: the Centre for Smart Protein and Sustainable Material Innovation at IKP Knowledge Park and India's first comprehensive facility for alternative protein research, manufacturing, and ingredient development by the Alternative Proteins Innovation Center.
- Bans and labeling regulations were largely successfully challenged by GFI regulatory teams in the U.S., Brazil, and Asia Pacific.

We're sharing deep-dive research with everyone, propelling the entire field forward

- Nutrition was a topic of interest with a U.S.-led gathering of scientists and industry stakeholders to discuss the nutritional attributes of plant-based proteins, and two studies in India, one to analyze the nutrition of plant-based proteins and another to determine the best ways to meet consumer expectations for protein products.
- GFI commissioned and coproduced two analyses, one for the U.S. and one in partnership with Green Alliance that covered Europe, on land use efficiency and restoration opportunities of diversifying protein sources with alternative proteins.

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, contact philanthropy@gfi.org.

To learn more, please visit www.gfi.org

Conclusion

A few closing thoughts... and an invite!

We hope this *2024 State of Alternative Proteins* report broadened and deepened your understanding of this extraordinary field, the people working within it, and the positive, global impacts it can have on the future of food and agriculture. In a time of information overload and nonstop news cycles, we hope this report also provided a calm, clear picture of a multifaceted food system solution still in its relatively early days. While the science, policy, and industry landscapes vary across cultivated, plant-based, and fermentation-enabled protein production, the field as a whole has just started scratching the surface of what's possible. When it comes to taste, price, nutrition, and sustainability, alternative proteins are in hot pursuit of wins on every front.

Most importantly, we hope this report—and the full series of deeper-dive 2024 State of the Industry reports—inspires you to lean in and learn more, stay connected, and see yourself in this important work. As a nonprofit and international network of organizations, GFI is committed to growing the alternative protein ecosystem (and that includes you). Whether you are a curious consumer, a student, early-career professional, or a seasoned supporter or leader fluent in all things alt protein, every single one of us has an opportunity to help create a far more sustainable, secure, and just food future. Every single one of us can help create a world where alternative proteins are no longer alternative.

Photo credit: Kerry

About the Good Food Institute

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

Acknowledgments

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