STATE OF THE INDUSTRY REPORT 2026

Smart protein in India

GFI India



Image credit: Biokraft Foods

Editors' Note

India's smart protein journey began as a story of early movers, trailblazing brands, and new products. Most of the industry discourse focused on what was landing on shelves and whether Indian consumers would try it.

Three years since our first State of the Industry report, the dialogue is no longer centred on whether alternative protein is valuable to India but is instead beginning to deliberate on how India can build the foundation for this technology to meet its domestic protein needs and grow to become a leader in the larger ecosystem. This shift did not happen in a straight line. As the global sector went through a correction, capital became more cautious, and some large brands stepped back from retail. India too felt the tremors, but the same period saw the establishment of India-specific groundwork for the future. The central government named smart proteins a national biotechnology priority under the BioE3 policy. States began building it into their own policies.

Today, the collective focus is no longer about offering an alternative to conventional proteins. The smart protein narrative is as much about nutrition security, better value for consumers, technological readiness, resilient supply chains, and India's opportunity to become a manufacturing and ingredient hub for the world. The next phase will naturally progress towards solving the problem of scale, and no single player can get there alone. It will take corporates, startups, investors, government, and academia working together to make this sector investable, bankable, and built to last.

This report brings together what we have seen and learned over the last three years. We hope it provides a clear picture of where the sector in India stands today and gives you direction and a reason to be part of where it goes next.

With gratitude,





Fathima Beevi **Aiyanna Belliappa**



Image credit: PROT

About

About this report

GFI India's second State of the Industry Report covers India's smart protein sector from **April 2023 to December 2025***, continuing from the first edition.

2023	2026
First edition	This edition
New brands, first products	Ingredients, manufacturing, scale

It covers:

- **Plant-based** — Meat, seafood, eggs, and dairy
- **Fermentation-derived** — Meat, eggs, and dairy
- **Cultivated** — Meat and seafood

Across:

01 Industry, ingredients, and manufacturing

02 Products and consumers

03 Investment

04 Research and talent

05 Policy and regulation

Built for:

Startups · Corporates · Investors · Researchers · Policymakers · Students · Regulators · Ecosystem enablers

**Select developments through October 2026, including GFI India initiatives, are included for context and identified separately; coverage of 2026 is not comprehensive.*

About GFI India

The Good Food Institute India (GFI India)* is the leading expert on India's emerging smart protein sector—the ecosystem of plant-based, cultivated, and fermentation-derived meat, eggs, and dairy. Drawing on India's unique strengths—including indigenous crops, a strong agrarian economy, low-cost technologies and infrastructure, an abundant talent pool, and biomanufacturing prowess—GFI India provides strategic market intelligence, ecosystem development support, and sector-focused advisory to institutional, academic, business, and civil society stakeholders across the smart protein value chain.

Our work is also informed by the global research, technical expertise, and best practices shared by our international network of organisations across the U.S., Brazil, Europe, Israel, Japan, and APAC. Our team of experts across science, business, and policy helps our partners unlock the knowledge and resources needed to transform how meat is made—satisfying rising food demand in ways that accelerate climate progress, protect animals and ecosystems, and strengthen public health.
At GFI India, we're dedicated to positioning India as a global leader in the rapidly evolving smart protein sector.

Areas of focus:



Science & Technology

We generate scientific insights and identify research priorities across plant-based, cultivated, and fermentation-derived proteins, with a focus on the technical challenges and opportunities most relevant to India.



Policy

We serve as a trusted knowledge partner to public sector institutions, academia, and civil society. By offering scientific and technical advisory, we assist decision-makers in navigating the technological advancements of the smart protein sector.



Industry

We work with companies throughout the smart protein supply chain to identify the most impactful business activities that will grow their bottom line and strengthen the commercial viability and market readiness.

**GFI India represents the brand name used by Alternative Protein Solutions Private Limited (APSPL).*

What's inside

01 **Introduction**	Where the sector stands today, and what's next	Slide 7
02 **Industry**	Companies, ingredients, manufacturing, products, food service, consumer insights, exports	Slide 14
03 **Investment**	Global and Indian capital flows, public capital, alternative finance	Slide 46
04 **Science & Technology**	Research, novel protein sources, infrastructure, talent	Slide 64
05 **Policy & Regulation**	Global policy signals, BioE3, GST reform, state policies, regulatory pathways	Slide 82

- *This report is not exhaustive. It reflects major developments identified during the reporting period.*
- *All $ figures are in US dollars. Figures are shown in the currency of the original source. Where that is not US dollars, an approximate US dollar equivalent is given in brackets. Conversions use the annual average exchange rate for the year each figure relates to. Figures for 2026, and projections for later years, use the rate on 31 December 2025, the end of the reporting period. Indian financial-year figures (April to March) use the rate for the year in which that financial year begins*
- *1 crore = 10 million. 1 lakh crore = 1 trillion. All conversions are approximate, and totals may not add up due to rounding*
- *GFI India is not a licensed investment or financial advisor. Nothing in this report is investment advice.*



Image credit: VCrave Foods

Introduction

Section 01

Where the sector stands today

When GFI India's first state of the industry report was published in 2023, the smart protein sector was building alternatives to conventional animal products. Between 2023 and 2025, the ecosystem expanded into something more fundamental: meeting India's rising protein demand, creating more value for farmers, leveraging the crops we already grow, building future-ready domestic manufacturing capacity, and strengthening resilient and sustainable protein supply chains aligned with national priorities.

No longer a niche, consumer-led category, smart protein now sits at the intersection of India's biotechnology, advanced manufacturing, and food security agendas and seeks to solve for climate variability, food price volatility, nutritional deficiencies, and farmer livelihoods.

2023

Initial focus

Animal-protein substiution

2025

Widening relevance

Protein security

Farmer value-addition

Biomanufacturing

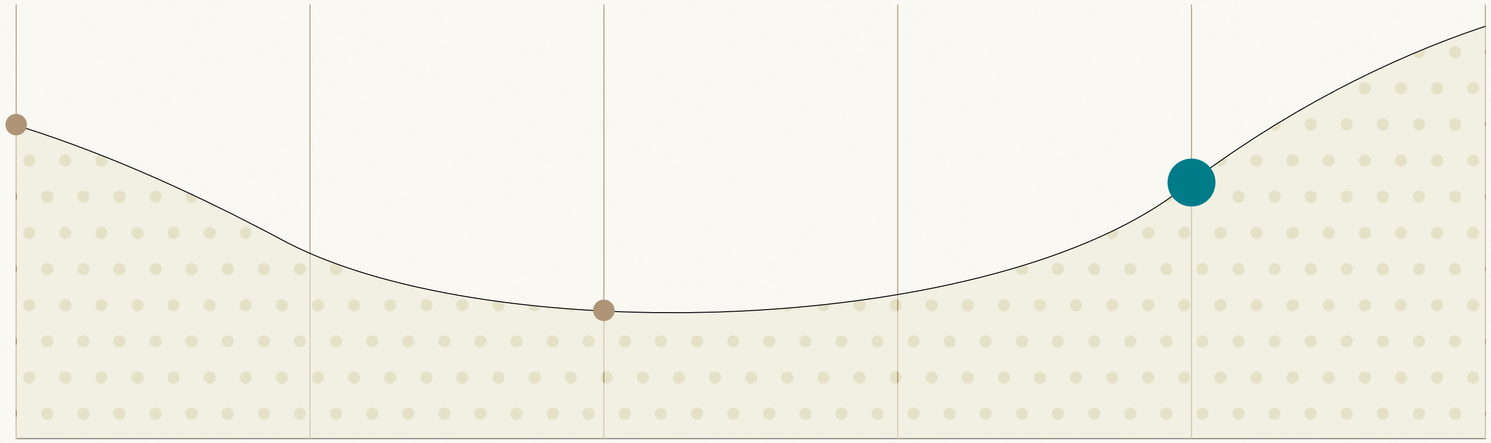
Supply-chain resilience

Nutrition



The market grew up!

The initial buzz surrounding smart proteins from 2021 to 2023 has faded, revealing a more mature and sustainable path to commercial success. India mirrored a global pattern of consolidation and renewed discipline in innovation and research. The most recent signals point upwards: after two muted years, investor interest was once again raised in 2025.



Early frenzy

2021-23

- Peak hype & big bets

Cautious execution

2024-25

- Unit economics

Renewed interest

2025-Present

- Funding ticks up

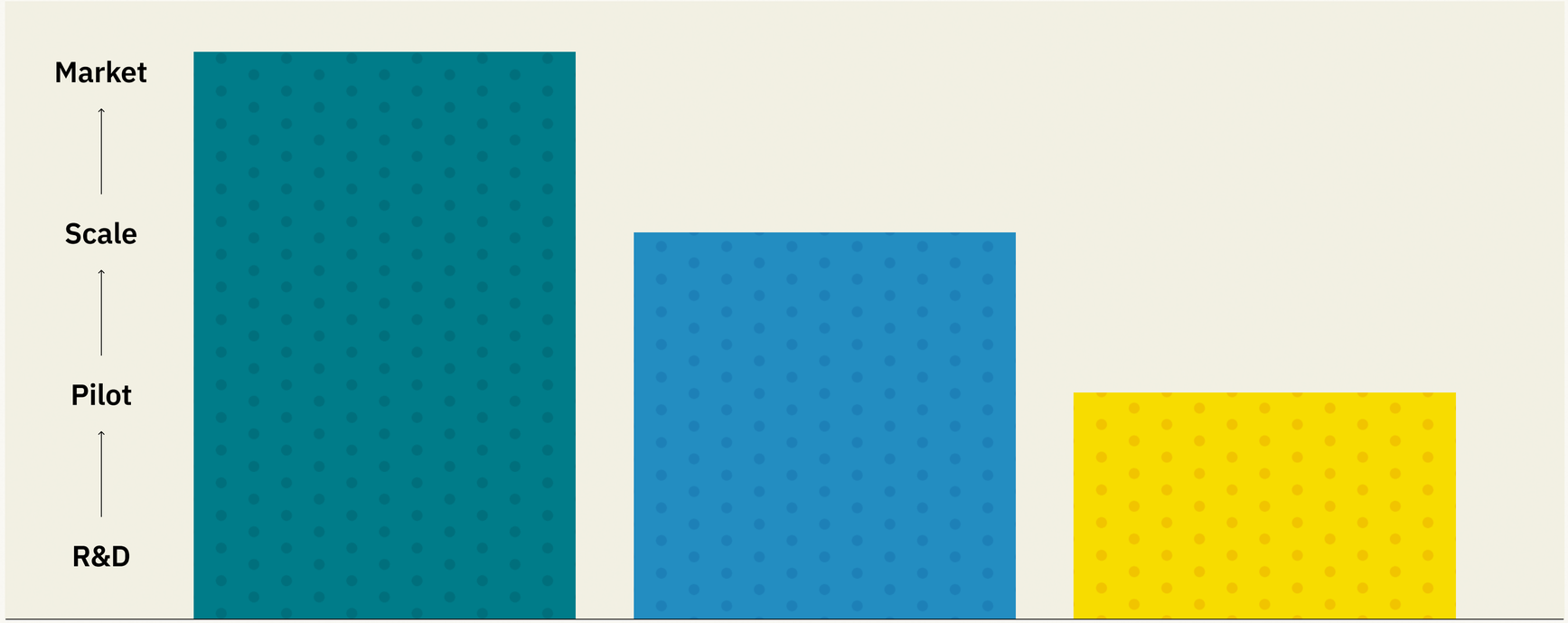
The government became the sector's lead de-risking investor and included smart protein as a national biotechnology priority.



The defining structural shift of this period was led by the public sector. In 2024, the BioE3 policy gave the smart protein sector a legitimacy it did not have in the previous year as the government's role shifted to that of an active catalyst, announcing grant calls and public infrastructure pledges dedicated to smart proteins.

> Smart proteins and functional foods are one of six thematic sectors under India's BioE3 (Biotechnology for Economy, Environment and Employment) Policy, marking national-level recognition of smart proteins as a strategic biotechnology and biomanufacturing priority. Read more about the BioE3 policy here.

State of the modalities



Plant-based

Most mature and market-tested

Key constraints:

Taste, texture, and price parity

Fermentation

Building on India's biotech and biomanufacturing strengths with support from BioE3

Key constraints:

Scale-up capital and pilot infrastructure

Cultivated meat

Active domestic R&D, especially in cultivated seafood

Key constraints:

A regulatory framework to unlock commercialisation

The Indian context

There is some dissonance between the global "meat alternative" narrative and the reality of an Indian vegetarian and flexitarian plate, where smart proteins often have to earn their place within existing traditional meals rather than replace the centre-of-plate protein. Recognising this, the smart protein industry moved towards high-protein and wellness-focused cues, alongside familiar Indian formats. Success rests upon creating a pathway for protein and nutrition security, farmer livelihoods, affordability, and public health, as well as the economic opportunity for India to become an upstream manufacturing and ingredient hub rather than primarily a consumer market.

Topics	India specific context
Nutrition and demand	Widespread protein deficiency and lactose intolerance make locally relevant alternative proteins a health case, not just a climate one.
Farmer livelihoods	Value-addition to indigenous pulses, legumes, oilseeds, grains, and millets can open up new revenue beyond commodity sales.
Affordability and access	Decoupling protein from volatile feed costs (pea, soy) supports cost-effective protein production relevant to programmes like PM POSHAN.
Public health	Reducing reliance on intensive animal agriculture lowers exposure to antimicrobial resistance (AMR) from routine antibiotic use.
Climate	India’s conventional protein systems contribute to emissions and face climate risks. Smart proteins offer opportunities to diversify supply and strengthen food-system resilience
Economic development and manufacturing	India can supply value-added alternative protein ingredients and equipment to global markets.
Science and talent	India’s talent and scientific ecosystem in allied fields of food technology, biotechnology, and bioprocess engineering provide a strong foundation for smart protein innovation and scale-up.

What's next

Recent progress has made it clear that the next challenge for the sector in India is scale. With a strong base of agricultural inputs and feedstocks, scientific and biotechnology capabilities, growing policy support, and emerging manufacturing capacity, there is opportunity to translate India's strengths into fit-for-purpose infrastructure, functional ingredients, and products that can compete on taste and price. Doing so will require coordinated action across the value chain, requiring corporates, governments, and academia to move together.

Topics	What the ecosystem needs to solve
Ingredients and supply chains	Import reliance due to inconsistent quality of agricultural inputs and limited processing capacity for functional ingredients.
Infrastructure	Few pilot-scale facilities and dependence on imported specialised equipment.
Products	Taste, texture, and price parity, especially for meat alternatives in Indian product formats; functional gaps in dairy.
Science and evidence	Research into low-cost indigenous crop inputs for flavour, texture, and nutritional performance. India-specific data on nutrition, bioavailability, and ingredient and end product performance.
Regulation	Clarity on evolving novel food pathways and coordination across regulatory bodies.
Capital	Availability of patient capital and private R&D investment.
Talent	Shortage of specialised skilling programs in alternative protein technologies for India's large talent pool
Ecosystem	Stronger coordination among industry, academia and government players for infrastructure, policy, and regulatory support in commercial scale-up needs



Image credit: Evolved Foods

Industry

Section 02

What has changed?

In its early years, the smart protein industry's progress was largely measured by launches, new brands, and shelf presence. As the market matured between 2023 and 2025, advancements have pivoted to the supply side towards the ingredients, processing, co-manufacturing, and shared infrastructure needed to scale.

While the global alternative protein industry went through a period of consolidation, India focused on laying the groundwork. The domestic plant-based sector remained the most prominent, with high-protein product launches, while fermentation-derived manufacturing gained momentum in 2025.

2020-2022

Market entry

New brands and product launches



2023-2025

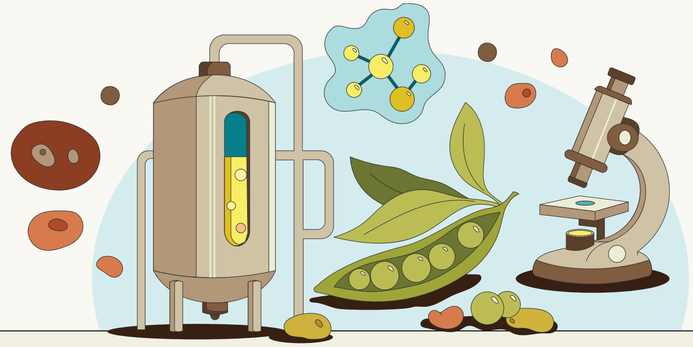
Manufacturing readiness

Ingredients

Processing

Infrastructure

Global overview: 2023-2025



Year	Plant-based	Cultivated meat	Fermentation
2023	• Sales softened as challenges with taste and price parity persisted. • Public investment, new markets, and major corporate launches sustained sector momentum.	• First commercial restaurant sales in the U.S. • 10 new facilities opened across five regions. • Company count rose to ~170 companies in the space.	• Company count grew to 158. • ADM and Ajinomoto partnered with startups to scale fermentation-derived products. • 7 new fermentation facilities opened globally.
2024	• The sector continued to innovate and diversify despite slower growth and lower levels of private investment. • 26+ facilities were opened, expanded, or announced, including dedicated plant-based meat facilities and pulse processing plants.	• Company count shrank to ~155. • First cultivated meat retail launch in Singapore. • New innovation hubs de-risked scale-up, and AI accelerated cost reduction.	• Continued growth with ~165 companies. • Regulatory approvals expanded to Canada, Singapore, the EU, and New Zealand. • 16+ fermentation facilities opened or announced globally.
2025	• Category performance varied, with growth in some regions and declines in others. • Dedicated innovation hubs and larger manufacturing facilities signalled a shift towards scalable commercialisation. • Some companies leaned into innovation, focusing on areas like flavour-forward, familiar favourites and meeting consumer demand for protein.	• Despite its modest size, the industry is aligning around cost reduction and process efficiency to enable scale-up. • ~140 specialised companies; diversified companies rose to 138 from 126. • Growth media costs fell to $0.20/L or below [1,2] (>99% reduction) • Regulatory pathways expanded across Singapore, the U.S., and Australia-New Zealand. • 6 new manufacturing sites and innovation hubs opened.	• Innovation and scale-up efforts grew in the industry, with collaborations across conventional and plant-based manufacturers, academia, and government. • ~160 specialised companies • Diversified companies grew from 210 to 267. • 9 new pilot- and commercial-scale facilities launched. • Targeted R&D towards mycelium products and whole-cut meat analogues.

[1] https://www.greenqueen.com.hk/gourmey-cultivated-meat-lab-grown-foie-gras-cost-approval/
[2] https://www.greenqueen.com.hk/clever-carnivore-lab-grown-meat-cultivated-pork-cost-fda-approval/

GFI 2026: State of the Industry: Plant-based meat, seafood, eggs, dairy, and ingredients
GFI 2026: State of the Industry: Cultivated meat, seafood, and ingredients

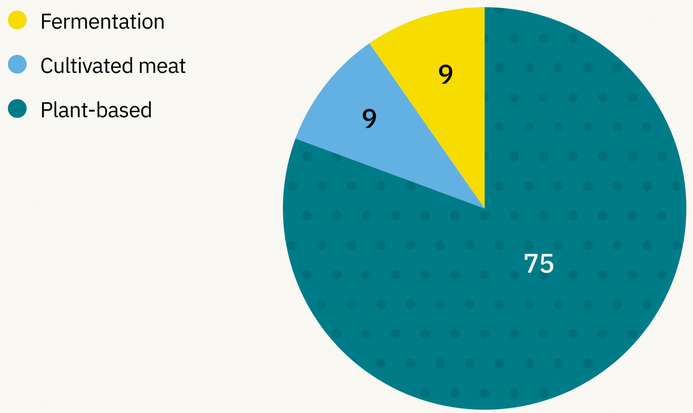
GFI 2026: State of the Industry: Fermentation for meat, seafood, eggs, dairy, and ingredients

The India Story

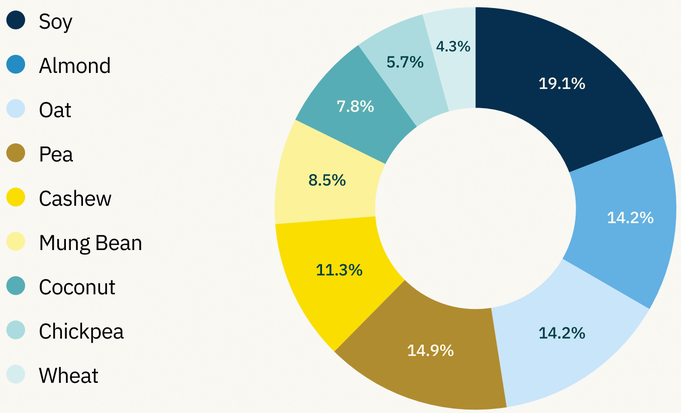
Following a surge of new startups entering the sector from 2020 to 2022, subsequent years saw a shift in focus among established market players, who prioritised using indigenous ingredients such as pulses, legumes, and millets rather than expanding their product formats.

Overview of India's smart protein sector

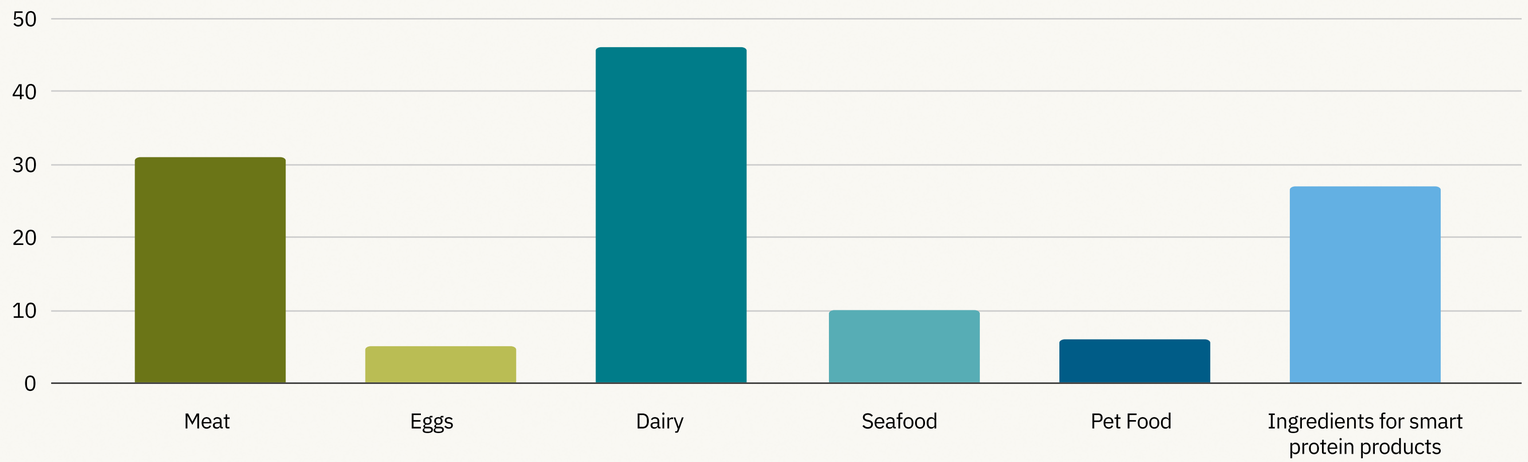
Number of startups – by focus area



Ingredient sources for smart protein products



Number of startups – by product category



Data source: GFI India Smart Protein Company Database
As of December 2025

Notable developments

in plant-based, fermentation-derived, and cultivated meat, 2024-2025:

2024

January
The Indian Council of Agricultural Research-Central Marine Fisheries Research Institute (ICAR-CMFRI) signed an MoU with New Delhi-based biotech company Neat Meatt to develop cultivated fish.

July
Singaporean startup Umami Bioworks set up an incubation centre at IKP Knowledge Park and established a collaboration with Sathyabama Institute of Science and Technology to produce marine species cell lines.

August
California precision fermentation startup Perfect Day sold its stake in Sterling-Biotech to Zydus Lifesciences. Now a joint venture, they are setting up a dedicated precision fermentation facility in Gujarat for global supply, expected to launch in late 2026 followed by a "controlled ramp-up" in 2027.

December
Biokraft Foods hosted India's first public cultivated chicken tasting in Mumbai. Their cultivated chicken breast was made from chicken cells alongside plant-based and algal biopolymers.

2025

March
Demolish Foods, headquartered in the U.S., established a Gen 4 platform for plant-based whole cuts with capabilities for precision replicability of conventional meat and scaling manufacturing throughput.

April
Biokraft Foods developed cultivated trout in collaboration with ICAR-Central Institute of Coldwater Fisheries Research (ICAR-CICFR).

September
ClearMeat signed an MoU with the National Institute of Food Technology Entrepreneurship and Management, Kundli (NIFTEM––K) for a joint venture to establish a first-of-its-kind APEX (Alternative Protein Excellence) facility for cultivated meat research and manufacturing, which will operate under the BioE3 framework.

August
Biokraft Foods held a cook-off among culinary students across India for their cultivated chicken.

Fattastic Technologies partnered with Ajinomoto Thailand to develop plant-based fats that replicates the functionality of animal-derived fats while reducing saturated fat content.

October
Following their expansion into Thailand, Canada, and Australia, Shandi Global entered India with a focus on business-to-business distribution of their plant-based Chanza protein before planned retail expansion in 2026.

*Discover key developments from across the smart protein ecosystem and stay informed on the latest news by following **GFI India on LinkedIn.***

FROM INDIA TO THE WORLD:

Export opportunities for smart proteins



As domestic manufacturing capacity expands, international markets present a significant opportunity for Indian smart protein companies. Our report identifies priority export markets for Indian plant-based products based on market size, growth potential, consumer demand, and regulatory readiness. The six key markets as the most promising export destinations are:

€1.7B

Germany

Largest plant-based market in Europe (2024)

$1.2B

United States

Retail sales data (2024)

£898M

United Kingdom

Second largest market in Europe (2024)

A$273M

Australia

Plant-based meat

Fastest-growing market in Asia-Pacific (2023)

$60M→$500M

GCC

Projected growth of plant-based meat market (2023-2030)

18%

Singapore

Share of flexitarian consumers (2023 survey)

→ **Continued in the next slide**

The report provides guidance on market access, regulatory requirements, distribution channels, and product positioning for alternative proteins. Western markets continue to be dominated by formats such as burgers, sausages, nuggets, and mince, whereas markets such as Singapore and the Gulf Cooperation Council (GCC) present opportunities for products tailored to regional cuisines, including chicken alternatives, kebabs, shawarma, and other locally relevant formats.

Germany

- Sausage
- Salami

United Kingdom

- Sausages
- Mince
- Pieces
- Breaded/centre-plate
- Burgers

United States

Largest formats, 2025

- Patties
- Nuggets
- Grounds
- Hot dogs
- Breakfast links

Australia

- Crumbed chicken
- Burgers
- Mince
- Sausages
- Snacks, finger foods, deli slices, and ready meals

GCC

- Burger patties
- Sausages
- Nuggets
- Mince

Growing trends

Kebabs | Koftas | Kabsa | Kibbeh | Shawarma | Shish tawook

Singapore

- Rice and noodles with stir-fried meat, veggies, or gravies/sauces.

India's competitive advantages in agriculture, ingredient manufacturing, and food processing can support export-led growth. However, long-term success will depend on developing market-specific products, meeting international quality and regulatory standards, and building partnerships across manufacturing, retail, and food service channels.

Corporate activity began to diversify

What declined

Retail plant-based meat underwent a market correction between 2023 and 2025.

The slowdown was most evident in the premium category of frozen meat analogues sold through retail and e-commerce channels.

Large consumer brands scaled back or exited the retail plant-based meat segment.

What grew

Dedicated companies invested in adjacent opportunities through food service, hospitality, and plant-based dairy.

A broader protein-forward trend arose from consumer interest in health and nutrition, gaining momentum across the F&B industry.

Mainstream food companies continue to view protein innovation as a strategic growth area.

Plant-based dairy emerged as a lower-risk growth category

While retail plant-based meat saw headwinds, plant-based beverages continued to attract corporate investment. Companies expanded oat-, soy-, and almond-based beverage portfolios and strengthened their protein-focused positioning. In 2025, Country Delight, a conventional milk and grocery delivery platform, entered the category with an oat-based beverage. Compared to centre-of-plate meat alternatives, plant-based dairy has multiple entry points, providing a lower-risk pathway to build consumer familiarity with plant-based alternatives.

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Corporates added protein to their portfolio products

The protein fortification trend created new demand for plant-based and fermentation-derived ingredients beyond traditional smart protein categories. Companies increasingly incorporated protein into familiar foods and beverages, reflecting growing consumer interest.

Tata Starbucks partnered with SuperYou to introduce protein-enriched cold foam made using fermentation-derived yeast protein across its beverages.

McDonald's India launched the Protein Plus range in collaboration with CSIR–CFTRI, allowing consumers to add a protein slice made from made from soy and pea proteins.*

**McDonald's add-on protein slice contains whey protein, in addition to plant proteins.*

ITC's Aashirvaad expanded its protein-focused portfolio with high-protein atta (contains a blend of wheat, 10% soya, Bengal gram and oats), bringing protein fortification into a familiar everyday staple.

These launches position smart protein ingredients as enhancements to familiar products rather than requiring consumers to adopt entirely new food formats.

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Although protein fortification is not indicative of consumer adoption of plant-based meat, egg, or dairy alternatives, it presents a complementary market opportunity for the smart protein sector.

Growing demand for protein-enriched foods

- scales value chains for functional plant-based and fermentation-derived ingredients
- increases consumer familiarity with alternative protein technologies
- expands business-to-business opportunities across the food industry.

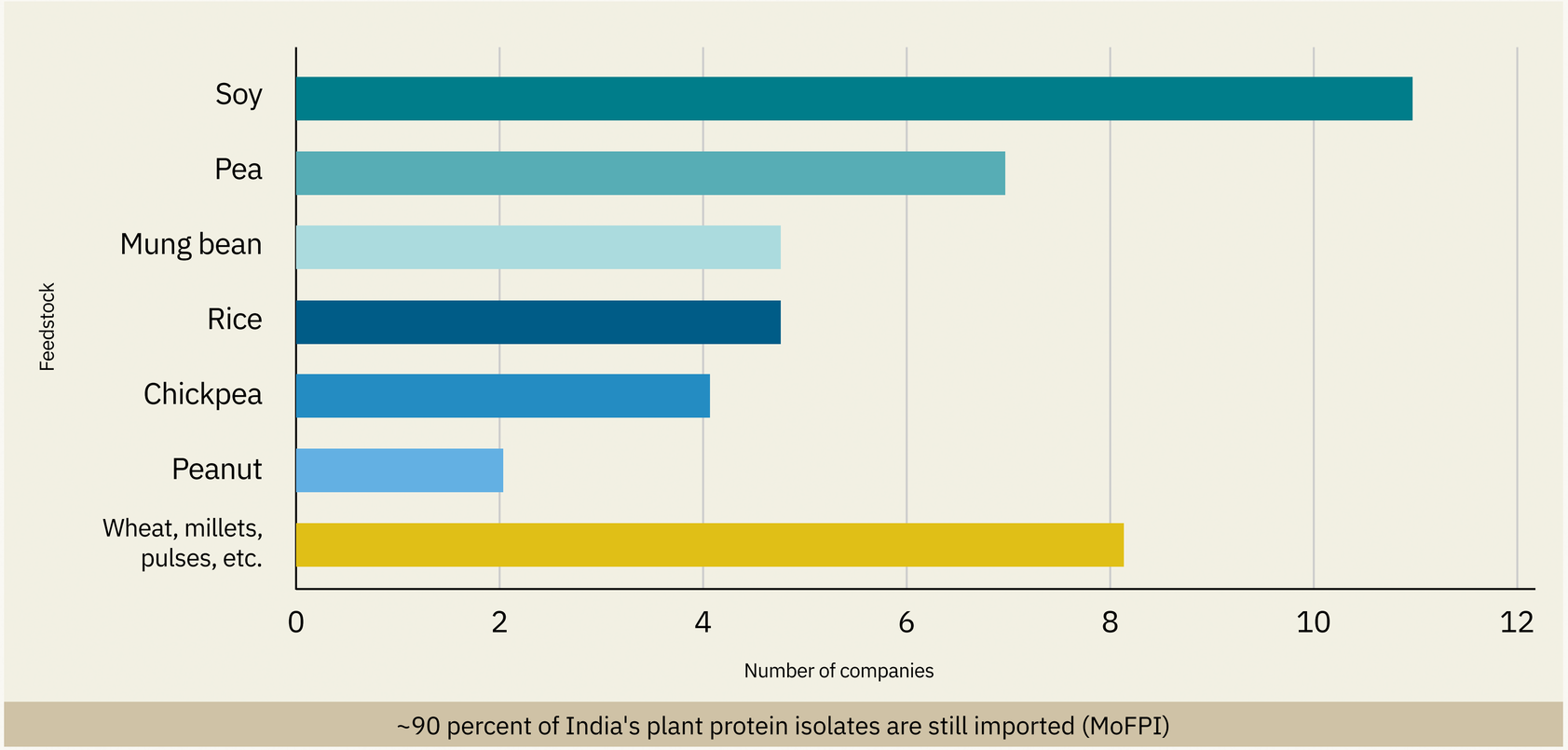


Image credit: Shandi Global

India's smart protein sector is entering a more commercially grounded phase wherein companies are aligning ingredients and products with established consumption occasions, existing food service channels, and mainstream protein trends. This shift indicates that near-term growth may be driven less by standalone alternative protein products and more through integration with existing market demands and preferences, creating opportunities to strengthen ingredient demand, expand business-to-business partnerships, and build consumer familiarity ahead of wider category adoption.

Ingredients landscape

Rising consumer interest in protein-rich foods has accelerated investment in domestic protein processing capabilities. Having relied on a predominantly import- and trader-led supply base before 2023, India is now building a domestic ingredient manufacturing ecosystem. The most notable progress has been in plant protein ingredients, where, alongside established soy and cereal processors, a newer group of manufacturers has begun producing proteins from pulses and oilseeds.



~90 percent of India's plant protein isolates are still imported (MoFPI)

Source: GFI India internal secondary analysis
Disclaimer: Bar lengths are only indicative

India’s plant protein feedstock landscape



Soy

Most mature

- **Maturity:** Most mature feedstock, built on India's established oilseed processing industry.
- **Ingredients produced:** Isolates, concentrates, texturised vegetable proteins, soy flour, lecithins, phospholipids, soy fibre.



Rice and wheat

Established

- **Maturity:** Benefitting from integrated, whole-grain valorisation processing platforms.
- **Ingredients produced:** Rice protein, wheat gluten, starches, syrups, maltodextrin, other co-products.



Pulses

Fastest-evolving

- **Maturity:** Fastest-evolving segment, using dry fractionation and wet extraction.
- **Ingredients produced:** Pea, mung bean, chickpea isolates and concentrates
- **Properties:** Solubility, neutral flavour, emulsification, foaming, gelling, dispersibility

Long-term competitiveness will depend not only on consistent availability of high-quality crops but also on advancements in protein processing, sensory performance, application development, costs, and manufacturing scale.

Domestic plant protein manufacturing expanded

Approximately 15-20 companies manufacture plant protein ingredients in India, with established processing facilities, commercial product portfolios, and quality certifications. While soy continues to dominate, domestic manufacturing capacity has expanded across rice, wheat, mung bean, chickpea, pea, rapeseed, peanut, and texturised protein ingredients, strengthening the country's upstream ingredient ecosystem.

However, limited domestic availability of ingredients with the required sensory quality, functionality, and consistency keeps India reliant on imports of protein isolates, concentrates, and specialised ingredient systems for smart protein products.

Strengthening domestic capabilities in these higher-value ingredients presents a significant opportunity to reduce import dependence, improve supply chain resilience, and enhance the competitiveness of India's smart protein value chain.

Ingredient categories manufactured domestically

Soy (Dominant)	Rice	Wheat
Mung bean	Chickpea	Pea
Rapeseed	Peanut	Texturised protein

Local crops moved from an emerging opportunity to early commercialisation

Manufacturers are developing ingredients from pulses (peas, mung beans, chickpeas), oilseeds (rapeseed, peanuts), and other indigenous crops, reflecting growing investment in local feedstocks as well as more diverse and locally sourced protein ingredients beyond conventional soy.

Notable examples:

Devigere Biosolutions

Protein concentrates from indigenous pulses using a water-based extraction process

Fytomax

Membrane-based soy protein isolate production

Hitay

India's first air-classified pea protein concentrate

OMN9

Portfolio of indigenous plant proteins, including mung bean protein isolate for food applications

Proeon Foods

Scaling up production of mung bean and peanut protein isolates

Progen Foods

Developing protein isolates from a diverse range of indigenous crops, including pea, mung bean, chickpea, and oilseeds

RELSUS

Commercial-scale manufacturing facility in Ujjain and partnered with Aminola® to produce plant-based proteins and functional ingredients

The ingredient supply expanded beyond protein

India's smart protein ingredient ecosystem now includes a network of traders, distributors, and international suppliers providing both protein and functional ingredients. The ingredients vary from plant protein isolates and concentrates to texturising agents, flavours, colours, fats, oils, and other customised ingredient systems that support the taste, texture, structure, and functionality of plant-based meat, eggs, and dairy.

Emerging upstream capabilities for fermentation-derived and cultivated proteins

Where we are

Fermentation-derived and cultivated meat inputs are in the early stages of industrial development, with capabilities being built across technologies and contract biomanufacturing services.

Maximum activity is clustered around research, pilot-scale production, and platform technologies.

There are early regulatory approval precedents for fermentation-derived proteins.

Where we could go

Recently announced large-scale biomanufacturing investments, together with BioE3-supported infrastructure, create positive momentum for upstream capacity at the commercialisation level, including fermentation platforms, cell-culture media, scaffolds, and bioreactors.

Fermentation-derived ingredients have a broader presence in the market.

India's growing manufacturing ecosystem

The most noticeable progress has been in plant-based protein manufacturing, with fermentation-derived ingredient manufacturing steadily gaining ground in 2025.

One of the key developments on the plant-based side is the establishment of The Alternative Proteins Innovation Center (APIC), an integrated facility supporting **smart protein ingredient and product R&D, manufacturing, and scale-up from lab concepts to commercial products.**



Photo credit: APIC

Long-term growth of the smart protein sector will depend on industrial capabilities such as:

- the availability of processing facilities
- specialised equipment
- pilot-scale infrastructure
- contract manufacturing capabilities
- robust process control
- hygienic design
- quality assurance systems

that are required to manufacture ingredients and products at consistent quality, commercial scale, and competitive costs.

An important lesson emerging from the ecosystem underscores that access to shared manufacturing infrastructure significantly accelerates commercialisation far more than investing at every stage of production.

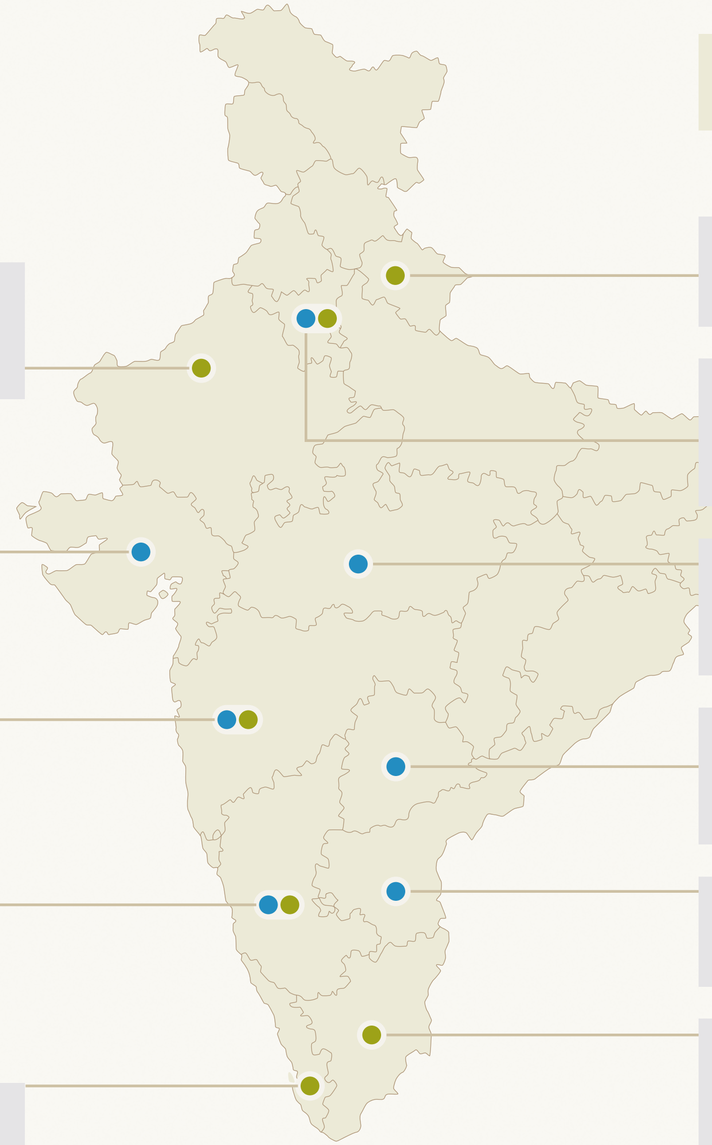
Some noteworthy infrastructure developments in 2026:

- Praj Industries established an AI-enabled Advanced Precision Fermentation Lab at Praj Matrix, Pune, and partnered with the Biotechnology Research and Innovation Council–National Centre for Cell Science (BRIC-NCCS) to strengthen bioprocess development, microbial research, and precision fermentation scale-up.

- PreferCo and Glatt established a Centre of Excellence for microbial precision fermentation in Hyderabad's Genome Valley, providing AI-enabled scale-up infrastructure with bioreactor capacity of up to 1,500 litres to support the commercialisation of fermentation-based technologies.

Co-manufacturing is becoming more integrated

Co-manufacturing models are becoming more integrated, combining protein texturisation with high-moisture extrusion, ingredient processing, finished products and private-label manufacturing, contract manufacturing, coating, freezing, and cold-chain capabilities within a single platform. This enables manufacturers to serve multiple customer segments, including consumer brands, food service operators, quick-service restaurants (QSRs), and export markets.



- Plant-based finished goods
- Fermentation-derived or CDMO

Rajasthan
- OrganoNutri / Organo Snacks & Cereal Industries

Gujarat
- Aumgene Biosciences
- Gujarat Enzyme
- Pellucid Lifesciences

Maharashtra
- GoSip India / Pastonji
- Om Industries

Karnataka
- Green Ecstasy Foods
- Laurus Bio
- Shilpa Biologicals
- Fermbox Bio

Kerala
- Symega Food Ingredients Ltd

Uttarakhand
- Zippy Edible Products Pvt Ltd

Haryana
- BVeg Foods Pvt Ltd
- Premas Biotech

Madhya Pradesh
- Symbiotec Pharmalab / Symbiotec Life Sciences

Telangana
- Sanzyme Biomolecules / Sanzyme Biologics

Andhra Pradesh
- Sanvira Biosciences

Tamil Nadu
- Dairy Gold
- Pure Tropic

Please note that the CDMOs/CMOs listed here are illustrative examples of players operating in the sector intended to indicate state-wise distribution. This does not represent an exhaustive list.

Read more: https://gfi-india.org/all-resources/ecosystem-database/#co-manufacturers-database

Mapping India's biomanufacturing potential for smart proteins

774,170 kL

A total of 774,170 kL of fermenter capacity was estimated among nine biomanufacturing segments, of which approximately 32,396 kL is directly relevant to smart protein biomanufacturing.

7,737 kL

Total idle capacity was estimated as 7,737 kL for precision fermentation-relevant segments and 24,658 kL for biomass fermentation-relevant segments.



By engaging 12%

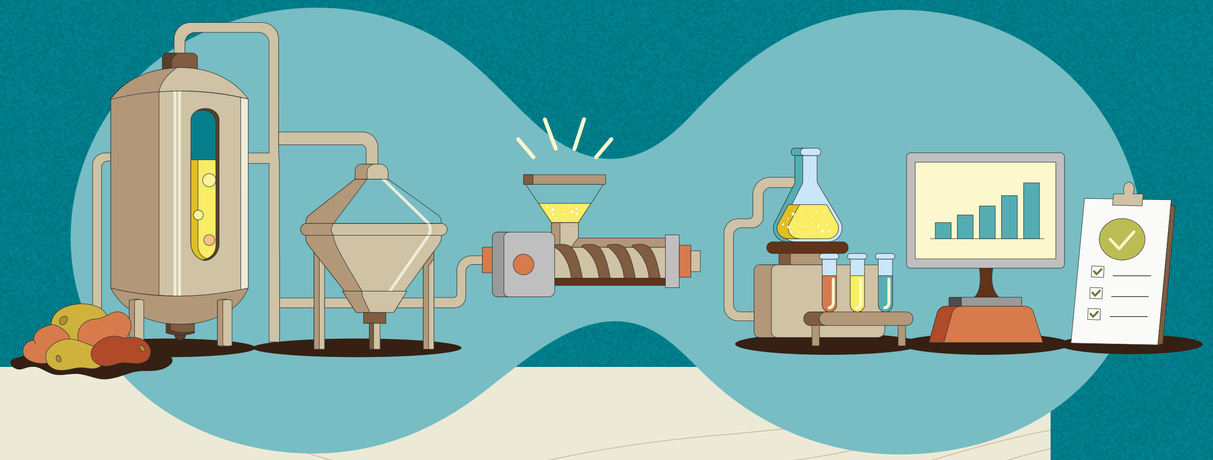
of estimated precision fermentation-relevant idle capacity, India could produce enough lactoferrin to address its 2025 global market size.

By engaging 26%

of estimated biomass fermentation-relevant idle capacity, India could produce enough yeast protein to meet its 2025 global market size.

Repurposing or retrofitting this extensive industrial capacity for smart protein biomanufacturing can give India an early-mover advantage in the rapidly growing global market for fermentation-derived proteins.

The equipment bottleneck

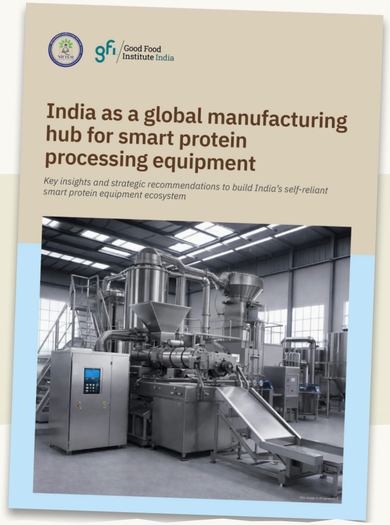


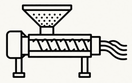
India's manufacturing opportunity lies in strengthening the entire processing value chain from ingredient extraction and fractionation to texturisation, application testing, and quality assurance. While products such as texturised proteins and shelf-stable formats can already leverage existing infrastructure, more advanced plant-based, fermentation-derived, and cultivated protein products will require greater investment in specialised processing equipment and technologies.

According to the Ministry of Food Processing Industries (MoFPI), India imports nearly **90 percent** of its plant protein isolates because of limited domestic extraction and processing capacity. Expanding ingredient localisation will therefore depend not only on crop availability but also on manufacturing infrastructure capable of producing food-grade ingredients at commercial scale.

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A lack of sophisticated equipment remains one of the sector's most significant constraints. GFI India and NIFTEM–Thanjavur's study found that while India has a growing domestic base of food and process equipment manufacturers, it imports high-value systems required for advanced smart protein production, including high-moisture extrusion, membrane filtration, advanced drying technologies, process automation, and validation infrastructure.





Extrusion

Moderate for conventional systems
Low for advanced high moisture systems

Gaps:

- Precision components and process control
- Hygienic equipment design

Import dependence: High-torque gearboxes, precision screws and shafts, specialty alloys and bimetallic liners, and hygienic seals and bearings



Drying

High for conventional spray and fluidised bed dryers at smaller scales
Low for advanced industrial systems

Gaps:

- Large-capacity drying systems
- Industrial freeze-drying capability
- Automation and energy-efficient integration

Import dependence: Refrigeration compressors, vacuum pumps, and advanced controls



Separation and membranes

Moderate capability in conventional separation
Low for advanced separation and membrane manufacturing

Gaps:

- High-performance separation efficiency
- Hygienic equipment design and automation

Import dependence: High-performance centrifuges, food-grade membrane modules, and critical precision components

Expected infrastructure under the BioE3 policy

Under the BioE3 policy, India is establishing a network of shared biomanufacturing infrastructure to accelerate the scale-up and commercialisation of smart protein technologies. Among the 15 biomanufacturing platforms approved under the programme, four are directly relevant to the sector.

HiMedia Laboratories

Mumbai

A one-kilolitre (KL) biomanufacturing facility focused on food products, food additives, probiotics, and cell growth stimulators, providing upstream capabilities relevant to fermentation-derived proteins.

IIT Madras–TICEL Bio Park

Chennai

A pilot-scale development and scale-up facility for food and allied biomanufacturing applications, supporting technology translation relevant to the smart protein sector.

Laurus Bio

Visakhapatnam

A fermentation facility supporting the development and scale-up of functional foods, smart proteins, enzymes, and related biomanufacturing applications.

Sundyota Numandis

Ahmedabad

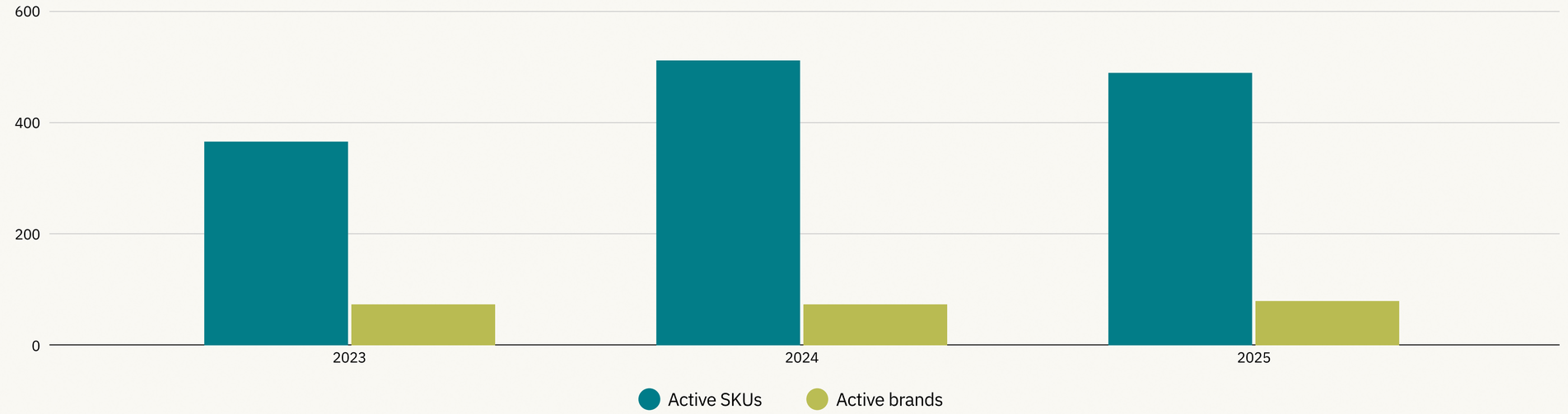
A quality management system (QMS)-compliant facility for the commercial-scale production of probiotics and smart proteins.

Product innovation

Smart protein retail offerings increased substantially between 2023 and 2025, with active SKUs 34 percent above 2023 levels, despite modestly decreasing in 2025. The recent decline appears to reflect portfolio rationalisation by a few larger brands rather than broader market contraction, as active brands continued to grow.

This suggests a shift from rapid portfolio expansion towards greater consolidation and product-market fit.

Active SKUs and brands: 2023–2025

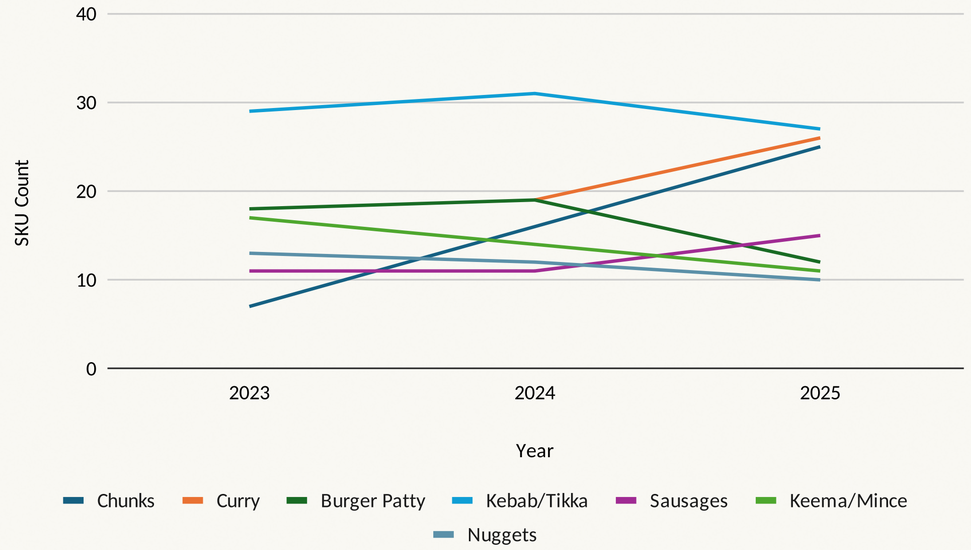


Data source: GFI India internal secondary analysis

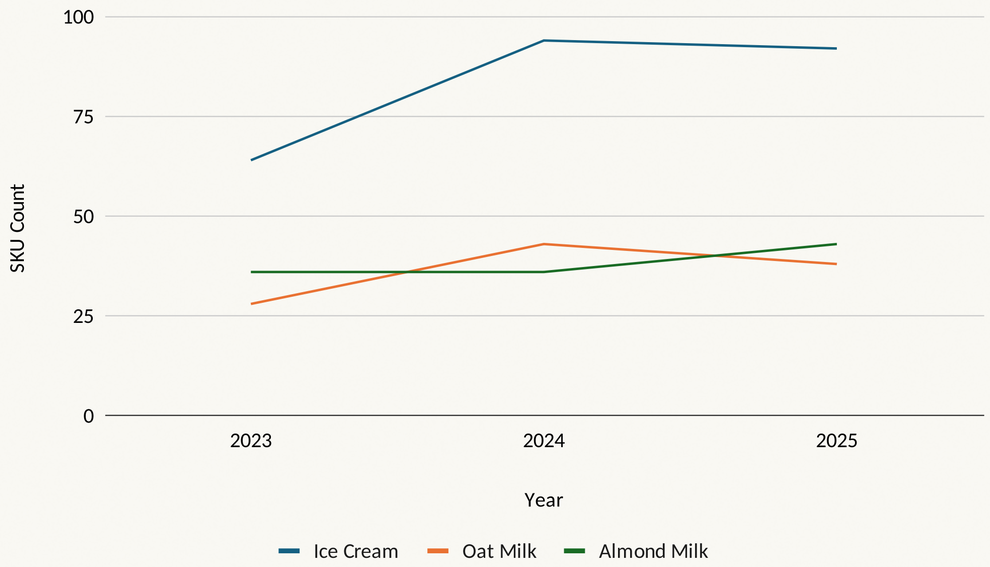
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Product innovation is shifting towards formats that align with Indian consumption patterns. Among meat and seafood alternatives, 18 chunk SKUs and 8 curry SKUs were added between 2023 and 2025, while patties, nuggets, and mince declined in number. Alternative dairy growth was led by plant-based ice cream and milks. The analysis shows a net increase of 28 plant based ice cream SKUs, from 64 in 2023 to 92 in 2025. For the milk formats shown in the graph, oat milk increased by 10 SKUs, from 28 to 38, and almond milk by 7, from 36 to 43, giving a combined net increase of 17.

Meat format trend (2023-2025)



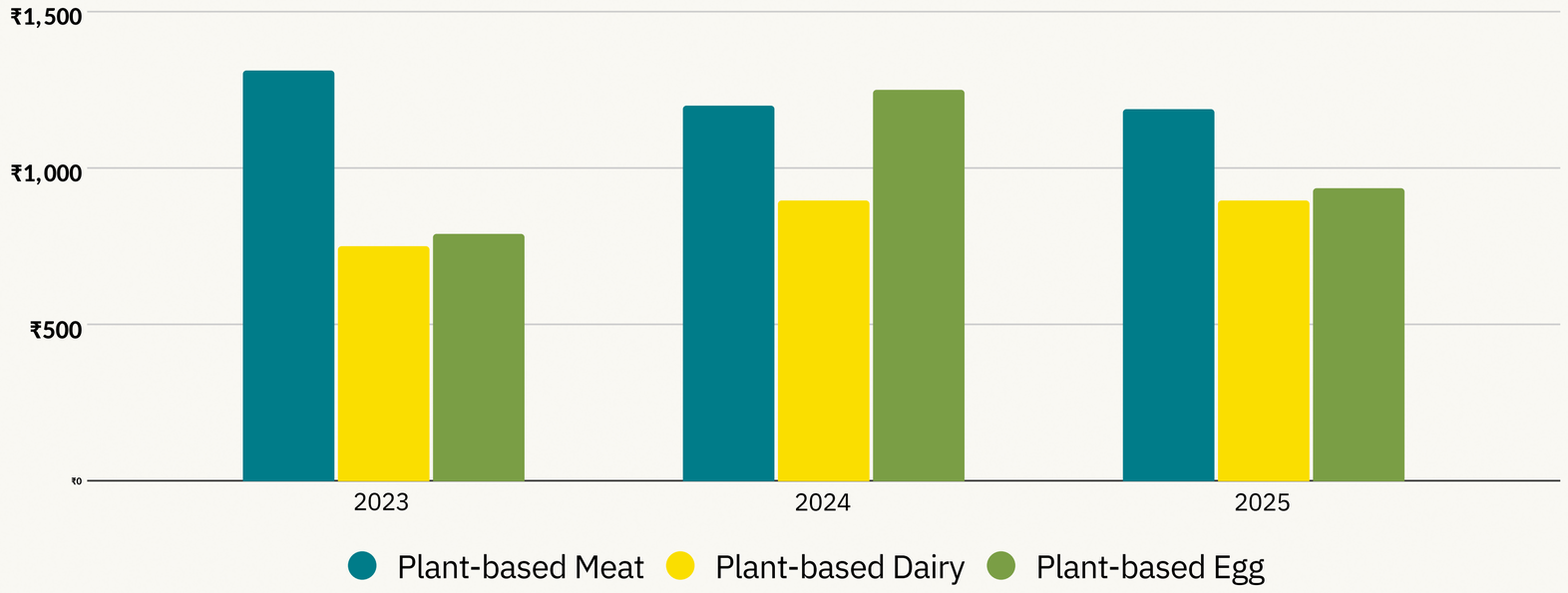
Dairy format trend (2023-2025)



Data source: GFI India internal secondary analysis

The reduction in category median prices does not necessarily reflect that existing products became cheaper. Among 254 comparable SKUs available in both 2024 and 2025, there was no median price change, even though category medians declined. The change was due to new products entering at different price points and others being discontinued. Affordability remains an important area for further progress.

Median listed unit price by segment



Data source: GFI India internal secondary analysis

Distribution within India

Since 2023, India's plant-based sector has tapped into the food service ecosystem, reflecting a broader shift in how companies are approaching commercialisation.

As companies engage more closely with chefs and institutional buyers, product development is being shaped by performance in kitchens, recipe adaptability, consistency, pricing, and supply reliability.

How companies reach consumers has shifted since 2023:

Then

D2C & retail launches

New brands and product launches

Now

Foodservice & B2B Channels

- QSR
- Cafes
- Hotels
- Institutional catering
- Cloud kitchens

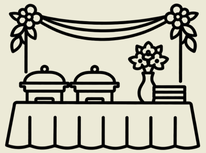


Food service is emerging as an important pathway to consumer adoption

Food service players seek to diversify their menus in response to changing consumer preferences for healthy, nutritionally balanced, and protein-rich options.



Premium hotels and restaurants are increasingly introducing plant-based offerings that extend beyond meat alternatives. Unlike retail, where products compete directly for shelf space and rely on repeat purchases, food service allows consumers to experience plant-based foods in familiar dishes and culinary experiences.



Institutional catering and wedding menus offer a new market beyond restaurants, where plant-based products are positioned as innovative and inclusive options, serving varied dietary preferences.

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These developments suggest that food service is evolving from a secondary sales channel into an important commercial pathway for India's smart protein sector. By enabling product discovery and generating repeat demand, it can help bridge the gap between product innovation and wider consumer adoption.

In 2024, **Shaka Harry launched Chefsclusive—** a line of high-quality plant-based starters, snacks, meals, and accompaniments—for the HoReCa sector.

Between 2024 and 2026, **GoodDot** partnered with leading food service brands including **Tibbs Frankie**, **Haldiram's**, and **Hilton Hotels** to introduce plant-based protein dishes.

Large food service and food manufacturing companies occasionally offer limited-period plant-based menus to test consumer acceptance. In 2024, **Nestlé India partnered with SOCIAL and BOSS Burger** to pilot MAGGI Professional's range of plant-based burgers, mince, kebabs, and sandwiches across more than 80 outlets in five cities.

Blue Tribe expanded its presence across more than 200 hotels and restaurants, supplying plant-based products to hospitality groups including ITC Hotels, The Oberoi Group, Hyatt, Fairmont, and Four Seasons, as well as restaurant groups such as Impresario.

In 2025, **ProMeat** partnered with Impresario Group to launch the plant-based smoky pepperoni across all Mezcalita restaurant outlets in Mumbai and Bengaluru.

Food service and the smart protein market

GFI India's 2024 study mapped restaurants across major cities and spoke to chefs, restaurant operators, marketers, and plant-based brands to examine how India's food service industry perceives and adopts plant-based meat.

Top metros present the strongest opportunity

India's food service industry is projected to grow to ₹7.2 lakh crore ($75 billion) by 2028.

The top nine cities account for nearly 60 percent of food service revenue.

Mumbai, Bengaluru, and Delhi currently account for almost 75 percent of restaurants serving plant-based meat.

Casual dining restaurants and cloud kitchens have emerged as the most receptive channels for early adoption.

Plant-based meat is still a niche category, and local formats are preferred

Most restaurants offer only a small number of menu items, largely concentrated in Western formats such as plant-based burgers, pizzas, wraps, and sandwiches.

The limited use of Indian and regional formats highlights a significant opportunity for product localisation.

Taste is the primary driver for adoption, but positioning also matters.

Chefs and restaurant operators consistently emphasised that consumers prioritise flavour, texture, and the overall eating experience over nutritional benefits when dining out.

“High-protein” and “plant-based protein” positioning are increasingly resonating with consumers rather than terms such as “meatless.”

Fine dining and speciality restaurants are more open.

Fine dining and speciality restaurants are more willing to experiment with new ingredients, accommodate premium pricing, and invest in menu innovation and storytelling.

Barriers that continue to limit adoption

- Low consumer awareness and demand, making it difficult to justify menu space.
- Gaps in taste and texture compared with conventional meat.
- Concerns around highly processed products
- Premium pricing and low profit margins
- Inconsistent product supply
- Lengthy onboarding timelines (6–12 months) due to recipe development, procurement, and commercial negotiations.

Consumer insights into the plant-based sector



Plant-based dairy

Consumer interest in plant-based dairy continues to grow, especially among younger consumers. The alternative milk segment is projected to grow at a compound annual growth rate (CAGR) of 6-8 percent between 2023 and 2027, driven by rising health awareness, prevalence of lactose intolerance, and concerns around milk adulteration.

Plant-based meat

Plant-based meat is now available across both Western formats, such as burgers, sausages, and nuggets, and Indian formats, including kebabs, biryani, keema, samosas, and paranthas. **Insights from GFI India's *Meat Your Match* study** indicate that while consumers appreciate the convenience, visual appeal, and premium positioning of plant-based meat products, **taste remains the primary driver of meat consumption in India** and the most significant determinant of repeat purchase.

Plant-based mutton samosas most closely matched their conventional counterparts on flavour, texture, and overall eating experience.

Plant-based nuggets and seekh kebabs performed well on appearance, convenience, and cooking performance but fell short on meatiness, juiciness, and flavour authenticity.

Plant-based keema, while valued for convenience and versatility, received the lowest ratings for taste and texture.



Consumer insights into the plant-based sector



Published by Ipsos, provides an overview of the global and Indian plant-based foods market.

- India's plant-based foods market is supported by rising health consciousness, awareness of lactose intolerance and protein needs, and an established culture of plant-based food consumption.
- E-commerce is emerging as an important access channel for plant-based foods, but wider adoption continues to be constrained by price, availability, consumer awareness, and taste and texture concerns.

2025



Developed by Ipsos and the Plant Based Foods Industry Association (PBFIA) explores the attitudes of Generation Z consumers towards plant-based foods and factors influencing their dietary choices.

- 78 percent of Gen Z consumers recognise the health benefits of plant-based diets. Their food choices are also shaped by sustainability and ethical considerations, making them a key demographic for the category.
- Key drivers of plant-based food adoption are convenient formats, digital engagement, affordability, taste, and quality.

2026

CULTIVATED MEAT IN INDIA:

Understanding consumer awareness, perceptions, and acceptance



According to GFI India's latest consumer study, nearly 50 percent of **respondents are aware of the concept of cultivated meat, and 28 percent report familiarity.** Awareness is higher among younger consumers, frequent meat eaters, and those active on digital platforms.

90 percent of consumers express interest and view cultivated meat as **"real meat made differently"** rather than a substitute. It is considered relevant and credible, with the potential to address concerns about quality, food safety, and use of antibiotics and growth hormones in conventional meat.

The intent to try cultivated meat is high (94 percent), although most consumers expect it to **complement rather than replace conventional meat**.

Chicken emerges as the preferred entry category. Consumers also expect price parity or a modest premium of around 15–20 percent for regular consumption.

Drivers

Consumers are open to trying cultivated meat for its health and quality benefits if food safety assurances and expectations on taste and price are met.

Barriers

Concerns over premium price points, limited availability, ingredients and food safety, and uncertainty about the production process are key barriers to adoption.

Enablers

Consumers identify regulatory approvals, transparent communication, trusted brands, and expert endorsements as the most important factors influencing acceptance and future consumption.

Access the entire report here

Blended meat

By definition, blended meat products combine conventional meat with smart protein ingredients, offering a potential pathway to improve cost, nutrition, functionality, and resource efficiency while retaining familiar eating experiences. Several Indian food companies already incorporate plant proteins into processed meat products in varying percentages to improve cost and functionality. Blended proteins could be an **opportunistic pathway that helps companies to diversify protein portfolios** and gradually introduce smart protein ingredients into mainstream food formats.

A GFI APAC consumer study in Singapore saw strong consumer interest in blended proteins, with over 90 percent of participants willing to replace part of their meat consumption. In blind taste tests, several blended products closely matched their conventional counterparts, and one outperformed them.

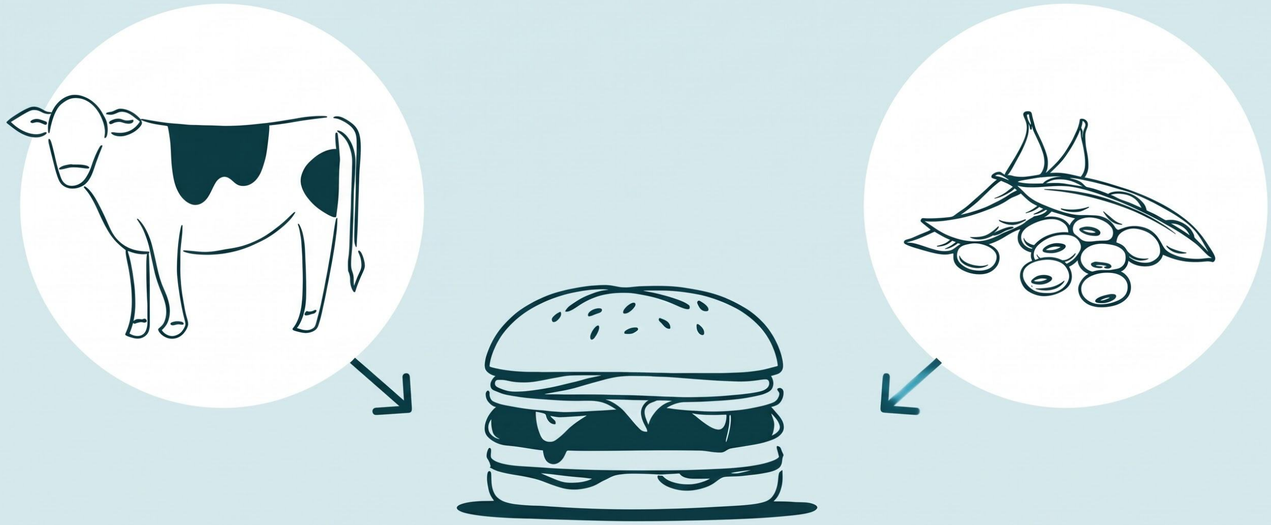




Image credit: Blue Tribe Foods

Investment

Section 03

How global investment has evolved

Investment into the alternative protein sector grew substantially between 2016 and 2025 despite year-to-year volatility—punctuated by periods of rapid acceleration and subsequent market correction.

- 2021 (banner year): $5.1 billion was invested into the category globally, registering an estimated 60 percent increase from 2020 and a whopping 400 percent increase from 2019.
- 2022 (market correction): Total investments fell to $2.9 billion amid challenging macroeconomic and market conditions worldwide. In spite of this, companies based in APAC saw a 43 percent year-over-year funding growth to reach $562 million (19.4 percent of total global investment).

Takeaways

- The centre of gravity for alternative protein innovation then, slowly but steadily **shifted eastward** as global investments moved out of North America. In 2022, for the first time in the sector's history, investments outside North America represented the majority share of the global total (58 vs. 42 percent).
- Despite growing investor appetite across Asia, India recorded only $17 million in investments across all three smart protein categories over 2021-2022, highlighting a critical **funding bottleneck for local startups**.



Current funding trends indicate progress in the right direction, but a significant gap remains, as discussed further

Capital flow into the alternative protein sector across the world



Data source: 2026 State of the Industry Reports (GFI)

Total global investment (2016–2025)

Privately held
$16.7B

Publicly traded
$2.7B

Investment in privately held companies
Investment in publicly traded companies

Plant-based sector

Private $8.2B Public $2.6B

Fermentation

Private $5.1B Public $0.1B

Cultivated meat

100% privately held ($3.4B)

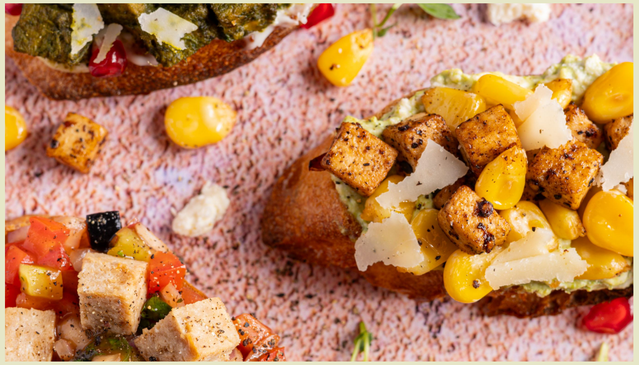
Zooming into global investment trends (2023-2025)

Global investment in the sector gradually decreased between 2023 and 2025. In 2025, investments in artificial intelligence (AI) dominated broader capital markets, capturing nearly 50 percent of all global venture funding. Venture capital tightened in most other sectors, including alternative proteins, which experienced barriers to raising capital within the climate tech and food tech segments.

Data source: 2026 State of the Industry Reports (GFI)

Note: The data represents combined public and private investment.

$1.58B
2023 Total



Plant-based
$859M
Cultivated
$267M
Fermentation
$456M

Image credit: PROT

$1.12B
2024 Total



Plant-based
$342M
Cultivated
$144M
Fermentation
$632M

Image credit: Biokraft Foods

$882M
2025 Total



Plant-based
$450M
Cultivated
$74M
Fermentation
$358M

Image credit: Genexis Biotech

Tackling the capital challenge

Factors affecting capital flow

Plant-based	Fermentation and cultivated meat
Elevated interest rates	Elevated interest rates
High production and materials costs	High production and materials costs
Slowing sales	Uncertain scale-up timelines and regulatory approvals

Trends in plant-based:

Despite reduced capital flow, the plant-based sector continued expanding through unique product formats, new partnerships, and improvements to existing production processes. In 2025, the largest plant-based deals went to companies already generating meaningful revenues in established retail, food service, or B2B channels.

Trends in cultivated meat:

From 2023 to 2025, funding dropped by half year-on-year, as investments funnelled into companies that demonstrated progress on primary factors like cost, taste, and scale. Some notable cultivated meat companies paused or ceased operations in 2025, following difficulties securing additional funding. At the same time, several cultivated companies acquired or merged with each other to combine portfolios, technology stacks, and intellectual property.

Trends in fermentation:

For the first time, in 2024, fermentation companies raised nearly double that of the plant-based sector. Investors are increasingly finding the product functionality and compelling B2B propositions of fermentation-derived ingredients and end products appealing. In 2025, fermentation funding fell ~43 percent to $358 million, even though this total includes several large public investments directed at commercialisation (see next slide).

Public capital backs alternative proteins

- In 2025, for the first time, Europe-headquartered fermentation companies ($179 million) raised more than North America-headquartered companies ($154 million). Public and development finance actors have been a driving force, investing in multiple fermentation companies:
  - **The European Investment Bank** provided a venture debt loan to Formo.
  - **Invest-NL** participated in Vivici's Series A and The Protein Brewery's Series B.
  - **The European Innovation Council** committed $15 million to MOA Foodtech.

- In the Middle East, the Abu Dhabi Investment Office partnered with The EVERY Company and Vivici to explore the establishment of a multi-tenant, industrial-scale facility.

Climate Bonds launched Alternative Proteins Criteria, a first-of-its-kind framework for certifying investments in sustainable protein solutions. This framework provides investors, industry, and policymakers with a science-backed tool to drive meaningful transformation in the food sector.

Increased investment in the Indian food processing sector



India's food processing sector has grown steadily between 2023 and 2025 to serve growing domestic and global demand, with Gross Value Added (GVA) rising to ₹2.24 lakh crore (~$27.1 billion) in FY2023-24 up 67 percent from FY2014-15. The Government of India allocated a budget of ₹4064 crore (~$452 million) to MoFPI for 2026-27, an increase of over ~₹500 crore (~$55.6 million) from 2025-2026.

At World Food India 2025, organised by MoFPI, 26 leading companies signed MoUs totalling **₹1.02 lakh crore (~$11.7 billion)**—one of the largest investment commitments in the sector.

Rising consumer demand for high-protein products has emerged as a key trend in India's food processing sector, drawing investor interest towards protein-fortified products. In 2025 alone, the high-protein segment attracted more than 24 rounds of investment worth over ₹440 crore (~$49.0 million). Rainmatter, for instance, made 90 percent of its protein investments in 2024 and early 2025.

This investor shift towards health and nutrition products, particularly with revived interest in high-value ingredients, has trickled down to the smart protein sector, generating upstream benefits for domestic supply chains.

Smart protein investments in the Indian ecosystem before 2023

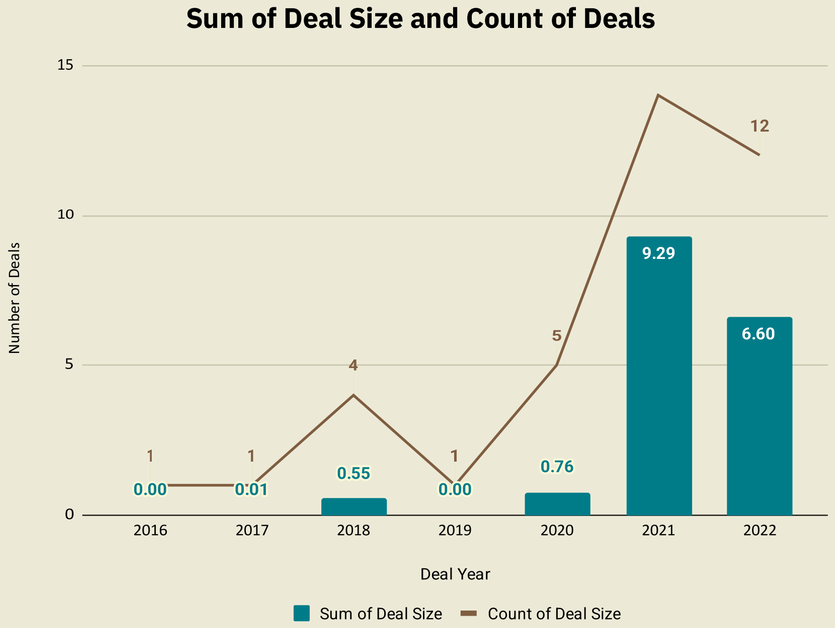
In 2022, two significant investments in manufacturing were recorded:

India-based food manufacturer **Symega Food Ingredients** committed a ₹100 crore (~$12.7 million) investment over five years to build a dedicated plant-based production facility in Kochi.

Plant-based meat manufacturing startup **BVeg Foods** unveiled its production facility, which can currently produce 4,000 metric tonnes of plant-based meat a year.

The cultivated meat and fermentation sector saw investments into early-stage R&D in 2022. Of these, only a few companies have reached the pilot and commercialisation stage.

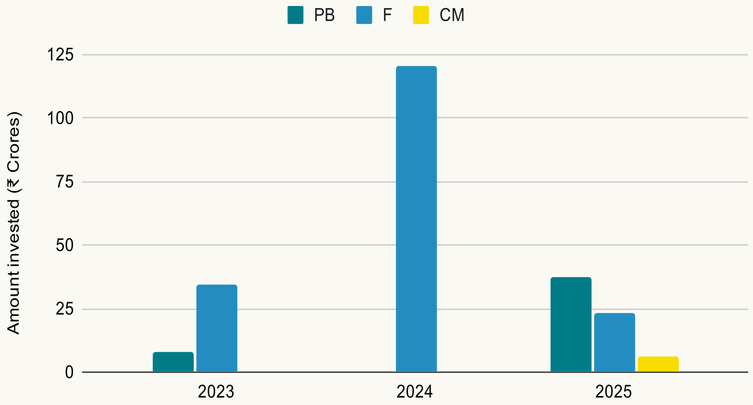
- Phyx44, a full-stack player working with animal-free whey, casein, and fatty acids, scaled to a pilot stage of 100 litre capacity.
- String Bio set up its first multi-purpose gas fermentation facility in Bangalore.



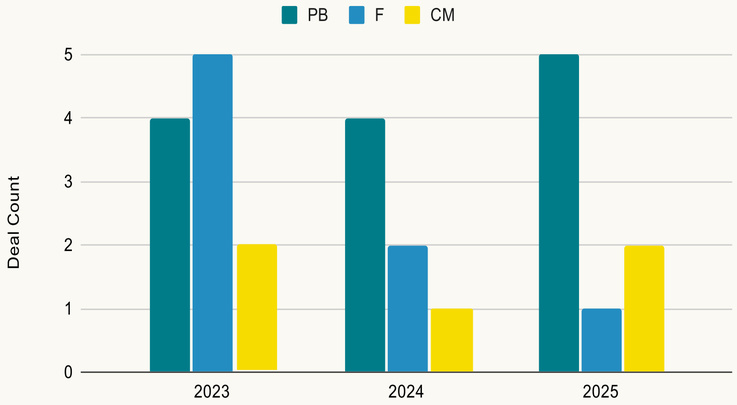
Data source: State of the Industry Report: Smart Protein in India

Smart protein investments in India 2023 onwards

Year-wise investment by modality



Publicly identified funding events by modality



- Fermentation-derived proteins recorded the highest number of deals in 2023, exceeding those in the plant-based sector. The sector also attracted the highest quantum of investment among the three smart protein pillars in 2023 and 2024, driven primarily by ₹120 crore(~$14.3 million) investment in Laurus Bio in 2024.
- Plant-based investment rebounded in 2025, supported by a mix of private investment, grants, and public funding.
- In 2025, cultivated meat startups secured two comparatively large investments, following one grant in 2024 and two small seed investments in 2023.

Three significant deals have happened in early 2026:

1.5 Degree, a plant-based dairy brand, has raised ₹9.04 crore (~$1.01 million) in a pre-series A round.

The Bland Company, a protein technology startup that converts agricultural sidestreams into functional egg-replacing proteins, raised $2.67 million.

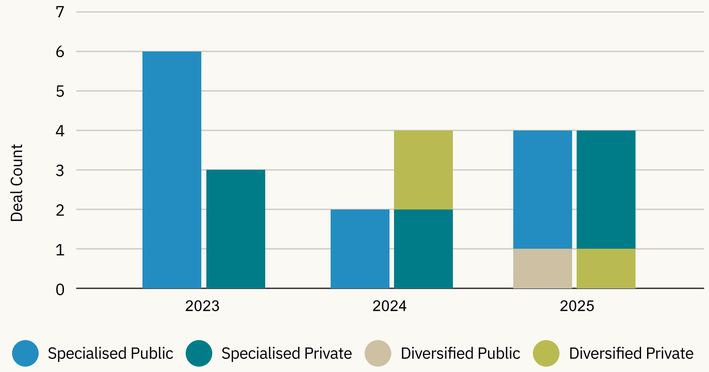
StrainX Bioworks, a precision fermentation and synthetic biology startup working on producing molecules for food, nutrition, and other categories, raised ~$13.8 million (₹124 crore , one of the biggest investments in India for a fermentation-based company.

The aggregated investment data for India presented in the graphs was sourced from an internal investment monitoring tracker maintained by GFI India and from Net Zero Insights. The data covers investments into specialised and diversified smart protein companies headquartered and/or operating in India between April 2023 and December 2025. To capture the diverse forms of capital flowing into the sector, the analysis includes private investments and disclosed public funding through government bodies, grants, competitions, and prize winnings. The total deal count includes deals for which investment amounts were not disclosed.*

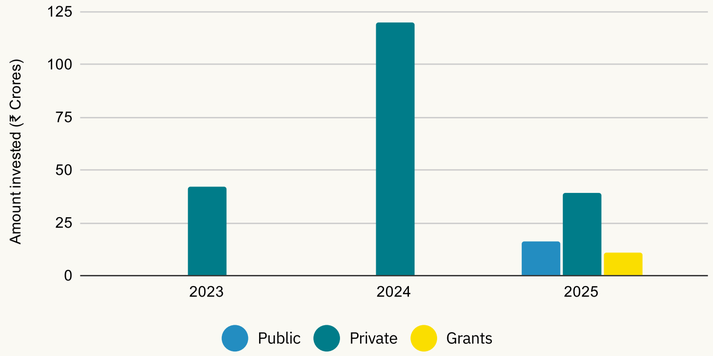
Note: Aggregated data has not been reviewed by Net Zero Insights analysts. The total deal count includes deals with undisclosed amounts.

Smart protein investments in India 2023 onwards

Number of private investments and public grants/non-dilutive funding received by specialised and diversified companies



Year-wise investment by funding type



- Deal count and capital raised tell different stories. Specialised companies attracted more individual deals, while a small number of diversified companies attracted substantially larger amounts of capital.
- The funding mix became more diverse in 2025. Unlike 2023–2024, when disclosed capital was mostly private, 2025 saw meaningful contributions from private investment, public funding, and grants/competitions.

Definition of specialised and diversified companies:

1. Specialised companies: Companies whose product line or business is focused primarily on smart protein.
2. Diversified companies: Companies that have a product line or business unit focused on smart protein, but smart **proteins are not their primary or sole focus**.

The aggregated investment data for India presented in the graphs was sourced from an internal investment monitoring tracker maintained by GFI India and from Net Zero Insights. The data covers investments into specialised and diversified smart protein companies headquartered and/or operating in India between April 2023 and December 2025. To capture the diverse forms of capital flowing into the sector, the analysis includes private investments and disclosed public funding through government bodies, grants, competitions, and prize winnings. The total deal count includes deals for which investment amounts were not disclosed.*

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The need for capital remains

India's investment trend followed the global pattern with a lag, peaking in 2022, a year after the global high, before declining. While more focused investments slowly restarted in 2025, the sector's needs also evolved, warranting more patient capital for large-scale infrastructure and manufacturing.

- For plant-based alternatives, achieving price parity with animal-based products and reaching economies of scale requires investment into robust supply chains: local raw material processing for low-cost ingredients, indigenous equipment manufacturing, and high-capacity production facilities.
- For fermentation and cultivated meat, funding is required at both pilot- and commercial-scale, given the high costs of primary equipment and inputs such as cell culture media.

Industry consolidation: Compared with the global trend of mergers, acquisitions, joint ventures, and partnerships across all three modalities between 2023 and 2025 as a strategy to build more sustainable and cost-effective businesses, India only saw one acquisition in the plant-based sector. Superfood brand Nourish You acquired plant-based dairy startup One Good in one of the largest smart protein acquisitions in the country. One Good previously acquired the nutrition brand Pro2Fit and plant-based cheese brand Angelo Vegan and merged with Katharos.



Learnings from the Indian biotech ecosystem

The Indian bioeconomy, valued at $10 billion in 2014, grew to $165.7 billion market by 2024. An important driver of this exponential growth was patient public capital and government support for domestic biotech startups.

Some key government initiatives include:

National Biopharma Mission – 2017

Accelerating early stage development for biopharmaceuticals

Bio-RIDE – 2024

Advancing R&D, entrepreneurship, and biomanufacturing.

Biotech-Krishi Innovation Science Application Network (KISAN) – 2017

Connecting agricultural research with farmers through regional hubs.

DBT-supported Bio-Technology Parks – 2003

Promoting shared infrastructure, technology incubation and entrepreneurship.

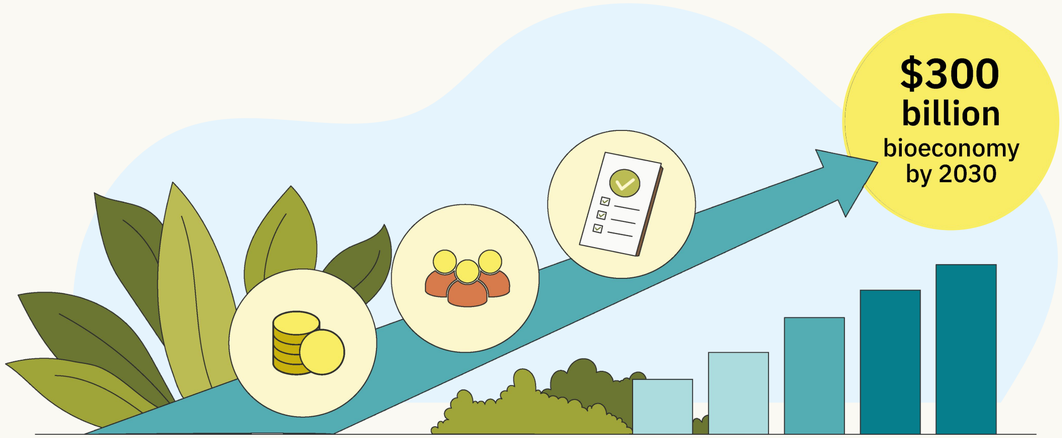
Biotechnology Industry Research Assistance Council (BIRAC) initiatives

Support Stage	Key BIRAC Initiative
R&D and industry collaboration	• Small Business Innovation Research Initiative (SBIRI) – 2005 • Biotechnology Industry Partnership Programme (BIPP) – 2008
Early-stage innovation	Biotechnology Ignition Grant (BIG) – 2012
Incubation and infrastructure	Bio-incubators Nurturing Entrepreneurship for Scaling Technologies (BioNEST) – 2016
Enterprise development	• Sustainable Entrepreneurship and Enterprise Development Fund (SEED Fund) – 2016 • Launching Entrepreneurial Driven Affordable Products Fund (LEAP Fund) – 2018

Learnings from the Indian biotech ecosystem

Government support de-risked early-stage innovation and catalysed private capital flow for scale-up and commercialisation. Big players in the global biotech industry were incentivised and encouraged to pursue research, development, talent building, infrastructure and greenfield facility creation, as well as invest into domestic startups. India allows 100 percent Foreign Direct Investment (FDI) under the automatic route for greenfield pharmaceuticals and manufacturing of medical devices.

This multi-pronged approach catalysed a sector with high technology, funding, and talent needs to transition from niche to mainstream within a decade. The smart protein sector, especially precision fermentation and cultivated meat companies, requires a similar level of support and capital facilitation to produce sustainable and affordable products at scale.



Newer policies like the **Research Development and Innovation Fund (RDIF)** and **BioE3 policy** (which specifically names smart proteins) have been introduced to achieve the government's target of a $300 billion bioeconomy by 2030.

Early-stage support through acceleration and incubation

Since 2023, there has been significant growth in establishing diverse incubation facilities, from smart protein-focused centres to government-supported biofoundries:

- May 2024: The Centre for Smart Protein and Sustainable Material Innovation was established at the IKP Knowledge Park, Bangalore. The hub provides state-of-the-art equipment and expert mentorship to early-stage smart protein companies.
- September 2025: The Centre for Alternative Protein Research was established by the University of Hyderabad and ASPIRE-BioNEST with support from Cytiva, a global biopharmaceutical company, under their Corporate Social Responsibility programme. The centre aims to advance translational research and entrepreneurship in smart proteins to address food security, nutritional needs, and climate change.

Notable development in 2026

March 2026: BIRAC-BioNEST Incubation Centre was established at CSIR–CFTRI, Mysuru, providing food bioprocessing and biotechnology startups, including those working on precision fermentation, with R&D, scale-up, and product validation facilities.

GFI India's Incubation support for a thriving smart protein ecosystem report (2024) outlines common challenges that startups face, along with actionable recommendations to address them.

The Navigating acceleration and incubation for smart protein startups in India guide (2025) maps relevant accelerators and incubators for smart-protein startups in India, with facility details and a practical checklist to help founders choose partners suited to their stage of growth.

Beyond private capital

Grants and schemes

Public investment has played a significant role in supporting early-stage smart protein innovation. Initiatives such as BIG, the Pusa Krishi Grant-in-Aid Accelerator Program, DST NIDHI-PRAYAS, and others have provided essential support, but with a broader focus on food technology and biotechnology. In 2025, the **Department of Biotechnology-Biotechnology Industry Research Assistance Council (DBT-BIRAC) released a Joint Call for Proposals** under the BioE3 Policy, which marked a major milestone as the government's first dedicated funding mechanism exclusive to smart proteins. The call supported the setting up of Biofoundries and Biomanufacturing Hubs in India, either by building new facilities or expanding existing ones, including shared infrastructure for process development, scale-up, and product validation, to close the gap between laboratory research and pilot- and pre-commercial-scale manufacturing. Academia, companies, startups, and research organisations were eligible to apply, and grants went up to ₹50 crore for Bio-AI Hubs, ₹65 crore for Biofoundries, and ₹75 crore for Biomanufacturing Hubs.



Between 2023 and 2025, GFI India signed five strategic MoUs with key incubation institutions, including CSIR–CFTRI, APIC, NIFTEM–K, IKP, and CSIR–IHBT to provide sector-focused advisory to accelerators and incubators that support emerging smart protein startups.

To improve visibility into private and public sources of capital, GFI India's funding opportunities database showcases active, upcoming, and rolling grants and schemes, including startup challenges and innovation and grant programmes.

Alternative finance

Smart protein companies are outgrowing what venture capital (VC) and grants can fund:

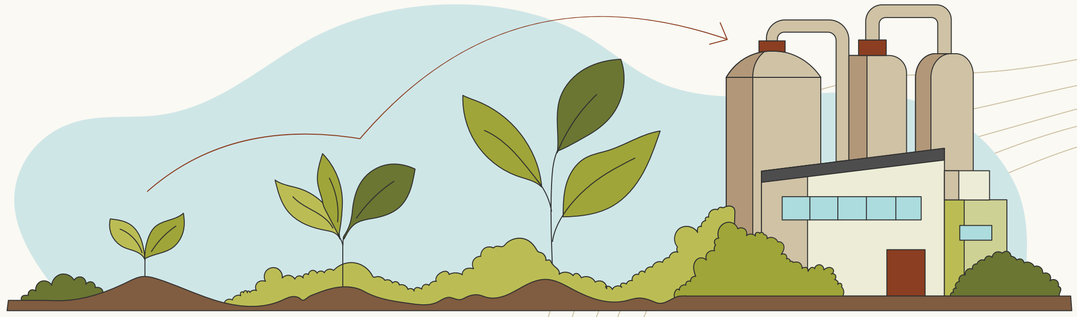
Many smart protein companies are actively moving out of the early stage into more mature stages of growth. Current VC investments and funds raised via innovation programmes, grants, and other sources are no longer adequate to fuel these companies' long-term growth. There is both a need and opportunity for alternative forms of financing to enter the sector.

Why does the smart protein sector in India need alternative financing?

- A growing need to increase production volumes and reduce costs.
- Lower-cost capital brings down unit economics faster than equity alone—which is critical for reaching price parity and capturing market share as companies move from pilot- to commercial-scale.
- Early-stage companies are considered too high-risk to access debt financing at low-enough capital costs.
- Slowdown of venture capital investments into the sector.
- Misalignment of repayment timelines for venture debt compared to the growth trajectories of companies scaling from R&D to commercialisation.

What is alternative financing?

Alternative financing refers to financial mechanisms outside traditional bank lending and conventional capital markets. It includes models such as crowdfunding, peer-to-peer lending, revenue-based financing, invoice financing, and equipment loans, that provides businesses with faster access to capital and more flexible eligibility and repayment terms than traditional financing.



Alternative financing interventions for smart protein scale-up and R&D

For scaling infrastructure	
Financial interventions	**Non-financial interventions**
• Shared infrastructure and common-use facilities. • Equipment leasing and financing for specialised smart protein equipment. • Advanced market commitments to support commercialisation of innovative technologies. • Project financing by providing low-cost capital for infrastructure development.	• Demand aggregation on the input side. • Product development partnerships and offtake. • Joint-venture partnerships for scale-up.

For scaling R&D	
Financial interventions	**Non-financial interventions**
• Non-dilutive capital to innovative startups through catalytic/philanthropic capital with the ability to transfer knowledge through IP agreements. • Incubators and infrastructure consortiums to support licensing and scale-up of technology.	• Access to critical infrastructure to reduce capital expenditure (CapEx). • Support training and capacity development for new technologies. • Streamline regulatory frameworks.

Global perspective on alternative finance

Alternative finance vehicles are gradually being adopted for R&D and manufacturing scale-up globally. In 2025, the **European Investment Bank** (EIB), backed by the EU's **InvestEU** programme, provided a €20 million (~$22.6 million) loan to **Heura Foods** to support R&D and scale-up investments. Other large-scale financings combined equity with venture debt to fund production expansion, such as **MATR Foods**' €40 million (~$45.1 million) raise, with debt from EIB and participation from **Denmark's Export and Investment Fund**.

GFI resources	Region	Summary
Funding the build	United States	A review of capital pools beyond venture capital that provides a realistic assessment of the funding landscape for alternative protein scale-up and commercial manufacturing. The initial phase of research is focused on U.S. companies or companies focused on the U.S. market opportunity.
Blended finance: Accelerating the growth of the market for alternative proteins in Europe	Europe	A paper on blended finance as a financial tool to help close the funding and scale-up gap for alternative proteins in Europe by combining public and/or philanthropic capital with private investment to reduce risk as well as mobilise additional funding.
Innovative financing mechanisms for alternative proteins in Europe	Europe	The report shows how public and blended finance can be leveraged to address critical funding gaps, particularly at the infrastructure, scaling, and commercialisation stages. It outlines a recommended roadmap for mobilising more capital, opening new investment channels, and accelerating market development across the value chain in Europe.



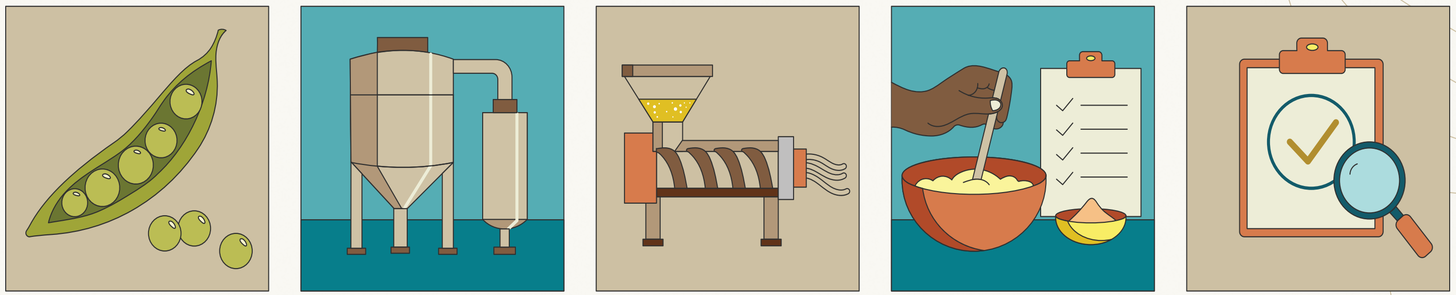
Image credit: Blue Tribe Foods

Science & Technology

Section 04

Overview of the scientific ecosystem

India's smart protein scientific ecosystem made significant strides in 2024, supported by public investment, favourable policies for research and innovation, and research infrastructure development. The sector saw groundbreaking research publications, patents, and new technologies across all three smart protein pillars, with the most research activity clustered around the plant-based sector.









Read more about GFI India's academic partnerships here.

R&D highlights in plant-based ecosystem

01 Protein ingredients

CSIR–CFTRI

A CSIR–CFTRI study examined protein hydrolysates from **horsegram** and found improved solubility, water- and oil-holding capacity, and foaming properties, highlighting their potential as functional ingredients in food formulations.

University of Kashmir

University of Kashmir researchers benchmarked the techno-functional optimisation of pulse proteins from **mung bean, lentil, broad bean, chickpea, and horsegram** for use in smart protein products.

→ Continued in the next slide

02 Non-protein ingredients

CSIR–NIIST

CSIR–National Institute for Interdisciplinary Science and Technology (NIIST) found that oleosomes from **virgin coconut meal** could function as natural emulsifiers in products such as plant-based mayonnaise.

CSIR–NIIST researchers also developed a novel plant-based fat ingredient using **coconut oleosomes and wheat gluten** to provide a clean-label solution for enhancing the sensory and structural properties of plant-based meat.

03 Technological processing

NIFTEM, Thanjavur

A NIFTEM–T review explored **electrospinning** to create plant-based meat with more realistic meat-like textures, highlighting its ability to produce nanofibres that closely mimic animal muscle structure.

CSIR–CFTRI

A CSIR–CFTRI review examined **ultrasonication** as a promising non-thermal technology for improving plant protein functionality, helping address challenges related to solubility, texture, digestibility, and performance in food applications.

04 End-product formulations



Plant-based meat

Researchers investigated the use of **rice protein and wheat gluten** in high-moisture plant-based meat products and found that wheat gluten produced stronger, more meat-like fibrous structures when blended with pea protein isolate.



Plant-based cheese

A study identified optimal processing conditions for producing plant-based cheese with improved meltability and texture, using a blend of **cashew paste, pea protein, tapioca starch, and coconut oil.**



Plant-based meatballs

The sensory and structural performance of plant-based meatballs made from **Indian pulse protein concentrates** and other ingredients was analysed using composite ingredient systems.



Pea protein-based cappuccino

NIFTEM–T developed a **pea protein-based cappuccino premix** that offers higher protein content in a convenient and relatively low-calorie beverage format.

Novel sources of smart proteins

Ingredients	Research findings
Protein isolates from tomato seed waste	Functional and sustainable protein ingredient for food applications
Guar meal protein isolates	High protein content and strong digestibility
Protein concentrate from quinoa germ	Strong water- and oil-holding capacities
Protein extracted from quinoa bran	Nutritious and functional plant protein ingredient for food applications
Defatted coconut meal	Alternative to pea protein concentrate for high-moisture plant-based meat products

Algae as a source of protein:

- A multi-institutional review systematically evaluated sustainable alternative protein sources including **mycoprotein and algal proteins** from nutritional, absorption, and techno-functional perspectives.
- Researchers from NIFTEM–Kundli examined emerging **algal protein extraction methods** and their benefits, which could support more sustainable food systems.
- Scientists at CSIR–Indian Institute of Chemical Technology (IICT) explored the potential of microalgae as an alternative protein source, highlighting ***Chlorella* growth factor** as a nutrient-dense ingredient.

R&D highlights in fermentation ecosystem

India's strong research foundation in biotechnology and industrial fermentation has led to its emergence as a global leader in biopharmaceuticals and vaccine production. The National Biofuels Policy has supported rapid growth in the bioethanol industry, with India now standing as the third-largest producer and consumer.

Building on this expertise, the BioE3 policy aims to build capacity in high-performance biomanufacturing, including scaling fermentation-derived proteins. Early policy implementation has focused on building long-term supportive research infrastructure, including pilot facilities and biofoundries.

Top innovations in India's fermentation-derived protein sector

Academia

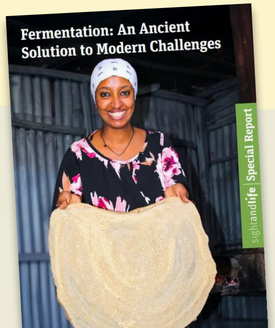
Researchers from Indian Institute of Technology (IIT) Delhi's Centre for Rural Development and Technology produced *Agaricus bisporus* mycelia using cost-effective agro-industrial byproducts (corn steep liquor and defatted soy flour) via submerged fermentation. They found that the resulting mycelium was a nutrient-dense functional food ingredient with high levels of protein and essential minerals, with an opportunity to enrich it with vitamin D2 through UVB irradiation.

- The same researchers also published an article on the kinetics and nutritional qualities of *Lentinus edodes* mycoprotein, produced through a fed-batch fermentation process using a soy flour dextrose medium.

Industry

After the approval of Reliance Industries' first microalgae-derived protein in August 2023, their synthetic biology R&D team continued to build on microalgae systems and published a comprehensive safety assessment of algae protein from *Picochlorum* for human consumption. Their second microalgae-derived protein is currently being scrutinised by the Food Safety and Standards Authority of India (FSSAI) under the Approval for Non-Specified Food and Food Ingredients regulations.

GFI India contributed to a technical article for Sight and Life's Special Report, Fermentation: An Ancient Solution for Modern Challenges, examining the role fermentation-derived proteins could play in tackling malnutrition globally, particularly in low- and middle-income countries.



R&D highlights in cultivated meat ecosystem

Cultivated meat research is concentrated among a small group of institutions in India, focused on developing new cell lines for terrestrial and aquatic species, optimising culture media, and advancing cellular aquaculture.

Researchers from ICAR–Central Institute of Fisheries Education (CIFE) are strengthening India's cultivated seafood research base through fish muscle cell-line development, proteomic characterisation, and genetic manipulation for cellular aquaculture applications. Specifically, they have developed a cultivated muscle cell line from rohu (Labeo rohita), a muscle cell line from genetically improved farmed tilapia (Oreochromis niloticus), and muscle cells from Asian seabass (Lates calcarifer) with proteomic analysis.

IIT Madras researchers investigated the use of systems biology tools to develop serum-free media for cultivated meat applications, identifying multi-omics characterisation and computational modelling that can support rational design of serum-free media using valorised inputs. This research aims to address the high cost of cell culture media, which is a major manufacturing barrier for cultivated meat.

Sathyabama Institute of Science and Technology researchers developed cultivated fish cell lines from four commercially important species—milkfish, grouper, red snapper, and tilapia. The team also reported receiving authentication from the National Bureau of Fish Genetic Resources (NBFGR).

India has an established biotech industry that is helping **grow domestic capabilities in the development and manufacturing of critical inputs for cultivated meat,** reducing reliance on imports. Large companies such as HiMedia Labs have expanded their bioscience portfolio to include food-grade culture media and also offer customised formulations for multiple animal species used in cultivated meat production.



GFI's Research Grant Program: Funding for cultivated meat research in India



Pramod Wangikar, of IIT Bombay and Clarity Bio Systems

is leading a project on low-cost, serum-free culture media for cultivated chicken by combining metabolic modelling, spent-media analysis, and computational optimisation.

It seeks to build detailed genome-scale metabolic models of chicken muscle cells to predict how different media formulations affect cell growth, which could replace expensive recombinant growth factors and serum proteins with plant-derived alternatives, as well as optimise media through dynamic flux balance analysis.

Project goal:

To reduce the cost and development time of cultivated meat media, addressing one of the industry's biggest barriers to commercialisation while improving scalability and eliminating animal-derived media components.



Lakshmi Mundkur of Umami Bioworks in India and researchers from Nord University in Norway

are working to establish continuous, suspension-adapted mesenchymal stem cell lines from Atlantic halibut. The research team plans to optimise culture conditions for stable, long-term growth and use machine learning to screen cost-effective media formulations that can support the cell lines in serum-free cultures.

Project goal:

To advance the scientific understanding of growth conditions and serum-free requirements in cold-water marine species for cultivated seafood applications.

Patent landscape in India



Patenting activity provides an indication of how smart protein research and technological development translates into commercialisable products, processes, and ingredients. While more than 100 patent applications were filed by Indian assignees between 2023 and 2025, only two patents were granted in the plant-based and fermentation-derived sectors each during this period.

Plant-based

2024	*Cowpea-Based Protein Concentrates for Food Products and Method of Manufacture*
2024	*Multi-Millet Beverage and Process of Making the Same Thereof*

Fermentation

2024	*A Process for Production of Animal-Free A2 Beta-Casein Milk Protein (CSN2)*
2025	*Animal-Free Fusion Milk Proteins and a Process for Preparing the Same.*



IIT Kharagpur filed a patent in 2024 for a Micronutrient-enriched Mycelium Powder-based Low Moisture Meat Analogue, which was granted in 2026 [Indian Patent Number - 586963].

Data source: Data sourced from Dimensions, an interlinked research information system provided by Digital Science.
Image Credit: Green Queen Media

Noteworthy articles from the Indian R&D ecosystem

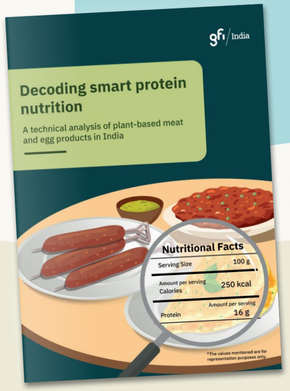
Article	Key insights
Nutritional Analysis of Plant-Based Meat: Current Advances and Future Potential	• Combining plant protein sources and using phytase enzymes is a promising strategy to improve amino acid balance and mineral absorption of plant-based meat, which supports the development of more nutritious products.
Mycoprotein: production and nutritional aspects: a review	• Mycoprotein produced through submerged fermentation can achieve higher yields and strong nutritional value while offering a substantially lower carbon footprint than conventional meat.
Smart proteins as a new paradigm for meeting dietary protein sufficiency of India: a critical review on the safety and sustainability of different protein sources	• Microbially derived proteins hold long-term promise for sustainable protein production, with high productivity and use of low-cost substrates for a circular economy approach. • Continued safety and allergenicity assessments across smart protein categories are necessary.
A review on advancing sustainable vegan meat alternatives through scalable production of plant-based smart proteins	• Plant proteins derived from agricultural residues, when combined with advanced structuring technologies, offer a path towards more cost-effective and sustainable plant-based meat products.
Alternative proteins from waste streams: a circular economy roadmap for sustainable food systems	• A circular economy roadmap shows that producing alternative proteins from agricultural residues, industrial byproducts, and organic waste streams through microbial, algal, and fungal systems is viable. • Waste-to-protein technologies could improve resource efficiency, reduce environmental impacts, and strengthen food security, but safety, regulatory, and consumer acceptance challenges must be addressed to enable large-scale adoption.
Precision fermentation: Pioneering the future of sustainable and alternative animal protein production	• Engineered microorganisms can produce dairy and egg proteins with animal-equivalent functionality while utilising fewer resources and generating less waste than conventional production systems.
Cell-cultivated aquatic food products: emerging production systems for seafood	• The roadmap outlines key advances and challenges across cell culture, biomaterials, tissue engineering, processing, safety, and regulation for scaling cellular aquaculture as a sustainable and resilient production system.

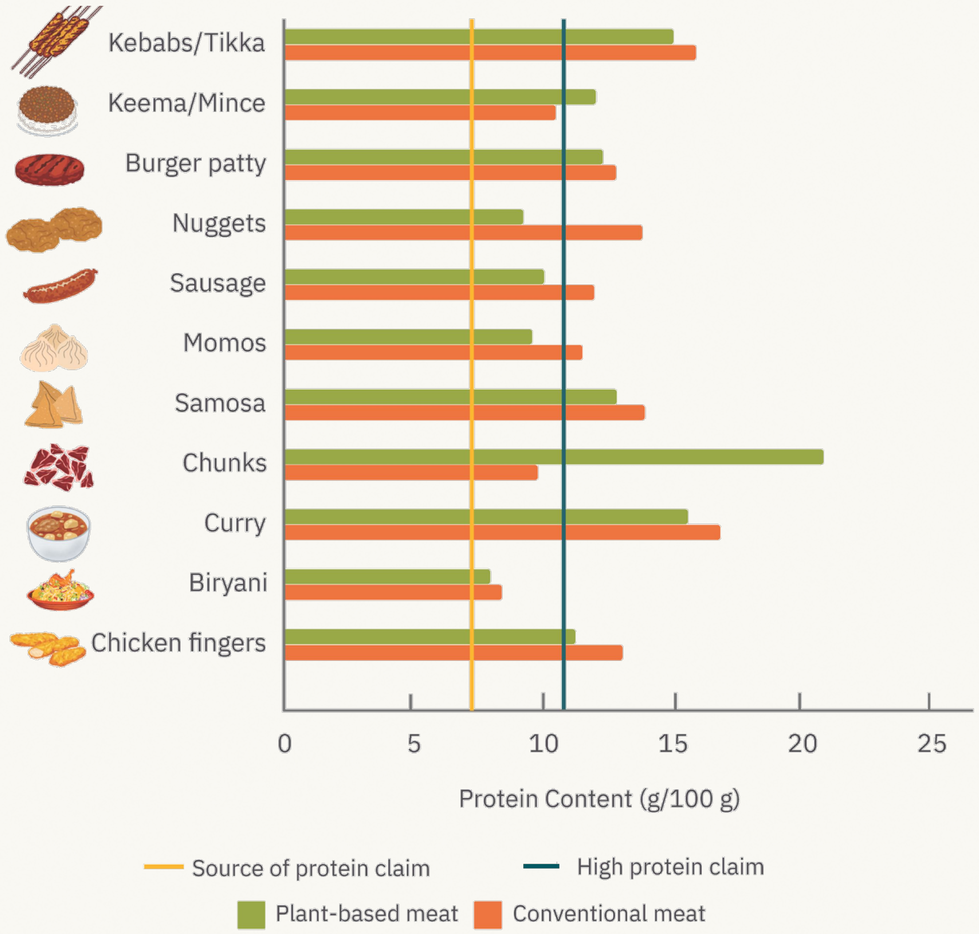
Nutrition and bioavailability

Phase 1

GFI India published a comprehensive e-book that presents the nutritional composition and quality aspects of plant-based meat and egg products in the Indian market. The study underscored the importance of scientifically optimising plant protein combinations to improve amino acid scores and micronutrient content.

- The Indian plant-based meat and egg products analysed had comparable or higher protein content than their animal-derived counterparts.
- These products comply with the 'source of protein' claims of the FSSAI and the Food and Drug Administration (FDA).
- Both plant-based meat and egg product formats were found to be "rich in dietary fibre," giving them an advantage over animal-derived products.





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Phase 2

GFI India published a first-of-its-kind research project analysing the protein bioavailability of processed millet- and pulse-based ingredients and Indian plant-based meat products. Bioavailability is the fraction of a nutrient in food that is absorbed and utilised by the body after consumption,which has not been widely studied for India's protein-rich crops or plant-based meat products. Key findings:

- Protein content ≠ Protein digestibility ≠ Protein bioavailability.
- Processing effects are crop-dependent.
- Biological processing shows promise for millets.
- Pulses benefit from both thermal and biological processing.
- The extraction method must be aligned with ingredient application.
- Cooking plant-based meat does not necessarily compromise protein quality.
- Plant-based meat can deliver comparable or higher bioavailable fractions of protein than animal-derived meat.

How does the protein quality of plant-based meat compare with conventional meat?

	Type	Total Crude Protein (TP) (%)	Bioaccessible Fraction (%)	Bioavailable Fraction (%)
Burger patty	Plant-based (Brand 1)	11%	1%	57%
	Plant-based (Brand 2)	17%	1%	58%
	Chicken (Animal derived)	19%	2%	21%
Nuggets	Plant-based	14%	2%	61%
	Chicken	22%	2%	43%
Seekh kebab	Plant-based (Brand 1)	23%	2%	81%
	Plant-based (Brand 2)	15%	1%	86%
	Chicken (Animal derived)	21%	3%	39%

Recommendation from the study: Protein quality is a function of both the crop and processing routes. As the study demonstrates, processing need not be a nutritional liability; when appropriately tailored, it can improve protein utilisation, strengthen the assessment of protein quality in foods as consumed, and unlock India's indigenous crops for alternative protein applications. Formulation—especially protein source, processing history, and product matrix—govern the protein bioavailability of plant-based meat.

Public infrastructure development for translational research

Between 2025 and 2026, the BioE3 policy drove investments into facilities that support applied research, process development, and pilot-scale manufacturing. The biofoundries and biomanufacturing programme has been designed to address infrastructure gaps through a public-private partnership model, including scale-up validation and pre-commercial production for bio-based technologies such as smart proteins.

March 2026

Union Minister of State for Science and Technology Dr. Jitendra Singh laid the foundation stone for the first biofoundry for smart protein biomanufacturing at the BRIC-National Agri-food and Biomanufacturing Institute (BRIC-NABI). The facility will offer pilot-scale validation and sustainable technologies for smart proteins and bio-based products, enabling pre-commercialisation testing, technology transfer, and skill development.



August 2025

The BRIC-National Institute of Animal Biotechnology (BRIC-NIAB) established India's first animal stem cell biobank. The facility hosts an animal stem cell repository and provides cost-effective culture media, with the aim of accelerating cultivated meat innovation, strengthening domestic biomanufacturing capabilities, and reducing reliance on imported inputs.



June 2025

The BRIC-NCCS inaugurated the BioE3 Strain Resource Centre, a biorepository that provides access to domestically developed, high-performance microbial strains, which could benefit startups working on fermentation-derived proteins and ingredients.



Talent and workforce development

A skilled workforce is essential to support research, innovation, and commercial scale-up of smart proteins. While India produces nearly 250,000 graduates in relevant disciplines annually, companies report challenges finding talent with specialised, hands-on skills required for smart protein research, product development, and manufacturing.

GFI India's 2025 skills mapping study assessed the skills required across key job roles in the smart protein sector, evaluating the alignment between academic curricula and industry requirements. Based on inputs from industry, academia, sector skill councils, and policymakers, the study also examined opportunities to integrate smart protein training into university curricula and professional development programmes.

Together with an accompanying recommendations brief, the report outlines strategic actions for policymakers, industry, academia, and skilling organisations to strengthen India's smart protein talent pipeline.

GFI's scientific experts, in collaboration with faculty across global educational institutuons, have developed open access resources for designing smart protein coursework. These can be accessed through GFI's open access teaching library (https://gfi.org/resource/teaching-library/) or GFI's online course, The Protein Transition (https://learn.gfi.org/courses/The-Protein-Transition).



Technical skill gaps among new graduates

Plant-based	• Plant protein extraction and functionalisation • High-moisture extrusion
Fermentation and cultivated meat	• Basic animal cell culture techniques, molecular biology, metabolic engineering • Bioreactor handling, bioprocess optimisation, and scale-up for fermentation and cultivated meat
Experimentation and analytical work	• Food sensory studies with newer technologies (E-nose, E-tongue) • Experimental design and analytical protocols for high-throughput screening using HPLC, GC-MS • New product formulation using novel smart protein ingredients
Regulatory affairs	• Awareness of regulatory pathways for novel smart proteins

Smart protein curricula

Initiatives with Food Industry Council for Skills and Innovation (FICSI)

January, 2025

Industry leaders and academics gathered to deliberate talent development for the plant-based sector. The discussion highlighted key priorities to address the skilling gap: stronger industry–academia collaboration, hands-on training and internships, and integration of plant-based protein concepts into curricula.

June, 2026

A self-paced Plant-Based Alternative Proteins e-Course was launched in June 2026. Covering the science, processing, formulation, manufacturing, safety, regulation, and commercialisation of plant-based proteins, the course provides students, early-career researchers, professionals, and entrepreneurs with an accessible pathway to build industry-relevant knowledge.

Smart protein-related academic coursework

Gujarat Biotechnology University (GBU) introduced a dedicated M.Sc. elective smart protein course for students across five disciplines: plant, animal, environmental, industrial, and medical biotechnology.

The Institute of Chemical Technology (ICT) Mumbai is planning an elective course structure on Alternative Protein Technologies, with a proposed launch in the January–June 2027 academic cycle.

Amity University in Uttar Pradesh is developing a smart protein elective as part of its biotechnology curriculum, with a planned introduction in 2027.

GFI India's ecosystem partnerships:

- GFI India is part of Echo Network's consortium on Rural Livelihoods, which aims to create a roadmap for localised circular food systems, including toolkits for sidestream valorisation through field-based research.
- GFI India plays an advisory role for the Sustainability Ambassadors Global Exchange (SAGE) PhD fellowship programme under the "Feedstock" theme. An IIT Bombay fellow is researching **the valorisation of tomato processing waste** to extract value-added compounds, including proteins, under the joint supervision of Professor Amit Arora and Professor Solange I. Mussatto at the Technical University of Denmark.

Talent and research initiatives

The Smart Protein Project (SPP), known globally as the Alt Protein Project, trains and empowers student leaders at key universities to build thriving alternative protein academic ecosystems. As of December 2025, this network had six active chapters at premier institutions across India: Delhi University, Ashoka University, NIFTEM–K, Institute of Chemical Technology (ICT) Mumbai, IIT Madras, and Amity University. In 2026, two new SPPs were launched at Gujarat Biotechnology University (GBU) and Sathyabama Institute of Science and Technology.

Noteworthy activities by the SPP chapters:

The Mumbai Smart Protein Project (SPP) conducted a four-part webinar series in partnership with Biotecnika, focused on educating students and early-career professionals on the fundamentals of smart protein, featuring talks by SPP members, startup founders, and scientists.

The NIFTEM–K SPP hosted the Alt Protein Market Breakthrough Challenge as part of their larger Ideathon event during their e-summit, attracting over 30 teams who pitched their innovative smart protein startup solutions to a panel of expert judges.



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As part of a 15-student cohort, two students from Delhi University and Ashoka University SPP chapters participated in the APP Regional Student Symposium at Singapore International Agri-Food Week in 2025. They also participated in the GFI APAC-organised workshop and the Agri-Food Tech Asia Expo, featuring alternative protein companies and researchers, learning how academia, industry, and policy align to drive the alternative protein sector forward in APAC.

The ICT SPP, in collaboration with FoodYaari (an online food technology and safety skills-sharing platform), hosted a webinar featuring Debabrata Das, founder of ProMeat, to spotlight the smart protein landscape with a focus on plant-based meat. In 2025, the ICT SPP team members also published two articles titled ‘Circular economy approaches for valorising guar-gum processing waste into protein-rich products’ and ‘Leveraging waste for the plant-based meat sector’ in the Association of Food Scientists and Technologists of India (AFSTI) Mumbai chapter’s newsletter.





These activities give students first-hand exposure to the sector, allow them to network with innovators and scientists, and inform how they continue innovation, community building, and research on campus.

SPARK Fellowship

The Smart Protein Advanced Research & Knowledge (SPARK Fellowship) was launched in 2024 to encourage postgraduate students from diverse scientific disciplines such as food technology, biotechnology and bioengineering, microbiology, and chemical engineering to work on smart protein industry-relevant applied research.

Under the Fellowship, selected students conduct lab-based research over a six-month to one-year period at premier Indian research institutions, under the guidance of expert faculty mentors. Since 2024, eleven SPARK fellows have successfully completed the program and subsequently pursued doctoral research or professional roles across the food, biotechnology, and related industries. Research conducted in the SPARK Fellowship has focused on critical gap areas in smart proteins, such as improving ingredient functionality, hybrid product processing and formulation, cell line and media development.

To know more about the SPARK projects, please visit https://gfi-india.org/spark-fellowship/



Image credit: Blue Tribe Foods

Policy & Regulation

Section 05

Policy

Policy & Regulation

Alternative proteins are a global food systems solution

Around the world, governments are recognising protein diversification as a strategy to meet food and nutrition security, economic growth, biotechnology leadership, and industrial resilience goals. While alternative proteins debuted on the policy stage as part of sustainability-oriented agendas, their value is now being reflected in broader socio-economic and technological priorities, with countries building domestic manufacturing capabilities and pioneering advanced novel food production.

According to GFI's 2026 State of Global Policy, governments around the world are significantly expanding support for research, infrastructure, commercialisation, and industrial scale-up of plant-based, fermentation-derived, and cultivated meat, seafood, eggs, and dairy.

Similar to how countries approached semiconductor production, renewable energy, and pharmaceutical manufacturing for sustainability and self-sufficiency goals, the focus is now on biomanufacturing capacity as a strategic asset.



Policy signals from around the world

China

China's State Development and Investment Corporation announced nearly $1 billion in biotechnology facility investments in 2025, explicitly including food-related applications. Chinese policymakers integrated alternative proteins into national development priorities, referencing fungal and algae-based protein extraction technologies in their policy statement, No. 1 Central Document.

What it means:
China is signalling their determination and ambition to lead in "new proteins" and industrial biotechnology.

European Union

In 2025, through policy initiatives such as the Life Sciences Strategy and the Bioeconomy Strategy, the European Union awarded more than €100 million (~$113 million) in loans to plant-based and fermentation companies to support industrial expansion. Tens of millions of euros in additional funding were allocated for research and innovation programmes across member states.

What it means:
Europe is showcasing its leadership in the scale-up and commercialisation of plant-based and fermentation-enabled products, supported by strong research ecosystems and public-private innovation networks.

Canada

Canada strengthened its position as a global hub for plant protein production through Protein Industries Canada (PIC), the country's plant protein supercluster, supported by C$ 150 million (~$109 million) in funding between 2023 and 2028. PIC launched new public-private partnerships to expand Canada's capacity to manufacture ingredients, strengthen research leadership, and develop an innovation ecosystem around alternative proteins.

What it means:
Canada is linking agricultural production, food processing, and biotechnology policy into integrated industrial strategies.

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Australia

In 2025, the Australian government launched the Pioneer BioPilot biomanufacturing hub in Queensland, supported by A$18 million ($11.6 million) in federal and state funding. Invest Victoria explicitly identified alternative proteins, including fermentation technologies, as a strategic investment priority and highlighted public financing mechanisms to accelerate commercialisation.

What it means:
Australia is driving commercialisation of alternative proteins, especially precision fermentation and cultivated meat, positioning them as strategic industries.

Brazil

While national-level investments remained limited in Brazil, state governments drove research and commercialisation efforts for new protein sources. The state of Paraná led Brazil's investments in fermentation research and commercial support in 2025, announcing multiple new public research initiatives.

What it means:
Brazil's alternative protein ecosystem is evolving through state-specific initiatives tailored to local strengths and priorities.

United States

In 2025, the U.S. federal government announced only $6 million in new research funding for plant-based, fermentation-derived, and cultivated proteins, which was drastically lower than previous years. The number of new grants awarded by the National Science Foundation reportedly fell by 25 percent.

What it means:
The U.S. is signalling a pullback in public funding for alternative protein research, in contrast with growing government investment in other regions.



A Global Innovation Needs Assessment conducted in 2021 estimated that governments need to invest approximately $10.1 billion annually for the sector to fully develop. Such investment could support up to 9.8 million jobs, generate approximately $1 trillion in economic value, and strengthen food resilience, public health, and environmental security. However, despite growing enthusiasm and policy engagement across many countries, estimated government investment in 2025 amounted to no more than 10 percent of this benchmark.

Policy push for smart proteins in India

BioE3 Policy

The Government of India's Biotechnology for Economy, Environment, and Employment (BioE3) policy was approved in 2024 and has been operationalised through subsequent grant calls and infrastructure investments from the DBT and BIRAC. It is a flagship national policy to advance high-performance biomanufacturing through shared infrastructure, biofoundries and pilot and pre-commercial scale support. Smart proteins and functional foods are explicitly identified as one of its six priority areas, creating a policy pathway for research, innovation and commercialisation.

Six pillars of BioE3:

- Smart proteins & functional foods
- High value bio-based chemicals
- Futuristic marine & Space Research
- Precision biotherapeutics
- Climate-resilient agriculture
- Carbon capture & utilisation

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Policy push for smart proteins in India

Momentum since launch

In September 2025, DBT-BIRAC provided a major boost to smart proteins, particularly precision fermentation, through the High Performance Biomanufacturing Platforms initiative.

The initiative builds on investments in industry-academia infrastructure, with facilities involving HiMedia Laboratories, IIT Madras-TICEL, Laurus Bio and Sundyota Numandis identified under the BioE3 biomanufacturing platform network, with applications spanning upstream and downstream bioprocessing for recombinant proteins, functional ingredients, enzymes, growth factors, nutraceuticals, and food-grade bioactive compounds.

BioE3-linked infrastructure programmes are intended to address one of the largest structural bottlenecks facing India's smart protein ecosystem: **limited access to shared pilot-scale and pre-commercial-scale biomanufacturing infrastructure, particularly for fermentation.**

Evolving biomanufacturing ecosystem

Government-backed BioEnabler infrastructure is being developed to address critical gaps in India's biomanufacturing ecosystem.
These facilities aim to provide access to shared capabilities in strain engineering, fermentation, process optimisation, analytical testing and pilot-scale production. For smart protein companies, this infrastructure could reduce the cost and risk of technology development and help bridge the gap between laboratory research and commercial manufacturing.

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Bio-RIDE Scheme

Bio-RIDE scheme approved in 2024 with an outlay of ₹9,197 crore (~$1.10 billion), supports biotechnology research, innovation, entrepreneurship and industrial development. Its components include R&D, industrial and entrepreneurship development, and biomanufacturing and biofoundry initiatives. While not exclusive to smart proteins, it provides a broader enabling framework for biotechnology innovation and biomanufacturing.

Mission for Aatmanirbharta in Pulses

The mission was launched to scale up domestic pulses production from 252.38 lakh tonnes (2024-2025) to 350 lakh tonnes and expand the cultivation area from 275 lakh hectares (2024-2025) to 310 lakh hectares by 2030–31 (increase of 35 lakh hectares). This mission supports the supply of high protein quality seeds to the farmers to ensure the quality is at par with industrial standards. It is also providing the necessary push for strengthening the plant protein ecosystem in India and reduce the dependency on imported raw materials for the growth of the sector.

GST reforms for plant-based alternatives

The Goods and Services Tax (GST) reforms introduced in 2025 mark a huge shift in how smart proteins are taxed, which can improve their affordability.

Previous tax structure

12%-18%

- Several plant-based ingredients and products, including texturised vegetable proteins, nuts used in plant-based meat and dairy, and processed fruits and vegetables, were taxed at **12 percent**.
- Plant-based milk faced an even higher **18 percent** tax rate.
- Soy milk was taxed at **12 percent**.

Revised tax structure

5% GST

- GST on plant-based milk, including soy milk, has been reduced to **5 percent**, bringing it closer to the rates applicable to many animal proteins.
- Extruded or expanded products, which may include plant-based meat and other plant-based foods, have also moved to a **5 percent** rate.
- GST reforms also extend to fermentation-derived products such as nutritional yeast and microbial proteins, with reported reductions from **12 to 5 percent** for inactive yeast and single-cell microorganisms.



At the state level

Karnataka

The Karnataka Biotechnology Policy 2024–2029 explicitly identifies “bio-agriculture,” including smart proteins, as an emerging strategic sector. Karnataka positioned smart proteins within a broader advanced biomanufacturing framework focused on synthetic biology, fermentation infrastructure, and bio-based manufacturing. The policy also proposed incentives for biomanufacturing and bioprocessing infrastructure relevant to fermentation-derived proteins and functional ingredients.

This policy marks the first instance of an Indian state government formally recognising smart proteins as part of a biotechnology industrial framework.

Maharashtra

With strategic support from the Government of Maharashtra, the World Bank and the Grant Thornton Bharat LLP, the Indo Pulses Development Association (IPDA) was established as a Commodity Stewardship Council (CSC) to drive systemic improvements across the pulses value chain through boosting productivity and promoting innovation to shaping policies and enhancing market access.

Maharashtra’s intervention reflects state-level recognition that India’s large domestic pulse production base could support upstream protein ingredient manufacturing.

In early 2025, GFI India signed an MoU with IPDA to offer technical expertise in ecosystem building and capacity development related to smart proteins.



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Several other state biotechnology and startup ecosystems also indirectly supported smart protein innovation between 2023 and 2025, through bioincubation infrastructure, agri-food innovation programmes, and food processing incentives.



Telangana

Telangana's Next Gen Life Sciences Policy 2026–2030 focuses on precision fermentation technologies. The state government is also expanding the Genome Valley park, which aims to establish a fully integrated biomanufacturing cluster to serve as a launchpad for companies and demonstrate proof of concept. **These efforts will also benefit precision fermentation and cultivated meat startups.**

Tamil Nadu

Under the Tamil Nadu Budget 2025-2026, the state government announced a plant-based protein manufacturing scheme to support MSMEs, FPOs, and entrepreneurs in setting up extraction and processing units to produce protein from de-oiled rice bran, groundnut cake, and gingelly cake. The scheme provides financial support of up to 35 percent of plant and machinery costs, capped at ₹50 lakh (~$57,400) per project, alongside promoter contribution and bank financing. The scheme also provides technical training and guidance with support from ICAR–CIPHET (Central Institute of Post-Harvest Engineering and Technology).

A notable trend among state-level interventions is that most remain **ecosystem-oriented rather than consumer- and market-oriented.** State governments framed smart proteins as part of food processing modernisation, industrial fermentation, agricultural value addition, and bioeconomy expansion, with an emphasis on manufacturing infrastructure and commercialisation support.

Regulatory

Policy & Regulation

Regulatory greenlights around the world

Regulatory frameworks play a critical role in determining the path to market for novel smart protein products, particularly fermentation-derived products and cultivated meat.

Cultivated meat regulatory approvals around the world

2023

Singapore	**Serum-free media**	Singapore Food Agency (SFA) approved the use of serum-free media in the production of GOOD Meat's existing cultivated chicken.
United States of America	**Chicken**	The United States became the second country to authorise the commercial sale of two cultivated chicken products. Following completion of the FDA's pre-market safety consultation, the USDA granted inspection approval to UPSIDE Foods and GOOD Meat, indicating that their production facilities satisfied regulatory standards.

2024

Singapore	**Quail**	SFA approved Vow's cultivated quail for sale.
Israel	**Beef**	Aleph Farms received pre-market approval from Israel's Ministry of Health for cultivated beef, but is awaiting administrative steps prior to commercial sale.
United Kingdom	**Pet food**	Meatly became the first European company to receive regulatory approval for cultivated meat in pet food from UK regulatory bodies.

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Regulatory greenlights around the world

2025

United States of America	**Pork fat**	The FDA completed its pre-market consultation and issued a “no questions” letter to Mission Barns’ cultivated pork fat. Mission Barns also received regulatory approval from the U.S. Department of Agriculture (USDA) to commercialise its cultivated pork fat.
United Kingdom	**Foie gras**	Gourmey submitted an application for cultivated foie gras, which was validated by the UK Food Standards Agency (FSA) and Food Standards Scotland (FSS).
United States of America	**Chicken**	Believer Meats received regulatory approval from the USDA to commercialise its cultivated chicken.
Singapore	**Pet food**	Friends & Family Pet Food Company received approval to sell cultivated meat-based pet food for cats and dogs.
Singapore	**Chicken**	Parima received regulatory approval from the SFA for its cultivated chicken.
Europe	**Seafood ingredients**	Umami Bioworks registered two cultivated seafood ingredients for pet food in the European Union Feed Materials Register.
Australia & New Zealand	**Quail**	Food Standards Australia New Zealand (FSANZ) approved Vow’s cultivated quail for sale in the domestic market after two rounds of safety assessment and public comments. As part of the approval, FSANZ has developed category-wide requirements and guidance for cultivated meat producers. This is a step towards bringing cultivated meat more in line with the standardised requirements of conventional food categories.

Global regulatory approvals for fermentation-derived proteins

Precision fermentation

- Remilk's animal-free dairy protein (beta-lactoglobulin) has received regulatory approvals in multiple nations.
- The company received a "no questions" letter from the U.S. FDA, regulatory approval from Israel's Ministry of Health for its cow-free milk, and a No Objection Letter from Health Canada, becoming the first company producing animal-identical dairy proteins to receive such approval in Canada.

- In Australia, Cauldron Ferm received approval from the Office of the Gene Technology Regulator (OGTR) in 2024 to conduct limited-scale production trials of protein ingredients in batches of up to 10,000 litres.

- Perfect Day, Impossible Foods, ImaginDairy, and other companies have received FDA "no questions" letters for their ingredients.

Biomass fermentation

- In 2025, the European Food Safety Authority (EFSA) issued a positive scientific opinion on The Protein Brewery's mycoprotein ingredient Fermotein, concluding that it is safe under the proposed conditions of use.

- In 2023, Nature's Fynd received approval from Health Canada to commercialise its novel fungal protein Fy™ Protein, and also received a "no questions" letter from the U.S. FDA.

- Several biomass fermentation companies, including The Better Meat Co. and ENOUGH, have received FDA "no questions" letters for their ingredients.

Disclaimer: This list may not be exhaustive. It reflects major regulatory developments and approvals as identified during the reporting period.

How governments are approaching alternative protein regulations

Asia Pacific

01

- In 2023, the Prime Minister of Japan announced plans to develop a domestic cultivated meat industry as part of the country's strategy to reduce its carbon footprint. The Asia-Pacific Society for Cellular Agriculture (APAC-SCA) and the Japan Association for Cellular Agriculture (JACA) also signed an MoU to coordinate regional regulatory development.
- In 2023, South Korea amended its legislation for pre-market approval of novel foods under the Ministry of Food and Drug Safety's *New Food Materials—Temporary Recognition of Foods* framework to include ingredients derived from cell and microbial cultures. Subsequently, the country established regulatory free zones, including the Gyeongbuk Cell-Cultivated Foods Regulatory-Free Special Zone (RFSZ), to support cultivated meat research and development. In the same year, North Gyeongsang Province led the signing of an MoU involving 28 organisations, including local governments, academic institutions, and companies, to establish a national cellular agriculture cluster.
- In 2024, JACA published a comprehensive report analysing international approaches to the safety assessment and regulation of cultivated meat.
- In 2024, the Fatwa Committee of the Majlis Ugama Islam Singapura (MUIS) announced that cultivated meat may be considered halal under specified conditions.
- In 2025, Singapore enacted the Food Safety and Security Act, formally establishing a regulatory category and pre-market approval pathway for novel foods, including biomass and precision fermentation-derived proteins. The SFA also updated its novel food safety assessment guidance to clarify regulatory requirements and approval timelines for fermentation-enabled proteins.

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Europe

02

- In 2023, the UK FSA and FSS launched a new application system for regulated products, including novel foods. The FSA also published *Guidance for businesses on cell-cultivated products and the authorisation process*, with a commissioned report on the *identification of hazards in meat products manufactured from cultured animal cells*. The report informs the risk assessment process for the authorisation of cultivated meat.
- In 2023, the EFSA held a scientific colloquium on the safety of cell culture-derived foods to strengthen its preparedness for scientific evaluations.
- In 2024, the FSA established a regulatory sandbox, supported by the UK Department for Science, Innovation and Technology, to accelerate the assessment of novel foods. The initiative enables collaboration between regulators, industry, and researchers to generate scientific evidence and refine regulatory approaches to start conducting safety tests for cultivated meat.
- In 2024, EFSA published *Guidance on the scientific requirements for an application for authorisation of a novel food in the context of Regulation (EU) 2015/2283*, which specifies scientific requirements for foods consisting of, isolated from, or produced from animal cell or tissue cultures.
- In 2025, the FSA launched a one-year programme to strengthen regulatory expertise in precision fermentation and support companies navigating the novel foods approval process.
- In 2025, the European Parliament voted in favour of proposals to restrict the use of meat-related terms on plant-based product labels, advancing the proposal to trilogue negotiations with the European Commission and the Council of the European Union.
- In 2025, the Netherlands became the first European Union member state to establish a framework allowing pre-market public tastings of precision fermentation- and biomass fermentation-derived foods under controlled conditions. The Code of Practice allows companies to gather consumer feedback before European Union novel food authorisation, while maintaining defined safety and oversight requirements.

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Middle East 03

- In 2025, the Abu Dhabi Agriculture and Food Safety Authority (ADAFSA), Abu Dhabi Quality and Conformity Council (QCC), and Abu Dhabi Investment Office (ADIO) launched an initiative to develop a regulatory framework for novel foods. The framework streamlines market approvals of cultivated proteins and precision fermentation technologies while aligning with international regulatory and halal certification standards.

Brazil 04

- In 2023, the Brazilian Health Regulatory Agency (Anvisa) published Resolution RDC 839/2023[1], establishing requirements for the safety assessment and authorisation of novel foods and novel food ingredients, including foods produced through precision fermentation and cell culture (cultivated meat.

[1]*This article gives a short overview of the new framework in English.*

Regulatory landscape for smart proteins in India

The Food Safety and Standards Authority of India (FSSAI), India's apex food regulatory authority, plays a central role in enabling the safe introduction of innovative food categories, including smart proteins. The FSSAI establishes science-based standards governing the manufacture, storage, distribution, sale, and import of food products and ingredients to ensure the availability of safe and nutritious food.

The Food Safety and Standards Act, 2006, together with the rules and regulations framed under it, provides the regulatory path to market for all food products, including smart proteins.

Plant-based

Plant-based meat, eggs, and dairy typically use ingredients that are standardised under the Food Safety and Standards (Food Products Standards and Food Additives) Regulations, 2011. However, many products represent new applications or formats that are not covered by existing standards and are therefore regulated as proprietary foods.

Fermentation-derived

Fermentation-derived ingredients and proteins are regulated under the Food Safety and Standards (Approval for Non-Specified Food and Food Ingredients) Regulations, 2017 (NSF Regulations). Under these regulations, companies must obtain prior approval from the FSSAI before manufacturing, producing, or importing a non-specified food, including novel food products. Following prior approval, the food business operator may apply for the relevant licence to commercialise the product.

In 2023, the FSSAI granted prior approval under the NSF Regulations to Reliance's phototrophic algal biomass-derived protein powder.

In 2024, Nature's Fynd received regulatory approval from the FSSAI for its biomass fermentation-derived Fy™ Protein, a nutritional fungal protein derived from *Fusarium* strain *flavolapis*.

Cultivated meat

India's food regulator is currently reviewing an application for cultivated meat under the NSF regulations.

The FSSAI has received its first application seeking approval for a cultivated meat product in India. In addition, several Indian cultivated meat companies are at advanced stages of research and development and are considering submitting applications for regulatory approval.

In the final quarter of 2024, two cultivated meat companies, BioKraft Foods and ClearMeat, participated in closed-door product tastings with regulators and other stakeholders.

Advancing India's smart protein regulatory framework

DBT–BIRAC Regulatory Conclave

The Department of Biotechnology (DBT), in collaboration with the Biotechnology Industry Research Assistance Council (BIRAC), organised a closed-door, invitation-only Regulatory Conclave on Smart Protein in 2024.

The DBT–BIRAC Regulatory Conclave was the first government-led initiative of its kind in India to convene stakeholders to discuss the regulatory pathway to market for smart proteins. The conclave brought together representatives from government, including the FSSAI and MoFPI, alongside experts from academia, Indian and international companies, industry associations, and Codex Alimentarius, the international food standards body.

The discussions highlighted the importance of an enabling regulatory framework to support innovation and commercialisation.



Global Food Regulators Summit

In 2024, India's Union Minister of Health and Family Welfare, J.P. Nadda, highlighted the need for a regulatory framework for novel foods, including cultivated meat, at the Global Food Regulators Summit (GFRS).

In the 2025 edition, the FSSAI discussed regulatory approaches for novel smart proteins, including robust pre-market approval processes, process validation and controls, and developing adaptive tools such as risk-based approaches and regulatory sandbox programs.

The remarks reflected the Government of India's continued focus on strengthening food safety standards and preparing the regulatory ecosystem for emerging food technologies.



The Secretary for Department of Biotechnology (DBT) Government of India during his keynote speech at GFRS 2025 on food safety in emerging food tech.



Image credit: PROT Block

Conclusion

Reflections on the road ahead

1 The need has grown

Smart protein now addresses more than one priority area: nutrition, domestic manufacturing, and resilient supply chains.

- Value-addition to pulses, oilseeds, and millets can open new revenue for farmers beyond commodity sales while building agricultural resilience.
- Driven by rising consumer demand, India's high-protein segment drew more than 24 rounds of investment worth over ₹440 crore (~$49.0 million) in 2025.
- Widespread protein insufficiency makes smart protein a public health case, not just a climate one.

2 Scale is the test

The bottlenecks have moved upstream to functional ingredients, specialised equipment, pilot infrastructure, patient capital, and regulatory clarity. Taste and price still determine adoption.

- India remains heavily reliant on imports for smart protein ingredients, including plant protein isolates, and specialised equipment such as high-moisture extrusion, membrane filtration, and advanced drying systems.
- Companies are outgrowing what venture capital and grants can fund, and thus, require patient growth capital and financing better suited to infrastructure and equipment financing.

3 Change is underway

For the first time, policy frameworks, ingredient manufacturing, infrastructure, and talent are moving in the same direction.

- BioE3, state policies, and new publicly funded biofoundries are expanding policy support for research and scale-up. Translating this support into accessible pilot and manufacturing facilities across smart protein modalities will be critical.
- 15 to 20 domestic companies now manufacture plant protein ingredients, from soy through to indigenous pulses and oilseeds like mung bean, chickpea, and rapeseed.

Key takeaways

Industry:

Focus moved upstream

What changed: Growth shifted from retail launches to B2B and food service channels, co-manufacturing, and domestic ingredient production from pulses and oilseeds.

What's next: Locally manufacturing specialised equipment and functional ingredients to cut import dependence and reach taste and price parity.

Investment:

Capital became selective

What changed: Private capital became more selective, favouring companies with revenue and clearer paths to scale, while public funding and grants became a more meaningful part of India's funding mix in 2025.

What's next: Patient, blended, and alternative finance for capital-intensive manufacturing.

Science and technology:

Research is aligning with industry needs

What changed: Research expanded into indigenous crops, sidestream valorisation and novel protein sources, alongside work on nutrition and scale-up barriers, supported by new public infrastructure and talent programmes.

What's next: Turning research into commercial technologies and building hands-on, industry-ready skills.

Policy and regulation:

Smart protein entered national and state policy

What changed: BioE3, state policies, and GST reform built support, while the FSSAI approved fermentation-derived proteins and received its first cultivated meat application.

What's next: Clear and enabling regulatory pathways for precision fermentation and cultivated meat and public procurement pathways for smart proteins.

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Contributors

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GFI India's suite of expertly curated newsletters puts timely news, insights, and opportunities right in your inbox.

GFIdeas India community

The GFIdeas India Community hosts online webinars and a LinkedIn community for the smart protein sector. With leading experts from across India, the webinars focus on topics related to starting and scaling a good food business as well as cutting-edge research developments that enable smart protein innovation. Community members also receive a monthly newsletter highlighting developments in the smart protein industry, upcoming events, hiring requests, community updates, and new resources