

FOOD PROCESSING

Towards Sustainable Growth Opportunities



SECTOR PROFILE

PLANT-BASED PROTEINS

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ABSTRACT

The Indian food processing sector has witnessed remarkable growth, surpassing a 9% average annual growth rate since 2014-15. The Gross Value Addition (GVA) in the food processing sector has shown a Compound Annual Growth Rate (CAGR) of 7.27% in the past five years. The sector contributes approximately 20% to the overall GVA, highlighting its competitiveness and ability to cater to international markets. India's processed food exports have experienced a significant surge, reaching US\$13.07 billion in 2022-23. The Ministry of Food Processing Industries has provided support and incentives to the sector through its flagship schemes, such as the Pradhan Mantri - Kisan Sampada Yojana, and the Pradhan Mantri Formalisation Micro Food Processing Enterprises.

India has the potential of becoming a major player in the global plant-based, given its diverse agro-climatic conditions, availability of raw materials, and the ability to cater to local taste preferences. India's rich sources of plant-based protein, such as pulses, soybeans, legumes, and nuts, as well as several good quality protein raw materials such as chickpeas, soy, wheat, and millets can serve as an excellent alternative to the animal products. The market size of India's plant protein sector is projected to grow at a CAGR of 14.5% for 2019-2024, highlighting immense potential to capitalize on this trend. The market offers a wide range of plant-based products, including milk, meat substitutes, bakery items, and snacks, catering to different taste preferences. The diversity of Indian cuisine and the availability of raw materials in India are also advantages for the plant-based food business in the country.

The global consumption of plant-based foods is on the rise, driven by increasing trends towards healthy nutritious plant-based foods and convenient options. The three categories of plant-based foods, plant-based processed foods, and plant-based protein alternatives are explored, highlighting their growing popularity as alternatives to traditional animal-based products. Factors such as rising awareness about health, nutrition, environment, and animal welfare issues contribute to the sector's growth.

Overall, with the right support and investments, India can become a significant player in the global plant-based protein market, contributing to a sustainable and healthy food ecosystem.

01. INTRODUCTION

In the recent days, there has been increasing awareness and consciousness among the youth about the food that we eat every day. The people across the globe have been preferring the healthy and nutritious food. One type of such foods includes the plant-based food as correlated by rising trends of vegetarianism, veganism and flexitarianism. Apart from health, the other reasons for the preference of these food include environmental concerns, animal welfare issues, religious beliefs etc.

The plant-based food landscape can be broadly divided into three categories: plant-based foods, plant-based processed foods, and plant-based protein alternatives. Plant-based foods refer to whole, unprocessed plant foods such as fruits, vegetables, nuts, and grains. Plant-based processed foods include products such as plant-based beverages, dairy-free cheese, non-dairy yogurt and vegan ice cream. Additionally, plant-based protein alternatives such as plant-based meat, seafood, and eggs are gaining traction as consumers seek out alternatives to traditional/animal protein.

Plant based proteins are used in manufacturing of plant-based products where all necessary amino acids which would otherwise be present in an animal-based meat would be present in a product made from plant-based proteins. For example, Beyond Burger's usage of peas, mung beans and legumes to make a "complete protein" burger which tastes exactly as an animal-based product.

This document highlights the global trends in plant-based proteins, India's strength in plant-based protein as a sector, opportunities, R&D and skill development ecosystem to support the plant-based protein sector in the country.

¹ Food & Agriculture Organisation (FAO)



2. GLOBAL TRENDS IN PLANT-BASED PROTEIN

2.1 GLOBAL CONSUMPTION

Plant-based foods consist of processed fruits, vegetables, whole grains, legumes, nuts and seeds, herbs, and spices and excludes all animal products, including red meat, poultry, fish, eggs, and dairy products. Whole-food plant-based (WFPB), processed plant-based foods, and plant-based proteins share common elements. While the plant-based proteins may include relatively more processed imitation meats and cheese; a WFPB diet eschews these products in favour of whole or minimally processed, close-to-nature foods that makes it easy to meet nutritional needs.

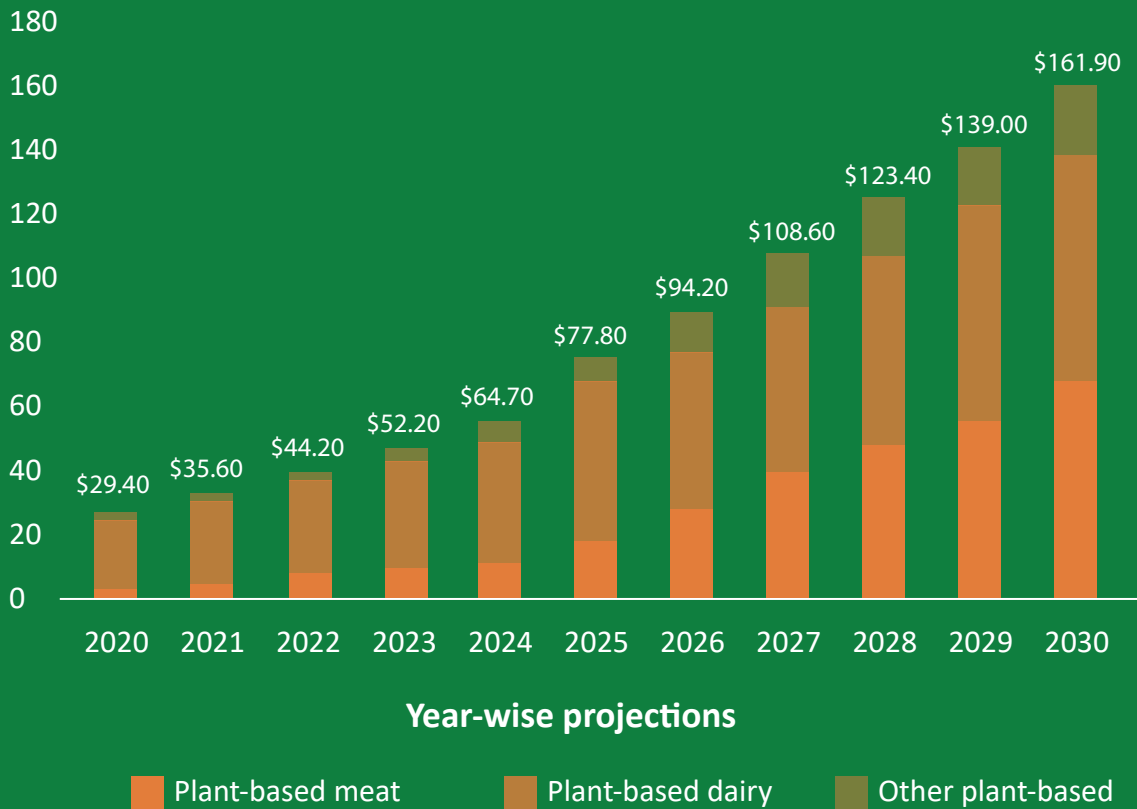
While consumers are reducing their consumption of animal-based products such as milk, dairy products, meat, etc. due to various reasons like sustainability, animal welfare, health concerns etc, many still desire the specific flavour, texture, mouthfeel and feeling of satiety associated with various animal-derived protein products. This has led to the development of various plant-based protein products that mimic the taste and consuming experience of the traditional animal-based products.

Plant-based meat substitutes are being consumed in fast food restaurants by people across the globe.

The following graph shows the consumption of plant-based protein market consisting of plant-based beverages, plant-based meat and other plant-based products. It is projected that the global plant-based protein industry is like to touch USD 160 billion by 2030².

² FAO Data

TOTAL GLOBAL PLANT-BASED RETAIL MARKET SIZE (IN US \$ BILLION)



2.2 GLOBAL TRADE SCENARIO

It is expected that the population growth causing a strain on resources will contribute to plant-based food growth. Among all the regions, the Asia-Pacific region is more vulnerable to limited food supply, with an expected population of 4.6 billion by 2030. Therefore, the Asia-Pacific region is likely to dominate the plant-based protein market reaching USD 64.8 billion by 2030, up from USD 13.5 billion in 2020. The majority share of that market in Asia-Pacific will be comprised of alternative dairy products, at 57% by 2030. Comparatively, Europe and North America will see roughly USD 40 billion in sales, with Africa, the Middle East and Latin America expected to have between USD 8-9 billion each³.

³ Euromonitor International

03. PLANT-BASED PROTEIN MARKET IN INDIA

3.1 MARKET OVERVIEW

India has an abundance of protein rich foods such as pulses, seeds, nuts, and wheat which are excellent alternatives to meat proteins. Being a food surplus production country, India has several good quality protein raw materials such chickpeas, soy, wheat, millets, and many more which can serve as an excellent alternative to the animal products, allowing not only product diversification from former agricultural crops but will also contribute towards a sustainable environment.

India's plant protein market size in 2019 was USD 427 million and it is expected to grow with the CAGR of 14.5% for 2019-2024. This captures almost 10% of the total Asia-Pacific plant-protein market⁴.

One of the advantages of plant-based food business in India is the diversity of the Indian cuisine, which can be used to create a wide variety of plant-based products that cater to the local taste preferences.

For example, plant-based meat substitutes can be developed for popular Indian dishes such as biryani or kebabs. Another advantage is the availability of raw materials in India.

Legumes/pulses and millet crops have a high level of sustainability because they have a low carbon footprint, are efficient in terms of water use, benefit bio-diversity and soil health, and provide a significant economic benefit to farmers due to their low cost and ability to grow in a variety of climates.

⁴ Ibid

3.2 KEY GROWTH DRIVERS

Although India has been a new player for this industry, the youth have been conscious about their eating habits. There has been rising awareness about health, nutrition, environment etc. which have been the growth factors for plant-based protein sector in India. The following are some of the key growth drivers of the plant-based protein in India from the perspective of consumers:



As more people become aware of the negative impacts of animal-based diets on the environment and how plant-based diets might help combat climate change, more individuals are transitioning to veganism. Furthermore, the health benefits of veganism, such as a lower chance of medical conditions such as high blood pressure, stroke, and cancer, make it an excellent path for young people to take.

With the changing global trends and a shift towards renewable, sustainable sources businesses have also identified that it is beneficial to follow sustainable development goals, thus a shift of investment towards plant-based products seems beneficial.

Hence, for businesses, there have been key drivers which are responsible to maintain the demand-supply balance intact. Some of the key drivers to balance the demand and supply of the plant-based protein products are as mentioned in the following illustrative:

DEMAND-SUPPLY DRIVERS FOR MARKET GROWTH

SUPPLY

- Availability, Increased Distribution
- Manufacturing Capacity Expansion
- Increase In Raw Material Availability

DEMAND

- Prices approach parity with conventional products
- Improved taste and usability
- Spending power shifting to millennials/Gen Z
- Sustainability claims/climate change
- Health benefit perception

3.3 KEY PROCESSED MILLETS PRODUCTS IN DOMESTIC MARKET

Millet products are an essential ingredient of Indian cuisine, forming an integral part of India’s collective tradition and culture. India’s millet consumption patterns vary across the states.

BY TYPE	BY SOURCE	BY DISTRIBUTION CHANNEL
Plant-based beverages and derivatives (viz. Milk, Cheese, Yogurt, Butter, Ice Cream, Creamer, Others)	Soy	Business to Business (B2B)
	Almond	Business to Customers (B2C)
Plant-based meat (viz. Burger Patties, Tempeh, Hot Dogs and Sausages, Seitan, Meatballs, Ground Meat, Nuggets, Crumbles, Shreds, Others),	Wheat	Modern Groceries
	Pea	Convenience Store
Meals	Rice	Specialty Store
Bakery and Confectionery	Coconut	Online Retail
Sweet and Savory Snacks	Cashew	Hotel, Restaurant, Café (HoReCa)
Ready To Drink Beverages (Like Tea and Coffee)	Others	
Egg Substitutes		
Seafood Substitutes		
Others		

3.4 KEY INDUSTRY PLAYERS

Although India is a relatively new country to adapt to the shift from traditional food to plant-based food, the concept has been a welcoming move in the country. As a result, the sunrise sector has been witnessing few innovative new entrants which are aiming to provide the consumers similar experience to the traditional animal-based food. The following is the indicative list of start-ups which are operating in the plant-based protein segment in India⁵:

⁵ QUEST FOR PLANT PROTEIN INDIA 2020: Euromonitor International

NAME OF THE COMPANY	PRODUCT OFFERINGS
Gooddot	It offers plant-based meat alternatives made from soy, pea protein, and other ingredients
One Good	One Good (or Good Mylk) is one of the first Indian plant-based dairy companies that offers a range of vegan dairy products, including milk, cheese, cream, and yogurt alternatives made from nuts and seeds.
Blue Tribe	This is one of the most loved vegan meat brands for their close resemblance in taste and texture to chicken and mutton.
WhiteCub	WhiteCub is a widely accepted 100% vegan ice cream brand, as their ice creams are made with a coconut, soy and almond milk base.
Imagine Meats	Imagine Meats was the first brand in India that introduced delicious alternatives to Indian meat dishes like Chicken Biryani and Seekh Kebabs, besides the usual patties and nuggets.
Phyx44	It is focused on developing naturally occurring, microbe-produced proteins and fats for human consumption, with the goal of producing cow or bovine milk and milk derivatives
Vezlay Foods	Vezlay Foods is a plant-based food company that offers a range of meat alternatives, including burgers, sausages, and nuggets, made from ingredients like soy and pea protein.
ProMeat	ProMeat produces the plant-based meat products that are high in protein, have a beautiful texture, and are made from local crops
Naya M!lk	Naya M!lk is a plant-based dairy business with a focus on creating substitutes for value-added dairy products made using innovative native crops
Plantish Foods	They are creating ethically produced plant-based eggs that can be utilized to make a variety of egg meals without sacrificing flavor, cost, or nutrition

India has the potential to be a major player in the global plant-based market, due to its diverse agro climatic conditions, which allow for the cultivation of a wide range of crops, affordable labour and availability of R & D facilities in India. Although the plant-based food sector is relatively young in India, its early signs point to a significant growth opportunity. The plant-based protein sector can enable India to create an abundance of nutritious foods, domestically and internationally, without sacrificing the health and future of its ecosystem.

The following illustrative displays the strengths that India has to prosper this upcoming sector and various high potential opportunities that we have to be addressed in coming years.

STRENGTHS

- **IMPROVED NUTRITION:** Low in saturated fat and cholesterol, and rich in fibre, vitamins, minerals, antioxidants, and other essential nutrients.
- **LOW RISK OF DISEASE:** May be useful in reducing the risk of chronic diseases such as heart disease, diabetes and obesity.

OPPORTUNITIES

- Growing lactose intolerant/Vegan/Vegetarian population
- Strategic investment in product development and R&D
- Rising adoption of plant-protein ingredients among F&B manufacturers
- Growth of the organized retail sector and exports
- Substituting meat imports

04. GOVERNMENT INTERVENTIONS FOR SUPPORTING PLANT-BASED PROTEIN PROCESSING SECTOR

Government of India has taken up various initiatives to promote the plant-based protein processing sector in India

4.1 GOVERNMENT POLICIES

Government of India has from time to time adopted policies that benefit the plant protein processing sector directly. This ranges from FDI regulations, providing tax support, easing requirements for operating processing units etc. Some of the prominent policies are

POLICIES

DETAILS

Easing FDI regulations

The government of India has allowed 100% FDI in the food processing industry through the automatic route, to promote investments in the sector.

Income Tax exemptions

The government supports the sector through 100% exemption of Income Tax on profits and gains for new Food Processing Units for initial 5 assessment years.;

Corporate tax has been substantially reduced in the budget announcement of 2019, making India among the countries with lowest corporate tax. where new companies

Corporate tax slab

New companies: 15%
Existing companies: 22% + cess

Enabling environment

The government classified food processing sector including plant based protein processing under 'agricultural activity' and is considered under Priority Sector Lending for ensuring credit availability in the sector.

4.2 GOVERNMENT SCHEMES

The following schemes by various ministries support the plant-based protein processing sector in India

A.

PRADHAN MANTRI KISAN SAMPADA YOJANA (PMKSY):

PMKSY is a comprehensive scheme implemented by MoFPI which aims to create modern infrastructure with efficient supply chain management from farm gate to retail outlet. The key objectives of PMKSY are

- Creation of modern infrastructure for food processing mega food parks/ clusters and individual units
- To create effective backward and forward linkages - linking farmers, processors and markets
- To create robust supply chain infrastructure for perishables

B.

PM FORMALIZATION OF MICRO FOOD PROCESSING ENTERPRISES (PMFME):

The PMFME is a centrally sponsored scheme with an outlay of INR 10,000 Cr to be implemented over a period of five years from 2020-21 to 2024-25. The scheme provides financial, technical and business support for existing micro food processing enterprises.



05. GOVERNANCE AND REGULATORY LANDSCAPE

The regulatory framework for plant based protein processing industry in India includes detailed guidelines laid down by the Ministry of Food Processing Industries (MOFPI), Agricultural and Processed Food Products Export Development Authority (APEDA), Food Safety and Standards Authority of India (FSSAI), Bureau of Indian Standards (BIS), and Export Inspection Council (EIC). The functions of the regulatory bodies are given below.

5.1 MOFPI

MoFPI is a ministry of the Government of India set up in 1988, with a view to develop a strong and vibrant food processing industry. The functions of MoFPI are broadly classified under policy support and development activities. MoFPI acts as a catalyst for bringing in greater investment into this sector, guiding and helping the industry and creating a conducive environment for its healthy growth. The major aims of MoFPI are:

- Facilitate better utilization and value addition through innovation of agricultural produce.
- Minimize wastage at all stages in plant protein processing including food processing value chain, by development of infrastructure for storage, transportation and processing of agri-produce to develop plant based protein sector.
- Induct modern technology into the plant protein processing industry from both domestic and external sources
- Encourage R&D in processing for product and process development and improved packaging of plant based protein products
- Formulation and implementation of policies and plans for the food processing industry
- Promoting investments in the food processing sector
- Providing technical and financial assistance for the establishment of food processing industries

- Conducting research and development activities to promote food processing technology
- Providing training and capacity building to stakeholders in the food processing industry

5.2 APEDA

APEDA, the Agricultural and Processed Food Products Export Development Authority, is an apex organization of the Indian government's Ministry of Commerce and Industry that was formed in 1985 under the APEDA Act. APEDA has been instrumental in promoting and facilitating the export of processed foods including plant based protein products from India.

Some of Its primary responsibilities include:

- To promote the export of agricultural and processed food products from India.
- To develop and finance specific projects for the promotion of exports.
- To provide assistance to exporters in the development of packaging, marketing and quality control of products.
- To undertake training and education programmes in the field of marketing, packaging and quality control.
- To collect and disseminate information related to exports of agricultural and processed food products.
- To register exporters and to regulate the export of scheduled products.

5.3 BUREAU OF INDIAN STANDARDS ACT, 1986

The Bureau of Indian Standards (BIS) was created through the enactment of the Bureau of Indian Standards Act in 1986 and serves as a national organization responsible for setting standards. The BIS standardization and certification scheme covers processed plant based protein products in India, establishing the criteria for their quality, safety, and labelling. To ensure conformity with the relevant standards, the BIS also conducts routine inspections and tests on products.

Some of the Key Functions are as follows :

- It develops national standards for agriculture, food, and processed foods.
- It provides third-party certification for processed foods to ensure compliance with Indian standards.
- It enforces standards through a network of laboratories and inspection offices.
- It promotes the use of quality standards to enhance the competitiveness of Indian products.
- It sets safety standards and certification requirements to ensure consumer protection for processed foods.

5.3 FSSAI

Food Safety and Standards Authority of India, which is a statutory body was established under the Food Safety and Standards Act, 2006. It was created to ensure food safety and hygiene in the country by regulating and supervising the manufacture, storage, distribution, sale, and import of food products.

Some of the key functions of FSSAI under the Food Safety & Standards Act are:

- Laying down standards for food products and regulating their manufacture, storage, distribution, sale, and import to ensure their safety and quality.
- Licensing and registration of food businesses, including food processing and packaging units, storage, transport, and distribution.
- Conducting inspections, surveillance, and enforcement activities to ensure compliance with food safety standards and taking action against non-compliant entities.
- Promoting consumer awareness about food safety and nutrition through education and information dissemination.
- Conducting research, risk assessment, and generating scientific data related to food safety.
- Providing training and capacity-building programs for stakeholders involved in the food industry.
- Collaborating with international organizations and governments to promote food safety and trade in safe and quality food products.

To further enable it to meet its objectives, FSSAI enacted the Food Safety and Standards Rules, along with several other regulations as listed below

FOOD SAFETY AND STANDARDS REGULATIONS IN INDIA

PROCEDURAL REGULATIONS

Food Safety and Standards (Licensing and Registration of Food Businesses) Regulation, 2011

Food Safety and Standards (Prohibition and Restriction on Sales) Regulation, 2011

Food Safety and Standards (Laboratory and Sampling Analysis) Regulation, 2011

Food Safety and Standards (Food Recall Procedure) Regulation, 2017

Food Safety and Standards (Import) Regulation, 2017

FOOD STANDARDS

Food Safety and Standards (Food Product Standards and Food Additives) Regulation, 2011

Food Safety and Standards (Packaging and Labelling) Regulation, 2011

Food Safety and Standards (Contaminants, Toxins and Residues) Regulation, 2011

Food Safety and Standards (Food or Health Supplements, Nutraceuticals, Foods for Special Dietary Uses, Foods for Special Medical Purpose, Functional Foods and Novel Food) Regulation, 2016

Food Safety and Standards (Fortification of Food) Regulation, 2016

Food Safety and Standards (Organic Foods) Regulation, 2017

5.5 EXPORT INSPECTION COUNCIL

The Export Inspection Council (EIC) was set up by the Government of India under Section 3 of The Export (Quality Control and Inspection) Act, 1963 (22 of 1963). The EIC is the official export –certification body of India which ensures quality and safety of products exported from India. Some of the key functions of EIC include:

- Notify commodities which will be subjected to quality control and / or inspection prior to export
- Establish standards of quality for such notified commodities
- Specify the type of quality control and / or inspection to be applied to such commodities

However, the regulatory checks through EIC are voluntary and are not covered in the EIC Act 1963.



06. R&D AND SKILL DEVELOPMENT ECOSYSTEM FOR MILLETS PROCESSING

It is vital to maintain or be as close as possible to give the same taste and texture while manufacturing plant-based protein especially plant-based meat, as compared to that with the animal-based meat. Thus, being a new entrant in this business, it becomes the responsibility of the manufacturer to provide similar experience to the consumers. In order to set up the manufacturing and processing unit, the manufacturer requires the deep understanding of the sector and various parameters like ingredient selection after a thorough research, adoption of new processing technologies, selective flavours and seasoning, study of nutritional value, marketing & branding of the products, packaging & distribution.

Similarly, for plant-based dairy products, the R&D areas include advanced milk processing technology, machinery for manufacturing the milk products like cheese, flavoured milk, etc., packing material to increase the shelf life of the products, etc.

SOME OF THE AREAS FOR R&D ACTIVITIES

- Production of protien plants
- Ingredients & quality benchmark
- Processing technology
- Flavour & seasoning
- Nutritional value
- Packaging material

Some of the significant gap areas which need to be addressed by the extensive research and development are:

- 1 Boost taste, texture and nutritional profile through R&D investment**
- 2 Offer better protein quality leveraging Soy protein, which accounts for 60% production**
- 3 Reduce production cost to bring affordability, leading to greater impact to target mass protein deficient consumers**

Need gap for further development in R&D

The industry and research institutes like - International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), CSIR – Centre for Cellular & Molecular Biology (CCMB), National Institute of Food Technology, Entrepreneurship & Management – Thanjavur (NIFTEM-T), Indian Council of Agriculture Research (ICAR), Protein Foods and Nutrition Development Association of India (PFNDAI) etc. provides R&D support for the sector. These institutes play a vital role in developing the sector in India and performing further research to take the sector to the next high-demand sector.

The R&D ecosystem for plant-based protein is supported by government research institutions as well as private companies. Some of the key institutions are

INSTITUTIONS	DESCRIPTION
<p>Indian Council of Agricultural Research (ICAR)</p>	<ul style="list-style-type: none"> ● Premier research organization under the Ministry of Agriculture and Farmers' Welfare, Government of India, that conducts research and development in the field of agriculture ● ICAR has several institutes and centers dedicated to food processing research and development ● The Central Food Technological Research Institute (CFTRI) and the Central Institute of Post-Harvest Engineering and Technology (CIPHET) are two such institutes under ICAR
<p>Central Food Technological Research Institute (CFTRI)</p>	<ul style="list-style-type: none"> ● National-level research institute under the Council of Scientific and Industrial Research (CSIR) ● Specializes in food science and technology research, including research on plant based protein
<p>National Institute of Food Technology Entrepreneurship and Management - Thanjavur</p>	<p>Research institute that focuses on research and education in the area of food science and technology, including R&D on innovative plant based protein applications</p>
<p>National Institute of Food Technology Entrepreneurship and Management - Kundli</p>	<p>The Institute aims to offer high quality educational and research program with management orientation specific to the food industry, disseminate knowledge on the processed food sector and provide business incubation facility.</p>
<p>Indian Institute of Horticultural Research (IIHR)</p>	<p>Research institute that conducts research on horticultural crops, including plant proteins , and develops technologies for their processing.</p>

INSTITUTIONS	DESCRIPTION
Other institutions	<ul style="list-style-type: none"> ● Central Institute of Post-Harvest Engineering and Technology (CIPHET): Focuses on post-harvest technology research, including fruit and vegetable processing ● Tamil Nadu Agricultural University (TNAU): Conducts research on agriculture and allied subjects, including fruit and vegetable processing ● University of Agricultural Sciences, Bangalore (UASB): Conducts research on agriculture and allied subjects, including fruit and vegetable processing ● Private sector



07. PLANT-BASED PROTEIN : HIGH POTENTIAL OPPORTUNITIES

Processed food industry based on plant protein, meat alternatives etc are at a very nascent stage in the country. The sector stands at a very promising cusp of opportunities with rising demand over the years. Some of the high potential opportunities in the sector are as follows.

1

PRODUCT INNOVATION

With rise in awareness regarding animal welfare/ethical issues, consumers are proactively opting for plant-based meat alternatives, dairy alternatives etc.

2

SUSTAINABLE PACKAGING SOLUTIONS

Active, intelligent and sustainable packaging solutions in immense potential as much as the plant-based protein sector itself. Keeping sustainability at core, packaging solutions with reduce, recycle, reuse will have long lasting impacts.

3

PROCESSING TECHNOLOGY & MACHINERY

Innovative processing technology and machinery presents high potential in the sector, Adopting fortified and infused product offerings, cold storage and innovative AI based processing technology will be game changer.

The plant-based protein sector has been growing globally in terms of market, acceptance by consumers and by food processing companies. The people across the globe have been preferring the healthy and nutritious food, environmental concerns, animal welfare issues, religious beliefs etc.

Although India has been a new player for this industry, the urban demographic have been conscious about healthy dietary choices. One of the advantages of plant-based food business in India is the diversity of the Indian cuisine, which can be used to create a wide variety of plant-based products that cater to the local taste preferences. India has the potential to be a major player in the global plant-based market, due to its diverse agro-climatic conditions, which allow for the cultivation of a wide range of crops, affordable labour and availability of R & D facilities in India.

The plant-based protein sector can enable India to create an abundance of nutritious foods, domestically and internationally, without sacrificing the health and future of its ecosystem.



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