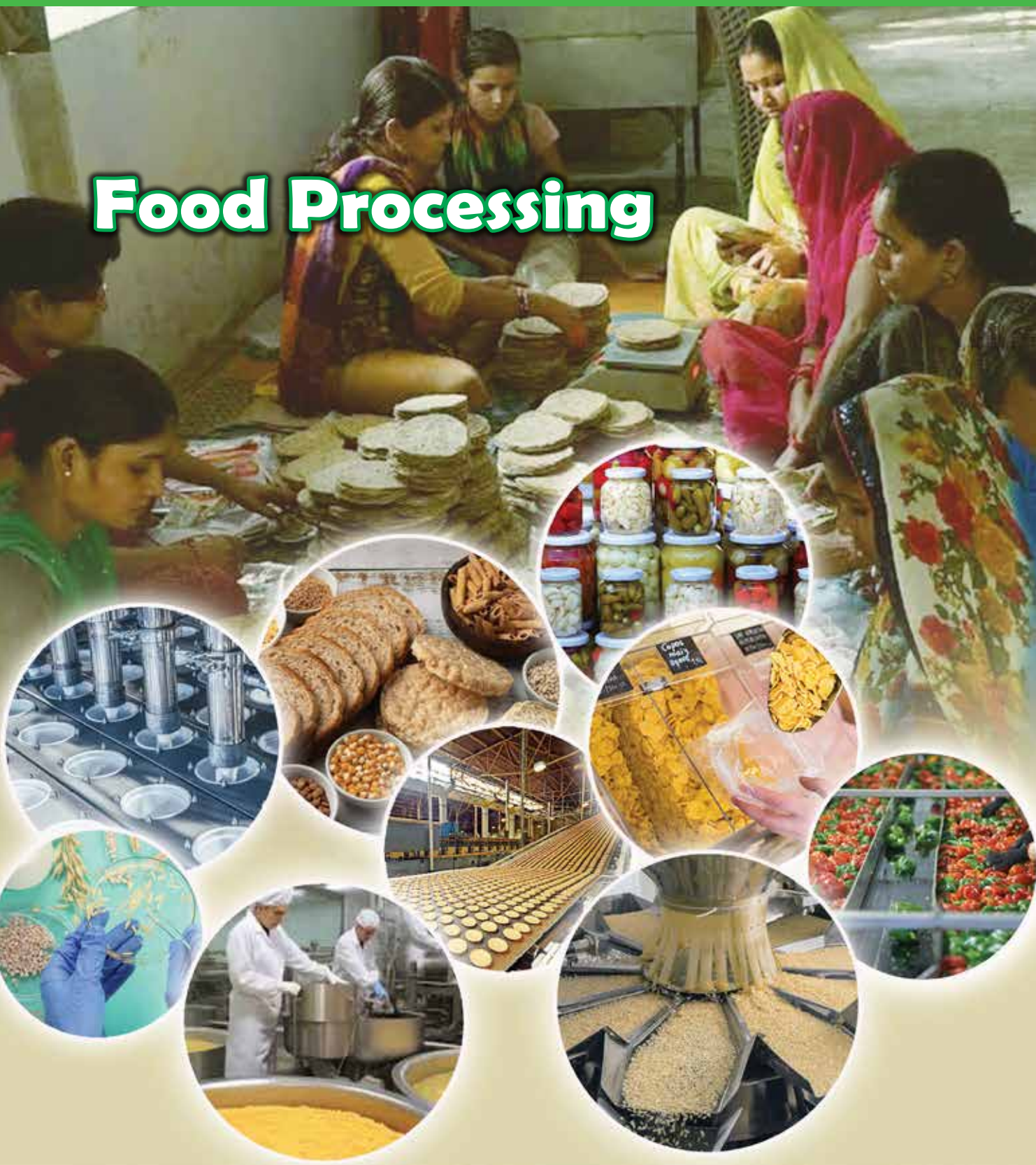
YOJANA

JULY 2024

A DEVELOPMENT MONTHLY



Food Processing

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Since 1957 A DEVELOPMENT MONTHLY

Let noble thoughts come to us from all sides.
Rig Veda

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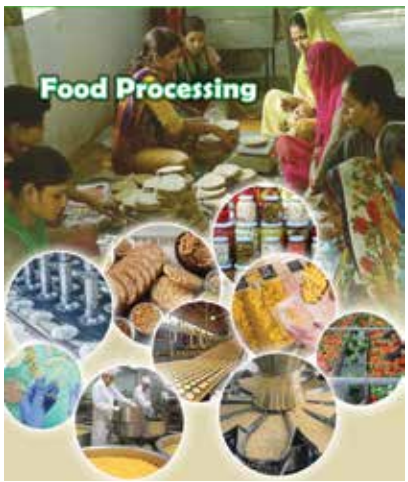
Food Processing: Harvesting Opportunities



India, with its rich agricultural tradition and diverse climate, holds immense potential in the food processing sector. This industry is not only a cornerstone for the country's economic growth but also pivotal for ensuring food security, reducing wastage, enhancing farmers' incomes and providing employment opportunities. In order to achieve a developed nation status in the next 25 years, this sector would be crucial in transforming India's primary agriculture sector with enhanced productivity and profitability while ensuring sustainability and resilience.

Our country is the world's largest producer of milk, pulses, and jute, and the second largest producer of essential crops such as rice, wheat, sugarcane, groundnut, vegetables, fruits, and cotton. Food processing involves transforming raw agricultural products into consumable food items, adding value and extending shelf life. Recognising the sector's potential, the government has launched several initiatives to boost food processing industries. The foremost and important scheme - Pradhan Mantri Kisan Sampada Yojana (PMKSY) aims to create modern infrastructure with efficient supply chain management from farm gate to retail outlet. It includes Mega Food Parks, Cold Chain, and Preservation Infrastructure. Mega Food Parks provide a mechanism to link agricultural production to the market by bringing together farmers, processors, and retailers. Some other schemes include Pradhan Mantri Formalisation of Micro Food Processing Enterprises (PMFME), Production Linked Incentive (PLI) Scheme for Food Processing Industry (PLISFPI) and One District One Product (ODOP). The government is continuously working on improving the ease of doing business by simplifying procedures and providing single-window clearance for projects. Initiatives are also being taken to enhance the skill-set of workers in this sector. To promote entrepreneurship, a 'Startup Forum for Aspiring Leaders And Mentors-SUFALAM' was also held recently in which startups were urged to play a proactive role in collaborating with farmers and venturing into consumer friendly affordable and nutritious products.

Through its initiatives, the National Agricultural Cooperative Marketing Federation (NAFED) has significantly contributed to stabilising agricultural incomes and enhancing market opportunities for smallholder farmers. The financial institution- National Bank for Agriculture and Rural Development (NABARD) complements these efforts by extending critical financial assistance and developmental support. Leveraging credit facilities and infrastructural development initiatives, NABARD has played an important role in promoting sustainable agricultural practices and fostering rural livelihoods.

Rising health consciousness among consumers is driving demand for processed and packaged foods that are safe and nutritive. Food Processing also involves better health markers on the packets. This has assumed importance in our day-to-day lives as our dependence on such food packets is growing. There is also a need to tap the popularity of various food grains and coarse grains like millets which are gaining increasing importance due to their nutritional benefits and adaptability to various climatic conditions.

Amidst a global shift towards health and wellness, traditional ingredients like coconut have garnered renewed attention. The Coconut Development Board through its initiatives, emphasise technological advancements and value addition, promoting entrepreneurship and elevating product quality across the coconut value chain. Virgin Coconut Oil (VCO), valued for its purity and therapeutic benefits, symbolises coconut's evolution from a traditional staple to a sought-after global health commodity.

This edition of Yojana delves comprehensively into India's food processing sector, highlighting its key role in the nation's economic landscape. With a steadfast focus on innovation, sustainability and market integration, the articles in this issue, offer a nuanced perspective on how the food processing industry can propel India towards heightened economic growth and enhanced global competitiveness. ❑

Impact of Food Processing on Employment Generation and Skill Development

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In order to become a developed nation in the next 25 years, the vision of India in the Amrit Kaal era would require a critical transformation in its primary sector, agriculture. The development paradigm within agriculture needs to transform from agriculture to agribusiness, with the employment dependency on agriculture being suitably addressed by skill development and absorption in the emerging agribusiness sphere. The food processing sub-sector will be centric to this agricultural transformation pathway. NABARD has been at the forefront as an important stakeholder in the food processing sector, playing a vital role in infrastructure creation for the food processing industry.

Thanks to the Green Revolution, over the last five decades (1970s to 2020s), India has moved from a position of scarcity to surplus in terms of food production. Agricultural production in India has consistently recorded higher output, ranking first in pulses and milk, second in vegetables, fruits, wheat, and rice, and third in cereals, eggs in world agriculture. With increasing production and supply of raw materials, India's food processing sector in recent years has been known for its high growth, thus increasing its contribution to world food demand every year. Currently, India is processing less than 10% of its agricultural output, thus presenting immense opportunities for increasing processing levels and leading to immense

investment potential in this sector. With about 70% of households still dependent on agriculture for their livelihood in India, this sector provides huge employment generation potential as well. In this background, the food processing sector has been recognised as a 'sunrise sector' and a key priority industry under the 'Make in India' initiative, led by the Prime Minister, Shri Narendra Modi and is being promoted aggressively through fiscal and monetary incentives.

Status and Role of the Food Processing Sector in India

a. Contribution to GDP

During the last 5 years ending 2020-21, the food processing sector had grown at an average annual growth rate of around 8.38%, as compared to around 4.87% in the agriculture and allied sectors (at 2011-12 prices). The food processing sector has also emerged as an important segment of the Indian economy in terms of its contribution to GDP, employment, and investment (Table 1).

The food processing sector also constituted as much as 10.54% and 11.57% of the Gross Value Added (GVA) in the manufacturing and agriculture sectors, respectively, in 2020-21 (at 2011-12 prices) (Table 2).

Although there has been increasing demand for processed food and ready-to-eat food in India, the share of the food processing industry in overall GVA has only been 1.88% (2020-21) as against the share of manufacturing at 17.86% and the share of GVA in agriculture at 16.26% (Table 3).

b. Employment Generation

As per the latest Annual Survey of Industries (ASI) for 2019-20, the total number of persons engaged in the registered food processing sector was 20.32 lakhs. Moreover, the unregistered food processing sector supported employment for 51.11 lakh workers as per the NSSO 73rd Round, 2015-16, and constituted 14.18% of employment in the unregistered manufacturing sector (Table 4).

Table 1: GVA by Food Processing Industries (FPI) at Constant Prices (2011-12)

(₹ lakh cr.)

Sr.	Economic activity	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
1	GVA-All India	85.46	90.64	97.12	104.92	113.28	120.34	127.34	132.19	125.85
2	GVA Manufacturing	14.87	15.61	16.84	19.04	20.55	22.09	23.29	22.61	22.48
3	GVA-Agriculture, Forestry, Fishing	15.24	16.09	16.06	16.16	17.26	18.40	18.79	19.82	20.48
4	GVA-FPI	1.30	1.30	1.34	1.61	1.79	1.93	2.36	2.26	2.37

Source: *Annual Report 2022-23, MoFPI, GoI*

Table 2: Share (%) of FPI in GVA of Manufacturing and Agri & Allied Sector

Sr.	Economic activity	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
1	GVA Manufacturing	8.74	8.33	7.96	8.46	8.71	8.74	10.13	10.00	10.54
2	GVA Agriculture, Forestry And Fishing	8.53	8.08	8.34	9.96	10.37	10.49	12.56	11.40	11.57

Source: *Annual Report 2022-23, MoFPI, GoI*

Table 3: Share (%) of Various Sectors in Overall GVA

Sr.	Economic activity	2018-19	2019-20	2020-21
1	GVA-FPI	1.85	1.71	1.88
2	GVA-Manufacturing	18.29	17.10	17.86
3	GVA Agri and allied sectors	14.76	14.99	16.26

Source: *Annual Report 2022-23, MoFPI, GoI*

Table 4: Number of Persons Engaged in Food Processing Sector

(lakh persons)

Sector	Food Processing Industry*	All Industries	(%) Share of FP sector
Registered (2019-2020)	20.32 lakh	166.21 lakh	12.22
Un-incorporated	51.11 lakh	360.41 lakh	14.18

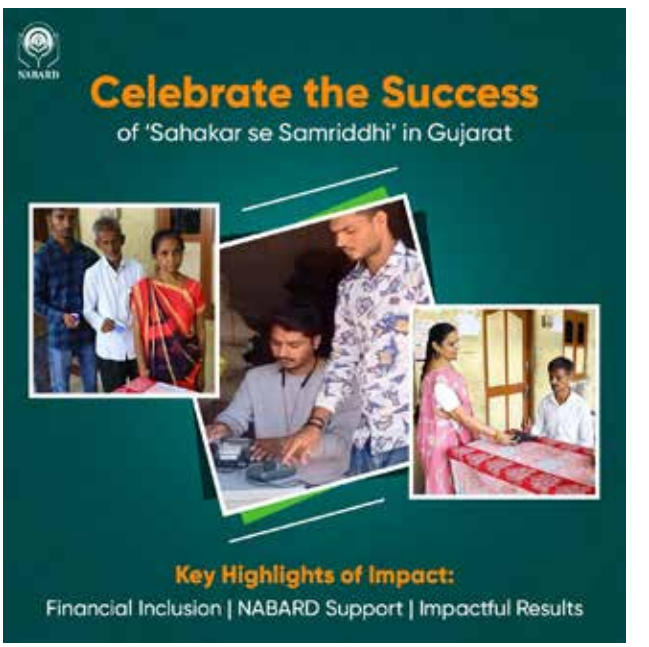
Source: *Annual Report- FY 2022-23, MoFPI, GoI, *includes food products and beverage segments*

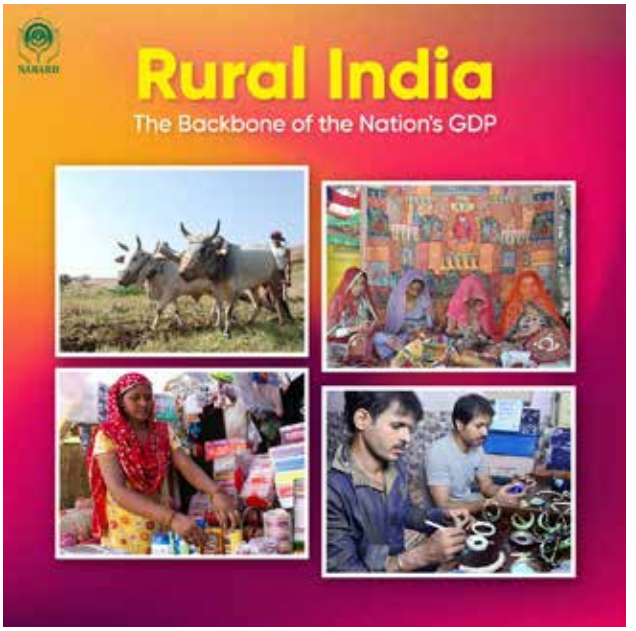
The Ministry of Food Processing Industries (MoFPI) through the implementation of the Central Sector Scheme, namely, Pradhan Mantri Kisan Sampada Yojana (PMKSY), across the country has facilitated the creation of modern infrastructure with efficient supply chain management from farm gate to retail outlet for promotion. The scheme has resulted in the overall development and growth of the food processing industry, through the creation of employment opportunities, reducing wastage of agricultural produce, increasing processing levels, and enhancing the export of processed foods. Based on evaluation studies carried out for relevant components of PMKSY, substantial direct/ indirect employment opportunities have been created through this scheme. The evaluation study of the Integrated Cold Chain and Value Addition Infrastructure Scheme under PMKSY, conducted by M/s NABARD Consultancy Limited (Nabcons) in the year 2020, has estimated that each project has resulted in the creation of about 600 direct/ indirect employment opportunities. It is estimated that about 9.69 lakh direct/indirect employment opportunities have been generated through projects completed under component schemes of PMKSY.

Similarly, under Atmanirbhar Abhiyaan, the MoFPI launched a Centrally Sponsored Scheme (CSS) named Pradhan Mantri Formalisation of Micro Food Processing Enterprises (PMFME) in June 2020 to encourage 'Vocal for Local' in the sector with a total outlay of ₹10,000 crore during the period 2020-2025 under this scheme. The scheme aims to enhance the competitiveness of individual micro-enterprises in the unorganised segment of the food processing industry and promote formalisation of the sector. This is the first ever Government scheme for Micro Food Processing enterprises and is targeted to benefit 2 lakh enterprises through credit linked subsidies and adopting the approach of 'One District One Product'. Since the inception of the scheme, so far, a total of 65,094 loans have been sanctioned under the credit-linked subsidy component of the PMFME scheme to individual beneficiaries, Farmer Producer Organisations (FPOs), Self Help Groups (SHGs), and Producer Cooperative Societies. Further, an amount of Rs 771 crore has been released as seed capital assistance, benefiting 2.3 lakh SHG members.

c. Skill Development Initiatives

The availability of skilled manpower has been identified as one of the major challenges facing the food processing industry in India. In order to address the issue, the MoFPI has been working in close collaboration with the Food Industry Capacity and Skill Initiative (FICSI), the Sector Skill Council (SSC), and the National Institute of Food Technology Entrepreneurship and Management (NIFTEM), an institute under the MoFPI, to regularly guide and assist it in achieving its mandate. As per the study undertaken by FICSI, the net expected skilled human resource requirement in the 11 major food processing subsectors of the industry in the country, viz., bread and bakery products; cold chain; dairy products; fish and sea food processing;





F&V processing; meat and poultry processing; milling (grain and oil seeds); beverages (tea and coffee); ready-to-eat (RTE) and ready-to-cook (RTC) products; soya processing and spices and condiments respectively, during 2021-30 would be around 13.4 lakh.

Accordingly, the Government has undertaken several skill development initiatives to ensure availability of technically qualified and trained staff in the food processing sector. It is in the process of strengthening the SSC in this sector to complete the validation of the Qualification Packs (QPs) for each job role that has been developed. It is also assisting in the development of the course curriculum through NIFTEM.

Role of NABARD in Food Processing and Storage Infrastructure

NABARD has been at the forefront as an important stakeholder in the food processing sector, playing a vital role in infrastructure creation for the food processing industry. Currently, NABARD manages two important funds viz., the Food Processing Fund (FPF) and Warehouse Infrastructure Fund, allocated by the Government of India for supporting the food processing sector and the creation of warehouse infrastructure for scientific storage of food grains in the country.

a. Food Processing Fund

The Government of India instituted the Food Processing Fund (FPF) in NABARD during 2014–15, with a corpus of ₹2,000 crore, with the objective of providing affordable credit to public and private players for setting up of Designated Food Parks (DFPs) notified by the Ministry of Food Processing Industries (MoFPI), Government of India, and establishing food processing units therein. As of 31 March 2024, NABARD has sanctioned a term loan of ₹1191.57 crore for 14 Mega Food Parks (MFPs), 03 Industrial Parks, 09 Agro Processing Clusters (APCs), and 15 Individual Food Processing Units, and the cumulative disbursement is ₹768.77 crore.

i. Expected Capacity Creation

An area of about 1370.03 acres would be developed in 14 Mega Food Parks (MFP), 03 Industrial Parks, and 09 Agro Processing Clusters (APC) projects, which act as Central Processing Centres (CPCs). The 14 CPCs of MFP projects would be supported by 45 Primary Processing Centres (PPCs) and several Collection Centres (CCs) to be established at suitable places in the catchment zone of the respective mega food parks. These centres will help in the sourcing of agricultural produce directly from the farmers by the processing units to be established in the mega food parks, thereby creating direct marketing access to the user industry. These projects, when completed, would result in providing a diversified and much-needed core and processing infrastructure (Fig.1).

ii. Milestone Achieved

Under the Food Processing Fund, term loans have been extended to all types of eligible activities, viz.: mega food parks, industrial parks,

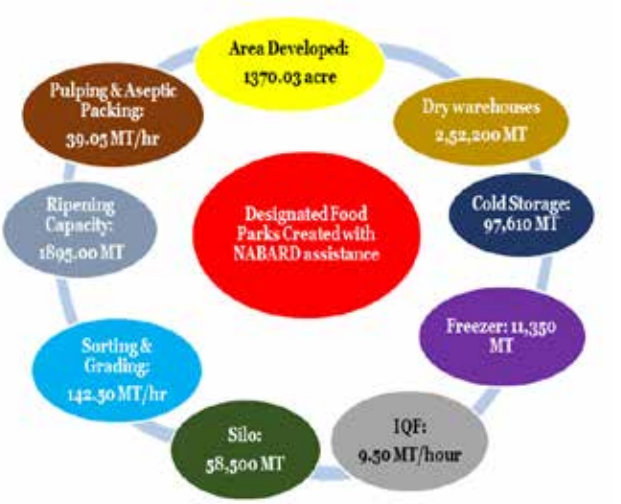


Fig.1

agro processing clusters, and individual units; and to different borrowing entities, viz. State Governments, State Government-owned entities, SPVs, federations, companies, partnership firms, and limited liability partnerships. Government of India has approved the Production Linked Incentive (PLI) scheme for 10 key sectors, including the food processing sector, with a budgetary outlay of ₹10,900 crore spread over a period of six years (FY 2021-22 to FY 2026-27). This would, inevitably, create huge opportunities for investment in the sector by both the public and private sectors. Food Processing Units established in Designated Food Park (DFP) would be able to avail benefit of such schemes. State-owned entities like State Agricultural Marketing Boards/Directorates of resource-rich States are coming up with proposals to set up Agro Processing Clusters (APC) across the districts. There is a good opportunity to tie up with the State Government to support their infrastructure plans through finance for the APC or any other designated food park managed by the PSUs of state governments. Financing of Individual Units coming up in the completed DFPs, especially those that have been supported by NABARD, will ensure the viability of both the DFP and the individual food processing units, respectively.

b. Warehouse Infrastructure Fund

The Government of India announced a dedicated Warehouse Infrastructure Fund (WIF) with a corpus of ₹ 5,000 crore in 2013–14. The WIF corpus was augmented with a further allocation of ₹5,000 crore in 2014–15. The fund was set up to support State governments, State-owned agencies, and Corporates for the creation of scientific warehouse capacity through financial support. The creation of storage infrastructure in APMCs was later included as an eligible activity for support under WIF.

The Fund envisages financing State governments, State government undertakings and the private sector for establishing dry warehouses, cold storage facilities, and cold chain infrastructure. As of date, the corpus under WIF is fully committed, and a total of 8,161 projects have been sanctioned across the country that envisage the creation of a storage capacity of 13.74 million MT. In terms of capacity created, a total of 9.96 million MT of scientific storage has been created in the country.

The southern and western regions of the country accounted for the majority of decentralised storage. The northern region, being the major procurement region, accounted for large-sized storage structures, whereas small-sized storage structures at village level have been sanctioned in Gujarat, Odisha, and Tamil Nadu. As of 31 March 2024, a total of 9.96 million MT of capacity has been operationalised consisting of varied storage structures, from small 100 MT farm gate warehouses of Primary Agricultural Cooperative Society (PACS) to modern state-of-the-art 50,000 MT silos meant for bulk storage.

Estimated Investment Potential in Food Processing Sector

The India food processing market size reached ₹ 28,027.5 billion in 2023 and is one of the largest in the world, and its output is expected to reach ₹61,327.5 billion by 2032, exhibiting a projected market growth rate of 8.8% between FY 2024-2032. New initiatives like planned infrastructure spending of approximately ₹100 lakh crore under the National Infrastructure Pipeline (NIP) and PMKSY with a budgetary outlay of ₹4600 crore till FY 2025-2026 as well as PMFME with an outlay of ₹10,000 crore spread over a 5-year timeline till FY 2024-25 have provided the much-needed fillip to the sector.

Further, the GoI has taken policy initiatives like exempting all processed food items from the purview of licensing under the Industries (Development and Regulation) Act, 1951; allowing 100% Foreign Direct Investment (FDI) through an

automatic route for the food processing sector; lowering GST for raw and processed products; and covering more than 71.7% food products under various chapter heads and sub-heads in a lower tax slab of 0% and 5%. All these would attract the necessary private investments to the sector. The sector has attracted $6.18 billion in FDI equity inflow between April 2014 and March 2023, and it is going to grow further in the future.

Future Outlook

The Gross Value Added (GVA) of the food processing sector has increased from ₹1.34 lakh crore in 2014-15 to ₹2.08 lakh crore in 2021-22. The share of processed food exports in agri-exports has increased substantially from 13.7% in 2014-15 to 25.6% in 2022-23. However, India's food processing sector contributes only around 1.8% to the total GVA. This has grown at a six-year average annual rate of 3.5%. To make India a developed country by 2047, the contribution of the food processing sector to the overall Gross Value Added (GVA) needs to quadruple to ~7.2%. Future strategies need to be aligned to achieve the target of 10.4% CAGR by 2047 and make India a developed country. This can be achieved by making India's processed food exports globally competitive. The policy focus should be on making India a market leader in global trade for at least five value chains (processed fruits and vegetables, processed fish and sea food, meat, dairy products, poultry, and eggs) by 2047. This must be accompanied by nurturing a skilled workforce for the food processing sector and addressing the current skill gaps between the workforce and the industry. ❑

(The views expressed by the author are his own and not that of the Institution i.e. NABARD)

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India's Food Regulatory Landscape: Transitioning Towards a Robust and Contemporary System

India has undergone a transformative journey in its food regulatory landscape with the enactment of the Food Safety and Standards Act (FSSA), 2006. This comprehensive Act replaced the erstwhile fragmented and outdated laws and established the apex food regulator of the country, the Food Safety and Standards Authority of India (FSSAI). FSSAI is responsible for domestic and imported food, while the Department of Commerce is responsible for regulating the export of food products. FSSAI's mandate encompasses formulating science-based standards and regulating the manufacturing, import, distribution, and sale of food products. This article delves into the organisational structure, standard-setting process, enforcement mechanisms, and capacity-building initiatives undertaken by FSSAI, testing and enforcement infrastructure, the involvement of various research institutions, and the role of different autonomous organisations in regulating the export of food products.

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National food control systems are designed to meet the specific criteria embodying the needs and priorities of countries to ensure the safety of food for human consumption. Each country develops its own national systems to address the specific needs and priorities of the country. This implies a focus on the standards that must be met by domestic production and sales, as well as for international trade. Although governments may use a number of different policies and administrative tools to ensure the safety of food, the core objectives of regulatory systems are similar around the world. The Food and Agriculture Organization (FAO) defines the primary

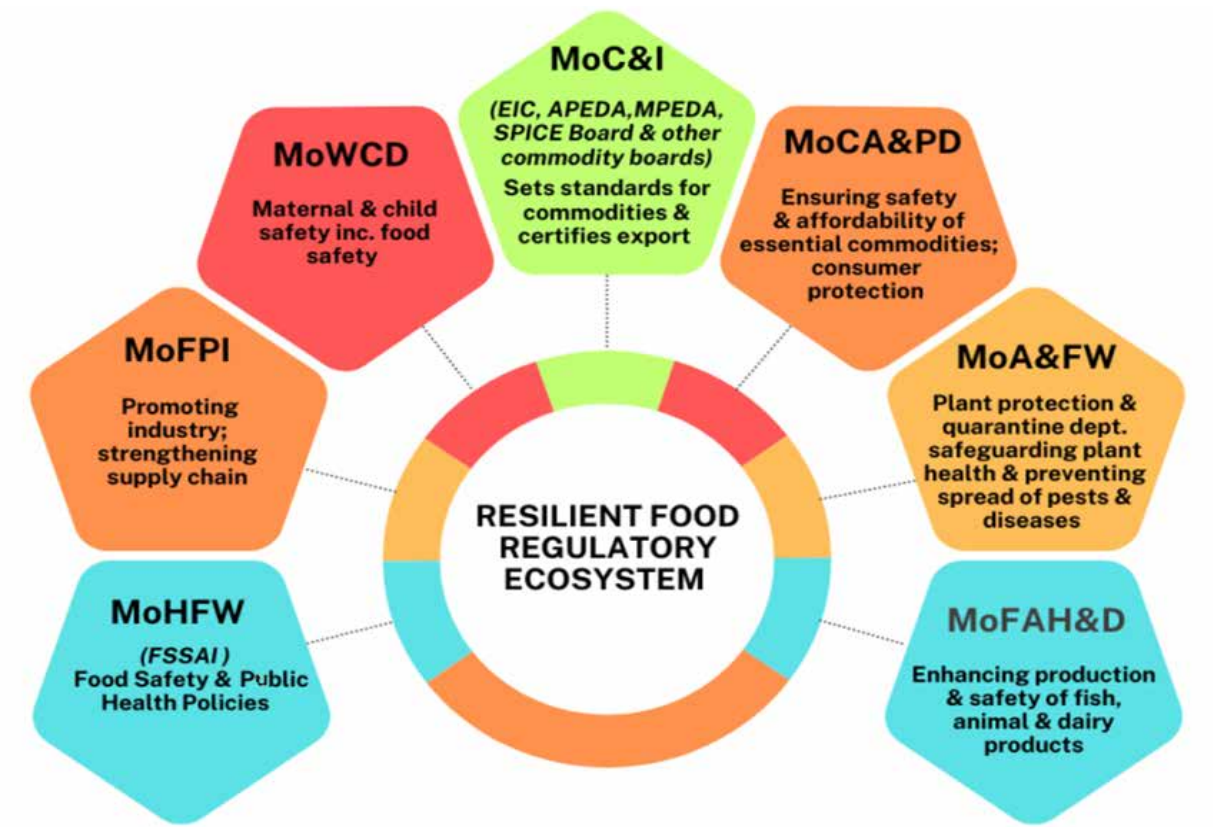
objectives of a national food control system as the following:

- protecting public health by reducing the risk of food-borne illness;
- protecting consumers from unsanitary, unwholesome, mislabeled, or adulterated food;
- contributing to economic development by maintaining consumer confidence in the food system and providing a sound regulatory foundation for domestic and international trade in food.

Despite the main focus in various countries when addressing the above objectives being similar, the standards specified to achieve these objectives differ in major ways. The standards may differ both across countries and across products within the same country (e.g., fisheries, meat and meat products, fruit and vegetables, milk and milk products, and different types of cereals).

A Resilient Food Regulatory Ecosystem: A Whole of Government Approach

The Government of India diligently works towards establishing a strong, transparent, predictable, and risk-based regulatory framework for ensuring safe food for consumers. This included the coordinated efforts of various ministries and departments, like the Ministry of Health and Family Welfare (MoHFW), Ministry of Agriculture & Farmers Welfare, the Ministry of Food Processing Industries (MoFPI), the Ministry of Women and Child Development (MoWCD), the Ministry of Commerce and Industry, Ministry of Fisheries, Animal Husbandry and Dairying, the Export Inspection Council (EIC), the Agricultural and Processed Food Products Export Development Authority (APEDA), the Marine Products Export Development Authority (MPEDA), the Spices Board, etc. At the forefront of India's food safety ecosystem stands the Food Safety and Standards Authority of India (FSSAI), a robust regulatory body established in 2006 under the aegis of MoHFW. FSSAI's mandate encompasses setting comprehensive science-based standards for food products and overseeing their production, storage, distribution, and import, all geared towards safeguarding public health and ensuring consumer safety, while the Department of Commerce, through several autonomous organisations like Export Inspection Council, APEDA, MPEDA, Spices Board, Tea Board, CAPEXIL, SHEFEXIL, Coffee Board, IOPEPC, etc.,



is responsible for regulating the export of food products.

National Food Control System

The Food Safety and Standards Act, 2006 consolidates various acts and orders that had earlier handled food related issues in various ministries and departments. FSSAI's mandates encompass a wide range of responsibilities, including formulating science-based standards for food products, additives, processing aids, contaminants, packaging and labelling requirements, etc. It also regulates the manufacturing, storage, distribution, import, and sale of food products and establishes an integrated food safety surveillance system. Additionally, FSSAI promotes self-compliance among food businesses through training, certification, and capacity-building initiatives and fosters collaboration with international organisations to harmonise Indian standards with global benchmarks.

Standard Setting Process and Harmonisation

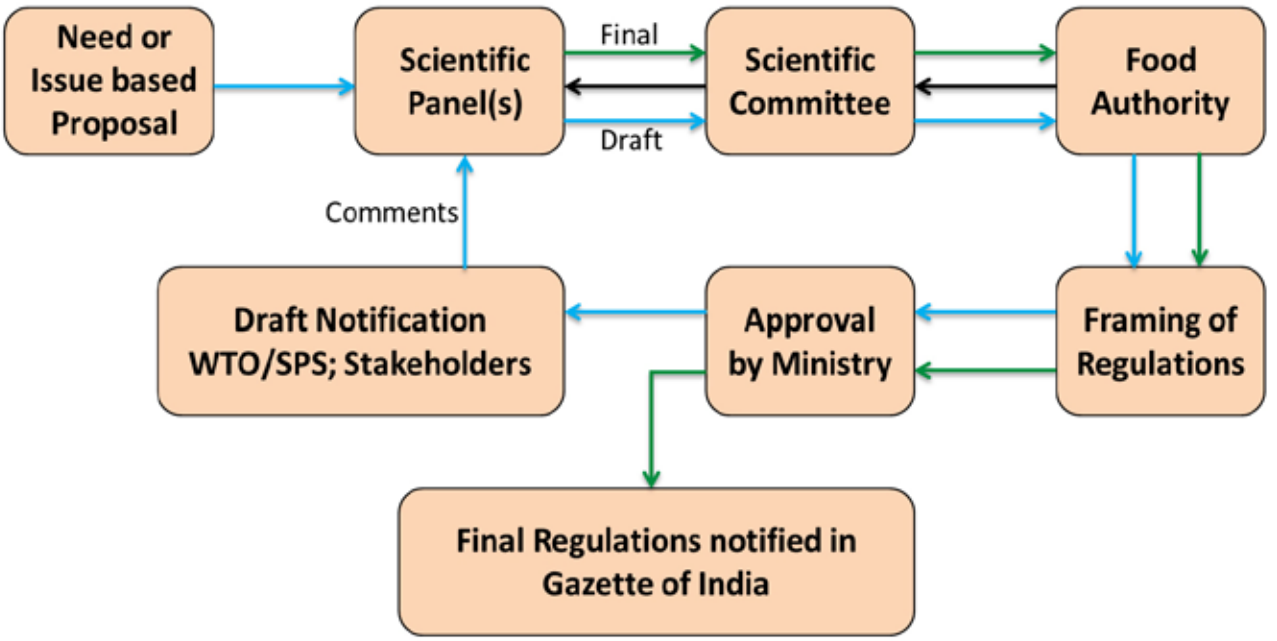
The development of food standards at FSSAI follows a rigorous, scientific, and transparent process by various scientific bodies. FSSAI emphasises harmonising Indian food standards with international guidelines, particularly those established by the Codex Alimentarius Commission. This harmonisation ensures alignment with global best practices, facilitates international trade, and promotes higher levels of food safety.

The Food Authority lays down science-based standards for articles of food with the support of its subsidiary bodies, namely, Scientific Panels (SPs) and the Scientific Committee (SC), established under Sections 13 and 14, respectively, of the FSS Act, and other working groups that may be set up by the Scientific Committee from time to time.

The process of developing a science-based standard is driven by the principle of food safety and assessment of the associated risks. A standard could be of a general nature that applies to all product categories and are often referred to as a horizontal standard. Such standards include provisions for food additives; limits on contaminants, toxins, antibiotic residues, pesticide residues, etc.; microbiological criteria; packaging and labelling requirements, etc. On the other hand, standards that are specific to a product or a product category are referred to as vertical standards. The vertical standards mainly

prescribe the identity and quality characteristics of a food product or product category.

FSSAI has constituted 21 Scientific Panels, which consist of subject experts from universities, research institutes, and other reputed Government Organisations like CSIR, ICAR, ICMR, IITR, NIFTEM, IIT, CFTRI, etc. The Scientific Panel carried out the risk assessment, took into consideration available scientific evidence, and developed a draft standard, which was then forwarded for endorsement by the Scientific Committee (SC). The Scientific Committee consists of the chairs of 21 scientific panels and six independent experts. The standard is reviewed and validated by the SC before being finally approved by the Food Authority. The draft of a standard or regulation approved by the Food Authority is then notified in the Gazette of India with the due approval of the ministry, inviting comments from



stakeholders and WTO members. The regulations are then finalised after appropriately addressing the stakeholder comments and subsequently endorsed by the Scientific Committee and Food Authority. Further notified after legal vetting by the Department of Legislative Affairs and subsequent approval by the MoHFW for implementation as a final standard.

As of date, FSSAI has developed over 700 standards for food products, 350 additives, and processing aids, covering over 9,000 provisions, the majority of which are in harmony with Codex standards and guidelines.

In addition to the Scientific Panel and Scientific Committees, the Act has also established a Central Advisory Committee (CAC) consisting of members representing the interests of the food industry, agriculture, consumers, relevant research bodies and food laboratories, all Commissioners of Food Safety, and the Chairperson of the Scientific Committee. In addition, members are invited from various government departments, Panchayati Raj, farmer organisations, public health institutes, etc.

Enforcement Machinery and Regulatory Oversight

An effective enforcement ecosystem is crucial for the successful implementation of food safety standards. FSSAI employs a multi-pronged approach to regulatory oversight, combining traditional inspection mechanisms with innovative self-compliance initiatives and third-party audits. Food safety is a shared responsibility, and state authorities play a major role in ensuring compliance.

As of date, almost 6 million Food Business Operators (FBO) are part of the food safety network in India. The Food Safety Compliance System (FoSCoS) serves as an integrated online platform for licensing, registration, and monitoring FBOs capacity and compliance. It also aids in promoting ease of doing business and enabling comprehensive profiling of businesses.

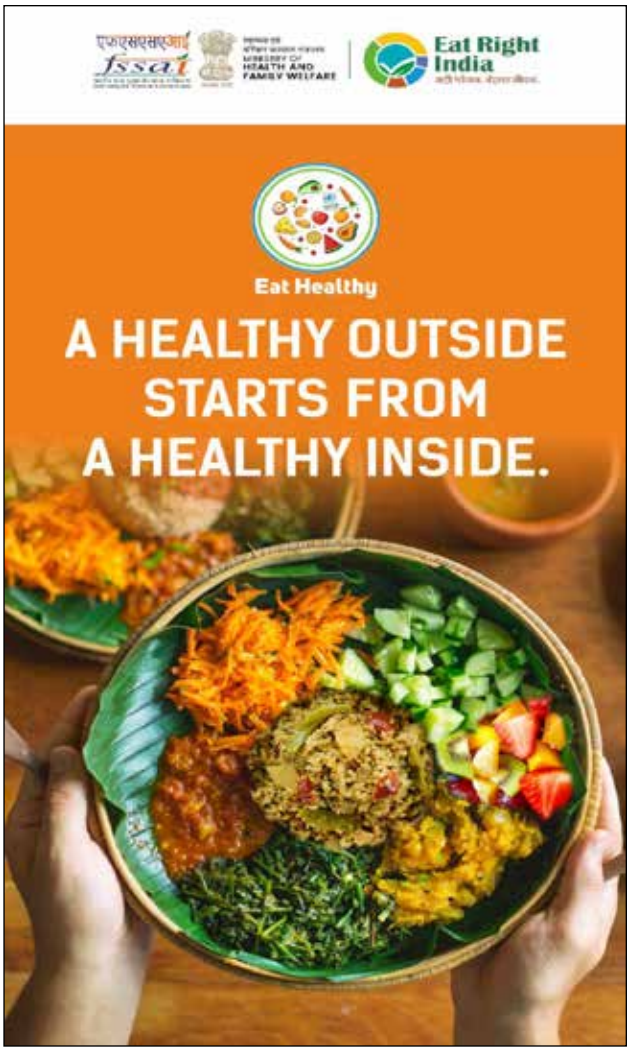
There are different sets of good hygiene and manufacturing practices specified according to the risk and product matrix, which the food business needs to comply with along with the food standards and testing requirements. At ground level, a network of Food Safety Officers (FSOs) at State Food Safety Departments and Regional Offices of FSSAI conducts inspections, collects samples, and investigates complaints.

FSSAI has developed a Risk-Based Inspection System (RBIS) that targets Food Business Operators (FBOs) based on risk matrices, optimising regulatory efforts. The inspection process is supported by the Food Safety and Compliance Risk Assessment System (FoSCoRiS) mobile application, which enables real-time monitoring, data collection, and analysis while promoting transparency through

features like randomisation of inspection allocations, geo-tagging, and time-stamping of photographs.

Capacity Building and Promoting a Culture of Self-Compliance

- FSSAI understands that food safety cannot be achieved alone, a culture of self-compliance is crucial for ensuring effective implementation of food safety policies. To achieve the same, FSSAI has introduced various programmes and initiatives. They are: Food Safety Training and Certification (FoSTaC) programme, which aims to build the capacity of food handlers and ensure the presence of trained Food Safety Supervisors in food establishments. One food safety supervisor for up to 25 food handlers ensures that safe food handling practices are effectively implemented in the food premises. As of date, FSSAI has effectively trained over 17.2 lakh food handlers across the country.



- Third Party Ecosystem: FSSAI has also recognised third-party auditing agencies to conduct mandatory food safety audits for high-risk food categories. Food businesses with satisfactory audit scores are subject to fewer frequent inspections, incentivising compliance. The Hygiene Rating Scheme, a voluntary initiative, encourages foodservice and retail businesses (bakery, meat, and dairy) to assess their compliance and improve their food hygiene and safety levels, supporting consumers in making informed choices while dining or ordering foods.

Managing the Import of Food Products

In India, the Food Safety and Standards Authority of India (FSSAI) is primarily responsible for regulating domestic and import food safety. With the increasing importation of food products, FSSAI has established a rigorous system to regulate the safety of imported food. The Food Import Clearance System (FICS) ensures that all imported food products meet the required safety and quality standards. This system is integrated with the customs ICE-GATE, facilitating quick scrutiny and faster approvals. Additionally, the introduction of the Risk Management System (RMS) categorises food items based on risk levels, streamlining the clearance process. At present, FSSAI has notified authorised officers at 156 points of entries to facilitate food import clearance.

Further, it may be noted that Animal Quarantine Certification Services and Plant Quarantine Inspection Services under Ministry of Fisheries, Animal Husbandry & Dairying and Ministry of Agriculture & Farmers Welfare, respectively, also carry out food import control w.r.t. animal and plant health.

Food Testing Ecosystem and Surveillance

A robust food testing ecosystem is essential for evaluating compliance with safety standards and identifying emerging risks. FSSAI has established a network of primary laboratories, referral laboratories, and National Reference Laboratories (NRL) to support food analysis and surveillance activities.

With 239 primary food testing labs, 22 referral labs, and 12 reference labs, along with over 264 Food Safety on Wheels (FSW) positioned strategically across the nation, India ensures rigorous monitoring

and testing of food products. This extensive network plays a critical role in detecting and addressing potential hazards, guaranteeing that only safe and compliant food reaches consumers. These FSWs have performed over 231,100 tests to ensure safe food for the citizens, 9,600 awareness sessions, and over 5,200 training sessions.

These FSWs are installed with Rapid Analytic Food Testing (RAFT) kits and equipment, which aid rapid food testing kits to carry out on-site testing and reduce the cost of food testing. FSSAI has approved over 80 RAFT kits for testing of milk adulteration, pesticides in food, etc. These initiatives aim to extend food safety monitoring to remote areas and enable real-time testing. FSSAI has also developed easy-to-use public tools, such as the Detect Adulteration with Rapid Test (DART) book and the Food Safety Magic Box, empowering consumers to test for common adulterants at home or in a school laboratory setting.

FSSAI conducts regular pan-India surveillance programmes to identify hotspots of non-compliance and adulteration. This data-driven approach aids in targeted interventions and ensures transparency for citizens regarding the safety and quality of food products. To strengthen the food testing ecosystem further, FSSAI is actively working on capacity building of food laboratories, ensuring the availability of competent staff, and developing an Integrated Food Laboratory Network (INFOLNET) to enable real-time monitoring and data analysis.

Collaborative Approach

Recognising the importance of stakeholder engagement and capacity building, FSSAI has undertaken several initiatives to empower food businesses and promote self-compliance. Apart from the training network of FoSTaC, which comprises 228 training partners and around 4,800 trainers across the country, FSSAI has created a Network of Professionals in Food and Nutrition (NetProFaN), which include members from public health bodies, consumer organisations, professors from the food science and nutrition, senior dieticians, chefs, etc., who engage with FSSAI in developing and scaling up the implementation of various programmes of FSSAI for industry and consumers.

Additionally, FSSAI has established the Network for Scientific Cooperation for Food Safety and Applied Nutrition (NetSCoFAN), which brings together research institutions and academic bodies to collaborate on food safety issues, identify research gaps, and support standard-setting processes.

Role of Different Autonomous Organisations in Export Trade in India

- **Export Inspection Council**

The Export Inspection Council (EIC) is the official export certification body of India that ensures the safety of products exported from India. It has a mandate to notify commodities that will be subject to quality control and/or inspection prior to export, establish standards of quality for such notified commodities, and specify the type of quality control and/or inspection to be applied to such commodities. EIC provides mandatory certification for selected food items, namely fish and fishery products, basmati rice, dairy products, honey, egg products, meat and meat products, poultry meat products, animal casing, gelatin, ossein, and crushed bones, as well as feed additives and pre-mixtures, while other food and non-food products are certified on a voluntary basis.

- **Agricultural and Processed Food Products Export Development Authority (APEDA)**

The Agricultural and Processed Food Products Export Development Authority (APEDA) is an export promotion organisation under the Ministry of Commerce and Industries, Government of India. It is mandated with the responsibility of promoting and developing the export of its scheduled products, including organic food products.

- **Marine Products Export Development Authority (MPEDA)**

The Marine Products Export Development Authority (MPEDA) was set up by an Act of Parliament in 1972. MPEDA is given the mandate to promote the marine products industry, with special reference to exports from the country. It is also empowered to carry out inspections of marine products, their raw materials, fixing standards, specifications, and training, as well as take all necessary steps for marketing the seafood overseas. MPEDA's focus is mainly on market promotion, capture fisheries, culture fisheries, processing infrastructure and value addition, quality control, research and development.

- **Tea Board**

The Tea Board of India of the Government of India was established to promote the cultivation, processing, and domestic trade as well as the export of tea from India. It is responsible for the assignment of certification numbers to the exports of certain tea merchants and the approval of inspection agencies. Export certification from the Tea Board is mandatory for exports to take place. The Tea Board provides an export license, distribution license, and a permanent exporter's license under the Tea (Distribution & Export) Control Order 2005.

- **Coffee Board**

Export certification from the Coffee Board is mandatory for exports to take place. The Coffee Board is establishing laboratories under the GoIs Trade Infrastructure for Exports Scheme (TIES). It also issues a registration-cum-membership certificate (RCMC).

- **Spices Board**

The Spices Board is the Indian government's regulatory and export promotion agency for Indian spices. It has the responsibility of maintaining and monitoring the quality of exports, registration, licensing of spice exporters, and export promotion of 52 spices shown in the schedule of the Act. A mandatory quality check is required for the export of chilli or chilli products or food products containing chilli products in any form (mandatory sampling and quality testing for Aflatoxin and Sudan I, II, III, and IV), and shipment is permitted by Customs only on the basis of a cleared analytical report from the Spices Board.

- **Coconut Development Board**

The Coconut Development Board is a statutory body established by the Government of India (Ministry of Agriculture & Farmers Welfare) for the integrated development of coconut production and utilisation in the country, with a focus on productivity increase and product diversification.

- **CAPEXIL**

CAPEXIL was set up by the Government of India to promote the export of chemical and allied products from India. It is the competent authority for the exports of crushed bones, ossein and gelatin. It issues the RCMC and shipment clearance certificates, apart from other promotional activities.

- **SHEFEXIL**

The Shellac Export Promotion Council (SEPC) was established by the Government of India to facilitate India's exports of shellac and lac-based products. It issues RCMC and health certificates for the export of Guar Gum, apart from other promotional activities.

- **IOPEPC**

The Indian Oilseed and Produce Export Promotion Council (IOPEPC) is concerned with the promotion of various oilseeds and oils. It provides certificates of export for several countries and also issues RCMC.

Conclusion

Food safety is a shared responsibility. India has adopted the 'Whole of Government' approach in its national food control system with the involvement of several ministries, State governments, research and academic institutions, and autonomous organisations. Transparency, predictability, cohesiveness, and a risk-based approach are the key guiding principles in setting standards and their enforcement in India. The State food safety authorities have been the backbone of ensuring compliance by food businesses. India has a robust food testing infrastructure spanning across the country, and it is growing every day. Through sustained efforts and innovative strategies, FSSAI continues to drive the nation's progress towards a safer, healthier food system that aligns with global standards. ❑

Processed Foods : Rising Demand for Healthier Food Options

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As the demand for healthier food options continues to rise, initiatives like NAFED's Bharat Atta, Bharat Dal, Bharat Rice, and promotion of millets play a crucial role in meeting consumer expectations while also supporting sustainable agriculture and food security. By promoting the production and consumption of millets, NAFED not only supports farmers in diversifying their crops but also provides consumers with nutritious and eco-friendly food options. This shift towards healthier and more sustainable food choices is not just a trend but a necessity for addressing global challenges like climate change and food security.

।। युक्ताहारविहारस्य युक्तचेष्टस्य कर्मसु। युक्तस्वप्नाव बोधस्य योगो भवति दु:ख ।।

Which means 'an individual can be free from all sorrows by having a balanced diet, healthy entertainment, maintaining balance in his deeds, making the right efforts, and taking a sound sleep.'

In today's fast-moving and up-tempo world, processed foods have been the go-to option for quick meals. They are convenient, readily available, and often satisfying to the taste buds. However, in recent years, a noticeable shift has been underway. There has been a significant change in the way people think about the food they eat. More individuals are opting for healthier food choices over processed food alternatives.

I had once come across an impressive quote on healthy eating: "The journey to wellness starts with a single bite of intention." People are realising the significance of healthy food for their well-being. They understand that what they eat impacts not just their physical health but also their energy levels, mood, and long-term vitality. This awareness is driving a shift towards choosing foods that nourish their bodies and support a healthier lifestyle.

As people increasingly recognise the importance of healthy food, the National Agricultural Cooperative Marketing Federation of India (NAFED), which is an agriculture-based cooperative, has expanded its business towards coming out with healthy food initiatives like Millets, Bharat Atta, Bharat Dal, and Bharat Chawal. These initiatives align with NAFED's dedication to promoting healthy eating at affordable prices.

Millets are highly nutritious grains that offer numerous health benefits. These are rich sources of protein, fibre, and essential vitamins and minerals, including phosphorus, magnesium, and iron. Millets are particularly beneficial for those with diabetes, as they have a low glycemic index and help manage blood sugar levels. Additionally, it is gluten-free, making it an excellent dietary option for people with celiac disease or gluten sensitivities. With its ability to aid in digestion, prevent asthma, and support heart health, millet is a versatile and healthy food choice. Furthermore, recognising the nutritional benefits of millets and their potential to improve food security, NAFED has been encouraging their cultivation and utilisation as part of a diversified and sustainable food system.

NAFED embarked on a comprehensive journey to promote millets as a dietary staple and foster their growth across India during 2022-2023. This included the establishment of the Millets Experience Centre, affectionately named Shree Anna, at Dilli Haat, New Delhi, aiming at showcasing the nutritional benefits and culinary versatility to people of all ages. The Prime Minister, Shri Narendra Modi appreciated NAFED's efforts in providing market linkages for Shree Anna products. These were displayed on the sidelines of the Millets Luncheon hosted by the Ministry of Agriculture & Farmers Welfare at the Parliament of India on 20 December 2022 to mark preparedness for the International Year of Millets-2023 (Shree Anna). Additionally, NAFED actively supported millet-based startups by showcasing their products at events hosted by esteemed figures like the then Union Agriculture Minister, Shri Narendra Singh Tomar, thus bolstering their visibility and accessibility. The introduction of exclusive Millet Corners within NAFED Bazaar stores further amplified the promotion and availability of millet-based products, signalling NAFED's unwavering commitment to the International Year of Millets.

Moreover, through strategic partnerships with the Ministry of Agriculture & Farmers Welfare, NAFED deployed 'Millet Vending Machines' across the Delhi-NCR region, encouraging healthier snacking habits. This dedication extended even to international platforms, as NAFED curated custom millet-centred gift hampers for the G20 Meetings, showcasing millets as a symbol of India's commitment to healthy living and sustainable agriculture. These initiatives collectively underscore NAFED's pivotal role in promoting millets and nurturing a healthier lifestyle across India and beyond.

Millets, known for their resilience to adverse weather conditions and rich nutritional profile, offer a promising alternative to traditional staple grains. By promoting the production and consumption of millets, NAFED not only supports farmers in diversifying their crops but also provides consumers with nutritious and eco-friendly food options.

'Bharat Atta' is a premium-quality whole wheat flour, launched under the Government's Open Market Sale Scheme (OMSS) of the Department of Food and Public Distribution (DFPD), Ministry of Consumer Affairs, Government of India. By offering nutritious options, NAFED contributes to the broader movement towards healthier food choices and supports the Government's efforts to ensure food security for all. Bharat Atta is not only affordable but also high in dietary fibres, vitamins,

and minerals, making it an excellent choice for health-conscious consumers. Bharat Atta is made from 100% whole wheat grains and processed to retain their natural goodness.

Top of Form

In response to the constantly increasing prices of wheat flour, the Government of India decided to offer it at concessional rates under the OMSS to lower the market prices of wheat flour for consumers. The Department of Food and Public distribution, decided to release 50 lakh metric tonnes (LMT) wheat from the Food Corporation of India (FCI).

NAFED has taken the initiative and acted swiftly to lead in the lifting of the allocated stocks of wheat. Bharat Atta has been made available at ₹27.50/kg, which has been set by the Government of India across the states through various retail chains and distribution points, including NAFED Bazaar retail outlets and mobile vans across the country.

NAFED has been at the forefront of promoting agriculture and allied sectors in India for over 60 years. The launch of Bharat Atta is yet another milestone in NAFED's efforts to empower farmers and provide high-quality agricultural products to consumers.

In addition to Bharat Atta, NAFED's commitment to promoting healthy eating extends to its initiative, Bharat Chawal. This aims to provide consumers with access to high-quality rice varieties that are not only nutritious but also affordable. Bharat Chawal consists of essential nutrients, vitamins, and minerals, ensuring a wholesome dining experience. By introducing healthier options like Bharat Chawal, NAFED underscores its dedication to addressing the nutritional needs of the populace while supporting the Government's overarching goal of food security for all.

But NAFED's commitment to good food doesn't stop here. In line with the Government's vision of achieving self-sufficiency in pulse production, NAFED has also been actively promoting the cultivation and consumption of pulses through its Bharat Dal initiative. With an emphasis on reducing dependence on imports and increasing

domestic production, NAFED's Bharat Dal aims to support farmers and ensure a steady supply of high-quality pulses to meet the growing demand in the market.

NAFED's commitment to promoting healthier food options extends beyond flour to pulses like Tur Dal and Masoor Dal. Pulses are a powerhouse of nutrition and an essential part of a healthy diet. They are high in protein and fibre, while being low in fat, which makes them an excellent choice for maintaining a healthy weight and reducing the risk of chronic diseases. Pulses are also rich in complex carbohydrates, micronutrients, vitamins, and minerals like iron, calcium, magnesium, and potassium, which are crucial for overall health. Additionally, pulses are environmentally friendly as they require less water to grow and improve soil fertility, making them a sustainable food choice. Incorporating pulses into meals can contribute to heart health by managing cholesterol levels and providing slow-release energy, which keeps you satiated for longer periods of time. Whether you're looking to enhance your diet or support environmental sustainability, pulses are a versatile and nutritious option to consider.

Pulses are essential foods in India, but sometimes there aren't enough of them. To address this issue, the government is supporting farmers through schemes like the Price Support Scheme (PSS) and Price Stabilisation Fund (PSF), ensuring fair prices for their crops and adequate food supply for all.

The success of NAFED's initiatives can be attributed to its comprehensive approach to promoting healthier food options. By collaborating with various stakeholders, including farmers, retailers, and government agencies, NAFED has been able to create a positive impact on both the agricultural sector and the health and well-being of consumers.

Epilogue

As the demand for healthier food options continues to rise, initiatives like NAFED's Bharat Atta, Bharat Dal, Bharat Rice, and promotion of millets play a crucial role in meeting consumer expectations while also supporting sustainable agriculture and food security. By embracing these initiatives, consumers can not only make healthier choices but also contribute towards building a more resilient and sustainable food system for future generations. Choosing products like Bharat Atta, Bharat Dal, and Bharat Chawal not only ensures better nutrition but also supports local farmers and promotes agricultural diversity. Additionally, the promotion of millets encourages crop diversity, which enhances soil health and reduces the reliance on water-intensive crops. This shift towards healthier and more sustainable food choices is not just a trend but a necessity for addressing global challenges like climate change and food security. It empowers consumers to be a part of the change, shaping a food landscape that is both nutritious and environmentally responsible. ❑

Export Potential and Global Competitiveness of Indian Processed Foods

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India exports a wide array of items over 10,000 tariff lines. Within this vast export basket, food and agricultural products constitute approximately 11% of our total exports. Recognising the strategic importance of agri-exports, India has taken significant policy initiatives aimed at enhancing its export performance. Another critical policy intervention is the Production Linked Incentive Scheme for Food Processing Industry (PLISFPI), approved by the Union Cabinet on 31 March 2021. By capitalising on its rich agricultural base, investing in modern infrastructure like food parks, and prioritising food safety standards, India can become a globally competitive player.

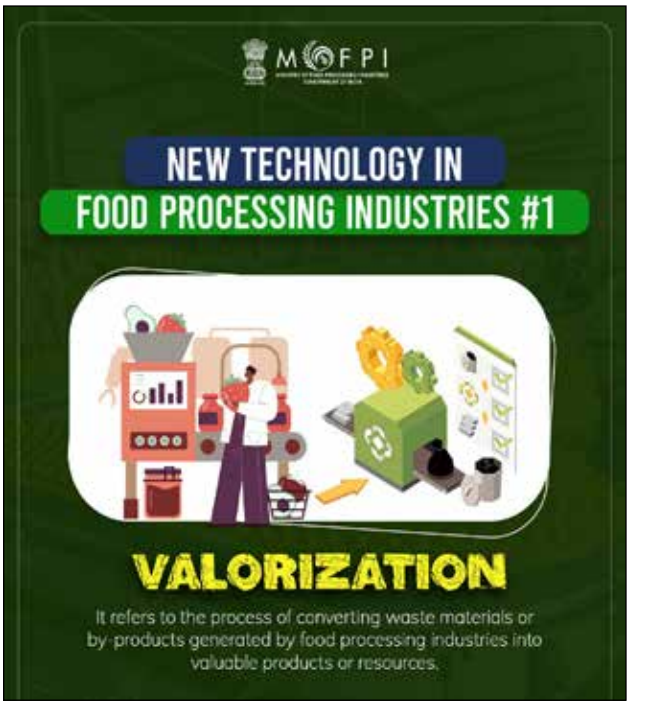
The food processing industry is one of the most important and promising sectors of the Indian economy. India is one of the largest producers of various food categories such as dairy, cereals, fruits and vegetables, animal proteins, fishes, spices, tea, etc., which indeed gives it an edge in terms of the availability of resources. This sector involves a large number of SMEs (Small and Medium-sized Enterprises) and is a substantial contributor to creating additional employment opportunities as well as ensuring higher income for our farmers.

Exports indeed act as a strong incentive for growth. However, we should realise the fact that India's share in global merchandise exports is currently around 1.8%, making it the 18th largest exporter in the world. The Indian economy is not export-centric, yet exports contribute to around 23% of the GDP, which is impressive when compared to large economies as the US has an export-to-GDP

share of 12%, Japan 19%, and China 21%. Our exports post-Covid-19 showed a notable recovery, but the momentum slowed down in the last fiscal year, with merchandise exports marginally declining to USD 437 billion in 2023-24. On similar lines, India's share in global imports of processed food is way too low compared to its potential. Despite being the second largest agri-producer, India ranks much lower in the exports of processed food products globally. Overall, there is immense export potential for India in the processed food sector, a field that offers significant opportunities for growth and economic diversification. To fully grasp this potential, it is essential to delve into several key aspects related to India's export capabilities and challenges.

India exports a wide array of items over 10,000 tariff lines. Within this vast export basket, food and agricultural products constitute approximately 11% of our total exports. The export landscape is dominated by a few key items such as rice, spices, buffalo meat, sugar, and oil meals. These products have established a strong foothold in various international markets like the USA, China, UAE, Saudi Arabia, Bangladesh, Iran, Indonesia, Vietnam, Sudan, and the Netherlands.

Recognising the strategic importance of agri-exports, India has taken significant policy initiatives aimed at enhancing its export performance. One notable development was the introduction of a dedicated agricultural export policy in 2018 with an ambitious vision to take it to USD 100 billion and to create a more conducive environment for agricultural exports through various supportive measures.



Another critical policy intervention is the Production Linked Incentive Scheme for Food Processing Industry (PLISFPI), approved by the Union Cabinet on 31 March 2021. This scheme aims to diversify India's export portfolio by focusing on value-added segments and incentivising manufacturing in four specific food product segments: ready-to-cook/ready-to-eat foods, processed fruits and vegetables, marine products, and mozzarella cheese. Moreover, the scheme promotes innovative and organic products from SMEs. India being a large consumption economy, however, we are quite optimistic that once the production starts in full swing, a part of it will also be diverted to the international market and help push our exports in this space.

Another integral component of this PLI (Production Linked Incentive) is the global promotion of 'Brand India' through branding and marketing support. However, for SMEs to fully leverage this scheme, greater encouragement and support are needed, as evidenced by the relatively low number of applications received so far. Additionally, realising the needs for infrastructure modernisation, R&D in the food processing sector, the Pradhan Mantri Kisan Sampada Yojana (PMKSY) addresses the infrastructure challenges being faced by SMEs and promotes technology adoption, the establishment of cold chains, and other processing

Table 1: India's position in top 10 items consumed globally

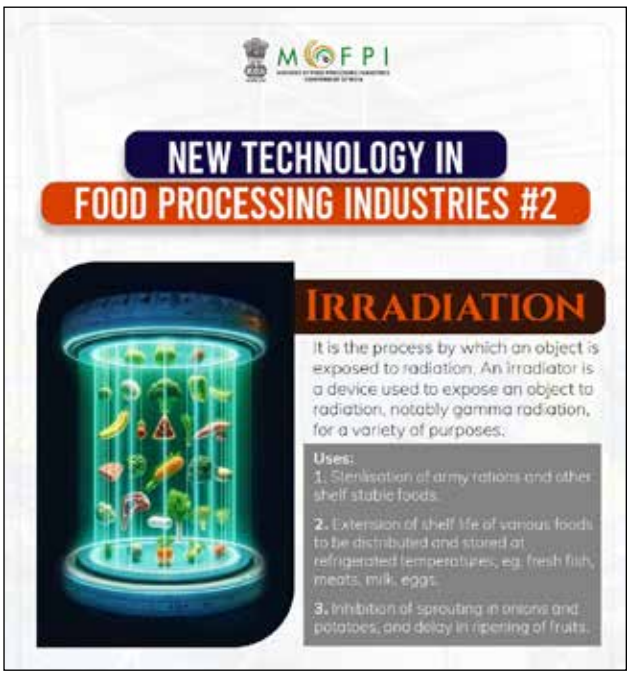
Hs Code (6-digt)	Product label	World imports from world		India's exports		India's share in world imports 2022
		Value in 2022 (USD bn)	CAGR (2018-22)	Value in 2022 (USD bn)	CAGR (2018-22)	
210690	Food preparations, n.e.s.	58.351	7%	0.581	20%	1.00%
151190	Palm oil and its fractions, whether or not refined (excl. chemically modified and crude)	42.711	18%	0.003	130%	0.01%
190590	Bread, pastry, cakes, biscuits and other bakers' wares, whether or not containing cocoa; communion ...	31.576	9%	0.167	5%	0.53%
220421	Wine of fresh grapes, incl. fortified wines, and grape must whose fermentation has been arrested ...	27.739	1%	0.001	-17%	0.002%
100630	Semi-milled or wholly milled rice, whether or not polished or glazed	25.430	6%	9.400	8%	36.96%
040690	Cheese (excl. fresh cheese, incl. whey cheese, curd, processed cheese, blue-veined cheese and ...	23.160	4%	0.028	16%	0.12%
230910	Dog or cat food, put up for retail sale	22.886	13%	0.063	13%	0.27%
230990	Preparations of a kind used in animal feeding (excl. dog or cat food put up for retail sale)	22.711	7%	0.279	2%	1.23%
220300	Beer made from malt	17.435	2%	0.045	1%	0.26%
180690	Chocolate and other preparations containing cocoa, in containers or immediate packings…	15.929	3%	0.098	-4%	0.61%

facilities, which contribute to improving the supply chain and storage capabilities in the food processing sector.

The Government has recently launched initiatives specifically designed to boost food exports through Mega Food Parks. These parks create modern infrastructure for food processing across the entire supply chain, from farm to market. This includes establishing modern processing facilities; such parks enable processors to meet international quality standards for food products. Improved infrastructure reduces spoilage and extends shelf life, making exports more viable through higher value addition.The clustering of processing units facilitates knowledge sharing and access to common resources, leading to potentially higher quality and competitiveness in the export market. Programmes within the Ministry of Food Processing Industries (MoFPI) offer grant-in-aid to approved food processing units, incentivising them to set up units within Mega Food Parks.

Looking at the larger picture at the global level, a lot of segments emerge where we could focus. Upon analysing the UNCTAD WITS (United Nations Conference on Trade and Development World Integrated Trade Solution) data on consumer goods, which covered 189 tariff lines at 6 digits, including both finished and semi-finished food products, it was observed that India holds only a 3.7% share in the top 10 commodities consumed globally. This indicates significant room for growth and improvement, particularly in the sectors that are encouraged by the Central Government through PLI and through specific State agri-export promotion plans.

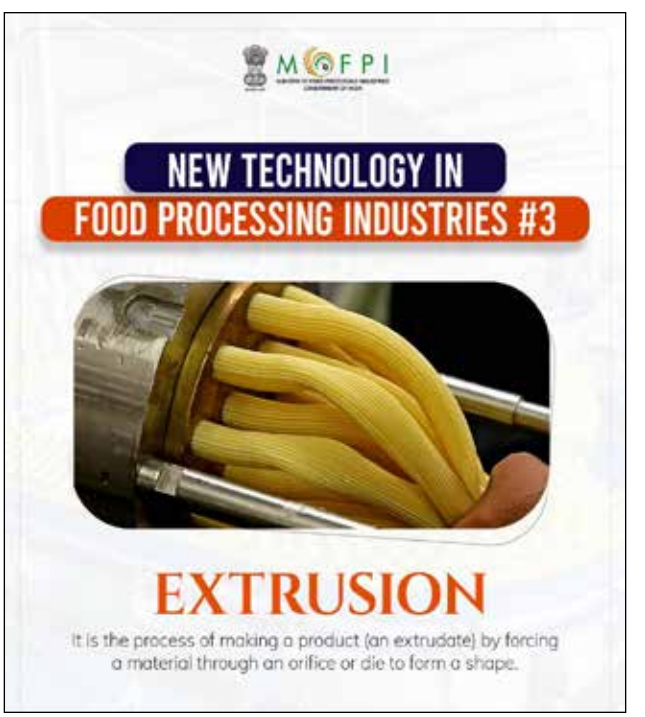
From table 1, it is evident that apart from rice, India does not hold a significant share in the global imports of other processed food products,



particularly where the global imports are rising at a rapid pace, like pet food and bread and bakery items. While all top 10 items have shown a positive CAGR (Compounded Annual Growth Rate) in world imports, India's exports of wine and chocolate have declined, indicating areas where improvements and strategic interventions are necessary. These statistics underscore the need for targeted strategies to sustain and boost export activities. There are a couple of aspects that could help in this regard.

Firstly, data-driven policies are essential for identifying and maximising export potential. According to MoFPI, the definition of food processing industries includes both manufactured and other value-added processes. Manufactured processes involve transforming any raw product of agriculture, animal husbandry, or fisheries through a process involving employees, power, machines, or money, resulting in a change in its original physical properties. If the transformed product is edible and has commercial value, it falls within the domain of the food processing industry. Other value-added processes include significant value addition, such as increased shelf life or products being shelled and ready for consumption, even if they do not undergo manufacturing processes. Therefore, nearly all agricultural produce in any form is considered processed for data purposes, which broadly covers ITC Chapters 2-23. Aligning these categories at the 8-digit HS (Harmonized System) level can provide more precise insights into the value-added processed food exports. Countries like Singapore have already implemented separate HS codes for processed food, a practice that India could adopt to better track and promote its value-added exports. India has already taken similar initiatives for emerging sectors like Ayush and technical textiles, where specific tariff lines are identified.

Secondly, food products, being consumable, are subject to stringent standards in major international markets. Each of these markets has unique demands and regulatory environments, presenting both opportunities and challenges for Indian exporters. The WTO SPS (World Trade Organization Sanitary and Phytosanitary Measures) agreement advocates for furthering the use of harmonised sanitary and phytosanitary measures between Members as per the international standards developed by the relevant international organisations, which could be translated into national legislation or regulations to be enforceable. However, members are permitted to implement national standards that exceed those standards to ensure food safety and quality. Ensuring compliance with these standards is crucial for accessing and maintaining a presence in international markets. Emerging national and private standards pose challenges for smaller SMEs, as there is no single repository for all standards. Moreover, a lot of private or industry standards have



also come into play. This makes it difficult for SMEs to comply with the varied requirements, highlighting the need for a centralised repository of standards that SMEs can refer to for compliance.

Thirdly, India is aggressively negotiating Free Trade Agreement with many countries, which is indeed a welcome step as it will help in better market access through duty concessions. However, there is also a need to include Mutual Recognition Agreements (MRA) in such agreements between the national certifying and testing agencies of such countries so that products once certified locally do not require any additional certification. For example, recently, India has come up with their Halal certification (i-CAS Halal) for meat and meat products, which would help the sector once it gets accreditation from other global halal issuing agencies through MRA.

Another aspect is the quality of finished products, which is dependent on the quality of raw materials. The Government's initiative to form and promote 10,000 Farmer Producer Organisations (FPOs) is a positive step in this direction. FPOs can help ensure a steady supply of consistent-quality raw materials, which is crucial for maintaining the standards of processed food products destined for export. There is a need to enhance the interaction and linkages between these two segments of the value chain.

Skill development is also crucial for the food processing sector. For instance, the Indore cluster might require specialised training for operators in namkeen and confectionery production, soybean meal processing plants, and solvent extraction units. However, the needs of a cluster in Solapur or Guntur could be different. Therefore, capacity-building programmes and training sessions, particularly in food processing clusters, can help local manpower align with export demands. Basic training related to food safety and HACCP (Hazard Analysis Critical Control Point) certification is also essential. Additionally, introducing professional courses in food technology, food science, food engineering, and food packaging will help develop the necessary skill base for the industry.

Efficient and competitive logistics play a crucial role in all sectors, including the food and agriculture sectors, which could have specific needs for cold chains, temperature-controlled warehouses, reefer vans, etc. An adequate infrastructure at clusters as well as at sea and air ports would be essential to maintaining the quality of goods during transportation.

Lastly, enhanced marketing would be critical to pushing our exports. Global trade fairs play an exemplary role in exposing global buyers to Indian processed food exporters in a convenient and outcome-oriented fashion. It is especially encouraging to startups and MSMEs (Micro, Small and Medium Enterprises) who lack the wherewithal to take their products and engage with buyers in key destination markets despite their strong product range. A larger support from the Government to encourage companies to engage in such activities would definitely help in showcasing India's capabilities and occupying a larger share of global processed food imports.

In conclusion, India's processed food sector boasts immense potential for export growth. By capitalising on its rich agricultural base, investing in modern infrastructure like food parks, and prioritising food safety standards, India can become a globally competitive player. To fully unlock this potential, continued government support, industry collaboration, and a focus on innovation will be crucial. By addressing these areas, India can transform its processed food industry into a major driver of economic growth and forge a strong position in the international food market. ❑

The Coconut Craze
It is Real and Here to Stay

A very successful food industry based on coconut exists in all major coconut growing countries, and India is not behind. We are the largest producers of coconuts in the world. The coconut food industry is on the go, having diversified from a handful of products to hundreds of value-added products; it may be from the coconut kernel, coconut water, coconut inflorescence, or coconut haustorium. Coconut Development Board promotes the processing and value addition of coconut through assistance in the development of technologies for processing. The technologies developed are transferred to potential manufacturers through the approved process for technology transfer. As the epics describe, coconut is indeed the Kalpavriksha, the tree of life. With the need to provide food to all and the increasing advent of health consciousness in the community, coconut, with its varied health and nutritional benefits, could be a suitable food product on the table in the journey to reduce hunger and poverty in the world.

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A white sand beach with clear turquoise bluish water; coconut palms against the blue skies and swaying alongside the beach—this is the picture of a tropical paradise people dream of and are crazy to be in. But there is a much bigger and more popular craze for coconut, especially for coconut products, which is real and is going to stay.

Coconut is a tropical palm cultivated mainly in tropical countries lying on both sides of the equator. It is predominantly seen in coastal areas. In this era of sustainable agriculture, coconut is a crop that supports long-term environmental, social, and economic sustainability. It is a crop from which all parts can be put to diversified uses. Coconut is known traditionally as an oil crop, and coconut oil has been used for culinary and other topical applications since time immemorial. But during the last three decades, a wide variety of food products have emerged from coconuts the world over. The diversification of the uses of coconut for various purposes makes it a nutritive food. In today's world, where consumers are after products that are produced sustainably, coconut offers a wide range of products that have health and nutritional attributes.

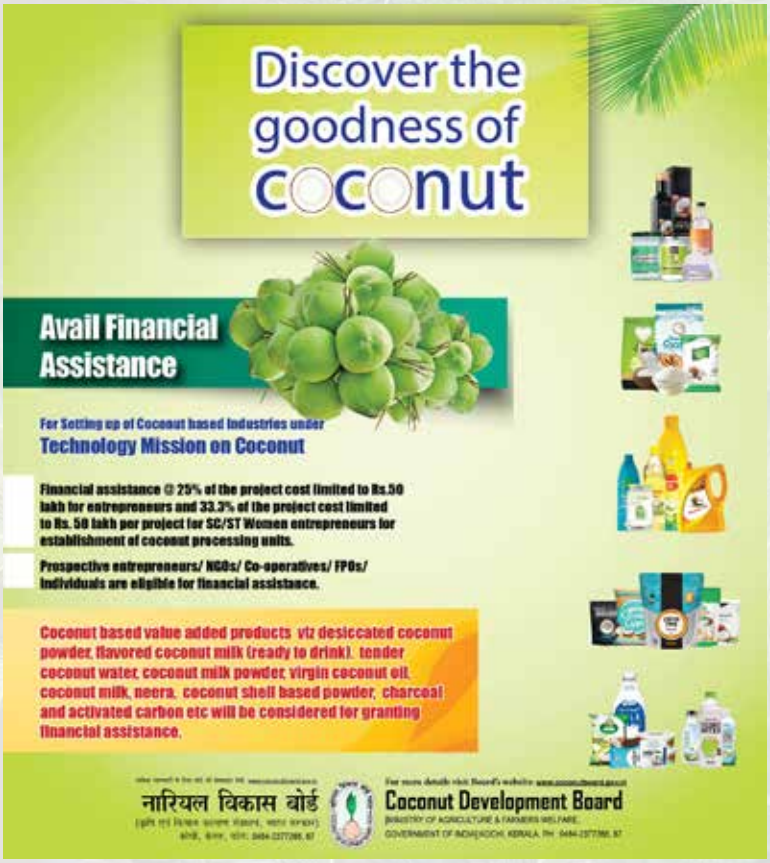
A very successful food industry based on coconut exists in all major coconut growing countries, and India is not behind. We are the largest producers of coconuts in the world. Coconuts are processed to produce a variety of products, both traditional and innovative, thereby contributing to livelihood security and social security in rural areas. Perhaps, for people in non-coconut-producing

states, coconut water and coconut oil might be the only products familiar to them. This article is an attempt to familiarise the readers with the diversified food products made from coconut, which will contribute to the health and wellness of society.

Coconut Oil: This is the most popular product from coconut, which is produced from the white kernel inside the coconut. The kernel is dried in the sun or using modern dryers, and the dried product is called copra. Expellers are used to extract coconut oil from the copra. Coconut oil has been used traditionally as a cooking oil in south India, mainly in Kerala and parts of Tamil Nadu and Karnataka. It was used for topical applications on the skin and hair from time immemorial, across the country. Coconut oil is an essential ingredient in many beauty care products, including face creams, make-up removers, tooth paste, soaps, detergents, mouthwashes, etc. It is an important raw material for the oleo-chemical industry. Coconut oil contains medium-chain fatty acids, of which the predominant one is lauric acid (C12 fatty acid), which enhances the immunity of individuals when consumed. Lauric acid gets converted to monolaurin when ingested, which is the component present in breast milk that imparts immunity to infants.

With increased awareness and health consciousness among consumers, the industry has started separating lauric acid fractions from coconut oil through fractionation. The product, lauric acid, is marketed as a health supplement that contributes to enhancing immunity. The caproic, caprylic, and capric acid fractions (C6-C8) in coconut oil also have antimicrobial and antifungal properties. The industry also fractionates the above fatty acids and markets them as MCT oil (Medium Chain Triglycerides) with or without the lauric fraction. Thus, coconut oil, known earlier as a cooking oil or hair oil, has now elevated its position as a health supplement by enhancing immunity.

Virgin Coconut Oil (VCO): This is a product that emerged globally during the late 1990s. It is the purest form of coconut oil and is produced without the application of heat, thereby retaining the volatile components of coconut oil. It is produced from coconut milk by centrifuging or fermentation. VCO retains all the health attributes of coconut oil and is superior even to olive oil in health attributes. There are numerous clinical studies across the globe conducted by scientists, doctors, and researchers that have conclusively proven the medicinal and health attributes of VCO—be it in skin care, managing Alzheimers or Dementia, Type 2 Diabetes, Psoriasis, reducing abdominal obesity, etc.—the list is long. VCO capsules are available in the market and can be consumed. In Indonesia, VCO is sold in pharmacies as a health supplement, and people consume 10-15 ml of it daily to enhance their immunity. With increasing health consciousness among consumers, VCO is now being extensively used in the health and beauty care segment in moisturisers, lip balms, roll-on sprays, deodorants, oral rinses, pain balms, mosquito repellents, etc.



Coconut water: Coconut water, both from tender coconut and mature coconut, is acknowledged across the globe as a healthy beverage. The presence of vitamins, minerals, electrolytes, and antioxidants in coconut water makes it

a healthy, natural rehydrating drink. It is believed that during the Second World War, the American soldiers who were stranded in the Pacific Islands survived on coconut water and the kernel inside. Due to the antithrombotic nature of coconut water and its isotonicity with human blood, it has been used as an intravenous hydration fluid in the Pacific Islands as a short-term remedy for hydration and resuscitation of critically ill patients. Coconut water is the most commonly prescribed oral rehydrating drink by doctors across the country. Coconut water was a craze globally during the last decade, with the western world consuming large quantities of coconut water under various brand names with celebrity endorsements too. Large companies like Pepsico and Coca-Cola have their own brands of coconut water. There are many manufacturers of packed coconut water in India, which are predominantly packed tender coconut water.

Desiccated coconut: The mature kernel of coconut is grated, shredded, and dried to produce desiccated coconut. It is used in snacks, bakery products, biscuits, cakes, muffins, toppings or coatings, oat meals, etc. It is naturally vegan and gluten free thus making it suitable for making healthy snacks and bakery products. It is available in different grades based on particle size.

Coconut milk and coconut milk powder: The freshly grated coconut kernel is squeezed to extract coconut milk, which is an essential ingredient in the cuisine of South and Southeast Asia. Coconut milk is processed, packed, and marketed with varying fat content, from coconut milk to coconut cream. It can be used directly in dishes while cooking or diluted and added. Coconut milk is spray-dried to make coconut milk powder, which can be used after dissolving in warm water.

With the increasing trend of consumers adopting a vegan diet, coconut milk is a perfect alternative to dairy, along with soymilk. It is rich in monolaurin and also suited for people with dairy allergies or lactose intolerance. Flavoured beverages made from coconut milk are also processed, packed in tetrapacks, and available in the domestic and international markets. Coconut yoghurt can also be made from coconut milk using starter cultures. It is a very good probiotic food supplement. It is vegan and contains several vitamins and minerals.

Nata de coco: This is a product processed through the natural fermentation of coconut water using Acetobacter. It is a celluloic substance with a gel-like structure. It is usually white in colour with a mild taste of coconut. Flavour can be added to nata de coco; many fruit flavours are used, like pineapple, mango, guava, lime, mango, strawberry, litchi, etc. Coconut water is added with nata de coco, and this product is very popular on the global market. This not only provides an energising and refreshing drink, but nata de coco in the water also pacifies hunger and is fibre-rich and fulfilling.

Coconut Neera and its value-added products—coconut sugar, coconut honey, coconut jaggery, coconut syrup, etc : Coconut Neera is a delicious drink extracted from the unopened inflorescence. It is very sweet and rich in vitamins and minerals, making it a healthy nutritional beverage. Neera is collected, processed, and packed in tetrapacks or bottles. Neera can also be concentrated to produce syrup, honey, and jaggery. Coconut sugar is made by the concentration and crystallisation of coconut Neera. It has a low glycemic index and is a natural sweetener that is rich in nutrients. Other diversified products include sauces, coconut feni, aminos, etc.

Coconut chips: The coconut kernel is sliced into thin pieces and tosted or dried to a crispy and crunchy texture, with or without the addition of flavours. It is an alternative to traditional snacks, which are fried. Various flavours like vanilla, chocolate, mint, pineapple, spice, etc. are added. Millets can also be added to increase the nutritive value, and these are called coconut clusters.

Coconut vinegar: Natural vinegar can be produced from coconut water by fermentation. This can be a substitute for the vinegar available on the market, which is diluted acetic acid. Coconut vinegar can be used in place of synthetic vinegar in recipes like pickles, meat preparations, non-vegetarian dishes, etc.

Coconut haustorium-based products : This is the spongy tissue inside the coconut kernels that develops during the germination of the nut. It is rich in nutrients and is usually consumed fresh, but has a very short shelf life. Haustorium can be processed into various products like haustorium candy, haustorium powder, haustorium crunches, haustorium-based ice cream, haustorium juice or shake, etc. It is rich in fibre and can be used to make health mixes.

Various other food products and coconut-based convenience foods like coconut biscuits, coconut candies, coconut chocolates, coconut burfi, coconut squash, lemonade, etc. can also be prepared that have market demand. Technologies are being developed across the globe to exploit the multifaceted potential of this crop in food; the production of dietary fibre, coconut water capsules for rehydration, etc. are a few examples to cite.

Support provided: Coconut Development Board promotes the processing and value addition of coconut through assistance in the development of technologies for processing. The technologies developed are transferred to potential manufacturers through the approved process for technology transfer. Trainings are also organised for the processing and value-adding of coconut for prospective entrepreneurs. The Board also provides incubation facilities for the manufacturers. Establishment of processing units for coconut by entrepreneurs is supported by extending credit-linked back-end subsidies at 25% of the project cost. Nearly 580 units have been established with the assistance of the Board in India for the production of processed products from coconut.

The Way Forward: The coconut food industry is on the go, having diversified from a handful of products to hundreds of value-added products; it may be from the coconut kernel, coconut water, coconut inflorescence, or coconut haustorium. The varying consumer preferences and the varying taste habits that emerge with the change in generations encourage processors to make diversified value-added products from coconut, exploring the multifaceted nutritional attributes of coconut. Products are developed to suit the demand, the palate, and the choices of generations, and to replace ingredients in diets with healthy alternatives using coconut. Coconut oil and coconut sugar are essential ingredients in many ayurvedic preparations. Market studies indicate the enormous potential of coconut water and coconut milk as beverages, as the world is in pursuit of natural and healthy products.

As the epics describe, coconut is indeed the Kalpavriksha, the tree of life. With the need to provide food to all and the increasing advent of health consciousness in the community, coconut, with its varied health and nutritional benefits, could be a suitable food product on the table in the journey to reduce hunger and poverty in the world. Coconut not only refreshes the mind through its lush leaves against the blue sky and the sloping trunk along the beaches; it also refreshes and rejuvenates the body through its refreshing beverages, its immunity-enhancing health products, the mineral-rich health supplements, the energising Neera and the fibre-rich food products. Let's go nuts over coconuts. ❑

Production Linked Incentive Scheme for Food Processing Industry

According to the Production Linked Incentive Scheme for Food Processing Industry (PLISFPI) Guidelines, the PLI beneficiaries are required to furnish incentive claims for a specific financial year by 31st December of the following financial year. Incentives of ₹584.30 crore for FY 2021-22 have been disbursed in 41 cases so far.

The selection of beneficiaries under PLISFPI has been made on the basis of eligibility criteria in the Scheme Guidelines finalised after consultation with stakeholders.

The state-wise information of the number of companies covered under the PLI Scheme, on the basis of the offices, is in **Annexure**. The manufacturing units are located throughout the country.

The scheme aims to create employment for approximately 2.5 lakh people. As of 30 September 2023, Quarterly Review Reports from PLI beneficiaries indicate the creation of employment for 2,37,335 persons. The employment data is maintained company wise; State-wise employment data is not maintained.

The Production Linked Incentive Scheme for Food Processing Industry (PLISFPI) was approved by the

ANNEXURE

Sl. No.	STATE/ UT	Number of Companies
1	ANDHRA PRADESH	7
2	DELHI	20
3	GOA	1
4	GUJARAT	29
5	HARYANA	2
6	HIMACHAL PRADESH	2
7	KARNATAKA	9
8	KERALA	8
9	MADHYA PRADESH	2
10	MAHARASHTRA	34
11	NAGALAND	1
12	ODISHA	1
13	PUNJAB	1
14	RAJASTHAN	3
15	TAMIL NADU	8
16	TELANGANA	9
17	UTTAR PRADESH	3
18	UTTARAKHAND	3
19	WEST BENGAL	13

Cabinet on 31 March 2021, with an outlay of Rs 10,900 crores, to be implemented from FY 2021-22 to FY 2026-27. The scheme consists of three components: incentivising manufacturing in four food product segments (Ready-to-Cook/Ready-to-Eat foods; processed fruits and Vegetables; marine products; and mozzarella cheese), promoting innovative or organic products of SMEs; and incentivising branding and marketing abroad for promoting Indian brands in the global market. Additionally, the PLI Scheme for promoting millet-based products was launched in the FY 2022-23 with an outlay of ₹800 crore, utilising the scheme's savings.

The PLI beneficiaries have reported investments of ₹7,126 crore under the scheme, with sales of ₹49,825 crore up to April-September 2023. According to scheme guidelines, PLI beneficiaries are required to furnish incentive claims for a specific financial year by 31st December of the following financial year. The disbursement status of incentives for FY 2021-22 is as follows:

Segment	Incentive Disbursed (₹ Crore)
Processed Fruits & Vegetables	137.71
Ready to Cook/ Ready to Eat	362.35
Marine Products	72.31
Mozzarella Cheese	8.91
Organic Products	3.02
Total	584.30

During the formulation of PLISFPI, proactive steps were taken to align it with global best practices and market demands. The process involved active engagement with various stakeholders, including industry experts, large-scale manufacturers and SMEs, etc. An extensive consultative approach was adopted to gather inputs while formulating the scheme guidelines. This collaborative effort is continuing in form of regular engagements with the stakeholders for ensuring continued relevance and effectiveness of the scheme guidelines.

The scheme aims to generate employment for approximately 2.5 lakh persons. As of 30 September 2023, Quarterly Review Reports from PLI beneficiaries indicate the creation of employment for 2,37,335 persons.

Details of One District One Product Brands

As part of Atmanirbhar Bharat Abhiyan, Ministry of Food Processing Industries (MoFPI) is implementing a centrally sponsored 'PM Formalisation of Micro Food Processing Enterprises (PMFME) Scheme' for providing financial, technical and business support for setting up/ upgradation of micro food processing enterprises in the country. The scheme is operational for a period of five years from 2020-21 to 2024-25 with an outlay of Rs 10,000 crore. Scheme primarily adopts One District One Product (ODOP) approach to reap the benefit of scale in terms of procurement of inputs, availing common services and marketing of products. It provides the framework for value chain development and alignment of support infrastructure.

The scheme aims to enhance the competitiveness of existing individual micro-enterprises in the unorganised segment of the food processing industry and promote formalisation of the sector.

The objectives of the scheme are to build capacity of micro enterprises through increased access to credit, integration with organized supply chain by strengthening branding and

marketing, increased access to common services, strengthening of institutions, research & training in the food processing sector.

Credit linked subsidy has been sanctioned to 12,024 numbers of micro food processing units based on ODOP in the country under PM Formalisation of Micro food processing Enterprises (PMFME) Scheme, out of which 109 units are in Rajasthan, 756 units are in Uttar Pradesh, 69 units are in Gujarat and 240 units are in Odisha.

The growth of ODOP units and other groups under the PMFME scheme is assessed and monitored through regular follow up/review meetings with States/UTs, lending banks, concerned Ministries/ Departments and other stakeholders. Handholding support is also provided to beneficiaries under the PMFME Scheme.

Under Branding and Marketing component of the PMFME Scheme, support is provided to FPOs (Farmer Producer Organizations)/ Self-Help Groups (SHGs) / Cooperatives or Special Purpose

ANNEXURE-I : Details of ODOP Brands launched under PMFME Scheme

State/UT	Product	Brand	Brand Ownership
Bihar	Makhana (Darbhanga, Madhubani)	Makhana King	NAFED
Delhi	Bakery Products (West Delhi)	Dilli Bakes	NAFED
UP	Multi Flora Honey (Saharanpur)	Madhu Mantra	NAFED
Rajasthan	Coriander Powder (Kota)	Cori Gold	NAFED
J&K	Lal Mirch Powder (Kulgam)	Kashmiri Mantra	NAFED
Haryana	Amla Juice (Gurugram)	Amrit Phal	NAFED
Maharashtra	Raagi Flour (Thane)	Somdana	NAFED
Uttar Pradesh	Multi Flora Honey & Lemon Honey (Saharanpur)	Madhurmithas	NAFED
Punjab	Mango Pickle (Amritsar) Mixed Pickle	Pind Se	NAFED
Meghalaya	Spicy Dried Pineapple (Ri Bhoi)	Anaras	NAFED
Punjab	Jaggery, Pickle and Murraba (Amritsar, Hoshiarpur, Gurdaspur, Fatehgarh Sahib and SAS Nagar)	Aasna (SPV)	Punjab Agro Unati Grameen Marketing Pvt. Ltd. (PAGMARK)
Maharashtra	Raagi (Nandurbar and Thane), Sorghum (Solapur) and Tomato (Pune and Latur)	Bhimthadi (SHG)	Bhimthadi Foundation
Karnataka	Millet based products (Davanagere)	Seemi	Davanagere & Chitradurgadistricts Organic Farmers Cooperative Federation (DCOFCF)
Karnataka	Red gram based products (Kalaburgi)	Bhima	Karnataka State Pulses Abhivrudhi Mandali Ltd.

ANNEXURE-II : Details of financial support provided to various beneficiaries in Pali, Deoria, Jhansi, Pratapgarh, Navsari and Balasore Parliamentary Constituencies under the PMFME Scheme

Sl.No	Parliamentary Constituencies	District	Loan sanctioned for Credit linked subsidy to beneficiaries		Seed capital sanctioned to SHG members	
			No .of beneficiaries	Amount (Rs. in crores)	No. of SHG Members	Amount (Rs. in crores)
1	Pali	Pali	10	1.80	164	0.80
		Jodhpur	38	6.40	55	0.21
		Total	**48**	**8.20**	**219**	**1.01**
2	Deoria	Kushinagar	90	9.20	8	0.03
		Deoria	34	2.01	160	0.55
		Total	**124**	**11.21**	**168**	**0.58**
3	Jhansi	Jhansi	56	6.60	22	0.08
		Lalitpur	16	1.20	42	0.16
		Total	**72**	**7.80**	**64**	**0.24**
4	Pratapgarh	Pratapgarh	**97**	**12.70**	109	0.37
5	Navsari	Navsari	8	0.85	11	0.01
		Surat	40	11.10	83	0.13
		Total	**48**	**11.95**	**94**	**0.14**
6	Balasore	Mayurbhani	6	0.82	465	0.99
		Balasore	48	3.30	1031	3.70
		Total	**54**	**4.12**	**1496**	**4.69**

Vehicle (SPV) of ODOP based micro food processing enterprises for Market Study and Product Standardization, Packaging Material, Quality Control and food safety adherence for consumer retail sales, Warehousing and Storage Rentals, Marketing and Promotion. Till 30th November, 2023, 14 ODOP brands have been launched in the country as per the details at **Annexure-I**.

The details of financial support provided to various beneficiaries in Pali, Deoria, Jhansi, Pratapgarh, Navsari and Balasore Parliamentary Constituencies under the PMFME Scheme is as at **Annexure-II.**

Under Capacity Building component of PMFME Scheme, training is being provided on 'entrepreneurship development' and 'food processing' to the beneficiaries of credit linked subsidy which includes FPOs/SHGs/Cooperatives etc.

Till 30 November 2023, 54,767 beneficiaries have been trained including members of FPOs/ SHGs/Cooperatives. ❑

Source: PIB

Innovations and Collaborations Take Centre Stage at SUFALAM

Start Up Forum for Aspiring Leaders and Mentors (SUFALAM) 2024 concluded with a take home message that Innovations, Collaborations and advanced technologies in different facets of Food Processing are the key drivers for transforming Startups in food processing domain to established food businesses.

The event witnessed participation from over 250 stakeholders, comprising of startups, senior executives from Food Processing companies, MSMEs, financial institutions, venture capitalists, and academia. Spanning over two days, the event consisted of three knowledge sessions, two pitching sessions, two panel discussions, networking sessions, and an exhibition. During the knowledge session on Startup—overview and benefits, the participants were apprised about the role of Startup India, different programmes for mentorship and innovations under Startup India and how the initiative is helping to foster the start-up ecosystem in India. During the other knowledge session on Food Regulations, the participants got a fair idea about various regulations, certifications and compliances in domestic, import and export of different food products as per FSSAI and EIC regulations. Newer insights about different schemes under APEDA for promotion of export of fresh as well as processed food products were Business and Financial Modeling for Startups, various tips were given to the start-ups on preparation of the business plan showing viability and sustainability in each aspect of the business, importance of free cash flow in financial planning in any business and proper cash flow management.

The panel discussion on transforming food systems focused on diversification of raw materials, climate-resilient options like algae and millets, and creativity in entrepreneurship. Designing of processing machinery, raw

materials, and innovative Agri-Tech solutions were highlighted to meet food safety standards and optimise supply chains. Interventions in raw material sourcing, exploring opportunities in protein-rich foods and sustainable packaging, and collaboration for sustained innovations were also touched upon.

During the session on Startup Conclave for Food Processing Entrepreneurs, India's potential as a food innovation hub, stressing the need for convergence among industry, startups and institutions were discussed. Key discussions centred on the importance of sustainable packaging aligned with consumer preferences and compliance standards. Startups were urged to play a proactive role in sourcing quality raw materials, collaborating with farmers, and venturing into protein-rich foods and affordable nutrition-based products. The session concluded with a strong emphasis on collaboration across sectors for sustained innovation, particularly through credit innovation and cross-industry partnerships.

The two pitching sessions, scheduled on each of the two days saw twelve selected startups pitching their ideas to a panel of food technologists, top banking officials from the leading Banks, VCs, NIFTEM faculty and industry professionals. Six start-ups were offered mentoring support in product refinement, market linkage as well as investor connect. The panelists welcomed this initiative and offered support in such future endeavours for guidance and mentorship to promising small ventures. Overall 38 exhibitors including 26 startups, nine PMFME beneficiaries and three Government agencies showcased their products, schemes and technologies during the two-day event. Besides, there were separate networking sessions between the Startups and Industry where discussions revolved around the hand holding and technical support to the startups.

SUFALAM 2024 has served as a catalyst for transformative discussions, shaping the trajectory of the food processing industry towards innovation-driven growth, fostering collaborations among the Startups, Industry, and Academia. ❑

Source: PIB

Smart Food Processing in India: Innovation and Future Prospects

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Food processing plays a crucial role as it aids in increasing the shelf-life of food products. Processed foods have many advantages, such as a low risk of spoilage, better palatability, and easy digestion. It is also hoped that if proper processing methods are employed during food processing, it can help in destroying spoilage microorganisms, food poisoning bacteria, and substances that can cause diseases. Other benefits of food processing include low-cost storage, ease of marketing and distribution, and enhanced food safety. In fact, the growth of the processed food industry would result in generating new employment opportunities, especially in rural locations. Great potential in food processing, with huge market opportunities, has persuaded several Indian as well as multinational companies to broaden their food processing activities in India.

While an increasing part of the world adopts more sophisticated eating habits, poverty in developing countries remains the main driver of malnutrition. Smart food processing is a solution that is directly aimed at reducing the cost of staple food preparation while creating the nutritional foundation for healthy lives. By utilising biocompatible, innovative, modern, mild, high-tech food processing methods, it is possible to increase the functionality as well as the nutrient density of grain- and pulse-based composite food at affordable prices. These processing methods also enable novel combinations of ingredients, such as fruits and vegetables, meat, fish, dairy produce, or legumes, within staple food commodities.

The concept 'Smart Food Processing' signifies that the post-harvest processing of grains and pulses no longer only serves its traditional purposes such as purification, grinding, or milling but also becomes a driver for health and nutrition. The term is derived from the concept of 'Smart Cities' and

implies new, creative approaches to developing innovative, future-clean and hygienic Smart Food Processing Technologies. A range of appropriate new modern methods for the health-promoting pre-treatment of staple foodstuffs like grains and pulses that process raw materials under mild conditions are available for developing countries in emerging high-tech and low-resource solutions. (Ravishankar & Elavarasan, 2024)

Current Status of Food Processing in India

India is the fastest-growing major market for packaged food in the world now. The food processing industry is one of the major industries in the Indian economy. It is one of the largest industries in the country. India's food processing sector is comprised of several leading firms that specialise in a variety of products ranging from confectionery to beverages, and from dairy to snacks. These companies are known for their significant market presence and contribution to the industry. The increased standard of living, changing lifestyle, urbanisation, and growing demand for packaged and self-cooked edible products are the main factors supporting the growth of the industry in the country. The demand for organic, healthy, nutritive, and wellness products is on the rise due to increasing health and hygiene consciousness in the country. There is significant potential for innovation in the processing of food products to attain increased shelf life, improved nutritional value, safety, and quality. Nutrient- or value-added foods are quite popular in urban areas and are facing increased demand. The important food items that contribute to the variety of value-added foods include convenience foods, processed and preserved fruits and vegetables, soft drinks, pet food, alcoholic beverages, confectionery, and sports drinks. In the case of the niche segment, products with dietary fibre content and various types of fibre-enriched products are enjoying high demand. Consequently, the functional foods that comprise the major components are vitamins, nutraceuticals, herbs, and plant-derived functional ingredients. The product portfolio also includes dietary supplements, fortified products with vitamins and other minerals, ergogenic aids, body-building products, and sports foods. These products are manufactured, marketed, and consumed all over the world. The primary function of functional foods is to prevent various health-related disorders and improve the overall wellness of the person. There are numerous applications of nutraceuticals in industries such as powder drinks, cereals, cookies, chocolate drinks, pet food, and dietary supplements. The second is related to the processing of the nutraceuticals from herbal sources. For example, nutraceutical components like flavonoids of soybean origin, curcuminoids from the turmeric extract, sesame lignans, and ginsenosides from the ginseng extract can be used in the processing of functional foods for their antioxidant activity. The antioxidant function of these products improves the shelf life of RTE foods and various packaged products and helps to maintain the overall quality and nutritional features.

Technological Innovation in Smart Food Processing

In the manufacturing unit, conveyors are an integral part, as processing efficiency is very much dependent on the steady supply of raw and processed produce to and from the machine. It is crucial to process in real time the information from which the next operation in terms of line speed, loader type, unloader type, joint motion, product type, etc. could be commanded. The end-effectors, too, are vital in the food packing industry, as a wrongly placed label or cap on a container can damage food safety. These components are the main brain or control unit of an automated factory line. The unit must have 'Synchronised Motion Control' where in-motion measurements and adaptability are must-have features.

Food processing has hit the next innovation wave, and it has taken the route of smart processing to reach the pinnacle of precision. This precision happens when machines talk to each other and are themselves intelligent enough to complete their given tasks. Prediction and adaptation of new procedures and decision-making make these machines smart. Processing health, operational efficiency, and detection of contamination are as important as the freshness and safety of the raw produce that needs smart handling. Processing in this manner becomes less of an industry and more of a healthcare provider, giving the term 'food processing' a whole new image and identity.

a) Internet of Things (IoT) in Food Processing

In addition, sensors can monitor, analyse, and report changes from point-to-point devices. It can also organise the transfer of active materials such as heating machines and cooling. Furthermore, the device gives a hint about the position of the farm product, storage status, and future approach. When a change is detected, the manufacturer or overseas food service provider can offer transaction services. It can improve the properties and requirements of this item and report results. The added value of the commodity can help farmers, manufacturers, retailers, and customers by continuing to use the services of continued maintenance and logistics, performance management offerings, and other critical promotional customer services in terms of needed business functions. At the end of an IoT implementation, according to the scenario, a result will be achieved, and overall operational processes and supplies can be improved.

Specifically, the technologies used to control the IoT objects and resources are extremely fast development and the updated teams, namely smart devices, smart sensors, and inhibitors. In the near future, there will be a tremendous paradigm shift in the food industry. In the presence of such technological transfer, gasoline will become more cost-effective and more efficient. The IoT ecosystem that focuses on the use of these things until it accomplishes them includes sensors that can recognise different things and events. These sensors acquire this data because of the low-cost head and the combination of this individual data and the RFID (Radio-Frequency Identification) tag with an event. It is an advanced technology that can sensibly acquire, analyse, and manipulate all elements present in this world. This concept has been attracting considerable attention since the word 'connected,' which investigates increasing the level of development of real society on the brink of digital convergence of the different technologies. The infinite computing power and

the storage of communication technology are embedded in the physical object, and the device and infrastructure have a smart style.

b) Artificial Intelligence (AI) Applications

Agrifood Products from a global standpoint, the production and consumption of the food chain are under the spotlight for various reasons, such as guaranteeing the food safety level, enhancing market orientation, ensuring food quality, and ultimately protecting the typical local product identity. The key challenge for today's supply chain includes the extraction of the source producing food items, and artificial intelligence (AI) can indeed address these challenges. Using AI, local identity is always preserved, and traceability is improved because the origin of food items is recognisable.

India, with its diverse food culture, post-harvest losses, import of food items, and human-intervened operations, among other things, has been working towards liberalising its agriculture sector. The shift in focus in the post-liberalisation era, with the advent of various new tools and techniques, including artificial intelligence (AI), has attracted research in India to move to smart food processing and alternative ways of agriculture. The development of AI techniques has indeed transformed traditional Indian agriculture and introduced a new paradigm that aligns with the AI approach. Postharvest losses in agriculture are a key area where AI can greatly help in achieving economic quality assurance for the country's diversified and invaluable food production.

c) Robotics and Automation

Industrial vision techniques and non-destructive and contactless sensors are at the core of robotics. Predetermined standards for geometry, colour, and homogeneity drive quality inspection and robotic operations with graded processing.

Robotics in food handling promises safer outcomes than manual handling for personnel exposed to allergens and washing accidents and ensures speed, continuous work, and custom machining, along with minimal stress for the processing of non-uniform natural products. However, the current generation of robots amounts to large investments that are far from desirable for most food processing entities. On one hand, innovative advancements are underway to ensure that these machines are not fixed to serve specific and simple operations. For example, robot designs that incorporate reprogrammable electromechanics and void fillers could be employed as general-purpose conveying systems on an industrial scale. Furthermore, assistive robotics for frail individuals and robotic customisation techniques could be incorporated.

With the increasing shortage in the availability of unskilled labour for the food industry, the economic necessities and prospects have been encouraging. Examples of robotic applications in food processing include material handling, cleaning, quality inspection, cutting, sorting, and packing, among others. Over the years, Rajalakshmi Engineering College, the All-India Council for Robotics and Automation, has improved system designs, ensuring that few companies progressively engage in food-processing-specific robotics.

Challenges and Opportunities

Agricultural processing includes the utilisation of farm outputs for the non-food sector. Food and agricultural processing activities involve the packaging, canning, fermenting, freezing, drying, cooking, mincing, cutting, steaming, baking, brewing, distilling, and grinding of food products. Additionally, processing is also directed towards some of the services the company provides, like cleaning, sorting, and grinding. This support occurs during the processing implementation of some of the top food product like milk, oil, fruits, vegetables, meat, and fish. This, in addition, also includes the processing of these food products into final products available for long-term use (cereals, cookies, tenders, fruit juice, and ready-to-eat food).

In India, food processing companies are responsible for the transformation of the primary

products of food and agriculture into new and safe products for consumers. More specifically, food processing is the practice that enables efficient and cost-effective conversions of perishable and climate-dependent crops from farms into products that can be protected for longer periods of time and transported over longer distances with minimal loss of nutritional health benefits. This helps to reduce food security concerns and plate wastage and also contributes to export earnings. Simply put, food processing is the practice of maximising the use of plant production crops and food items in a hygienic and elaborate way without compromising the quality or change of industrial items. Here we discuss the various challenges facing the food processing sector.

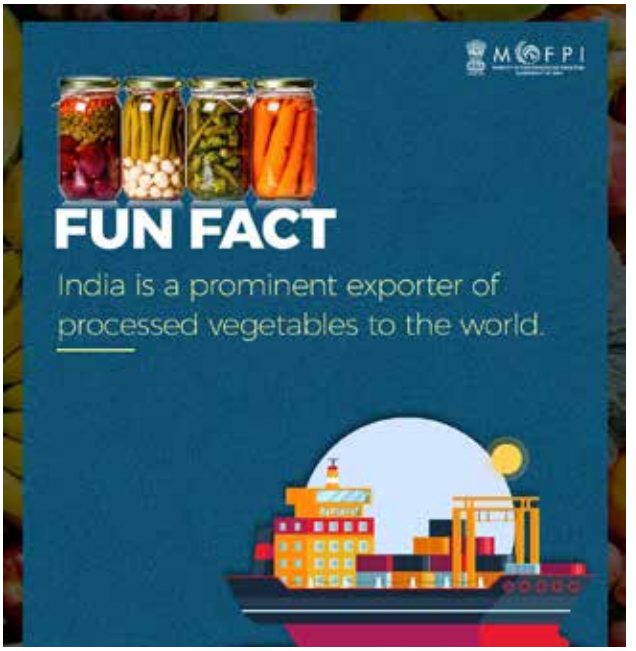
Infrastructure and Investment

Over the past ten years, increasing numbers of valuable studies concerning information infrastructure have been carried out on the importance of physical infrastructure. Inadequate infrastructure is often posed as a major limitation in the food sector, including the subcontinent's potential for handling more perishable types of produce. It includes storage and secondary infrastructure, compliance with hygiene and phytosanitary standards, poor transport, and logistics in getting produce to national and lucrative international markets.

Regulatory Framework and Standards

The Ministry of Food Processing Industries (MoFPI) was established in July 1988 to give impetus to the development of the food processing sector. Food processing in India is regulated by an array of laws and regulations, such as the Fruit Product Order 1955, the Meat Food Products Order 1973, and the Vegetable Oil Product Order 1998. The Ministry also regulates 100% Export-Oriented Units (EOUs) related to food products.

MoFPI oversees various subordinate organisations, namely the National Institute of Food Technology and Entrepreneurship Management (NIFTEM), an autonomous institute, and the apex and advisory body—the Food Processing Industries Confederation (FPIC). A number of food products are reserved for small-scale industry as per item-wise reservation of the 8th Schedule of Industries (Development & Regulation) Act, 1951. The MoFPI is a natural composite of the ministries dealing with agriculture, food, and commerce.



Future Trends and Recommendations

Food processing is one of the sectors that has immense potential for transforming the lives of people and contributing to the national economy. Only with organised state intervention can the food processing industry in the region have a share in the global market. Small units can exploit their time-tested products in the food sector by utilising available raw materials and having easy access to production techniques, marketing, and after-sales services. The immediate need of the region is to suggest ways to enhance their competitiveness in terms of production, design, packaging, distribution, prices, etc., and provide the necessary technical support. Market forces are also needed to develop appropriate tools like collective brand promotion to build a market in terms of credit, enabling environment, marketing, and extension services. Participatory and action-oriented research can help generate knowledge on the needs and concerns of this region.

With the opening up of the Indian economy, there are several opportunities for economic upliftment through the export of various foods. Although there are groups and individuals who have shown special interest in tapping these opportunities, it is only through industrial growth and subsequent investment that the future of food processing can be paved. Ready-to-eat meals and some convenience food preparations are already on the rise. In this context, the processing of perishable fruits and vegetables, as well as the planning of fruit and vegetable centres, have immense potential. Industrial development has also given a boost to several raw materials based on food and industrial alcohol plants made from food grains, which has led to several innovative food products. A long-sighted outlook is essential to utilise the raw materials from the food industry and the organised way of producing food products. There are several investment opportunities in the food industry.

In the last three decades, ready-to-eat meals, juices, ice creams, bakery products, and other convenience foods have become popular in households. This is mainly due to the organised way of production, packaging, distribution, etc., as well as mass educational and industrial development levels. Both rural and urban development have created reserves of good-quality fruits, vegetables, and some processed foods that can be used as important raw materials for food processing. However, the present status is quite bleak, as a major part of the reserved produce goes to waste. Although a number of traditional savoury and sweet products are being sold in local markets, there is still a need for systematic growth in the domestic and international markets. ❑

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