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Beyond the plate: Unpacking global potential and hurdles of India's food industry for sustainability

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Abstract

India's Food Processing Industry (FPI) plays a critical role in bridging agricultural production and consumer demand, with immense potential to contribute to global competitiveness and sustainable development. This review explores the current status of India's FPI, highlighting its rapid growth, policy support, and contributions to employment, export, and value addition. It also investigates how the sector enhances economic sustainability through forward and backward linkages, technology adoption, and global trade integration. Despite its growth trajectory, the industry faces several challenges such as inadequate infrastructure, fragmented supply chains, regulatory hurdles, and sustainability concerns related to environmental impact and resource inefficiency. Drawing insights from government reports, academic literature, and industry sources, the paper further discusses strategic solutions including public-private partnerships, digital transformation, farmer-producer integration, and investment in cold chain logistics. The study concludes that while India's FPI holds significant global potential, achieving true sustainability will require multi-stakeholder collaboration, capacity building, and holistic policy execution. This paper offers a comprehensive understanding for policymakers, researchers, and industry practitioners aiming to unlock the full value of India's food processing ecosystem in alignment with global sustainability goals.

Keywords: Food Processing Industry (FPI), sustainability, global competitiveness, economic development, India's agri-business

Introduction

Food processing industry (FPI) act as important linking factor between Industry and Agriculture, leading to development of nation ^[1]. FPI plays an important role in transforming agricultural produce into value added products through linking production with consumption in food value chain ^[2]. By converting raw materials into edible and culturally acceptable products, thus contributing into sustainable food systems ^[3]. This industry generates significant waste, which through circular economy creates value added products for food, pharmaceutical and cosmetic industries ^[4]. Food processing is important in agri-food industry, as it generates revenue for both farms as well as whole industry ^[5]. FPI's not only mitigates post-harvest losses but generates employment opportunities and contributes to Gross domestic product (GDP) of nation ^[6]. India's unrealized food processing potential is more than 4.5 billion dollars, which is highest among United states of America, Saudi Arabia, China and UAE ^[7]. Various challenges related to contracting, procurement, infrastructure, transportation, technology, government regulations, quality and safety standards affects growth of FPI ^[8]. Even exchange rate volatility is another prominent challenge for FPI ^[9]. Further prevailing policies have significant limitations which hinders long-term development of Cold Chain (CC), which in turn worsens technical and

structural coefficients of FPI ^[10].

India has strong agricultural foundation and various demographic advantages, FPI has yet to achieve a lot in terms of global competitiveness and sustainability. Since very less percentage of agricultural produce is processed, India faces post-harvest losses, low value addition and missed export opportunities. Moreover, there is limited work that assesses Indian FPI in terms of sustainability and global competitiveness. This study will bridge the gap by analyzing status of food processing industry, global competitiveness and economic sustainability status, barriers to it and how to overcome the same.

Research Questions

1. What is the current status of the Food processing industry?
2. How the Indian food processing industry creates global competitiveness and economic sustainability?
3. What are the barriers faced by FPI in achieving sustainability?
4. What is the solution to overcome these challenges of FPI in India?

Methodology

This review paper is based on qualitative research. Exploration of current status, global competitiveness,

sustainability challenges and various solutions related to India's Food Processing Industry opts for descriptive approach, whereby, secondary sources of data have been used. Wide range of secondary sources of data have been used such as peer-reviewed journal articles from Scopus, Web of Science and Google Scholar. Along with it, newspaper articles, blogs, reports published by Govt. of India and Govt. websites were explored. Key words such as Indian FPI, Sustainability, Exports, Infrastructure, Food waste and Policy reforms were utilized to find appropriate matter. Blogs that lacked authenticity, or articles that showed no related content to respective research were excluded. This study is restricted by the dependability and accessibility of published secondary data because it is a literature-based review.

Analysis and Discussion

Current status of the Food processing industry

India is second largest producer of food related products in world. Growth of food processing industry leads to development of nation^[11]. Over the past ten years, the Indian food processing industry (FPI) has seen tremendous change and is now one of the industries with the greatest rates of growth, supporting both economic growth and agricultural modernization^[12]. The food processing sector in India is expected to reach \$389 billion by 2025 and \$700 billion by 2030. In 2025, the food processing sector in India was valued at USD 389 billion^[13]. Thanks to the Ministry of Food Processing Industries' (MoFPI) proactive policy actions, the food processing industry has emerged as a major contributor to India's economy in recent years. From 2015 to 2022, the sector's average annual growth rate was an outstanding 7.3%, demonstrating its exceptional performance. It has made a substantial contribution to investment, jobs, and the GDP. By 2024, it accounts for 13% of India's exports, 6% of all industrial investment, and around 8.80% and 8.39% of GVA in manufacturing and agriculture, respectively. From Rs. 1.61 lakh crore (US\$ 24.60 billion) in 2015-16 to Rs. 1.92 lakh crore (US\$ 24.43 billion) in 2022-2023 is the GVA of the food processing sector^[14]. Rising earnings, urbanization, shifting consumption patterns, and the growing demand for packaged and convenient meals in both urban and rural India are the main causes of this strong rise^[15].

The food sector in India is a substantial source of employment, supporting about 7 million persons across both organized and unorganized parts. Numerous tiny, unregistered food processing businesses are included in this. It is well acknowledged that the sector contributes to the creation of jobs, especially for rural populations^[12, 16]. Additionally, there are about 5.1 million job prospects in the unregistered food processing industry^[17]. Additionally, the Pradhan Mantri Formalization of Micro Food Processing Enterprises (PMFME) scheme and other government-backed programs have been crucial in promoting entrepreneurship and job creation at the local level^[18]. Under PMFME, more than 1.41 lakh loans have been approved, helping to grow small businesses and improve the abilities of individual business owners and Self-Help Groups (SHGs)^[19].

Through focused governmental initiatives, the food processing industry's infrastructure development has

significantly increased. 24 of the 41 approved Mega Food Parks are open as of 2024^[20]. More than 400 cold chain projects and more than 76 agro-processing clusters have also been established, leading to a notable improvement in processing efficiency and storage capacity^[19]. The credibility and traceability of processed food products are improved by the 209 food safety and quality assurance facilities that further strengthen the infrastructure of the food sector^[21]. Important policy programs like the Production Linked Incentive Scheme (PLI) for Food Processing and the Pradhan Mantri Kisan SAMPADA Yojana (PMKSY), which work together to increase processing capacity, reduce post-harvest losses, and draw in private investment, have also benefited the industry^[22]. About 3.3 lakh employment have been created and over ₹8,900 crore in investments have been drawn to the PLI scheme alone^[23].

Small businesses and startups are becoming an increasingly important component of the FPI ecosystem in India. More than 3,300 food processing companies with DPIIT recognition were active in 425 Indian districts as of April 2023^[17]. These new businesses, which are frequently based in rural regions, are using technology and traditional knowledge to improve local produce and cut down on food waste. Furthermore, state-level success stories from areas like Punjab, Kerala, and Karnataka demonstrate the benefits of public-private partnerships, skill development initiatives, and decentralized processing units^[24].

Indian food exports, particularly processed goods, have continued to grow despite global unpredictability. In terms of the nation's agri-exports, the proportion of processed food exports rose from 13.7% in 2014-15 to 25.6% in 2022-23^[19]. The value of seafood exports alone exceeds 60,000 crore rupees^[25]. Nonetheless, India's export performance is still impacted by changes in international markets as well as obstacles including export limitations, problems with quality compliance, and logistical limitations. In order to meet the Indian government's target of \$100 billion in agri-food exports by 2030, trade facilitation, global branding tactics, and quality certification procedures must all be strengthened^[26].

Indian food processing industry creating global competitiveness and economic sustainability

In addition to promoting long-term economic sustainability and national food security, the Indian food processing industry (FPI) is progressively establishing itself as an internationally competitive enterprise. The industry's increasing export performance, acceptance of international food safety and quality standards, and integration with global value chains all demonstrate this. Products like marine items, processed fruits and vegetables, cereals, and ready-to-eat foods contributed significantly to India's processed food and related product exports, which totaled about USD 7.4 billion in 2022-2023, according to the Agricultural and Processed Food Products Export Development Authority. This represents a significant improvement over prior years, demonstrating both the growing demand for Indian food products in global markets and strategic policy support^[27, 28].

India's vast agricultural base, inexpensive raw materials, highly qualified labor force, and developing food processing

infrastructure are its key advantages. Over ₹8,900 crore has been invested in the food processing industry as a result of the government's push to increase competition through the Production Linked Incentive (PLI) scheme; over 60% of this money has gone towards important sectors like organic, marine, and ready-to-eat products ^[18]. Additionally, the program has helped create almost 3.3 lakh jobs, improve brand value in international markets, and upgrade technology ^[22].

Since post-harvest losses make up almost 30% of total agricultural output, efforts have been focused on minimizing them in order to ensure long-term economic sustainability ^[29]. Enhancing cold chain and processing facilities can significantly reduce losses, increasing food availability and profitability ^[30]. In this sense, India's programs like agro-processing clusters, cold chain projects, and Mega Food Parks are assisting in bringing farmers and markets closer together, cutting out middlemen and raising rural incomes. A systemic drive for economic sustainability is seen in the Pradhan Mantri Kisan SAMPADA Yojana's (PMKSY) operationalization of 41 Mega Food Parks and more than 300 cold chain projects by 2025 ^[31].

Additionally, climate-conscious and sustainability-driven practices are becoming more prevalent in India's FPI. Energy-efficient systems, circular economy models, and environmentally friendly packaging are being adopted by a large number of food processing facilities. In an effort to match their operations with international food safety standards and increase consumer confidence globally, businesses are increasingly pursuing certifications like HACCP, FSSAI, ISO 22000, and BRC ^[32, 33].

The expansion of the FPI is not just growth-oriented, but also strategically aligned with sustainability goals³⁴. SDGs 2 (Zero Hunger), 8 (Decent Work and Economic Growth), and 12 (Responsible Consumption and Production) are all being aided by the sector ^[35]. The Indian FPI is fostering inclusive and green growth through the development of farmer-centric value chains, the monetization of agricultural waste, and the encouragement of food entrepreneurship in rural regions.

Barriers faced by FPI in achieving sustainability

Notwithstanding its enormous potential, the Indian Food Processing Industry (FPI) encounters numerous obstacles in its pursuit of sustainability in terms of the economy, environment, and society. Inadequate infrastructure is one of the biggest problems, particularly in rural and semi-urban areas ^[36]. Nearly 30-40% of post-harvest losses occur due to outdated cold chains, warehousing, and logistics, especially for perishables like fruits and vegetables ^[37]. Through waste, these inefficiencies not only have an impact on business but also exacerbate environmental degradation.

The supply chain's fragmentation, which includes numerous middlemen and lacks traceability, is another significant obstacle. This reduces worldwide competitiveness by affecting food quality and creating problems with international safety standards compliance ^[38]. Additionally, since they have limited access to cash, technology, and market connections, small and marginal farmers who make up a sizable portion of the raw material base, frequently continue to be excluded from value addition and processing benefits ^[39].

Sustainability is also limited by obstacles relating to regulations and policies ^[40]. Multiple overlapping regulations by bodies like FSSAI, state governments, and export agencies create confusion and delays in approvals. Another impediment is the lack of a single national policy for sustainable food processing and the poor cooperation between ministries ^[41].

Unsustainable sourcing methods, excessive water use in processing facilities, a lack of waste treatment systems, and energy inefficiencies all jeopardize environmental sustainability. Certain small-scale processing businesses contribute to local pollution by operating without adequate waste disposal facilities. Furthermore, a major barrier to the widespread adoption of green technologies is their high upfront prices ^[42]. Another aspect that is often disregarded is social sustainability. Social injustices and poorer worker retention are caused by problems such limited female participation in processing activities, a lack of labor welfare laws, and informal employment practices ^[43, 44].

Solution to overcome these challenges of FPI in India

A thorough and integrated policy framework is necessary to solve the various issues that the food processing industry (FPI) in India faces. First, post-harvest losses can be significantly decreased by improving logistics and infrastructure through more public-private partnerships (PPP). Plans such as the Pradhan Infrastructure development has already begun under the Mantri Kisan SAMPADA Yojana, but it has to be expanded with focused investments in integrated food parks, cold chains, and packaging centers ^[22].

Second, it is essential to improve the backward connections with farmers. This involves using digital platforms, financing, and training to support Farmer Producer Organizations (FPOs) and guarantee their presence in value chains. Projects like AgriStack and e-NAM (Electronic National Agriculture Market) can guarantee improved price realization and increase market transparency, resulting in a sustainable input-output cycle ^[38].

The use of green and sustainable processing technology is another crucial remedy. Environmental sustainability can be enhanced by offering financial incentives for water recycling technologies, waste management systems, and energy-efficient equipment. These technologies can be made more accessible, particularly for MSMEs, with government assistance in the form of tax breaks, low-interest loans, and Technology Upgrade Funds ^[45].

Policy harmonization between the Ministry of Environment, the Ministry of Food Processing, and the Food Safety and Standards Authority of India (FSSAI) is necessary to increase regulatory efficiency. A single-window clearance process for food processing facilities can cut down on red tape and attract new business owners to the industry ^[46].

Policies should prioritize formalizing employment, protecting worker welfare, and encouraging gender inclusion in the food value chain in order to achieve social sustainability. Programs for skill development, especially for women and young people, can also increase the sector's social fairness and productivity ^[47].

Last but not least, bringing domestic norms into line with international standards, expanding food testing facilities, and providing branding and certification assistance for

Indian processed goods overseas can all improve export competitiveness. It will also take ambitious international marketing techniques backed by export subsidies and diplomatic initiatives to establish India as a global centre for ethnic, organic, and ready-to-eat foods^[48]. Unlocking the sustainable potential of India's food processing industry essentially requires a concerted multi-stakeholder approach that integrates technology, policy, finance, and education.

Conclusion

At this crucial moment, the Indian food processing industry has the unquestionable potential to spur inclusive growth, lessen agricultural waste, and advance sustainability. With the help of government initiatives, innovative business practices, and rising local and international consumer demand, India has made significant strides in developing its food processing skills throughout the years. However, the industry still faces difficulties with sustainability, complicated regulations, and a lack of infrastructure.

This study emphasizes that although achieving economic sustainability and global competitiveness is possible, doing so calls for a sustained, concerted effort. It is crucial to address barriers including disjointed supply chains, technology constraints, and inadequate farmer integration. Additionally, it is still crucial to close the gap between the creation of policies and their implementation at the grassroots level. Sustainable solutions, such as inclusive labor standards, environmental protections, or technology-enabled transparency, will be crucial in determining how FPI develops in India in the future.

In summary, India's path to becoming a major centre for food processing will rely on how growth is accomplished in an equitable and sustainable manner in addition to economic indicators. For the sector to thrive in a way that is competitive, inclusive, and future-ready, stakeholders like government agencies, private investors, farmers, and consumers will need to continue working together.

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