

Resilience of India's Food Processing Sector amid Climate Change and GST Implementation

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Abstract

The food processing sector in India plays a vital role in linking agricultural production with industrial development and consumer markets. It contributes significantly to employment generation, value addition in agriculture, export earnings, and rural industrialization. However, the sector is increasingly facing challenges from two major transformations: climate change and the implementation of the Goods and Services Tax (GST). Climate change affects agricultural productivity, supply chain stability, and the availability of raw materials required for food processing industries. At the same time, the GST reform introduced a unified tax system that altered logistics, pricing structures, and the operational dynamics of the sector. Despite these pressures, India's food processing industry has shown considerable resilience through technological innovation, infrastructure development, policy interventions, and market diversification. This article examines the structural importance of the food processing sector in India and evaluates how climate change and GST reforms have influenced its functioning. It further analyzes the adaptive strategies adopted by the sector to maintain stability and growth. The study argues that strengthening climate-resilient supply chains, promoting sustainable processing practices, and ensuring policy support are essential for enhancing the long-term resilience of the sector. A resilient food processing industry is crucial not only for economic growth but also for ensuring food security and sustainable development in India.

Keywords: Food processing industry, climate change, GST reforms, supply chain resilience, agricultural value chain, India

1. Introduction

India's food processing sector occupies a crucial position in the country's economic and agricultural landscape. As an important link between agriculture and industry, the sector plays a significant role in converting raw agricultural produce into value-added food products, thereby enhancing the economic value of agricultural commodities and improving their marketability. India is one of the largest producers of cereals, fruits, vegetables, milk, spices, and marine products in the world. However, the benefits of such large agricultural production can only be fully realized when efficient processing, storage, and distribution systems are in

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place. In this context, the food processing industry serves as a key driver of agricultural modernization, rural industrialization, and employment generation.

The sector contributes substantially to India's economy by generating employment opportunities, increasing farmers' income, reducing post-harvest losses, and strengthening export performance. It creates a strong forward and backward linkage between agriculture, manufacturing, and the service sector. Activities such as sorting, grading, preservation, packaging, transportation, and marketing form an integrated chain that supports millions of livelihoods across the country. With rapid urbanization, rising disposable incomes, and changing consumer preferences, the demand for processed and convenience foods has grown significantly in recent years. As a result, the food processing sector has emerged as one of the fastest-growing segments of India's manufacturing industry.

Despite its growth potential, the sector faces several structural and environmental challenges that threaten its stability and long-term sustainability. Among these challenges, climate change has emerged as a major concern affecting agricultural production and food systems globally. Rising temperatures, irregular rainfall patterns, and the increasing frequency of extreme weather events such as droughts, floods, and cyclones have direct implications for agricultural productivity and food supply chains. Since food processing industries depend heavily on agricultural raw materials, any fluctuation in agricultural output can disrupt processing activities, affect product availability, and increase production costs. Climate variability also influences the quality and shelf life of agricultural produce, thereby affecting the efficiency of processing operations. In addition to environmental challenges, the sector has undergone significant institutional and policy changes in recent years. One of the most notable reforms was the implementation of the Goods and Services Tax (GST) in July 2017. GST replaced a complex system of multiple indirect taxes with a unified national tax framework, thereby transforming the fiscal environment in which food processing businesses operate. The reform aimed to simplify taxation, promote transparency, and facilitate the seamless movement of goods across states. For the food processing industry, GST has had both positive and challenging implications. While it has improved supply chain efficiency and market integration, it has also required businesses to adapt to new compliance mechanisms and tax structures.

In this context, the concept of resilience becomes particularly relevant for understanding how the food processing sector responds to environmental and policy transformations. Resilience refers to the ability of a system to absorb shocks, adapt to changing conditions, and continue functioning effectively despite uncertainties. The resilience of India's food processing sector is reflected in its capacity to adopt technological innovations, improve infrastructure, diversify supply chains, and respond to policy reforms. Examining this resilience is essential for understanding how the sector can sustain growth while contributing to national food security and economic development.

Table 1: Factors and recent trends in GST

<i>Factor</i>	Recent Trend / Impact
<i>GST Rate (Most Processed Food)</i>	Reduced from 12%/18% to 5% (as of Sept 2025)
<i>Climate Risk</i>	Projected 15-20% production loss in key crops over 15 years
<i>Growth Driver</i>	PLI Scheme and PM Kisan SAMPADA Yojana infrastructure boosts
<i>Export Status</i>	Reached \$46.44 Billion (FY24), accounting for ~23% of agri-exports

2. Significance of the Food Processing Sector in India

The food processing sector occupies a strategic position in India's economic structure. It connects agriculture with industry and plays a significant role in enhancing the value of agricultural products. Through processing, packaging, preservation, and distribution, the sector transforms raw produce into consumable goods with longer shelf life and higher market value. One of the major contributions of the sector is value addition in agriculture. Farmers often receive low returns for raw produce due to price fluctuations and perishability. Food processing industries help stabilize prices and increase income by converting raw products into processed items such as juices, dairy products, canned vegetables, and packaged snacks.

Another important role of the sector is employment generation. Food processing industries create employment opportunities in both rural and urban areas. Activities such as processing, packaging, transportation, storage, and marketing require a large workforce, thereby supporting livelihoods for millions of people. The sector also contributes to reducing post-harvest losses. In India, a considerable amount of agricultural produce is lost due to inadequate storage and transportation facilities. Food processing helps preserve perishable commodities and extend their shelf life, thereby minimizing wastage. Furthermore, the sector has significant export potential. Processed foods such as spices, ready-to-eat products, dairy items, and marine products are exported to international markets, contributing to foreign exchange earnings. With increasing consumer awareness and changing lifestyles, the demand for processed foods is expected to grow rapidly in the coming years. Therefore, the food processing sector will continue to play an essential role in India's economic development.

Table 2: Contribution of Food Processing Sector in India's Economy

Indicator	Contribution
Share in Agricultural GVA	~8.4%
Share in Manufacturing GVA	~8.8%
Share in Total Exports	~13%

Employment Generated	Over 12 million jobs
Market Size (2024)	~US\$354 billion

3. Key Focus Pillars of the Food Processing Sector

The modern food processing industry is evolving rapidly in response to sustainability challenges, nutrition needs, technological innovations, and expanding global markets. One of the central priorities is sustainability and net-zero food processing, as agri-food systems contribute nearly one-third of global greenhouse gas (GHG) emissions. Adoption of renewable energy, circular waste management, water conservation, and digital technologies such as AI and IoT can significantly reduce environmental impacts. Another important pillar is processed food for nutrition and health. Properly formulated processed foods can enhance dietary quality through fortification, improved food safety, longer shelf life, and better accessibility, particularly in regions with limited infrastructure. Technological advancement is also reshaping the sector through innovative processing and packaging technologies. Non-thermal processing, plant-based food products, biodegradable packaging, and blockchain-enabled traceability are emerging trends improving sustainability and consumer trust. India has strong potential to emerge as a global food processing hub, supported by its diverse agricultural base, 15 agro-climatic zones, growing domestic demand, and favorable policy environment. Furthermore, livestock and marine sectors play a significant role in strengthening the rural economy by generating employment, supporting food security, and boosting exports.

Table 3: Key Indicators of Food Processing and Allied Sectors in India

<i>Sector/Indicator</i>	Key Data
<i>Global agri-food GHG emissions</i>	~33% of global emissions
<i>Livestock contribution to India's GDP</i>	~4%
<i>Livestock share in agricultural GDP</i>	~30%
<i>Marine sector share in national GDP</i>	~1%
<i>Marine exports value</i>	~₹63,000 crore (≈ USD 8 billion)
<i>Rural households supported by livestock</i>	>20 million
<i>Fisheries employment</i>	~15 million people

4. Climate Change and its Impact on the Food Processing Sector

Climate change has become one of the most pressing environmental challenges of the twenty-first century. Rising global temperatures, shifting precipitation patterns, and the increasing frequency of extreme weather events have profound implications for agriculture and food systems.

Impact on Agricultural Raw Materials

Food processing industries depend heavily on agricultural inputs such as grains, fruits, vegetables, milk, meat, and marine products. Climate change affects the production, quality, and availability of these raw materials. For example, rising temperatures may reduce crop yields and affect the nutritional quality of food crops. Similarly, irregular rainfall patterns can lead to droughts or floods, which damage crops and disrupt agricultural production. Such fluctuations in supply create uncertainties for food processing industries that rely on consistent raw material availability.

Supply Chain Disruptions

Extreme weather events such as cyclones, floods, and heat waves can damage transportation networks and storage facilities. These disruptions affect the timely delivery of raw materials to processing units and the distribution of processed products to markets. In addition, climate-induced disasters can damage agricultural infrastructure such as irrigation systems and rural roads, further affecting supply chains.

Increased Production Costs

Climate change also leads to higher production costs for food processing industries. For example, water scarcity may increase the cost of water used in processing activities. Similarly, rising temperatures may require additional energy for refrigeration and cold storage, increasing operational expenses.

Environmental Sustainability Concerns

The food processing sector itself contributes to environmental pressures through energy consumption, waste generation, and greenhouse gas emissions. Therefore, there is increasing emphasis on adopting environmentally sustainable practices in food processing industries.

Table 4: Major Climate Change Impacts on Food Processing Supply Chain

Climate Factor	Impact on Agriculture	Impact on Food Processing
Rising temperature	Reduced crop productivity	Higher energy demand for refrigeration
Irregular rainfall	Crop failures and reduced yields	Raw material shortages
Floods and cyclones	Damage to farms and infrastructure	Disrupted transportation
Drought conditions	Water scarcity	Increased production costs

4. Climate Adaptation Strategies in the Food Processing Sector

In response to climate-related challenges, the food processing sector in India has begun adopting various adaptation strategies aimed at enhancing resilience and sustainability.

Development of Cold Chain Infrastructure

Cold chain infrastructure plays a crucial role in protecting perishable food products from spoilage. Modern cold storage facilities, refrigerated transportation, and climate-controlled warehouses help maintain product quality even under fluctuating environmental conditions.

Technological Innovation

Technological advancements are improving efficiency and sustainability in food processing industries. Energy-efficient machinery, solar-powered cold storage systems, and automated processing technologies help reduce energy consumption and operational costs.

Diversification of Raw Material Sources

To reduce dependence on a single region or crop, many food processing companies diversify their raw material sources across different geographical regions. This strategy helps mitigate risks associated with climate-induced crop failures.

Adoption of Sustainable Practices

Sustainable practices such as waste recycling, water conservation, and renewable energy use are increasingly being adopted in food processing industries. These practices not only reduce environmental impact but also enhance long-term operational resilience.

Government Support for Climate Resilience

Government policies and programs aimed at promoting climate-resilient agriculture and sustainable food systems support the food processing sector. These initiatives encourage investment in infrastructure, research, and innovation.

Table 5: Adaptation Strategies Adopted by Food Processing Industries

Strategy	Description
Cold chain development	Storage and transportation systems for perishable foods
Energy-efficient technologies	Use of modern machinery and renewable energy
Diversification of sourcing	Procurement of raw materials from multiple regions
Waste recycling	Conversion of food waste into animal feed or bioenergy
Water conservation	Efficient water use and recycling systems

5. GST Implementation and Its Impact on the Food Processing Sector

The introduction of the Goods and Services Tax (GST) in July 2017 marked one of the most significant fiscal reforms in India's economic history. GST replaced multiple indirect taxes such as excise duty, service tax, and value-added tax with a unified tax structure.

Table 6: GST Rates for Selected Food Products

Food Category	GST Rate
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Fresh fruits and vegetables	0%
Milk and basic dairy products	0%
Packaged food items	5%
Processed foods and snacks	12%
Aerated beverages	28%

Simplification of Taxation

Before GST, food processing companies had to comply with multiple taxes imposed by different states. GST simplified the taxation system by introducing a single tax framework, thereby reducing administrative complexity.

Improved Logistics and Market Integration

GST eliminated interstate checkpoints and entry taxes, enabling smoother movement of goods across states. This improvement in logistics has reduced transportation time and costs for food processing companies.

Changes in Product Pricing

GST rates vary for different food products. While essential food items are taxed at lower rates or exempted, certain processed foods fall under higher tax brackets. These changes influence pricing strategies and consumer demand.

Impact on Small Enterprises

Small and medium food processing enterprises initially faced challenges in adapting to digital tax filing and compliance requirements under GST. However, over time, many businesses have adjusted to the new system and benefited from improved market access.

6. Resilience of the Food Processing Sector under GST

Despite the initial challenges, the food processing sector has demonstrated significant resilience under the GST regime. GST has streamlined supply chains by reducing transportation delays and improving logistics efficiency. This has been particularly beneficial for perishable food products that require rapid movement through the supply chain. The unified tax system has also encouraged the expansion of organized retail and e-commerce platforms, which play an important role in distributing processed food products. Moreover, GST has improved transparency in business operations and facilitated greater investment in the sector by creating a predictable tax environment.

7. Government Policies Supporting Sectoral Resilience

Government policies have played a critical role in strengthening the resilience of India's food processing sector. Programs such as Mega Food Parks, Pradhan Mantri Kisan Sampada Yojana, and Production-Linked Incentive (PLI) schemes aim to improve infrastructure, encourage

investment, and promote innovation. These initiatives provide integrated facilities for food processing, including cold storage, logistics support, quality testing laboratories, and packaging units. Such infrastructure reduces post-harvest losses and enhances value addition in agriculture. In addition, government support for research and skill development helps improve technological capabilities and workforce productivity in the sector.

Table 7: Major Government Schemes Supporting Food Processing Industry

Scheme	Objective
Mega Food Parks Scheme	Development of integrated food processing infrastructure
Pradhan Mantri Kisan Sampada Yojana	Reduce post-harvest losses and promote value addition
Production Linked Incentive (PLI) Scheme	Boost manufacturing and global competitiveness
Cold Chain Scheme	Improve storage and transportation of perishable goods

8. Emerging Opportunities

Despite environmental and policy challenges, several opportunities exist for the growth of India's food processing sector. Rising urbanization and changing dietary preferences are increasing demand for processed and convenience foods. Similarly, the growing popularity of organic and health-oriented products is creating new market segments. Technological innovations such as digital supply chain management, artificial intelligence, and blockchain can enhance transparency and efficiency in food processing industries. Furthermore, India's agricultural diversity provides immense potential for expanding exports of processed food products.

9. Challenges and Policy Implications

Although the sector shows strong resilience, certain challenges remain. These include inadequate cold storage infrastructure in rural areas, limited access to finance for small enterprises, climate-induced crop failures, and stringent international quality standards. Addressing these challenges requires coordinated policy efforts. Investments in infrastructure, research and development, and climate-resilient agriculture will be essential for strengthening the sector's long-term sustainability.

Table 8: Key Challenges Facing the Food Processing Sector

Challenge	Implication
Inadequate cold storage	Post-harvest losses

Climate-induced crop failures	Raw material supply instability
Limited access to finance	Slow growth of small enterprises
Export quality standards	Need for improved processing technology
Infrastructure gaps	Inefficient logistics

10. Conclusion

India’s food processing sector occupies a crucial position in the country’s economic and food security framework. It acts as a vital link between agricultural production and consumer markets while contributing significantly to employment, industrial growth, and export development. However, the sector faces increasing challenges from climate change and policy transformations such as the implementation of GST. Climate change threatens agricultural productivity and supply chain stability, while GST has altered the fiscal and logistical environment of the industry. Despite these challenges, the sector has demonstrated remarkable resilience through technological innovation, infrastructure development, market diversification, and supportive government policies. Strengthening climate-resilient agricultural systems, expanding cold chain infrastructure, promoting sustainable processing practices, and ensuring policy stability will be essential for sustaining the growth of the food processing sector. A resilient food processing industry will not only enhance economic development but also ensure food security, rural prosperity, and sustainable development in India.



Figure 1: Advantages in Food Processing in India

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