

Tomato processing industries in India for nutritional security

Abstract

Tomato (*Solanum lycopersicum* L.) is one of the most widely cultivated vegetable crops in India and serves as an important raw material for the food processing industry. Despite being among the world's largest tomato producers, India processes only a small proportion of its total tomato production, with the majority consumed as fresh produce. The tomato processing sector primarily manufactures products such as tomato paste, puree, ketchup, sauces, juices, soups, dehydrated tomato powder, and canned tomatoes. Major processing facilities are concentrated in states including Karnataka, Maharashtra, Andhra Pradesh, Telangana, Punjab, and Uttar Pradesh, where production clusters and industrial infrastructure support commercial operations. The industry is characterized by the coexistence of large organized companies and numerous small- and medium-scale enterprises. However, inadequate availability of processing-specific cultivars, seasonal fluctuations in raw material supply, high post-harvest losses, fragmented supply chains, limited cold storage infrastructure, and inconsistent fruit quality continue to constrain industry growth. Government initiatives such as the PM Formalisation of Micro Food Processing Enterprises (PMFME) Scheme, Pradhan Mantri Kisan SAMPADA Yojana (PMKSY), and Production-Linked Incentive (PLI) Scheme for Food Processing are strengthening processing infrastructure, promoting value addition, and encouraging private investment. Simultaneously, increasing consumer demand for convenience foods, expansion of organized retail, technological advancements in processing, automation, and export opportunities are driving the sector's modernization. Greater emphasis on contract farming, processing-oriented tomato hybrids, digital supply chain management, and sustainable processing technologies is expected to improve industry competitiveness. Strengthening farmer–processor linkages, expanding decentralized processing units, and enhancing quality standards will be crucial for reducing post-harvest losses and increasing value addition. Overall, the Indian tomato processing industry possesses substantial potential to evolve into a globally competitive sector, contributing significantly to food security, rural employment, agricultural diversification, and export earnings.

Keywords: *Solanum lycopersicum*, tomato processing, value addition, post-harvest losses, food processing industry, value chain, government initiatives

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Introduction

Tomato (*Solanum lycopersicum* L.) is one of the most important vegetable crops cultivated worldwide and serves as a major raw material for the food processing industry. India is among the largest producers of tomatoes globally, contributing significantly to vegetable production and nutritional security. Tomatoes are valued for their high content of vitamins, minerals, dietary fiber, and bioactive compounds such as lycopene, β -carotene, vitamin C, and phenolic antioxidants. Due to their highly perishable nature, processing plays a critical role in extending shelf life, reducing post-harvest losses, stabilizing market prices, and increasing farmers' income. The tomato processing industry has emerged as an important component of the Indian food processing sector, producing a variety of value-added products for domestic consumption and export markets.¹

India is the world's second-largest producer of tomatoes, producing 21.54 million tonnes with an average productivity of 25.54 t ha⁻¹ during 2024-25. Despite its large production, tomato is highly perishable because of its high moisture content and has a shelf life of only 2–3 days under ambient conditions, resulting in post-harvest losses of approximately 15–25% across the value chain. However, the country processes less than 1% of its total tomato production, which is considerably lower than the processing levels observed in developed countries such as the United States, Italy, and Spain.¹

Despite its substantial production base, India continues to rely on imports of processed tomato products, particularly tomato paste and concentrates, from countries such as China, the United States, and Italy to meet industrial and consumer demand.² This scenario underscores the urgent need to strengthen indigenous tomato processing capacity and enhance value addition within the domestic supply chain.

The highly seasonal nature of tomato production frequently results in market gluts, leading to sharp declines in farm-gate prices and significant post-harvest losses. During peak harvest periods, a considerable proportion of the produce remains unutilized due to inadequate processing infrastructure and limited storage facilities. It has been estimated that 70–80% of surplus tomatoes generated during glut conditions could potentially be diverted to processing industries, provided the fruits meet the quality requirements for industrial processing, such as high total soluble solids (TSS), desirable color, firmness, and pulp content.^{1,3}

The preservation of tomatoes in semi-processed forms, including pulp, puree, and paste, offers an effective strategy for managing seasonal surpluses while ensuring year-round availability of raw materials for the manufacture of value-added products such as ketchup, sauces, soups, beverages, and ready-to-cook formulations. Semi-processing not only reduces wastage and stabilizes market prices but also strengthens the supply chain by providing processors with a consistent source of raw material irrespective of seasonal

fluctuations.² Therefore, expanding tomato processing capacity and promoting processing-oriented production systems can play a crucial role in reducing post-harvest losses, minimizing import dependence, enhancing farmer incomes, and supporting the growth of India's food processing sector.

Tomato processing encompasses a diverse range of products that can be broadly categorized into peeled tomatoes, diced tomatoes, concentrated products, partially dehydrated products, strained tomatoes, tomato juice, pulp, puree, paste, powder, ketchup, sauces, and other value-added formulations. These products find extensive applications across the food processing sector, including the manufacture of snacks, convenience foods, culinary preparations, institutional catering, hotels, restaurants, and fast-food retail chains.² The increasing demand for processed and ready-to-eat foods has further expanded the market for tomato-based ingredients, making tomato processing an important segment of the food industry.

Among the various processed products, diced or peeled tomatoes, tomato puree, and tomato paste constitute the primary processing outputs. These products serve as intermediate raw materials for the production of a wide range of secondary processed products, including tomato juice, ketchup, sauces, soups, pickles, dehydrated tomato powders, ready-to-cook mixes, and ready-to-eat curries.¹ The conversion of fresh tomatoes into primary processed forms not only extends shelf life but also facilitates storage, transportation, and year-round utilization by downstream food industries.

The ketchup and sauce manufacturing sector represents one of the largest consumers of tomato puree and paste in India. These products provide the desired consistency, color, flavor, and total soluble solids required for the formulation of high-quality tomato-based condiments. With the rapid growth of the food service industry, quick-service restaurants (QSRs), and processed food markets, the demand for tomato paste and puree has increased substantially over the past decade.²

Economic analyses suggest that the commercial viability of tomato puree and paste production largely depends on the availability of adequate quantities of quality raw materials at competitive prices. Consequently, processing facilities are most successful when established in close proximity to major tomato-producing regions. Locating processing units near production clusters reduces transportation costs, minimizes post-harvest losses, ensures a steady supply of fresh tomatoes, and enhances overall processing efficiency.³ Therefore, the development of tomato processing industries in and around key tomato-growing areas remains essential for improving profitability, strengthening supply chains, and promoting sustainable growth of the tomato processing sector in India.

India's tomato processing industry has witnessed steady growth in recent years; however, a substantial portion of its potential remains untapped. Despite being one of the world's leading tomato producers, the country processes only a small fraction of its total production, leaving significant opportunities for value addition and industrial expansion. The increasing demand for processed foods driven by rapid urbanization, changing consumer preferences, growth of the food service sector, and expansion of organized retail has created favorable conditions for the development of the tomato processing industry. Furthermore, supportive government initiatives aimed at strengthening food processing infrastructure, reducing post-harvest losses, and promoting agro-based industries are expected to accelerate the growth of this sector in the coming years.^{2,4}

There is an urgent need to expand tomato processing capacity in India to address recurring issues of price volatility and substantial post-harvest losses during peak production seasons. The highly perishable nature of tomatoes, coupled with seasonal market gluts, often results in severe price crashes and economic losses for farmers. Converting fresh tomatoes into value-added products such as puree, paste, ketchup, sauces, juice, dehydrated powders, and ready-to-eat formulations can significantly enhance shelf life, improve marketability, and stabilize prices throughout the year.¹ Processing not only ensures the efficient utilization of surplus production but also creates opportunities for diversification and value addition within the agricultural sector.

Tomato processing industries play a critical role in reducing post-harvest losses and enhancing the economic value of perishable horticultural produce. By transforming fresh tomatoes into stable, marketable products, these industries contribute to improved supply chain efficiency, reduced wastage, and increased returns to farmers. In addition, processed tomato products serve as essential ingredients for the food manufacturing, hospitality, catering, and fast-food sectors, thereby supporting the broader food processing ecosystem.²

India is home to several private-sector tomato processing companies along with a limited number of government-supported processing units. These industries are actively involved in converting surplus fresh tomatoes into a variety of value-added products, including tomato paste, puree, ketchup, sauces, canned tomatoes, dehydrated tomato products, and specialty formulations. The presence of these processing units is particularly important in major tomato-producing regions, where they help absorb excess production, reduce market oversupply, and create employment opportunities. Furthermore, processed tomato products cater not only to domestic consumption but also contribute to export earnings by meeting the growing international demand for tomato-based ingredients and food products.¹ The major tomato processing industries operating in India and their product portfolios are presented in Table 1.⁵

Table 1 List of major tomato processing industries in India.⁵

S. No.	Name of company	Location/states	Products	Processing capacity
1.	Cremica Food Industries Ltd.	Himachal Pradesh	Tomato paste, sauces	700–1,400 MT/day (expansion ready)
2.	Hindustan Unilever (Kissan)	Pan India	Tomato paste, puree, ketchup, sauces	300–500 MT/day
3.	Nestlé India (Maggi)	Punjab, Karnataka	Tomato ketchup & sauces	200–400 MT/day
4.	ITC Ltd. (Aashirvaad, Kitchens of India)	Pan India	Tomato puree, sauces, chutneys & gravies	200–350 MT/day

Table 1 Continued...

5.	Varun Agro Processing Foods Pvt. Ltd.	Maharashtra (Nashik)	Tomato paste, puree, ketchup, pulp	300 MT/day (pulp), 5 MT/day (ketchup)
6.	Global Green Company Pvt. Ltd.	Andhra Pradesh, Karnataka	Tomato paste (Tify brand), sauces	20,000 MT/year (~55 MT/day average)
7.	FieldFresh Foods Pvt. Ltd. (Del Monte)	Punjab	Tomato paste, puree, ketchup, sauces	~250–300 MT/day (estimated)
8.	Tropolite Foods Pvt. Ltd.	Madhya Pradesh	Tomato puree, sauces, paste	200–300 MT/day (estimated)
9.	Mother Dairy (Safal)	Delhi, Karnataka	Tomato puree, ketchup	~100–150 MT/day (estimated)
10.	Veeba Food Services Pvt. Ltd.	Rajasthan, Haryana	Tomato sauces, ketchup for HORECA	~100–200 MT/day
11.	Desai Foods (Mother's Recipe)	Maharashtra, Gujarat	Tomato ketchup, paste, pickles	~150–250 MT/day (estimated)
12.	Keventer Agro Ltd.	West Bengal	Tomato puree, frozen tomato products	~100–150 MT/day
13.	Nijjer Agro Foods Ltd.	Punjab	Tomato paste, puree, sauces	300–500 MT/day (seasonal)
14.	Capricorn Food Products India Ltd.	Tamil Nadu, Andhra Pradesh	Tomato paste, pulp, sauces	250–500 MT/day
15.	Apex International	Rajasthan	Tomato paste, puree (export-focused)	700–1,400 MT/day (expansion ready)
16.	Punjab Agro Juice / PAGREXCO	Hoshiarpur, Punjab	Tomato puree, paste, and juice	10 MT/hr per plant (~240 MT/day total); 1,000 MT cold storage/plant
17.	Punjab Agro Tomato Juice	Abohar, Punjab	Tomato puree, sauces, paste and juice	6,000 MT/day tomato capacity
18.	PAIC Ludhiana Mega Food Park	Ludhiana, Punjab	Tomato puree, sauces & paste	CPC + 4 PPCs: Cold storage 200–600 MT each; dry storage up to 1,000 MT
19.	HOPCOMS (Karnataka)	Bangaluru, Karnataka	Tomato puree & paste	~100 MT/day fruits/vegetables processing

Government initiatives and policy support for tomato processing in India

Recognizing the importance of value addition, reduction of post-harvest losses, and enhancement of farmers' income, the Government of India has launched several schemes and policy interventions to strengthen the food processing sector, including tomato processing. These initiatives aim to develop modern processing infrastructure, improve supply chain efficiency, facilitate access to credit, and promote entrepreneurship in agro-processing industries. Major government programs supporting tomato processing include Operation Greens (TOP to TOTAL), the Agriculture Infrastructure Fund (AIF), Pradhan Mantri Kisan Sampada Yojana (PMKSY), and the Pradhan Mantri Formalization of Micro Food Processing Enterprises (PMFME) Scheme.⁶

Operation Greens was initially launched for Tomato, Onion, and Potato (TOP) crops and was subsequently expanded under the "TOP to TOTAL" framework to include all fruits and vegetables. The scheme focuses on stabilizing prices, reducing post-harvest losses, strengthening farmer-producer organizations (FPOs), and encouraging value addition through processing. The initiative seeks to create efficient value chains by linking producers with processors and markets, thereby ensuring better price realization for farmers and continuous availability of raw materials for the processing industry.⁶

The Agriculture Infrastructure Fund (AIF) provides medium- to long-term debt financing for investment in post-harvest management and community farming assets. Under this scheme, financial assistance

is provided for the establishment of warehouses, cold storage facilities, sorting and grading units, pack houses, ripening chambers, and primary processing centers. Such infrastructure is essential for minimizing post-harvest losses of perishable commodities like tomatoes and ensuring the availability of quality raw materials for processing industries.⁷

The Pradhan Mantri Kisan Sampada Yojana (PMKSY) has emerged as one of the flagship schemes supporting food processing industries in India. The scheme aims to create modern food processing infrastructure, establish integrated cold chains, reduce agri-waste, and promote value addition across the agricultural supply chain. Financial assistance is provided for the establishment and modernization of food processing units, cold-chain projects, agro-processing clusters, and food testing laboratories. PMKSY has significantly contributed to strengthening the processing ecosystem and enhancing the competitiveness of the food processing sector.⁶

Another important initiative is the PM Formalization of Micro Food Processing Enterprises (PMFME) Scheme, which focuses on supporting micro and small food processing units through financial assistance, capacity building, technology upgradation, branding, and marketing support. The scheme provides credit-linked subsidies to entrepreneurs and self-help groups engaged in food processing activities, including tomato processing. By strengthening micro-enterprises, PMFME contributes to decentralized processing, employment generation, and rural economic development.⁶

Among the various interventions, the Mega Food Parks Scheme has played a pivotal role in developing integrated food processing

infrastructure across the country. The primary objective of the scheme is to provide state-of-the-art facilities for food processing industries, facilitate value addition of agricultural commodities, and establish sustainable supply chains connecting producers, processors, and retailers. The scheme promotes cluster-based development by creating common infrastructure such as cold storage facilities, warehouses, quality control laboratories, packaging units, and logistics support systems. Furthermore, Mega Food Parks offer plug-and-play facilities that reduce capital investment requirements for small and medium-scale food processing enterprises, thereby encouraging entrepreneurship and industrial growth.⁶

Collectively, these government initiatives have created a conducive environment for the growth of tomato processing industries in India. By improving infrastructure, enhancing access to finance, promoting value addition, and strengthening supply chains, these schemes are expected to play a significant role in increasing processing capacity, reducing post-harvest losses, minimizing price fluctuations, and improving the overall competitiveness of the tomato processing sector in the country.

The Mega Food Parks Scheme has emerged as one of the most significant initiatives undertaken by the Ministry of Food Processing Industries (MOFPI) to strengthen food processing infrastructure and promote value addition in agricultural commodities, including tomatoes. The scheme aims to establish a cluster-based approach by integrating farmers, processors, logistics providers, and retailers through a network of modern food processing facilities. Such integrated infrastructure is expected to reduce post-harvest losses, improve supply chain efficiency, and enhance the competitiveness of the food processing sector.

The Ministry of Food Processing Industries has approved 41 Mega Food Park projects across the country to facilitate the development of modern food processing infrastructure. According to MoFPI reports, 21 Mega Food Parks have become operational (Figure 1),⁸ while 16 projects are at various stages of implementation and development (Figure 2).⁹ However, more recent ministry reports indicate that the number of operational Mega Food Parks has increased to 24, with the remaining projects progressing through different phases of completion and commissioning.⁶ This variation reflects the dynamic nature of infrastructure development and the gradual operationalization of approved projects over time.



Figure 1 The ministry of food processing industries-mega food parks in operational⁸

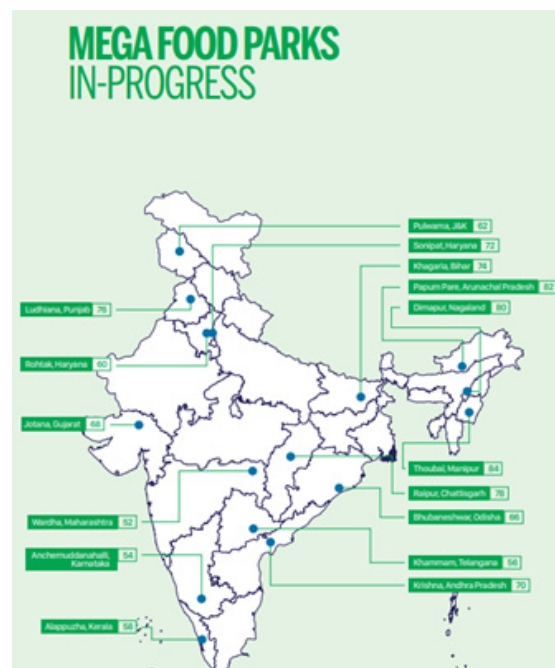


Figure 2 The Ministry of food processing industries-mega food parks in-progress⁹

The establishment of Mega Food Parks has significantly enhanced the availability of common infrastructure facilities such as cold storages, warehouses, quality control laboratories, packaging units, ripening chambers, processing centers, and logistics hubs. These facilities provide critical support for the processing of highly perishable commodities such as tomatoes by reducing post-harvest losses and ensuring a continuous supply of raw materials to processing industries. In addition, the parks offer plug-and-play facilities that lower the entry barriers for small and medium food processing enterprises, thereby encouraging investment and entrepreneurship in the sector.⁶

For the tomato processing industry, Mega Food Parks provide an important platform for establishing integrated value chains from farm to market. By facilitating aggregation, storage, processing, and distribution within a single ecosystem, these parks contribute to improved resource utilization, enhanced product quality, reduced transportation costs, and greater value addition.¹⁰ Consequently, the continued expansion and operationalization of Mega Food Parks are expected to play a crucial role in strengthening India's tomato processing capacity and supporting the long-term growth of the food processing industry (Table 2).

Prospects of tomato processing in India

Fresh tomatoes are highly perishable commodities with a limited shelf life under ambient conditions. Their availability and market prices vary considerably across seasons and geographical regions, often resulting in periods of both scarcity and surplus. Inadequate post-harvest infrastructure, insufficient cold-chain facilities, and limited processing capacity contribute significantly to losses throughout the supply chain. Consequently, a substantial quantity of tomatoes is wasted annually, while the country continues to import processed tomato products such as tomato paste, puree, and concentrates to meet industrial demand. These challenges underscore the need for expanding tomato processing capacity and promoting value addition as a means of improving resource utilization and reducing post-harvest losses.²

Table 2 List of operational mega food parks in India¹⁰

S. No.	Name of company	Location/states
1.	Srini Mega Food Park	Chittoor, Andhra Pradesh
2.	Godavari Mega Aqua Park	West Godavari, Andhra Pradesh
3.	North-East Mega Food Park	Nalbari, Assam
4.	Indus Best Mega Food Park	Raipur, Chhattisgarh
5.	Gujarat Agro Mega Food Park	Surat, Gujarat
6.	Cremica Mega Food Park	Una, Himachal Pradesh
7.	Integrated Mega Food Park	Tumkur, Karnataka
8.	Indus Mega Food Park	Khargaoan, Madhya Pradesh
9.	Avantee Mega Food Park	Dewas, Madhya Pradesh
10.	Paithan Mega Food Park	Aurangabad, Maharashtra
11.	Satara Mega Food Park	Satara, Maharashtra
12.	Zoram Mega Food Park	Kolasib, Mizoram
13.	MITs Mega Food Park	Rayagada, Odisha
14.	International Mega Food Park	Fazilka, Punjab
15.	Sukhjit Mega Food Park	Kapurthala, Punjab
16.	Greentech Mega Food Park	Ajmer, Rajasthan
17.	Tripura Mega Food Park	West Tripura, Tripura
18.	Patanjali Food and Herbal Park	Haridwar, Uttarakhand
19.	Himalayan Mega Food Park	Udham Singh Nagar, Uttarakhand
20.	Jangipur Bengal Mega Food Park	Murshidabad, West Bengal
21.	Haryana State Industrial and Infrastructure Development Corporation Ltd (HSIIDC), Haryana	Panchkula, Haryana
22.	Kerala Industrial Infrastructure Development Corporation (KINFRA) Mega Food Park	Palakkad, Kerala
23.	Kerala State Industrial Dev Corpt Ltd (KSIDC)	Alappuzha, Kerala
24.	Smart Agro Mega Food Park	Nizamabad, Telangana

The increasing demand for processed tomato products has created significant opportunities for the development and commercialization of preservation technologies, particularly dehydration and powder production technologies. Processing tomatoes into puree, paste, powder, and other shelf-stable products not only extends their storage life but also enhances their nutritional value. Studies have shown that thermal processing of tomatoes improves the bioavailability of lycopene, a potent antioxidant carotenoid, by disrupting the cellular matrix and facilitating its release for absorption in the human body.¹¹ Among the various processed products, tomato powder is gaining increasing popularity due to its convenience, ease of storage, extended shelf life, and wide applicability in ready-to-eat foods, soups, sauces, snack products, and instant food formulations.²

Tomatoes are versatile ingredients widely utilized in culinary preparations and food processing industries. They can be consumed fresh, baked, stewed, or processed into numerous products including ketchup, sauces, puree, paste, juice, soups, candies, chutneys, and dehydrated products. The diversity of tomato-based products provides substantial opportunities for entrepreneurship development, particularly at micro, small, and medium enterprise (MSME) levels. Government initiatives such as the PM Formalization of Micro Food Processing Enterprises (PMFME) Scheme have further strengthened the prospects for establishing small-scale tomato processing units by providing financial assistance, technical support, and capacity-building opportunities.⁶

India possesses enormous potential for expansion of the tomato processing sector owing to the rapidly increasing demand for processed tomato products. Industry estimates indicate that the consumption of processed tomato products has been growing at an annual rate of approximately 25–30%, driven by urbanization, changing food habits, rising disposable incomes, and the growth of organized food retail

and food service sectors.² Tomatoes can be transformed into a diverse range of products including tomato pulp, juice, puree, paste, ketchup, culinary sauces, soups, dehydrated curries, and tomato powders, all of which possess significantly longer shelf lives than fresh produce.

Among the various processed products, tomato ketchup enjoys widespread consumer acceptance and constitutes one of the largest segments of the tomato processing industry. The growth of quick-service restaurants, fast-food chains, institutional catering, and convenience food markets has substantially increased the demand for ketchup and sauces. Furthermore, fluctuations in fresh tomato prices have encouraged consumers and food manufacturers to adopt processed alternatives that provide convenience, consistent quality, and year-round availability. During periods of supply shortages and elevated tomato prices, demand for processed products such as tomato puree and ketchup often increases significantly, highlighting their importance as substitutes for fresh tomatoes in household and commercial applications.

Processed tomato products have become indispensable ingredients in households, restaurants, hotels, cafés, catering establishments, and food manufacturing industries. Tomato puree is commonly used as a substitute for fresh tomatoes in cooking applications, while ketchup and sauces are widely consumed as condiments and flavor enhancers. Tomato paste serves as an important intermediate product and raw material for the manufacture of ketchup, sauces, soups, and other value-added products. The increasing utilization of these products across different segments of the food industry is expected to further stimulate growth in the processing sector.¹

In addition to product diversification, the valorization of processing waste presents another promising opportunity for enhancing sustainability and profitability within the tomato processing industry.

Tomato processing generates substantial quantities of by-products, primarily consisting of seeds and skins. These residues are increasingly recognized as valuable sources of bioactive compounds and industrial ingredients. Tomato seeds contain significant amounts of edible oil rich in unsaturated fatty acids, particularly oleic and linoleic acids, while the residual seed cake serves as a potential protein source for food and feed applications.¹²

Tomato seed oil (TSO) has attracted considerable attention due to its nutritional and functional properties. Research has demonstrated that TSO contains essential fatty acids, tocopherols, phytosterols, and other bioactive compounds that exhibit antioxidant, antimicrobial, and health-promoting activities.¹³ These characteristics make tomato seed oil a promising ingredient for food, bakery, nutraceutical, and cosmetic applications. Moreover, tomato seed extracts contain numerous bioactive compounds with potential functional properties, thereby creating additional opportunities for value addition and waste utilization within the tomato processing sector. The major bioactive compounds present in tomato seed extracts and their functional attributes¹⁴ are presented in Figure 3.

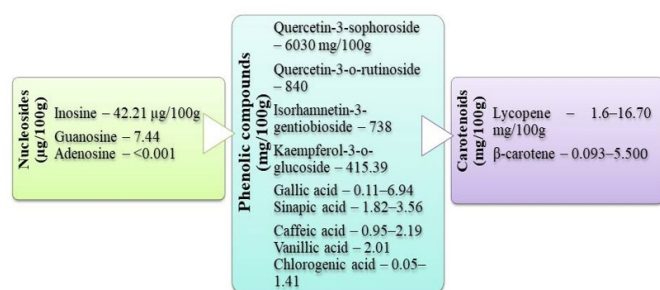


Figure 3 Bioactive compounds present in tomato seed extract and their composition¹⁴

Overall, the future prospects of tomato processing in India are highly encouraging. Expanding processing infrastructure, promoting value-added product development, strengthening supply chains, utilizing processing by-products, and leveraging government support programs can significantly enhance the contribution of the tomato processing industry to agricultural growth, food security, employment generation, and rural entrepreneurship. With increasing consumer demand and technological advancements, tomato processing is expected to become an increasingly important component of India's food processing economy.

Market growth and future demand for processed tomato products in India

Although tomato processing in India remains relatively underdeveloped compared with other major tomato-producing countries, the market for processed tomato products has shown consistent growth over the past few decades and is expected to expand further in the coming years. Rising incomes, changing dietary patterns, increasing consumer preference for convenience foods, and rapid urbanization have contributed significantly to the growing demand for tomato-based processed products. Furthermore, improvements in living standards in both urban and rural areas have accelerated the adoption of packaged food products, including tomato ketchup, sauces, soups, purees, and ready-to-cook formulations.²

The growth of the Indian tomato processing industry has also been facilitated by the entry of multinational companies, which have introduced advanced processing technologies, modern supply chain systems, aggressive marketing strategies, and extensive distribution networks. The expansion of organized retail and increasing penetration

of processed foods into semi-urban and rural markets have further strengthened consumer demand. Simultaneously, the rapid growth of the food service sector, including quick-service restaurants (QSRs), fast-food chains, cafés, institutional catering services, and hotels, has significantly increased the consumption of tomato-based condiments and ingredients, particularly ketchup, sauces, and soups.⁴

Among processed tomato products, ketchup remains one of the most widely consumed categories in India. Historically, the urban ketchup market has been dominated by major brands such as Nestlé India (Maggi) and Hindustan Unilever (Kissan), while several medium- and small-scale enterprises also contribute to production and regional distribution. The increasing popularity of processed foods and changing consumption habits have resulted in a sustained increase in the demand for tomato ketchup and related products. Industry reports indicate that India's demand for processed tomato products has increased substantially in recent years, with some estimates suggesting growth rates approaching 40% during periods of high fresh tomato prices and supply shortages.²

Despite this growing demand, India's processing capacity remains limited. Earlier industry estimates indicated a substantial gap between production and demand for tomato-based products, highlighting the need for expansion of processing infrastructure and manufacturing capacity. While the consumption of tomato ketchup, puree, and sauces continues to increase, the proportion of fresh tomatoes processed annually remains very low relative to total production. Tiwari et al.¹ reported that less than 1% of India's tomato production is processed, compared with significantly higher processing rates in developed tomato-producing countries. This gap presents considerable opportunities for investment in processing industries, particularly in regions characterized by high tomato production and recurrent seasonal gluts.

The market potential for processed tomato products extends beyond metropolitan areas. Increasing consumer awareness, improved retail penetration, and the growing availability of packaged food products have created substantial opportunities in semi-urban and rural markets. These regions represent emerging consumer segments with increasing purchasing power and demand for convenient, affordable, and shelf-stable food products. Consequently, the establishment of tomato processing units in production clusters can simultaneously address post-harvest losses, improve farmer incomes, generate rural employment, and meet the rising demand for processed foods.

Overall, the expanding market for tomato-based products, combined with increasing urbanization, changing lifestyles, growth of the food service industry, and supportive government policies, indicates strong future prospects for the tomato processing sector in India. The substantial gap between production and processing levels provides significant opportunities for entrepreneurs, food processors, and investors to develop innovative products and strengthen the country's tomato value chain.

Status of tomato processing in India

Despite being one of the world's largest producers of tomatoes, India has a relatively underdeveloped tomato processing sector. The number of dedicated tomato processing industries remains limited, and only a small proportion of the country's total tomato production is converted into value-added products. One of the major constraints affecting the growth of the industry is the inadequate availability of processing-specific tomato varieties possessing desirable characteristics such as high total soluble solids (TSS), deep red color, firm texture, high pulp content, and suitability for mechanical

processing.¹ Consequently, many Indian processors depend on imported tomato paste and pulp, primarily from China, to meet industrial requirements. The import of bulk tomato paste not only increases production costs due to transportation expenses and import duties but also reflects the gap between domestic processing demand and indigenous production capacity.²

In the absence of a reliable supply of processing-grade tomatoes, processors often procure fresh-market tomato hybrids during periods of seasonal glut when farm-gate prices decline substantially. While this practice allows processors to access low-cost raw materials, it does not provide a sustainable solution for the industry because fresh-market cultivars generally lack the quality traits required for efficient industrial processing. Moreover, severe market gluts frequently result in low prices for farmers and substantial post-harvest losses due to the perishability of tomatoes. This situation adversely affects both producers and processors, limiting the profitability and long-term sustainability of the tomato processing sector.¹

The geographical distribution of tomato processing industries in India is concentrated primarily in major tomato-producing regions. In southern India, the districts of Krishnagiri in Tamil Nadu and Chittoor in Andhra Pradesh have emerged as important centers for tomato processing due to their proximity to large tomato-growing belts and availability of raw materials. The establishment of processing facilities near production clusters significantly reduces transportation costs, minimizes post-harvest losses, and ensures a continuous supply of fresh tomatoes for industrial utilization.³ Tomato paste production, in particular, has proven economically viable in these regions because of the close integration between production and processing activities.

Tomato paste represents one of the most important primary processed products in the tomato industry. It is a concentrated, smooth, and thick product obtained by processing ripe tomatoes and serves as a key intermediate raw material for the manufacture of ketchup, sauces, soups, juices, and various other tomato-based products. The ketchup and sauce industries constitute the largest consumers of tomato paste, highlighting its strategic importance within the tomato processing value chain.² However, despite the increasing demand for processed tomato products, only a small quantity of tomatoes is currently processed into value-added products in India. A significant proportion of processing activities are undertaken by cottage-scale and small-scale enterprises, indicating substantial opportunities for the establishment of medium- and large-scale integrated tomato processing units.

A comparison with global processing trends further illustrates the untapped potential of the Indian tomato processing industry. According to the World Processing Tomato Council (WPTC), approximately 41.37 million tonnes of tomatoes were processed worldwide into value-added products, representing nearly 26% of global tomato production.¹⁵ In contrast, India processes less than 1% of its annual tomato production, a figure that is considerably below the average processing levels observed among major tomato-producing countries.¹ This disparity highlights the enormous scope for expanding processing infrastructure and increasing value addition within the Indian tomato sector.

Globally, processed tomatoes are utilized in a wide variety of products. Estimates from the United States Department of Agriculture (USDA) indicate that approximately 35% of processed tomatoes are used for the production of sauces, 18% for tomato paste, 17% for canned tomatoes, 15% for juices, and 15% for ketchup and related products.¹⁶ These utilization patterns demonstrate the diverse industrial applications of processed tomatoes and provide valuable insights

for the development of India's processing industry. By expanding processing capacity, promoting processing-oriented tomato cultivars, strengthening supply chains, and encouraging private investment, India can significantly enhance value addition, reduce post-harvest losses, and improve the profitability of its tomato sector.

Tomato processing value chain in India

The tomato processing value chain in India encompasses a series of interconnected activities ranging from production and aggregation of raw tomatoes to processing, distribution, and marketing of value-added products. A well-functioning value chain is essential for reducing post-harvest losses, improving product quality, enhancing market efficiency, and ensuring greater returns to farmers and processors. Given India's large tomato production base and increasing demand for processed foods, the tomato processing value chain possesses substantial potential for expansion and modernization. Strengthening infrastructure related to storage, transportation, cold-chain management, and processing facilities can significantly improve the efficiency and profitability of the sector.²

Production and primary marketing in India

The value chain begins with tomato cultivation by farmers, predominantly small and marginal producers, across major tomato-growing states such as Andhra Pradesh, Karnataka, Maharashtra, Madhya Pradesh, Uttar Pradesh, Telangana, and Gujarat. Following harvest, tomatoes are generally marketed through Agricultural Produce Market Committees (APMCs), local traders, commission agents, wholesalers, and farmer producer organizations (FPOs). A significant proportion of tomatoes produced in India is consumed as fresh vegetables, either for household use, culinary applications, salad preparations, or as ingredients in food service establishments.¹⁷ However, seasonal fluctuations in production frequently lead to market gluts, resulting in severe price volatility and substantial post-harvest losses.

Tomato processing and value addition in India

Tomato processing constitutes the most important value-addition stage within the value chain. Fresh tomatoes are converted into a variety of processed products including tomato paste, puree, ketchup, sauces, juice, soups, canned products, dehydrated powders, and ready-to-cook formulations. These products possess extended shelf life, improved marketability, and greater economic value compared to fresh tomatoes. Processed tomato products have become increasingly popular among consumers due to their convenience, consistency, and year-round availability.¹

Among the processed products, tomato paste serves as a key intermediate product and acts as the raw material for manufacturing ketchup, sauces, soups, and several other tomato-based formulations. The processing industry therefore plays a crucial role in stabilizing tomato markets by absorbing surplus production during periods of seasonal glut and transforming highly perishable produce into shelf-stable products.

Major processing clusters in India

The geographical distribution of tomato processing industries is largely concentrated in major production belts. Chittoor district in Andhra Pradesh is widely recognized as one of India's largest tomato-producing regions and has emerged as a major hub for tomato processing industries due to the availability of abundant raw materials, favorable agro-climatic conditions, and proximity to processing facilities.¹⁷ Similarly, Krishnagiri district in Tamil Nadu

has developed into an important processing cluster supporting the manufacture of tomato paste, puree, and other value-added products.

Despite these regional processing hubs, India's tomato processing industry remains relatively fragmented and underdeveloped. Several studies have indicated that large-scale dedicated tomato processing industries are limited, and processing activities often intensify only during periods when fresh tomato prices decline below economically viable levels in wholesale markets. Consequently, tomato processing in India is frequently characterized as an opportunistic rather than a fully integrated industrial activity.¹

Distribution and consumer markets

Following processing, tomato-based products are distributed through wholesalers, distributors, organized retail outlets, supermarkets, e-commerce platforms, institutional buyers, restaurants, hotels, and food service chains. The growing demand for convenience foods, ready-to-eat products, and processed ingredients has significantly expanded the market for tomato-based products. Urbanization, changing lifestyles, and increasing disposable incomes have further accelerated consumer acceptance of products such as ketchup, sauces, soups, puree, and tomato powders.²

Challenges in the tomato processing value Chain

Several bottlenecks continue to affect the efficiency of the tomato processing value chain in India. These include inadequate cold-chain infrastructure, fragmented supply chains, inconsistent availability of processing-grade tomatoes, weak farmer–processor linkages, limited adoption of contract farming, and insufficient processing capacity relative to production volumes. Price volatility during peak production periods remains a major concern, often discouraging investment in processing infrastructure and creating uncertainty for both producers and processors.¹

Future prospects of the value Chain

The future growth of the tomato processing value chain depends on strengthening linkages between farmers, farmer producer organizations (FPOs), processors, retailers, and consumers. Investments in cold storage facilities, transportation networks, aggregation centers, processing units, and quality assurance systems can substantially reduce post-harvest losses and improve supply chain efficiency. Additionally, the promotion of processing-specific tomato cultivars, contract farming arrangements, and cluster-based processing models can ensure a reliable supply of raw materials for industrial use.

Government initiatives such as Operation Greens (TOP to TOTAL), Pradhan Mantri Kisan Sampada Yojana (PMKSY), Agriculture Infrastructure Fund (AIF), and PM Formalization of Micro Food Processing Enterprises (PMFME) are expected to play a critical role in strengthening the tomato value chain and promoting value addition.⁶ The regions identified as potential hubs for processed tomato production in India¹⁸ are illustrated in Figure 4, highlighting areas with favorable production volumes, processing potential, and infrastructure development opportunities.

Overall, the tomato processing value chain in India offers considerable opportunities for reducing post-harvest losses, increasing farmers' income, generating employment, and enhancing the competitiveness of the food processing sector. The development of an integrated and efficient value chain will be essential for unlocking the full potential of tomato processing in the country.

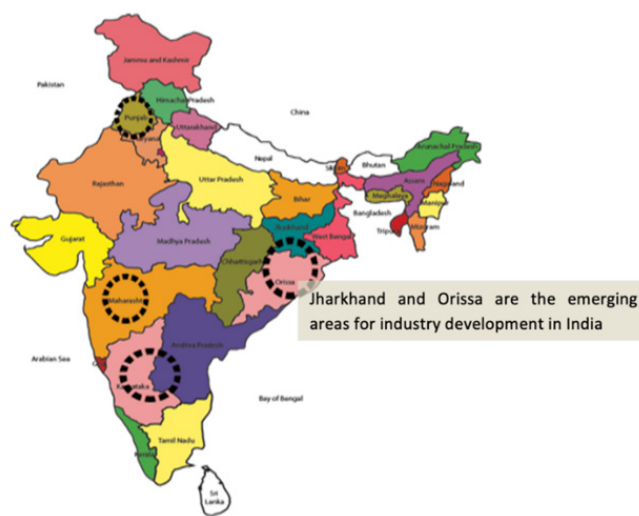


Figure 4 Potential areas for production of processed tomatoes in India¹⁸

Tomato processing industry and value chain dynamics in India

Several companies in India are engaged in the production of tomato paste and related processed products, catering to both domestic and export markets. Tomato paste serves as a key intermediate product for the manufacture of ketchup, sauces, soups, juices, and other tomato-based foods. Major national and multinational brands operating in the Indian tomato processing sector include Kissan (Hindustan Unilever Ltd.), Maggi (Nestlé India Ltd.), Del Monte (Field Fresh Foods Pvt. Ltd.), Heinz, Tops (G.D. Foods Manufacturing India Pvt. Ltd.), and Cremica. These companies collectively account for a significant share of the country's processed tomato market. In recent years, the rapid expansion of the HoReCa (Hotels, Restaurants, and Catering) sector, along with the growth of quick-service restaurants and organized food retail, has further stimulated demand for tomato-based products such as ketchup, sauces, and puree.²

Globally, more than 15,000 tomato varieties have been identified, whereas approximately 1,000–1,500 varieties are cultivated in India. However, only a limited number of these varieties are grown commercially and an even smaller number are suitable for industrial processing. Tomato varieties commonly used by the processing industry include traditional desi tomatoes, local cultivars such as Natti, and commercial hybrids including Namdhari, Sapata, and Abhinav.¹ The limited availability of processing-specific cultivars remains one of the major constraints affecting the competitiveness of the Indian tomato processing sector.

The tomato processing industry in India is largely concentrated in southern production belts, particularly in the Chittoor district of Andhra Pradesh and the Krishnagiri district of Tamil Nadu. Chittoor has emerged as one of the country's most important tomato processing hubs due to its proximity to major tomato-growing regions and established processing infrastructure. Unlike several developed countries, contract farming arrangements between processors and tomato growers are relatively uncommon in India. Previous attempts at contract farming were largely discontinued because farmers frequently preferred to sell their produce through wholesale markets (mandis) whenever prevailing market prices exceeded the agreed contract prices. Consequently, processors generally procure tomatoes

through open-market channels, sourcing raw materials from major trading centers such as Kolar and Madanapalle markets.^{19,20}

The absence of stable procurement arrangements, combined with relatively low tomato productivity, increases the cost of raw materials and reduces the competitiveness of Indian processed tomato products in international markets. Furthermore, the highly volatile nature of tomato prices creates significant challenges for processing industries. Processing units generally find tomato processing economically viable only when fresh tomatoes are available at prices below ₹4–4.5 per kilogram. During periods of high market prices, processors often shift their operations toward the processing of other fruits and vegetables to maintain profitability.² In contrast, countries such as China benefit from lower production costs, higher yields, large-scale mechanization, and dedicated processing varieties, enabling them to manufacture tomato paste at substantially lower costs. As a result, imported Chinese tomato paste is often preferred by Indian manufacturers due to its competitive pricing and consistent quality.

Structure of the tomato processing value Chain in India

The tomato processing value chain begins with the procurement of fresh tomatoes from farmers, wholesalers, or collection centers. Upon arrival at processing facilities, tomatoes undergo washing, sorting, grading, and inspection before being subjected to crushing and pulping operations. Depending on processing schedules and raw material availability, fresh tomatoes may be temporarily stored under ambient conditions for short durations before processing. The extracted pulp is subsequently concentrated through evaporation to produce tomato paste, which represents the primary processed product and serves as the foundation for a wide range of secondary processed foods.¹⁷

Tomato paste production is primarily a business-to-business (B2B) activity, wherein processing units supply concentrated paste to manufacturers of ketchup, sauces, soups, juices, and ready-to-eat products. The conversion ratio from fresh tomatoes to tomato paste varies depending on cultivar and solids content. Approximately 7.5–8.0 tonnes of fresh tomatoes are required to produce one tonne of tomato paste. Hybrid processing varieties generally provide slightly higher recovery rates than traditional cultivars due to their greater total soluble solids content and pulp yield.¹

The economics of the tomato value chain illustrate the challenges associated with value distribution among stakeholders. For example, one kilogram of commercial tomato ketchup typically contains approximately 30% tomato paste, requiring nearly 2.5 kg of fresh tomatoes. If fresh tomatoes are procured at ₹4 per kilogram, the raw tomato cost in one kilogram of ketchup is approximately ₹10. Given a retail price of around ₹125 per kilogram, the farmer's share represents only a small proportion of the final consumer price. The remaining value is absorbed by processing, packaging, transportation, branding, distribution, retail margins, and marketing costs. Studies on vegetable value chains indicate that farmers generally receive approximately one-third of the final consumer price, although the proportion may be considerably lower in highly processed products. This contrasts with sectors such as dairy, where producers often receive a substantially larger share of the consumer rupee.¹⁷

Despite these challenges, the tomato processing industry offers significant opportunities for value addition, employment generation, rural entrepreneurship, and reduction of post-harvest losses. Strengthening farmer–processor linkages, promoting processing-specific tomato cultivars, encouraging contract farming models, and

expanding processing infrastructure can substantially improve the efficiency and profitability of the tomato value chain in India.

Future trends in the tomato processing industry

The tomato processing industry is undergoing rapid transformation driven by changing consumer preferences, technological advancements, sustainability concerns, and increasing demand for convenient and nutritious food products. Globally, the sector is expected to expand steadily owing to the growing consumption of processed foods, urbanization, and the increasing popularity of ready-to-eat and ready-to-cook products. In India, the future of the tomato processing industry appears particularly promising because of the country's large production base, rising domestic demand, and supportive government policies aimed at promoting food processing and value addition.¹

Development of processing-specific tomato varieties

One of the most important future trends is the development and adoption of processing-oriented tomato cultivars. Plant breeding programs are increasingly focusing on varieties possessing high total soluble solids (TSS), enhanced lycopene content, improved pulp recovery, uniform ripening, disease resistance, and suitability for mechanical harvesting. Such varieties can improve processing efficiency, reduce production costs, and ensure a consistent supply of quality raw materials to processing industries.^{1,3}

Expansion of ready-to-eat and convenience foods

The demand for convenience foods is expected to increase substantially due to changing lifestyles, rapid urbanization, and rising disposable incomes. Tomato-based products such as ready-to-eat curries, soups, sauces, gravies, instant mixes, pasta sauces, pizza sauces, dehydrated powders, and snack seasonings are becoming increasingly popular among consumers. Food manufacturers are diversifying their product portfolios to cater to evolving consumer preferences and capitalize on growing market opportunities.²

Growth of functional and health-oriented foods

Consumer awareness regarding nutrition, wellness, and disease prevention is driving the global demand for functional foods enriched with health-promoting bioactive compounds. Tomatoes are an excellent source of bioactive constituents, including lycopene, vitamin C, β -carotene, flavonoids, phenolic acids, and dietary fiber, which exhibit strong antioxidant, anti-inflammatory, cardioprotective, and anticancer properties.^{11,21–23} Lycopene, the predominant carotenoid in ripe tomatoes, has attracted significant attention due to its high antioxidant capacity and potential role in reducing the risk of cardiovascular diseases, certain cancers, and metabolic disorders.^{24,25} Consequently, future product development is expected to focus on lycopene-rich beverages, nutraceutical ingredients, functional food formulations, encapsulated bioactive compounds, fortified tomato powders, and other health-oriented tomato products that provide benefits beyond basic nutrition.^{11,23,26,27}

Adoption of advanced processing technologies

Technological innovations are expected to play a crucial role in improving product quality, processing efficiency, and shelf life. Modern processing facilities are increasingly adopting advanced technologies such as aseptic processing, vacuum concentration, spray drying, freeze drying, membrane filtration, high-pressure processing (HPP), and intelligent packaging systems. These technologies help

preserve nutritional quality, reduce processing losses, and improve the sensory characteristics of finished products.²

Sustainable processing and circular economy approaches

Sustainability is becoming a major focus area within the food processing sector. Tomato processing industries are increasingly exploring methods for utilizing processing by-products such as peels, seeds, and pomace. These by-products can serve as valuable sources of dietary fiber, edible oils, lycopene, antioxidants, proteins, and other bioactive compounds. Waste valorization and circular economy approaches can improve profitability while reducing environmental impacts associated with food processing operations.¹³

Strengthening cold chain and supply chain infrastructure

Future growth of the tomato processing industry will depend significantly on the development of robust cold-chain systems, transportation networks, storage facilities, and aggregation centers. Improved post-harvest infrastructure can reduce losses, stabilize supply, maintain quality, and ensure year-round availability of raw materials for processing industries. Government initiatives such as Operation Greens, PMKSY, PMFME, and the Agriculture Infrastructure Fund are expected to contribute significantly to infrastructure development.⁶

Digitalization and smart agriculture

The integration of digital technologies into tomato production and processing is expected to transform the industry. Precision agriculture, remote sensing, artificial intelligence, Internet of Things (IoT)-based monitoring systems, blockchain-enabled traceability, and data-driven supply chain management can improve productivity, quality control, and operational efficiency. Digital platforms can also facilitate stronger linkages between farmers, processors, and markets.^{20,28}

Promotion of contract farming and farmer–processor integration

Ensuring a reliable supply of processing-grade tomatoes remains a critical challenge. Future industry growth will likely involve stronger collaboration between farmers and processors through contract farming, farmer producer organizations (FPOs), and cluster-based production models. Such arrangements can provide assured markets for farmers while ensuring a consistent supply of quality raw materials for processors, thereby reducing market uncertainties and improving value chain efficiency.¹

Increasing export opportunities

The global demand for tomato paste, puree, sauces, dehydrated products, and tomato-based ingredients continues to grow. India has significant potential to emerge as a competitive exporter of processed tomato products by improving processing efficiency, adopting international quality standards, and developing processing-specific production systems. Expanding export-oriented processing facilities can contribute to foreign exchange earnings and strengthen India's position in the global food processing market.^{15,29}

Emergence of decentralized and MSME-based processing units

Government support programs such as the PM Formalization of Micro Food Processing Enterprises (PMFME) Scheme are encouraging the establishment of small and medium-scale tomato

processing units in production clusters^{6,23}. Decentralized processing can reduce transportation costs, minimize post-harvest losses, generate rural employment, and promote local entrepreneurship. This model is particularly suitable for absorbing seasonal surpluses and creating value-added products at the community level.^{6,30,31}

Outlook

The future of the tomato processing industry in India is highly promising. The combination of increasing consumer demand, technological innovations, government support, product diversification, and expanding export opportunities is expected to drive sustained industry growth. Investments in processing infrastructure, research and development, processing-specific cultivars, and integrated value chains will be essential for transforming India from a major tomato producer into a significant global player in processed tomato products.^{6,20,29}

Conclusions

India is one of the largest producers of tomatoes in the world; however, only a small proportion of its production is processed into value-added products. The tomato processing industry has immense potential to reduce post-harvest losses, stabilize market prices, and improve farmers' income while meeting the growing demand for processed foods. Products such as tomato paste, puree, ketchup, sauces, soups, powders, and ready-to-eat formulations are gaining popularity due to changing consumer lifestyles, rapid urbanization, and the expansion of the food service sector.

Despite significant opportunities, the industry faces several challenges, including inadequate processing infrastructure, limited availability of processing-specific varieties, weak cold-chain facilities, and fluctuations in raw material prices. Strengthening the tomato value chain through improved infrastructure, better farmer–processor linkages, and adoption of advanced processing technologies is essential for sustainable growth.

Government initiatives supporting food processing, value addition, and infrastructure development have created a favorable environment for industry expansion. Furthermore, the utilization of tomato processing by-products for the production of edible oils, dietary fiber, and bioactive compounds offers additional opportunities for enhancing profitability and sustainability.

Overall, the tomato processing sector represents a promising avenue for agricultural diversification, entrepreneurship development, employment generation, and export growth. With strategic investments, technological advancements, and effective policy support, India can significantly enhance its processing capacity and emerge as a major player in the global processed tomato market.

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Conflicts of interest

The author states there are no conflicts of interest.

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