From Orchard to Market: Navigating Sustainability in Raw and Value-Added Mango Exports

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India is the largest producer of mangoes, accounting for about 45% of global production; however, less than 1% of that finds its way to global markets. While the large domestic market for mangoes is a primary reason, Indian mango exports are also hampered by non-trade barriers such as SPS and TBT measures, and by increased scrutiny from countries that can quickly escalate into reputational damage. The paper examines the challenges faced by mango exports and the plausible solutions. The study proposes a two-pronged approach: diversification of value-added products and markets, and the promotion of sustainable products and processes, alongside the larger strategy of enhanced public investment in rural infrastructure and research and extension services to adapt to evolving global standards and regulations. Thereby generating gainful employment opportunities in the rural hinterland and creating an inclusive ecosystem around value addition.

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Introduction

In 2026, fresh Indian mangoes faced a significant rejection in Japan. Japanese plant quarantine officials inspected India's irradiation and vapour heat treatment facilities in March 2026 and found deficiencies in fumigation and disinfection protocols. As a result, Japan suspended imports of fresh Indian mangoes for the season, citing food safety concerns. This hit premium varieties like Alphonso and Kesar, which are popular in Japan and fetch high margins for exporters.[2] This comes as a big shock to Indian mango exporters, who were reeling from financial losses due to the West Asian Crisis and high freight charges. So far, the reported rejection is specific to Japan, not a blanket global ban. However, the episode highlights vulnerabilities in India's mango export chain, especially around treatment facility standards, cold chain logistics, and eco-packaging compliance. These are precisely the areas where importing countries tighten scrutiny, and any weakness quickly translates into reputational damage.

It needs to be addressed with a two-pronged approach. The first is product diversification through the promotion of value-added mango products. Processed forms such as pulp, puree, concentrate, dried slices, and powders are less perishable, easier to ship, and face fewer phytosanitary barriers than fresh fruit. The second category of products with a sustainability edge is dried mango powder for drinks, which reduces water weight during transport, lowers the risk of spoilage, and aligns with eco-packaging norms. Both provide investment opportunities for entrepreneurs, create employment, and deliver higher margins, as product value increases and integration into global food and beverage supply chains makes exporters less vulnerable to single-market bans.

Further, at the second level, diversifying markets by reducing heavy reliance on premium fresh mango exports to niche markets (Japan, EU, US) creates vulnerability when any one market tightens SPS and TBT regulations and legislation. Focus and expansion need to be on Africa, Central Asia, and Latin American countries, where India is pursuing new FTAs to hedge against shocks in traditional destinations. Thirdly, the diaspora markets (the Middle East, the UK, and North America) remain strong for pickles, candies, and pulp. However, newer health-food

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[2] 2026, **Japan Bans Indian Mangoes Due To Low Quality, see,** https://m.dailyhunt.in/news/india/english/trakin-epaper-trakin/japan+bans+indian+mangoes+due+to+low+quality-newsid-n713653623.

markets (Europe, North America) are opening for dried and organic mango products. Some of these elements would be explored in this working paper. The authors have undertaken a detailed assessment of the possible value-added products in this paper. However, the global markets for value-added products have not been analysed; this will be addressed in the next version.

Mango is among the few fruits in world history that have carried the cultural gravitas of India; it has been celebrated not just as food but as a symbol of love, wisdom, and seasonal renewal. Historically, the mango has been hailed as the "Fairest Fruit of Hindustan" by Babur, the "essence or Sara of spring" by Magha, a classical Sanskrit poet, and the abode of the god of love in the Brihat Samhita. There have seldom been historical references to any other fruit with such deep cultural significance that it has inspired ancient sacred texts, travel accounts, royal edicts of wisdom, poetry, and parables across several generations.

Since ancient times, Mango has not just been a fruit but a symbol of fertility and prosperity, and has been considered an appropriate offering to the gods. Fortunately, owing to global integration and cultural exchange, mangoes have found their way across far-flung countries and continents. It is the third most important fruit crop in terms of export value and volume after banana and pineapple. India is the largest producer of mangoes, accounting for 42.9% of global production (Horticulture Statistics of India, 2026). Other important mango producers are Indonesia, China, Mexico, Brazil, Pakistan, Malawi, Egypt, Thailand and Bangladesh. Among the states of India, Andhra Pradesh (23%) and Uttar Pradesh (22%) together account for slightly less than half of the country's total mango production. Other important mango-producing states include Bihar (8%), Gujarat (5%), Karnataka (8%), Telangana (6%) and West Bengal (5%).

Table 1: Commercial Varieties of Mango in India

STATES	MANGO VARIETIES
Uttar Pradesh	Bombay Green, Chausa, Dashehari, Mallika, Amrapali, Ambika, Arka and Langra
Andhra Pradesh	Banganapalli, Suvarnarekha, Neelum, Ratna, Sihdhu, Ambika, Arka and Totapuri
Telangana	Banganapalli, Suvarnarekha, Neelum, Ratna, Sihdhu, Ambika, Arka and Totapuri
Karnataka	Alphonso, Totapuri, Banganapalli, Pairi, Neelum, Ratna, Sihdhu, Ambika, Arka, Arka Puneet, Arka Anmol, Arka Neelkiran and Mulgoa
Bihar	Bombay Green, Chausa, Dashehari, Fazli, Mallika, Amrapali, Gulabkhas, Kishen Bhog, Himsagar, Zardalu, Ambika, Arka and Langra
Gujarat	Kesar, Alphonso, Rajapuri, Jamdar, Totapuri, Neelum, Dashehari and Langra

Maharashtra	Alphonso, Mankurad, Mulgoa, Pairi, Rajapuri, Kesar, Gulabi, Vanraj

Source: GOI (2026). Horticultural Statistics at a Glance 2024

India also has many GI varieties of mangoes that have garnered international appeal, such as Alphonso, Banganapalli, Laxman Bhog, Malda Khirsapati, Rataul, Malihabadi Dussehri, Appemidi, Bhagalpuri Zardalu, Gir Kesar, Marathawada Kesar, Kuttiattoor, and Fazli. (Kallummal, Sushmitra, & Priya, 2026)

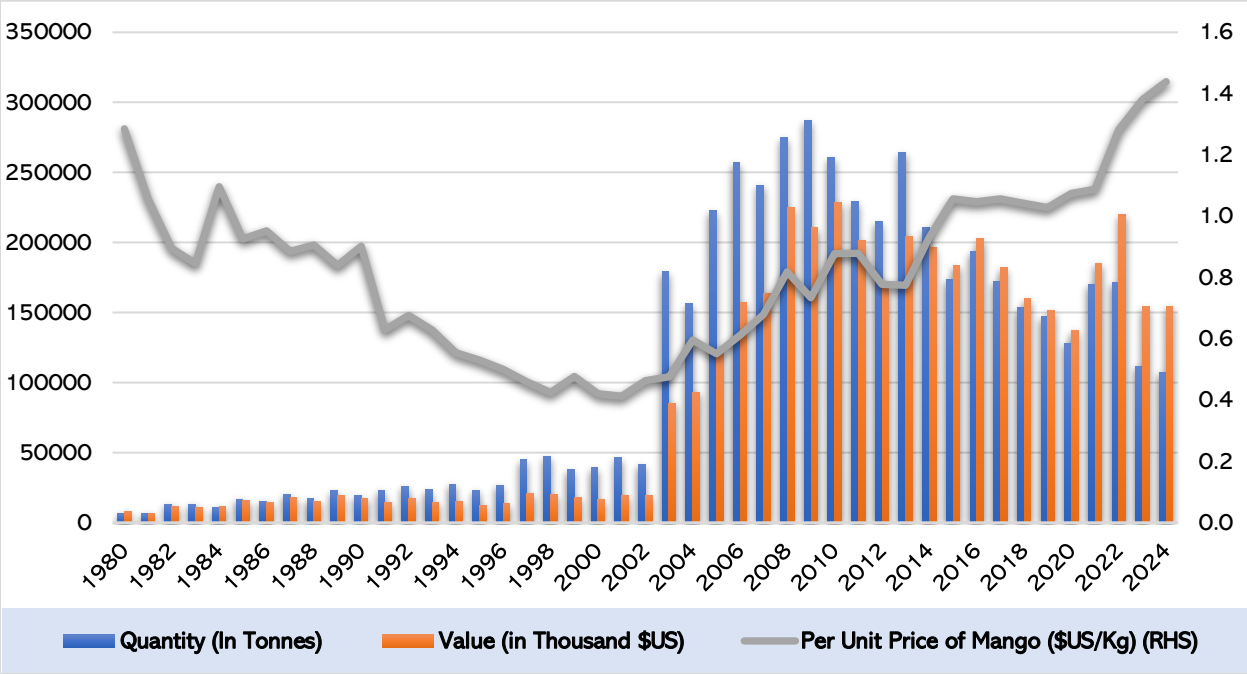
The Japanese ban on Alphonso, Kesar, Langra, and Banganapalli will impact farmers in Andhra Pradesh, Telangana, Karnataka, Bihar, Gujarat, and Maharashtra, but will not impact Uttar Pradesh, as none of these varieties is produced in the state. Regions like Uttar Pradesh, with unaffected GI varieties, could step into new markets if exporters reposition Malihabadi Dussehra or Rataul as substitutes. The Japanese ban highlights the risk of regional concentration in India's mango export chain. Diversification into value-added products and new GI varieties for international branding can cushion farmers in Maharashtra, Gujarat, Andhra Pradesh, and Bihar, while opening opportunities for states like Uttar Pradesh that were not directly impacted.

India's mango exports have grown steadily since the 1980s, shifting from small volumes of fresh fruit to a diversified range of premium varieties and processed products. By 2024, exports reached nearly 30,000 metric tonnes of fresh mangoes, valued at about $56.5 million, with the UAE, the US, the UK, Kuwait, and Qatar as the top destinations (Business Today Desk, 2026). The West Asian crisis during the mango season has significantly affected export prospects. In the 1980s–1990s, exports were driven largely by small, prestige-oriented shipments of Alphonso mangoes to the United Kingdom and Gulf countries. In the 2000s, institutional support from the Agricultural and Processed Food Products Export Development Authority (APEDA) increased exports to approximately 15,000-20,000 tonnes. However, export bans imposed by the European Union in 2003–04 and 2013 exposed Sanitary and Phytosanitary (SPS) vulnerabilities, primarily related to fruit fly infestations, similar to the recent ban imposed by Japan.

In 2010, for the first time, diversification into pulp and puree products, supported by diaspora demand in the Middle East and the United States, propelled export volumes to approximately 20 to 25,000 tonnes. Between 2020 and 2024, branding initiatives and enhancements to the cold chain infrastructure elevated exports to 29,938 tonnes, valued at $56.5 million in the fiscal year 2024–25. The United Arab Emirates, the United States, the United Kingdom, Kuwait, and Qatar emerged as the primary destinations. A heavy dependence on fresh mango exports to a limited number of premium markets increases vulnerability.

India's exports of mangoes remain rather subdued through the eighties and nineties but witnessed a quantum jump in the 2000s particularly after 2003 owing to new markets in the Middle-east, lifting of the ban on Indian mangoes by Japan in 2003 and the USA in 2007 and renewed efforts like the initiation of programmes like National Horticulture Mission (2004-05), strengthening of the National Horticulture Board and setting up of Agri-export zones to boost production and export of horticulture produce. However, thereafter, mango exports have seen a perceptible decline after 2013, largely due to the EU ban (2014-15) (Kallummal, 2013), stringent regulatory measures, documentation lapses, and other factors such as the Red Sea crisis, the global pandemic, and other supply chain disruptions. From 1980 to 2024, India's mango exports evolved from niche Alphonso shipments to a diversified premium presence. The West Asian crisis and Japan's suspension underscore the need for market diversification and for scaling up the production of processed products to safeguard farmers and exporters.

Figure 1: Export Trends of Indian Mango: 1980 to 2024



SOURCE: FAOSTAT Database

Some of India's important top export destinations for mangoes are the UAE, Kuwait, Qatar, Oman, the US, Canada, Singapore, Nepal, Bahrain, Saudi Arabia, Germany, Bhutan, and New Zealand. Hence, it is evident that India's exports of mangoes are concentrated in the Asia-Pacific and the Middle East and North Africa, with the UAE being the single largest market, accounting for over half of India's mango exports, followed by the United Kingdom (15%) and Nepal (9.7%) (Table 2).

Table 2: Share of Mango Exports in Key Export Destinations

Country	2020-21		2021-22		2022-23		2023-24	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
UAE	60.3	55.5	46.4	44.2	52.9	46.2	47.8	38.16
UK	11.7	18.8	12.1	22.4	12.1	15.2	14.7	18.90
USA	0.0	0.0	0.1	0.0	3.5	8.9	6.6	16.62
Kuwait	2.4	3.5	2.8	5.3	4.1	5.7	3.0	4.84
Qatar	8.3	7.0	7.6	7.1	8.8	7.7	4.1	3.59
Canada	0.7	0.8	1.1	1.7	1.4	2.0	2.2	3.18
Oman	7.0	6.2	6.1	5.8	4.9	5.6	3.0	2.92
Nepal	2.3	0.5	16.7	2.9	4.4	0.8	9.7	1.82
Singapore	1.8	2.2	1.3	2.2	1.5	1.9	1.2	1.74
Bahrain	1.8	1.5	1.2	1.2	1.1	0.9	1.5	1.21
Saudi Arab	0.8	0.7	1.2	1.1	0.8	0.8	1.3	1.18
Germany	0.7	0.8	0.6	1.1	0.6	0.6	0.7	0.95
Bhutan	0.0	0.0	0.5	0.3	1.7	0.9	1.7	0.77
New Zealand	0.1	0.1	0.2	0.5	0.1	0.4	0.3	0.76
Netherland	0.2	0.2	0.2	0.4	0.1	0.1	0.4	0.51
Others	1.8	2.1	2.1	3.6	1.9	2.2	2.0	2.87
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.00

Source: GOI, Horticulture Statistics at a Glance-2024

This distribution highlights two key features: India's mango exports are heavily reliant on the Gulf region, particularly the UAE, which poses risks of over-concentration. At the same time, there is emerging diversification into Western markets such as the UK, US, Canada, and Germany, as well as Asia-Pacific destinations like Singapore and New Zealand, offering scope for expansion, especially for premium varieties and processed mango products. Despite being the largest producer of mangoes, India exports only about 1% of its production due to several hurdles. In 2023-24, India produced 22,398 thousand tonnes of mangoes but exported only 32.10 thousand tonnes, accounting for just 0.15% of the produce. While this is largely due to India's large domestic market, which is instrumental in shaping global trade patterns, the truth remains that, despite robust demand and huge prospects in international markets, the vast potential of mango remains largely untapped.

Challenges to International Trade

The challenges faced by mango exporters in India arise on two fronts: an unstable supply base due to weather conditions and low yields.[3], lack of technological inputs, costly transport and logistics, lack of infrastructural (cold storage, pack house, processing infrastructure) and marketing facilities, lack of adequate institutional support like access to credit, extension services and export insurance plans, high post-harvest losses (5–15% for fruits and

[3] India ranks poorly in terms of productivity compared to its competitors. In 2023, the productivity of mangoes in India stood at 9.72 Tonne/Ha as opposed to 13.74 Tonne/Ha in Indonesia, 9.78 Tonne/Ha in China, 11.45 Tonne/Ha in Mexico, 12.15 Tonne/Ha in Pakistan, 22.74 Tonne/Ha in Brazil, 35.5 Tonne/Ha in Malawi, 10.59 Tonne/Ha in Egypt, 12.29 Tonne/Ha in Thailand and 10.6 Tonne/Ha in Bangladesh (Horticulture Statistics at a Glance, 2026).

vegetables), lack of gradation and quality control, unavailability of market information, unregulated use of chemical pesticides and insecticides on the domestic front and competition from other countries, market access issues (especially for the small and marginal farmers), difficulties in custom clearance and certification, multiple foreign regulations and compliance with safety standards like sanitary and phytosanitary (SPS) measures, pesticide residual levels, labelling and packaging requirements, technological constraints, poor quality control and traceability at the international level (EPW, 2002; NABARD, 2025).

Non-Tariff Measures (NTMs)

Food products such as mangoes face significantly higher trade barriers than other product categories, largely due to the prevalence of Non-Tariff Measures (NTMs). On average, mangoes and similar perishable goods encounter eight distinct NTMs, whereas most other products face only one or two. These NTMs include Sanitary and Phytosanitary (SPS) measures and Technical Barriers to Trade (TBT), which manifest as requirements for labelling, packaging, traceability, pesticide residue limits, certification, and private eco-compliance standards.

By contrast, non-food product categories often involve only a single mandatory conformity assessment procedure, making trade in them far less complex. The burden is particularly heavy on exporters from low-income countries, who must adopt and comply with the stringent regulations set by developed nations.

Table 3: NTMs Imposed by Some Countries on Indian Mangoes

Country	NTMs Imposed on Indian Mangoes
Australia	Presence of Fruit Flies and Weevils
United States of America	Quarantine laws mandating detailed labelling requirements with extensive product and content description, Mango exports are subject to irradiation treatment and Vapour Heat Treatment. Inspectors from USDA, APHIS, supervise the pre-clearance activity, Stringent Documentation and administrative procedures
European Union	Presence of harmful pests and organisms in the exported consignments Maximum Residual Limits for over 450 pesticides Certification of "Good Agricultural Practices" (Traceability, fertiliser storage)
New Zealand	Ban on the import of Indian mangoes and other fruits due to the presence of fruit flies and weevils, and high food safety standards. Stringent compliance with standards and biosecurity issues. Mandatory approval of the Vapour Heat Treatment (VHT) facility
South Africa	Presence of Pests and insects
South Korea[4]	Requirement of approval of the Pests Risk Analysis (PRA) management system, & Requirement of approval by the Animal and Plant Quarantine Agency of South Korea.
Japan	Requirement of hot-water treatment (HWT) or vapour heat treatment Quarantine Inspectors deputed from Japan for inspection of mango consignments

Source: Baliyan, K., Kumar, S., and Chandra, M. Constraints in Mango Exports in India. *Indian Journal Of Ecology* and EPW (2002)

[4] https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=1971931&reg=3&lang=2

This regulatory intensity disproportionately affects food exports such as mangoes, raising compliance costs, slowing market entry, and limiting competitiveness. In short, while most products face minimal NTMs, food products such as mangoes are subject to multiple overlapping standards, making them more vulnerable to trade restrictions and reducing their ability to expand into global markets. The Non-Tariff Measures hurt trade, with greater stringency for food products, which, on average, face eight different NTMs compared to only two for other product categories (UNCTAD & World Bank, 2018). The eight NTMs are classified as follows[5]: packaging and labelling guidelines; pesticide residue limit guidelines; chemical content restrictions; fruit-fly related rules; Uniformity requirements; Labour standards; documentation procedures, and Company and product registration.

Non-Tariff Measures (NTMs) have a greater impact on trade in food products, with mangoes facing nearly four times as many regulatory obstacles as other categories. This highlights the imperative for harmonisation and capacity-building within the compliance infrastructure. Such asymmetries compel mango exporters to navigate a complex regulatory environment, which encompasses phytosanitary inspections (including fumigation, irradiation, and pest-free certification), residue standards (covering pesticides, fungicides, and post-harvest treatments), packaging and labelling requirements (utilising eco-friendly materials, traceability codes, and multilingual labels), cold chain logistics (featuring temperature monitoring and real-time data sharing), as well as certification and audit processes (ISO, HACCP, GLOBALG.A.P., and accredited laboratories).

Interoperability transforms fragmented compliance into a cohesive and internationally recognised framework. For Indian mango exporters, it functions as the vital link between domestic capacity enhancement and access to global markets, thereby fostering sustainability, competitiveness, and smooth integration into international trade. Attaining interoperability is essential and can be achieved through Regulatory Harmonisation, wherein SPS and TBT measures- such as fumigation, irradiation, and pest-free certification- are mutually acknowledged among nations. This mutual recognition helps exporters avoid redundant testing and inspections, thereby reducing costs and minimising delays. Additionally, the acceptance of certifications such as ISO, HACCP, and GLOBALG.A.P., which are recognised across multiple jurisdictions, ensures interoperability among various certificates, eliminating the necessity for repeated audits and revalidation. Digital traceability within cold-chain logistics enables real-time monitoring of temperature and handling conditions. Interoperable digital systems facilitate

[5] WTO (2015) Understanding the WTO Information and External Relations Division, WTO 2015, Fifth Edition, ISBN 978-92-870-3748-0, Geneva, Switzerland, Retrieved from https://www.wto.org/english/thewto_e/whatis_e/tif_e/understanding_e.pdf

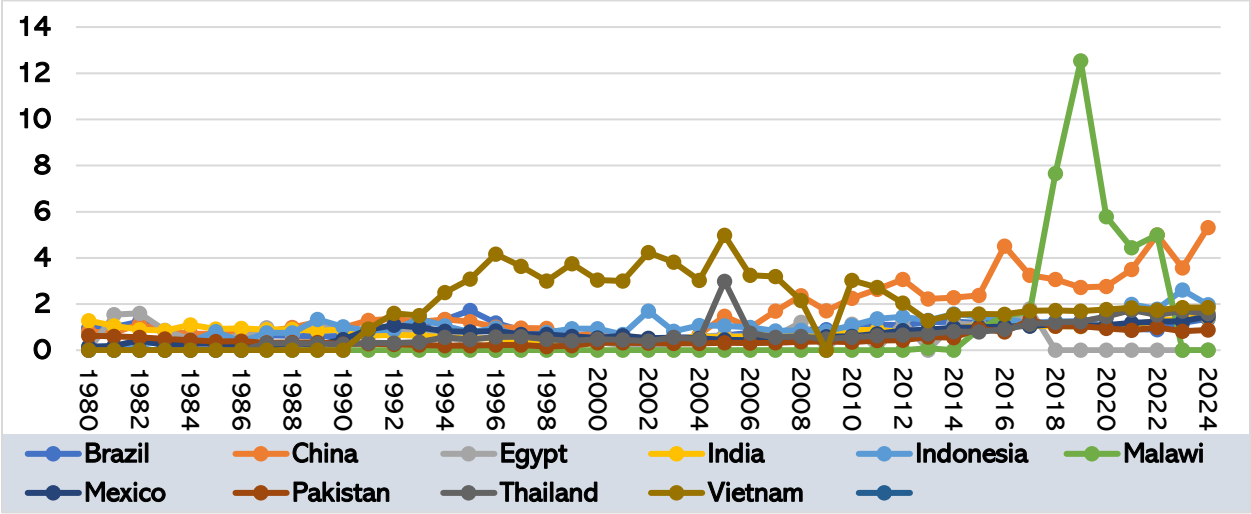
the consistent exchange of data among exporters, regulators, and buyers, thus enhancing transparency and fostering trust. Moreover, Eco-Compliance and Labelling requirements for packaging and labelling differ across markets. Interoperability across eco-friendly standards and traceability codes enables exporters to develop a unified system that meets the requirements of multiple countries. Ultimately, systems that are interoperable streamline customs clearance, inspections, and audits, reducing bottlenecks and bolstering supply chain resilience, thereby ultimately advancing international trade.

Europe is a particularly difficult market for Indian mangoes due to stringent sanitary and phytosanitary (SPS) requirements, limited trade agreements, and multiple non-tariff barriers (NTBs) that exporters must navigate. These include strict rules on pesticide residues, fumigation, irradiation, eco-friendly packaging, and traceability, all of which raise compliance costs and slow down-market entry. Compounding this challenge are high tariff barriers. Russia, Japan, Turkey, and the EU often impose duties that exceed WTO-bound rates. India is further disadvantaged because many of its competitors—especially mango exporters from Africa and Latin America—enjoy preferential access or tariff exemptions under the EU's Generalised System of Preferences (GSP) or bilateral trade agreements. This means that while Indian exporters face both SPS/TBT hurdles and high tariffs, rivals need only address regulatory requirements, giving them a significant competitive edge. Moreover, African and Latin American producers have benefited from support provided by the Standards and Trade Development Facility (STDF), which has helped harmonise best practices across developed markets. This assistance has enabled them to meet stringent SPS and TBT measures more efficiently, further strengthening their position in premium markets like the EU. In short, Indian mango exporters face a double disadvantage: tougher compliance requirements combined with higher tariffs, while competitors enjoy preferential trade terms and targeted capacity-building support. This underscores the urgent need for India to negotiate better market access through FTAs, push for mutual recognition of SPS standards, and invest in compliance infrastructure to level the playing field.

The result is a double disadvantage: Indian mangoes must navigate complex SPS and NTB compliance while also paying higher duties than competitors. This erodes price competitiveness and limits India's ability to expand in premium European markets, despite strong demand for varieties like Alphonso and Kesar. Strategically, India needs to negotiate better market access through FTAs, push for mutual recognition of SPS standards, and invest in compliance infrastructure (cold chain, certification, eco-packaging) to overcome these barriers. Without such measures, Europe will remain a difficult market, and India risks losing ground to rivals with more favourable trade terms.

The USA, the largest importer of mangoes and an important emerging market for India, once shut out Indian mangoes from its market. It had imposed a ban on Indian exports, citing excessive pesticide use. This embargo was lifted in 2007. However, exports are still hampered by stringent import requirements that mandate that mango shipments undergo irradiation to eliminate pests without affecting the fruits' quality, and by documentation certifying the irradiation process through the PPQ203 form. In 2025, the USA rejected the Indian consignment of mangoes not because of the presence of pests but due to documentation irregularities and administrative inconsistencies, resulting in a $500,000 loss because the costs of re-export were higher than the cost of the mangoes. India also faces significant competition from other exporting countries, including Pakistan, Nepal, Mexico, Brazil, Indonesia, and Thailand (Muthulakshmi et al., 2022). India also faces tariff disadvantages in countries like Indonesia[6]. Indian Mangoes, such as Alphonso, face cost disadvantages relative to those from other Latin American countries, as they are priced at $4.1 per kg. In contrast, Kent mangoes from Mexico and Brazil are priced at less than $1 per kg owing to high logistics and irradiation costs (Finance Commission, 2020).

Figure 2: Per Unit Price of Mango Exports *(In $US/Kg)*



Source: Computed from FAOSTAT Database

The figure presents comparative trends across ten countries from 1980 to 2024, highlighting both stability and divergence in their trajectories. Most countries, such as Brazil, Egypt, Mexico, and Thailand—remain clustered at the lower end of the scale, showing relatively steady values over time. China and India exhibit moderate fluctuations, reflecting gradual shifts rather than abrupt changes. The most striking feature is Malawi's sharp spike around 2018, where its values surge dramatically above 12 before declining, standing out as an anomaly against the

[6] https://drparashrampatil.com/indian-mango-exports-competitiveness-in-changing-global-scenario/

otherwise stable patterns. This contrast underscores how one country's exceptional deviation can reshape the comparative narrative, while the broader picture suggests long-term consistency among the majority of nations.

The cumulative effect is a rise in unit prices, as exporters pass on the increased costs of compliance and processing. This weakens India's ability to compete in premium markets, despite strong demand for varieties like Alphonso and Kesar. Strategically, overcoming these barriers requires India to negotiate better trade terms through FTAs, push for mutual recognition of SPS standards, and invest in capacity-building infrastructure such as cold-chain logistics, accredited laboratories, and eco-compliant packaging systems. Without such measures, Indian mangoes will continue to face restricted access and diminished competitiveness in global markets. In fact, the per-unit export price of Indian mango (fresh fruit) ranks low among its competitors (Figure 3). The per-unit price of mango was the highest in Vietnam and Malawi. However, in recent years, Bangladesh, Brazil, and even China, which was unfamiliar with mangoes until 1968, have overtaken India.

The ongoing West Asian and Red Sea crises have exposed another vulnerability: the ability of external events to disrupt shipping and supply chains, thereby raising freight rates and denting business prospects. Mangoes are transported domestically by road to ports. In contrast, air transport is preferred for time-sensitive and distant markets, such as the USA and the EU, for high-value varieties like Alphonso. For bulk purchases to the Middle East, Europe, and Africa, sea transport is preferred using reefer containers to maintain freshness. A study reveals that the West Asian crisis has raised air cargo prices from Rs 250 per kg to Rs 800-900 per kg per container, while shipping charges have risen from $1000 to $2500, which is often twice the price of mangoes. Factors responsible for this spike in prices include shortages of containers and vessels, as well as cargo congestion, prompting a shift from sea to air shipments.[7]

Opportunities in Value-Added Mango Products

Opportunities in Mango Trade lie not merely in expanding raw exports but in driving innovation through food processing and value addition. By transforming mangoes into pulp, juices, concentrates, dried slices, and processed desserts, India can enhance its global positioning and deepen integration into global value chains. As a seasonal and highly perishable fruit subject to price volatility, the mango gains strategic strength when converted into value-added products with longer shelf life, reduced post-harvest losses, and improved logistics efficiency. Sustainability, enabled by simple yet effective processing and packaging tools, provides the

[7] https://indiaseatradenews.com/mango-export-challenges-and-freight-cost-surge-in-india/

pathway to scaling exports and securing time to engage with global value chains. In this way, seasonality becomes a strength, positioning the Indian mango not just as a fruit but as a strategic commodity where innovation and logistics unlock significant opportunities.

Hence, the real opportunity lies not just in ramping up mango exports but in innovation in food processing and value addition, which can help improve India's global positioning and integration into global value chains. This is especially true because mango is a seasonal fruit, a highly perishable commodity and is subject to high price volatility. Value-added mango products such as mango pulp, juices, concentrates, dried slices, and processed desserts offer greater advantages owing to longer shelf life, reduced post-harvest losses, improved logistics efficiency, and greater scalability.

In addition, about 85.3% of the mangoes grown in the country are on marginal landholdings. At the same time, India has an extremely unorganised and fragmented marketing system with numerous intermediaries. Hence, expanding trade into value-added products could be a vital opportunity for smallholders to integrate into global value chains and benefit from the vast international markets through collective action in the form of farmer-producer organisations. This would require massive investments in processing units and a supportive marketing mechanism to ensure quick transport and processing to other value-added products.

This, in turn, has a distributional impact in the form of inclusive growth through the enhancement and stabilisation of farm incomes, employment generation, poverty alleviation, and the furtherance of rural industrialisation and export diversification. This can also boost international competitiveness, exports and foreign exchange earnings (Navamani & Chinnaswamy, 2024; NABARD, 2025).

It is estimated that about 60% of India's mango exports are minimally processed, such as dried, pulped, pureed, and extracted, while secondary-processed exports, such as juices and jams, account for only 5-10% of total exports (Finance Commission, 2020). This trend reflects India's failure to capture the market for high-value exports.

Export Potential of Indian Mango

India has enormous mango export potential, producing nearly 20 million tonnes annually (40% of global output), but exports remain a small fraction, valued at around USD 56 million in 2025–26. Premium varieties like Alphonso command high margins (20–30% above other mangoes), yet climate shocks, phytosanitary restrictions, and logistics costs are constraining

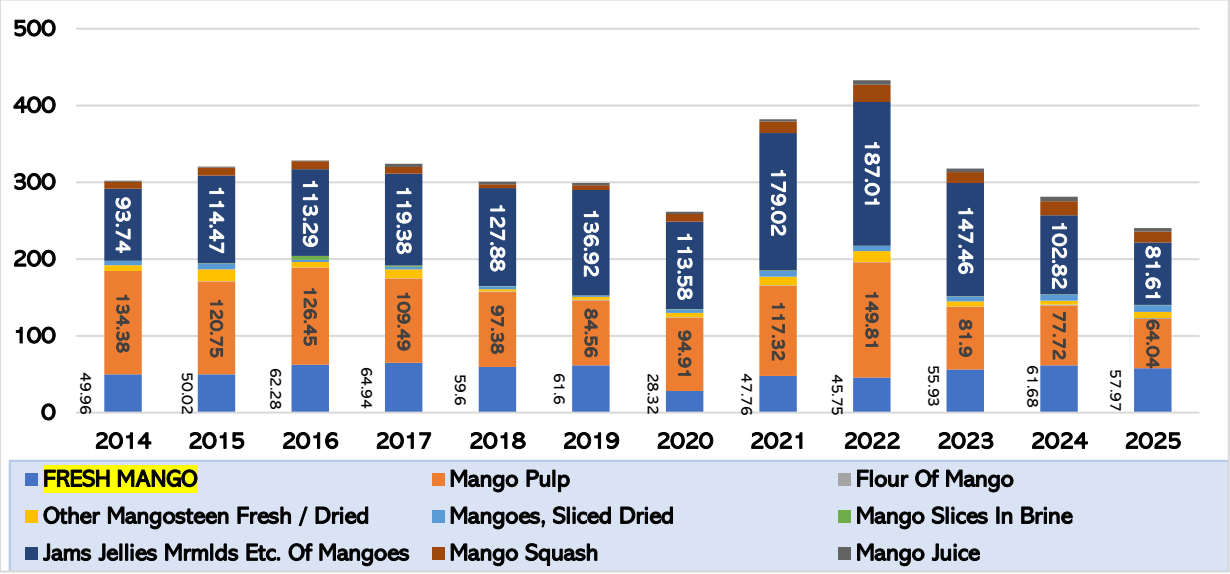
growth.[8] There has been considerable literature on raw mangoes and very little on value-added products. The versatility of the mango fruit is evident in the substantial by-products generated by processing, such as peels, seeds, and husks, which constitute around 35-60% of its weight (Jahurul et al., 2015).

These by-products are often underutilised yet rich in bioactive compounds and can serve as essential inputs for various industries. Figure 1 shows the various components of exports of mango and processed mango products in terms of value and volume for the period between 2014 and 2025. Table 5 shows the volume and value of exports of Indian mangoes and their products. The share of fresh mangoes in total mango exports, which stood at 16% in 2014, has grown to about a quarter of the total value in 2025. However, the processed mango products category is proving lucrative. In fact, with the ongoing conflict in West Asia, the major market for Indian mangoes, and disruptions in global logistics, energy prices, freight charges, and the global supply chain, this segment is expected to boom.

The largest component of mango exports was mango pulp, accounting for about 45% of total mango exports in 2014. However, its share has declined in recent years to 27%, with a corresponding increase in the share of processed products such as jams, jellies, and marmalades. India accounts for over half of global mango pulp exports, with a strong market presence in the EU and the Middle East. India's exports of mango pulp (in quantity) exceeded the exports of fresh mango by about 3- 5 times during the peak years of 2020 and 2022. The major destinations for India's mango pulp exports are Saudi Arabia, Kuwait, the Netherlands, Yemen, and the USA (Rajan et al., 2021).

[8] See, https://mkexports.co.in/alphonso-mango-export-india-complete-guide-2026/?utm_source=copilot.com.

Figure 3: Export Potential of Mango and its Products



Source: APEDA

The next significant product category for mangoes is processed products such as jams, jellies, and marmalades, which have overtaken mango pulp in both volume and value. Their share of total mango exports has grown from about 31% in 2014 to 47% in 2021, then declined to 42% in 2025.

This was followed by mango squash and mango juice, whose cumulative share in India's total mango exports increased from 3% in 2014 to around 10% in 2024, reflecting India's growing dominance in the domestic and global beverage markets.

Dried sliced mangoes accounted for 3-4% of India's total mango exports. Dried mangoes are low-volume, high-value products and can be highly remunerative for small-scale processors (NABARD, 2018). Dehydration preserves mangoes by removing the fluids and enzymes required for microbial growth that induces spoilage. This sector is increasingly popular as urban lifestyles gravitate towards healthier snacks and natural alternatives, and is slowly gaining ground in retail chains.

Table 5: Exports of Mango and its Products

HS CODE	Products	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
		Value In USD Million											
	Fresh Mango	50	50	62	65	60	62	28	48	46	56	62	58
08045040	Mango Pulp	134	121	126	109	97	85	95	117	150	82	78	64
11063030	Flour of Mango	0	0	1	1	1	1	1	1	1	1	1	1
8045090	Other Mangosteen Fresh / Dried	7	16	7	12	3	4	6	11	14	6	5	8
8045030	Mangoes, Sliced Dried	6	7	3	3	4	2	5	8	7	6	8	9
8129010	Mango Slices in Brine	0	0	5	2	0	0	0	0	0	1	1	0
20079910	Jams Jellies Mrmlds Etc. Of Mangoes	94	114	113	119	128	137	114	179	187	147	103	82
20089911	Mango Squash	9	10	10	9	5	6	10	15	23	14	19	14
20098910	Mango Juice	1	1	1	4	3	3	3	3	6	5	6	5
TOTAL		**302**	**320**	**328**	**324**	**301**	**299**	**262**	**382**	**433**	**318**	**281**	**240**
		Quantity in Thousand MT											
	Fresh Mango	43	36	50	54	46	52	19	30	21	31	31	33
08045040	Mango Pulp	155	129	133	116	109	90	97	117	120	63	62	55
11063030	Flour Of Mango	0	0	0	0	0	0	0	0	0	0	0	0
8045090	Other Mangosteen Fresh / Dried	11	14	10	20	3	4	7	16	17	6	5	9
8045030	Mangoes, Sliced Dried	4	4	1	1	1	1	3	7	9	5	4	4
8129010	Mango Slices in Brine	0	0	3	1	0	0	0	0	0	0	0	0
20079910	Jams Jellies Mrmlds Etc. Of Mangoes	81	96	100	115	139	156	105	144	136	104	76	73
20089911	Mango Squash	10	10	11	9	6	8	7	14	19	12	16	12
20098910	Mango Juice	1	1	1	2	1	1	1	1	1	1	2	1
TOTAL		305	290	307	317	306	313	240	329	324	223	196	188

SOURCE: APEDA, India Export Statistics (APEDA HS Code) Agri exchange. Accessed on: https://agriexchange.apeda.gov.in/India/GenerateAPEDAProductReport/Index.

The other emerging segments are mango flour and mango kernels. Mango kernels, in particular, contain good fats with nutraceutical benefits and are used in skincare, butter and oil extraction, and starch suited for the confectionery industry. Similarly, dried mango powder is an excellent alternative to fresh mangoes, as it has a longer shelf life of 12-18 months, reduced risk of spoilage during long-distance exports, lower transportation costs, and easier compliance. However, on sustainability grounds, the outcomes are mixed: mango powder reduces water use in transport and storage.

However, it may pose challenges for packaging, especially given the stringent requirements in countries like the US and Europe. It also offers transport efficiency through reduced weight and volume, resulting in lower freight costs and no requirement for refrigerated containers. The dehydrated products, such as mango flour and mango powder, also align with sustainability objectives, including a reduced water footprint in transit and lower energy and water consumption in cold-chain logistics. This makes the supply chains cleaner and less resource-intensive. It also aligns with the circular economy model, wherein mango by-products, such as peels and kernels, can be repurposed in the nutraceutical and wellness industries and reused or recycled into compost, pectin, and briquettes, thereby reducing waste. Value-added products also help reduce post-harvest wastage by utilising inferior or substandard-quality mangoes that are unfit for direct export, thereby improving value chain efficiency and supporting sustainable agricultural practices (Navamani & Chinnasamy, 2024).

India's mangoes and their products have huge potential in the developed world, especially in countries like the EU, USA, Japan, and Korea, for high-value-added processed foods. These products offer higher margins and give exporters greater control over prices (Navamani & Chinnasamy, 2024). The expansion of India's exports beyond fresh mangoes and pulp to high-value-added products would enable the country to reduce its reliance on traditional markets in the Middle East, diversify into other developed markets, and enhance its export earnings (Navamani & Chinnasamy, 2024).

However, this transition may not be easy and comes with its challenges on several fronts. Stringent packaging requirements from large markets like the EU and the USA, such as eco-friendly and biodegradable packaging, mandating labelling requirements, allergen and nutritional declarations, branding, certifications, traceability, and compliance with regulatory norms and laws, could effectively shut out small players in premium markets. The shift from conventional plastic to compostable packaging could increase costs for exporters due to the need to overhaul production lines. At the same time, balancing compliance with packaging requirements and cost-effectiveness could pose challenges for small exporters.

Thus, inclusive growth and the equitable distribution of opportunities and benefits expected to emerge from gaining a foothold in international markets warrant concerted efforts to augment and redirect investments toward infrastructure development and supportive marketing mechanisms.

Incentives

Role of APEDA and other Agencies

The Government of India, through its various agencies and ministries, such as the Ministry of Commerce, the Agricultural and Processed Food Products Export Development Authority (APEDA), the National Horticulture Board, and the Export Promotion Board, seeks to promote and support the growth and export of mangoes in the country.

Mango exporters need to register themselves with the Agricultural and Processed Food Products Export Development Authority (APEDA) to ensure adherence to regulations governing the export of mangoes and need certification for export eligibility. Even the Food Safety and Standards Authority of India (FSSAI) ensures that export mangoes meet the safety and quality standards for international trade.

The APEDA helps mango exporters by providing financial assistance to exporters for setting up infrastructure facilities like cold storage, packhouses, ripening chambers and refrigerated vans, pre-shipment treatment facilities such as irradiation, vapor heat treatment, hot water dip treatment, setting quality standards and aiding in implementing Food Safety Management Standards to meet international standards, promoting exports and providing logistical support (like airlifting products to markets like the UAE, UK and the USA) as well as facilitating the integration of farmers to export chains. It also provides financial assistance to meet quality standards by purchasing laboratory equipment and establishing quality management systems. It also created a traceability system by implementing online farm registration to monitor pesticide residues. As per its website, APEDA has set up Agri-export zones in all major mango-producing areas and modern packhouses in all major mango-exporting regions, a post-harvest management Centre, and an Export Facility Centre at Ratnagiri to train mango farmers to produce Kesar and Alphonso mangoes to global standards.[9].

The Ministry of Agriculture & Farmers' Welfare and APEDA have identified key products and countries to intensify market access negotiations to expand market access for products like

[9] https://apeda.gov.in/Mango

mangoes. India has filed Market Access Requests for mangoes with several countries, including Argentina, Chile, Ecuador, Israel, Malawi, Peru, Russia, Serbia, Uruguay, and Uzbekistan. There has been a significant increase in mango exports in 2022-23, with shipments to 41 countries and the exploration of new destinations, including Iran, Mauritius, the Czech Republic, and Nigeria.

At the same time, under the Agriculture Export Policy, certain clusters have been identified in states such as Andhra Pradesh, Gujarat, Maharashtra, Uttar Pradesh, and Telangana for the export-oriented production and promotion of mangoes.

Similarly, the Centrally Sponsored scheme, Mission for Integrated Development of Horticulture (2014-15), seeks to promote holistic growth of the horticulture sector. One component of this programme is the credit-linked assistance, which is extended to develop infrastructure such as cold storage, ripening chambers, and reefer transport vehicles for perishable horticultural crops like mango. Other programmes to boost mango production and exports include the National Horticulture Mission (NHM) and CHAMAN (Coordinated Programme on Horticulture Assessment and Management using Geoinformatics) (NABARD, 2025). The Government, through the Pradhan Mantri Annadata Sanrakshan Abhiyan (PM-AASHA)'s Market Intervention Scheme (MIS), aims to procure perishable agricultural commodities not covered under the Price Support Scheme to provide farmers with remunerative prices[10].

Although these initiatives have enabled the government to access global markets and new consumers and to secure remunerative prices for its farmers, sluggish growth in mango exports and a concentration in low-value products are symptomatic of the malady that continues to plague the mango export sector.

Conclusion and Recommendations

Thus, imperative policy and institutional interventions are warranted to sustain the Golden Revolution and to restore the lost glory of the "Emperor of Fruits". The foremost step would be to enhance mango productivity and quality, and to develop and strengthen rural infrastructure and marketing mechanisms. Public investment in developing and strengthening rural infrastructure would help crowd in private investment and boost rural ancillary industries such as packaging, food technology, and transport, which, through

[10] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2146930&reg=3&lang=2

multiplier effects, would contribute to rural growth and development (Navamani & Chinnasamy, 2024).

The goal of inclusive and equitable development could also be realised through the encouragement and organisation of Farmer-Producer Organisation (FPO) and women-led Self-Help Groups (Navamani & Chinnasamy, 2024). This would not only help gain better market access to members but also increase bargaining power, enhance productivity and support better livelihoods for small and marginal producers.

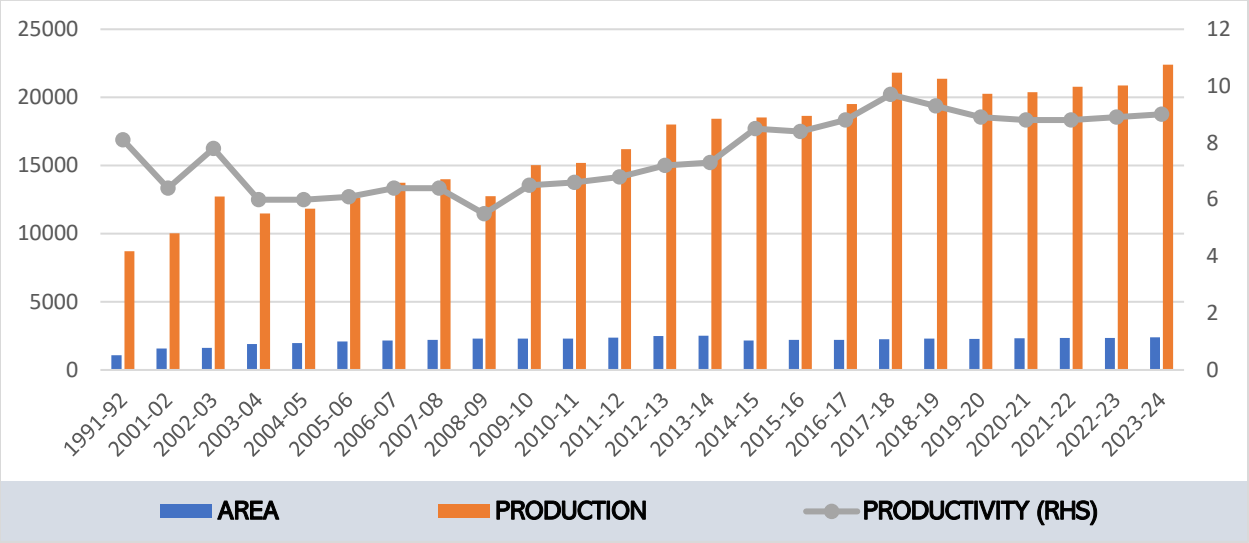
Schemes like the Pradhan Mantri Formalisation of Micro Food Processing Enterprises (PMFME) Scheme and the Production-linked incentive (PLI) scheme for the food processing industry need to be supported through higher budget outlays, along with greater allocations for food storage and warehousing. Other schemes, such as the Pradhan Mantri Krishi SAMPADA Yojana, which aim to promote micro-food processing units and other infrastructure (such as pack houses, ripening chambers, and refrigerated transport), struggle with low utilisation rates of funds and have therefore seen negligible or no increase in outlays (Singh, 2026). There should be stricter monitoring and enhanced utilisation of the funds under such schemes. Other schemes, such as the Crop Diversification Scheme, receive only paltry allocations, and those, too, focus on a few plantation crops like coconut, cashew, and cocoa (Singh, 2026). The coverage of this scheme should be broadened to include other horticultural crops, such as mango, with enhanced outlays to translate into significant outcomes.

In addition to expanding India's export markets while retaining a foothold in traditional markets, there is an urgent need to adopt and implement a systematic, scientific approach to risk assessment and management of the fresh-mango supply chain. These measures must also be accompanied by increased public expenditure on research and extension services, as well as by awareness-raising and information dissemination, to keep pace with the evolving standards and regulations of advanced countries. At the same time, the adoption of Good Agricultural Practices (GAPs) and the alignment of local standards with global standards, facilitated by scientific advances in mango production, should be promoted. In this regard, government support is critical for obtaining quality certifications to gain market access in the food sector, such as Good Agricultural Practices (GAP), Hazard Analysis and Critical Control Points (HACCP), and International Organisation for Standardisation (ISO) standards, especially for realising the potential of products like mango pulp. It would also benefit farmers to organise themselves into Farmer-Producer Organisations to pool their produce to meet the minimum eligibility requirements for exports and increase their bargaining power in the markets (Gopalkrishnan, 2013).

APPENDIX

Figure 4: Growth of Mango in India

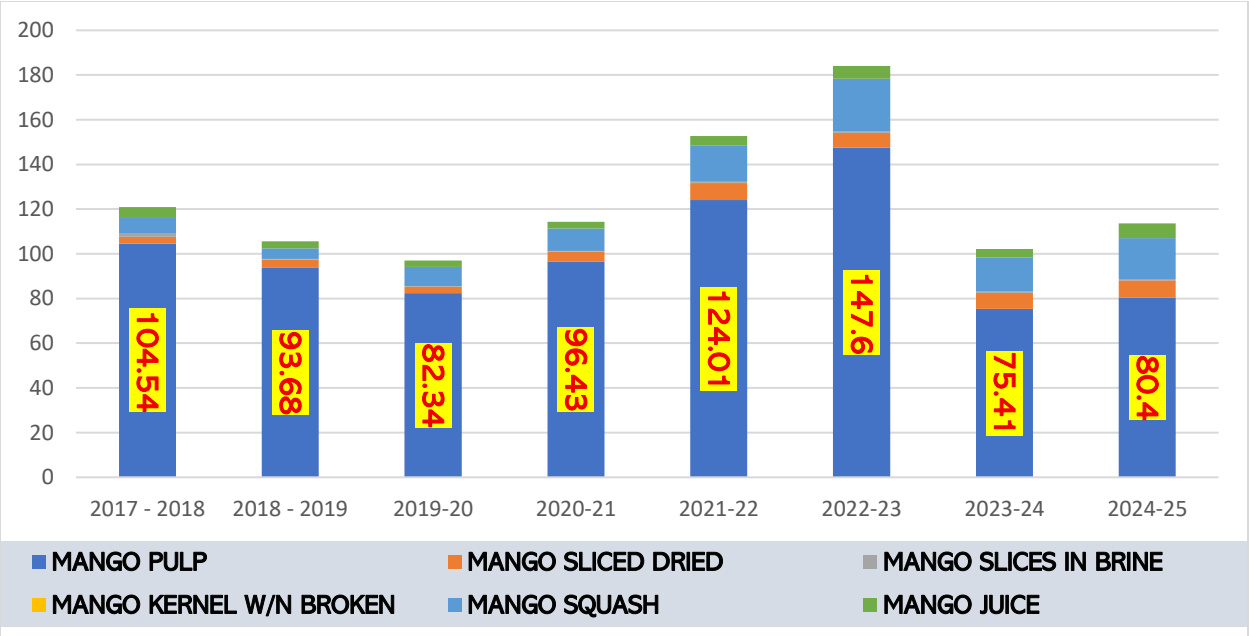
(Area in 000 Hectares, Production in 000 MT, Productivity in MT/Ha)



Source: GOI (2026), Horticulture Statistics at a Glance-2024

Figure 5: Export of Mango and its Products

(in US $ Million)



Source: DGFT Databank-Trade Stat, Ministry of Commerce and Industry, GOI

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