



Indo-German Cooperation on Agricultural Market Development

Building sustainable partnerships

Mango (Mangifera indica L)



Prepared by the
International Short-term Expert
Dr Raghu Chaliganti
on behalf of the German project implementation consortium of



January 2, 2022

Product information

Mango is an edible stone fruit produced by the tropical tree *Mangifera indica*, which is believed to have originated from the region between north western Myanmar, Bangladesh and north eastern India. The global exports of mangoes, guava, and magosteen have a combined Harmonised Code (HS) – 080450. This report is largely based on open-source data from Tridge, World Integrated Trade Solution (WITS), FAOSTAT, Access2Markets and Centre for the Promotion of Imports (CBI).

Mango Global Trade – India’s Role

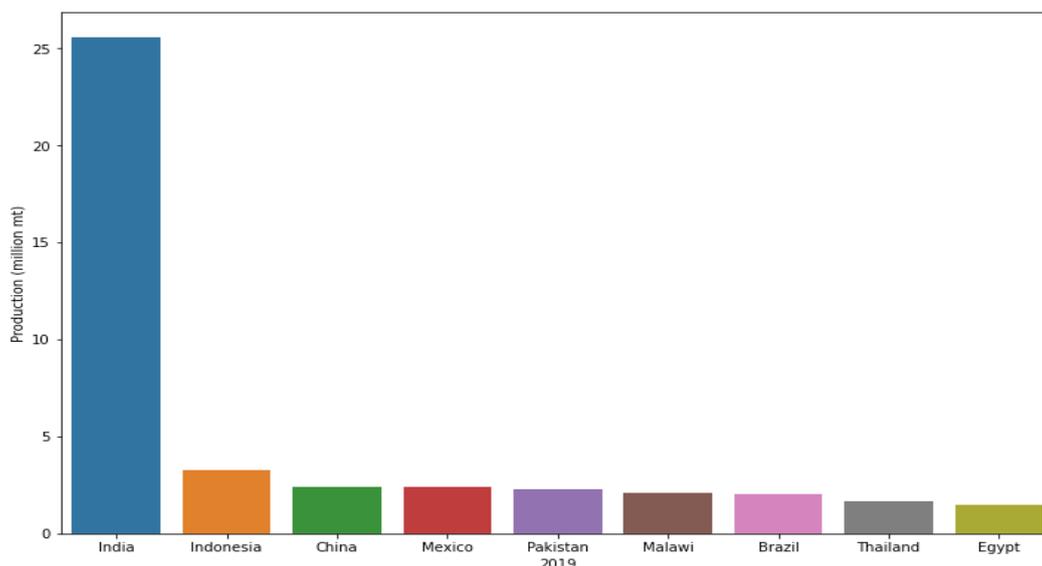


Figure 1. Major mango producing countries in 2019 (FAOSTAT 2021)

- In 2019, India was the world’s largest mango producing country contributing more than 45.81% of total world production with an export share of 3.67% (Tridge 2021ⁱ).
- Thailand was the world’s largest mango exporter with a share of 15.25% (US\$ 570 million), while China was the largest mango importer with a share of 23.7% (US\$ 919 million).

Table 1. Top global mango exporters in 2020

(Tridge 2021)

Country	Export Share 2020 (%)	Export Value in 2020 (US\$ million)	Export Growth Value from 2017-20 (%)
Thailand	15.25	570.65	-8.74
Mexico	12.29	459.82	+3.15
Netherlands	11.1	415.49	+13.08
Peru	11.1	415.19	+51.88
Brazil	6.81	254.49	+11.39
Vietnam	4.92	184.00	-46.15
Hong Kong	3.84	143.62	+161.69
India	3.67	137.45	-9.26
Spain	3.01	112.53	+19.62
Pakistan	2.71	101.46	+0.11

Table 2. Top mango importers from India in 2020

(Tridge 2021)

Trade flow	Export Share in 2020 (%)	Import Value In 2020 (US\$ million)	Export Growth value 2019-20 (%)
India to Saudi Arabia	17.77	24.42	+29.14
India to UAE	15.9	21.98	-11.38
India to Yemen	8.71	11.97	+25.03
India to Netherlands	7.52	10.3	-1.52
India to UK	7.49	10.29	-31.58
India to Kuwait	5.68	7.81	-22.29
India to Oman	5.13	7.05	+8.63
India to USA	3.83	5.27	-51.45

- From 2019 to 2020, India’s fresh mangos export growth value was US\$ 137 million, which declined to -9.26% compared to the previous year.
- From 2015 to 2020, India’s global export share has declined to -25.43%. The Middle East region comprises the major importing countries for Indian fresh mangos, such as Saudi Arabia (17.77%), United Arab Emirates (15.9%). India’s major export trade with the USA has declined to -51.45%. Similarly, trade with the UK decreased to -31.58%.

- From 2019 to 2020, India's mango pulp export growth value was US\$ 46.35 million; the export value increased to +12.4% compared to the previous year. The export growth value decreased by -22.37% during the last five years.

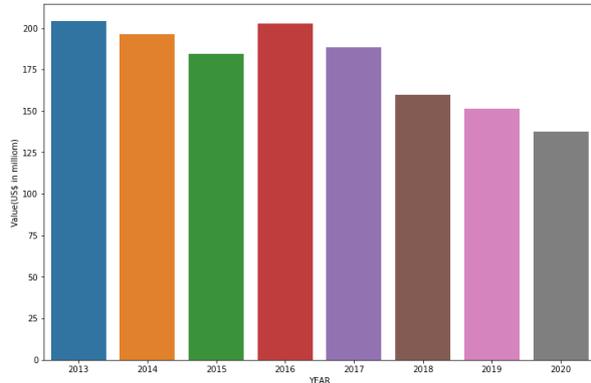


Figure 2. Indian fresh mango export trends from 2013 to 2020 (Tridge 2021)

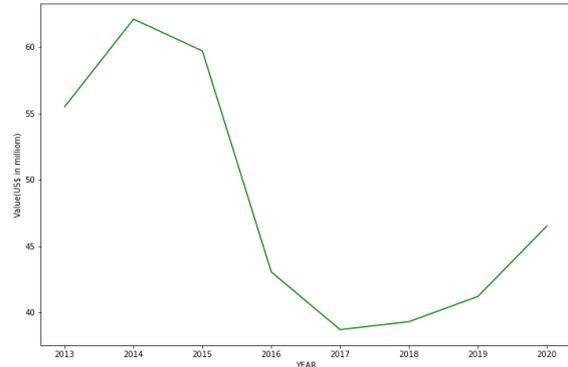


Figure 3. Indian mango pulp export trends from 2013 to 2020 (Tridge 2021)

Mango Import Trends in European Union

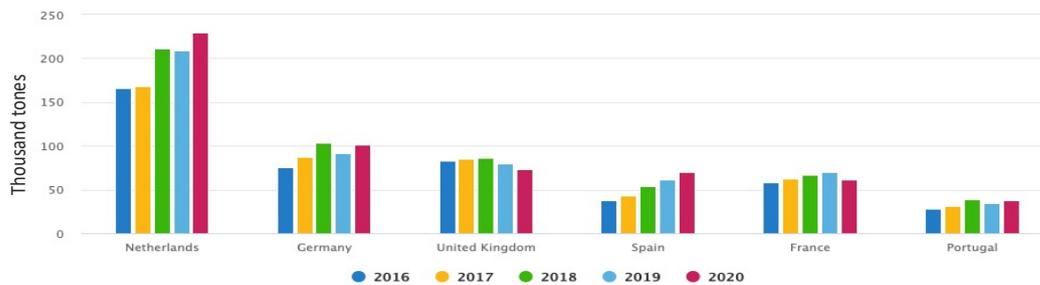


Figure 4. Leading importers of Mangoes in the EU (CBI 2021ⁱⁱⁱ)

- From 2014 to 2019, the Netherlands have been the top importer of mangoes in the EU. Around 33% of all mangoes in Europe are imported in, or traded by, the Netherlands. The Dutch mango exports of 212,000 tonnes are nearly as high as its imports (230,000 tonnes). This confirms their essential role in the distribution of imported mangoes. Most mangoes in the Netherlands are re-exported to Germany (43%) and France (11%).
- Spain is the second largest trade hub for mangoes after the Netherlands. Spain produced 28,276 tonnes of mangoes in 2020, with *Osteen* as the main mango variety. Spain exports more than the domestic production volume, adding somewhere between 20,000 and 30,000 tonnes in re-exported mangoes.

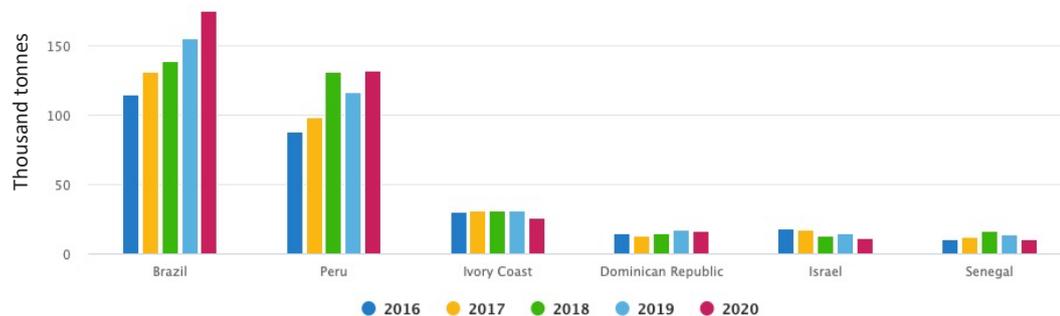
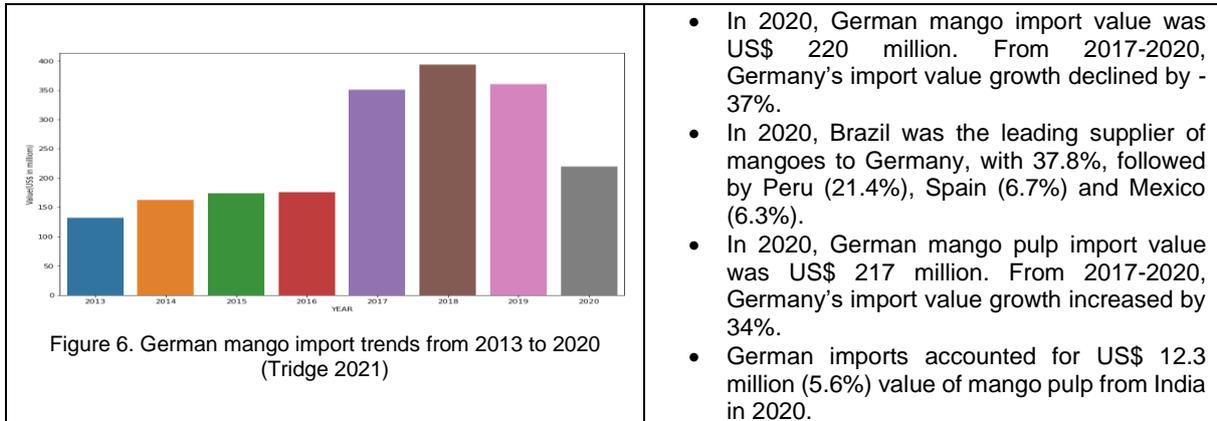


Figure 5. Leading exporters to EU

- During winter, Brazil and Peru dominate the mango supply to Europe. In summer, supply shifts to Central America, Dominican Republic, West Africa and Israel, followed by Spain.
- Brazilian mangoes are gradually taking a larger market share in European trade than other suppliers. European imports of Brazilian mangoes increased in five consecutive years to 175,000 tonnes in 2020.

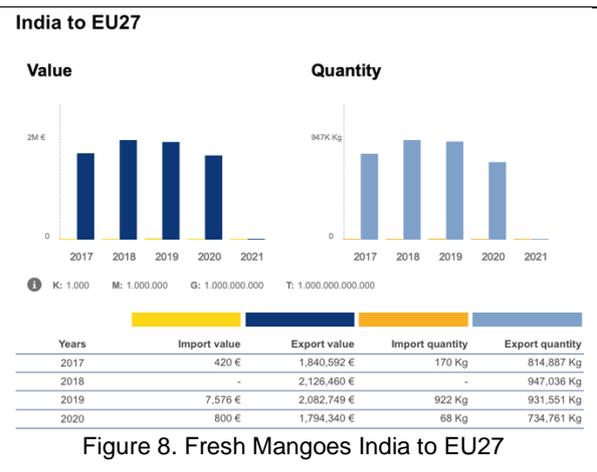
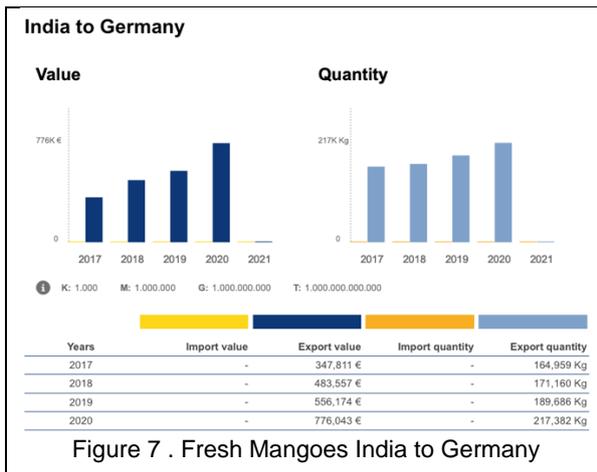
- Peru is one of the fastest-growing mangoes exporting countries, having increased its exports to Europe by 50% in five years.

Mango Import Trends in Germany



India to Germany and EU27

Fresh mangoes (HS 080450) exports from India to Germany and EU27 is negligible, which is US\$ 0.7 and US\$ 2 million, respectively (ACCESS2MARKETS 2021^{iv}). In 2020, Mango pulp exports from India to Germany accounted for a value of US\$ 12.36 million. India's exports share is around 5.67% of total mango pulp being imported by Germany.



Mango Market Segmentation in Europe

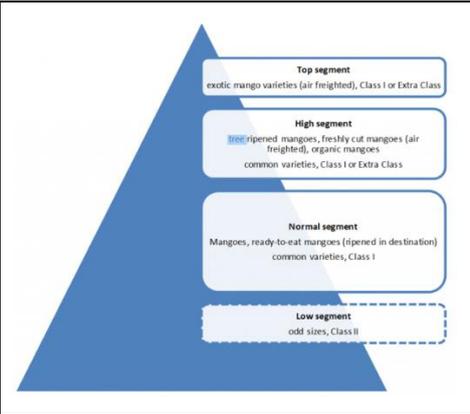
Fresh mangoes

The main segment for mangoes is Class I and common varieties such as *Kent* and *Keitt*, either conventional or ripened in the destination country. Class II mangoes are not common, but odd sizes or mangoes that fail to meet the usual specifications are sold for an acceptable price (CBI 2021^v).

High segment: Common mangoes can also be shipped tree-ripened by air and placed in an elevated part. The best time for airfreighted mangoes is when the market demand for mangoes is vital, which is usually between the end of November and the end of December.

Top segment: One can find exotic, tree-ripened varieties for luxury and specific ethnic markets in the entire piece. They are valued for their superior taste and sweetness, but their total volumes are tiny compared to the common mango trade. Specialist and ethnic retailers generally sell them.

Regular & low segment: Some importers have ripened packing facilities, which are essential for the growing part of ready-to-eat mangoes and supplying supermarkets. This is how mango importers such as Nature's Pride and TFC Holland become full-service providers to supermarkets.



Mango puree/pulp

The European market for mango puree is expected to show stable growth. This growth is likely to be driven by changes in the consumption patterns of European consumers. This especially relates to the popularity of smoothies as a convenient and healthy liquid snack option. Also, industry users are inventing new/innovative and healthier solutions with mango puree as one of the main ingredients. Other products include dairy fruit preparations, pastry fillings, beverages and baby food. The Netherlands, the United Kingdom, Germany, France, Spain and Portugal offer opportunities for developing country suppliers.

Leading mango puree importers and industry suppliers in Germany include Döhler, Binder International, Carrière, Pijahn and Austrian companies with facilities in Germany (Agrana and Grünewald). In the German fruit juice industry, mango puree is mostly used in juice blends (so-called multivitamin juices). Most fruit juices (with mango puree as an ingredient) are sold under brands of retail chains (private labels), with Refresco as the #1 juice developer and packer. Refresco's headquarters are in the Netherlands, but Germany is one of its key markets.

The German market offers distinct opportunities for suppliers from developing countries that offer organic mango puree. German baby food sector is a large user of organic mango puree, led by one of the foremost organic baby food pioneering companies, Hipp. Leading organic food brands Alnatura and dm-Bio have also launched several products with mango puree as an ingredient, including baby food, curries, yoghurts and sorbets. Some of those companies, such as Hipp, are supporting direct sourcing from organic suppliers from developing countries. Figure 9 shows various mango products, such as mango juice, mango lassi (yoghurt mix), mango chutney and baby food sold by the retail sector.

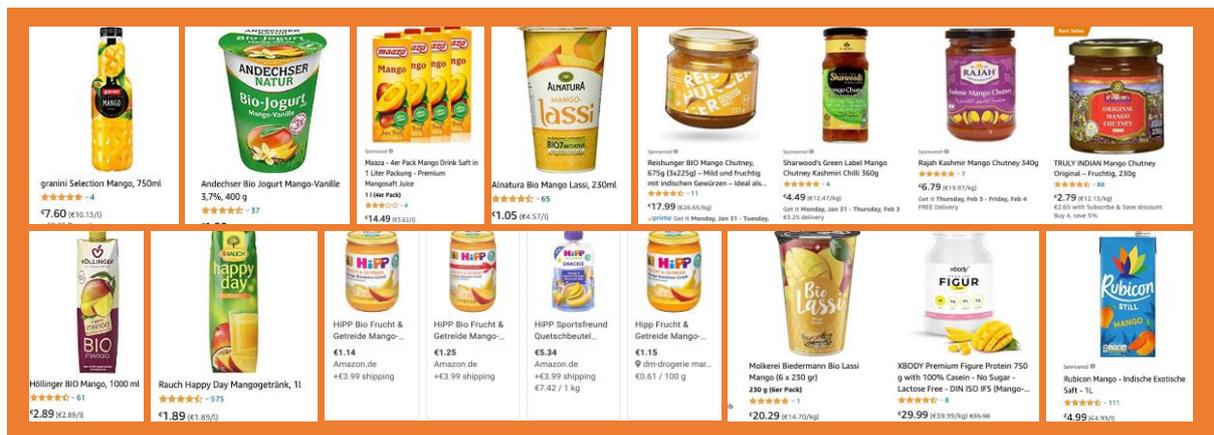


Figure 9. Mango products sold by German retail sector

EU Regulatory Requirements

Fresh mangoes must comply with the general requirements for fresh fruit and vegetables. The European Union has set maximum residue levels (MRLs) for pesticides and other contaminants, such as heavy metals in and on food products to avoid health and environmental risks. Products exceeding the MRLs are withdrawn from the market. The default MRL applies for substances not yet included in the European regulation, which is 0.01 mg/kg. It has to be ensured that lead contamination in mangoes remains below 0.10 mg/kg and cadmium below 0,050 mg/kg according to the maximum levels for specific contaminants in foodstuffs.

Microbiological criteria for fresh-cut mango:

The risk of microbial contamination increases when mangoes are being processed. For fresh pre-cut fruit (ready-to-eat), the following microbiological criteria apply:

- E.coli contamination must be below 100 cfu/g during the manufacturing process.
- Two out of five samples are generally up to the 1000 cfu/g limit.
- Salmonella in cut fruit must be absent throughout their shelf life, at least in five samples of 25 g.

Phytosanitary regulation for fruit flies in mangoes:

Mangoes are a high-risk fruit concerning fruit flies (*Tephritidae*). Therefore, a phytosanitary document is required for exporting mangoes to Europe and hydrothermal treatments (also called hot water treatment) before export is the standard.

The European Directive (EU) 2019/523 requires phytosanitary certificates for mangoes to include one of the following statements, which the national plant protection organisation must communicate in the country of origin in advance:

- The fruits originate in a country recognised as free from *Tephritidae* (non-European);
- The fruits originate in an area established by the national plant protection organisation in the country of origin as being free from *Tephritidae* (non-European);
- No signs of *Tephritidae* (non-European) have been observed at the place of production and in its immediate surrounding since the beginning of the last complete cycle of vegetation (this includes official inspections at least monthly during the three months before harvesting and on the harvested fruit). Traceability information must be indicated on the certificates.
- The product has been subjected to an effective treatment to ensure freedom from *Tephritidae* (non-European). The treatment data should be indicated on the certificates.

This requirement puts more pressure on plant health authorities. Authorities in producing countries have to declare a region pest-free or check on specific areas and product treatments. If local authorities are not sufficiently equipped for this phytosanitary control, it will affect the potential to export fresh mangoes to Europe.

Table 3. Mangos with extra quality and class I (CBI 2021)

<p>General quality requirements (all classes)</p>	
<ol style="list-style-type: none"> 1. intact. 2. sound, not affected by rotting or deterioration. 3. clean, practically free of any visible foreign matter. 4. free from marked bruising. 5. practically free from pests and damage caused by pests. 6. free from black stains or trails which extend under the skin. 7. free from marked bruising. 8. free from damage caused by low temperature. 9. free from abnormal external moisture. 10. free from any foreign smell or taste. 11. able to withstand transport and handling 	<p>Figure 10. Extra class and class I mangoes (from left to right)</p>
<p>Additional requirements and permissible tolerances for Class I mangoes</p> <ol style="list-style-type: none"> 1. a slight defect in shape. 2. slight skin defects due to rubbing or sunburn and suberised stains due to resin. 3. exudation (elongated trails included) not exceeding 3, 4, 5, 6 cm² for size groups A, B, C, D respectively. 4. scattered rust-coloured lenticels. 5. a yellowing of green varieties due to exposure to direct sunlight not exceeding 40% of the surface of the fruit, excluding necrotic stains 6. a tolerance of 10% is allowed for fruit that meets Class II standards. 7. a tolerance of 10%, by number or weight, of mangoes not meeting the sizing requirements is allowed. 	

Certification

Standard certifications for mangoes include GlobalG.A.P.¹ for good agricultural practices and BRCGS², IFS or similar HACCP-based food safety management systems for packing and processing facilities. Management systems recognised by the Global Food Safety Initiative (GFSI)³ are most recommended.

Organic

A small but growing niche market requires an organic certification for mangoes. Organic mangoes are traded mainly by specialised organic fruit importers, such as ProNatura (France), Biotropic (Germany), Eosta and OTC Organics (Netherlands). To market organic products in Europe, one must use organic production methods according to European legislation and apply for an organic certificate with an accredited certifier.

¹ https://www.globalgap.org/uk_en/

² <https://www.brcgs.com>

³ <https://mygfsi.com>

Mango Production in India

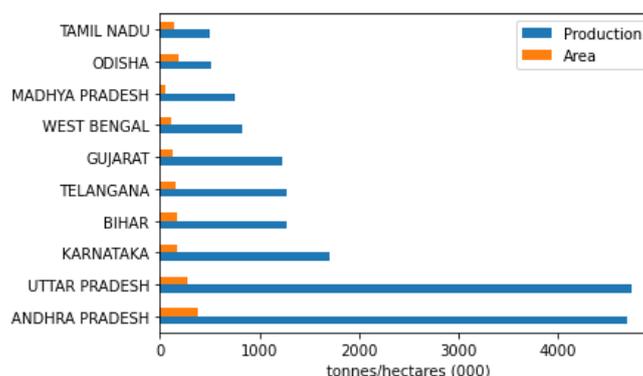


Figure 11. Leading Mango producing states in 2019-2020

In terms of production, Uttar Pradesh is the largest mango producing state in India with a share of 23.4%, followed by Andhra Pradesh (23.1%), Karnataka (8.4%), Bihar (7.6%) and Telangana (6.3%). These top five mango producing states together contributed more than 67% of the total mango production in 2019-20^{vi}. However, there is a lot of variability in terms of productivity. Rajasthan has the highest yield of mangoes at 18.1 tonnes/ha even though it has one of the smallest areas under mangoes. UP, being the largest mango producer, has the second-highest productivity levels at 17.1 tonnes/ha, followed by Punjab (16.9 tonnes/ha). Maharashtra, which is home to the famous *Alphonso* variety of mangoes, has one of the lowest yields at 3.7 tonnes/ha (Gulati 2021^{vii}). The peak season for mangoes in different states in India is between April to July.

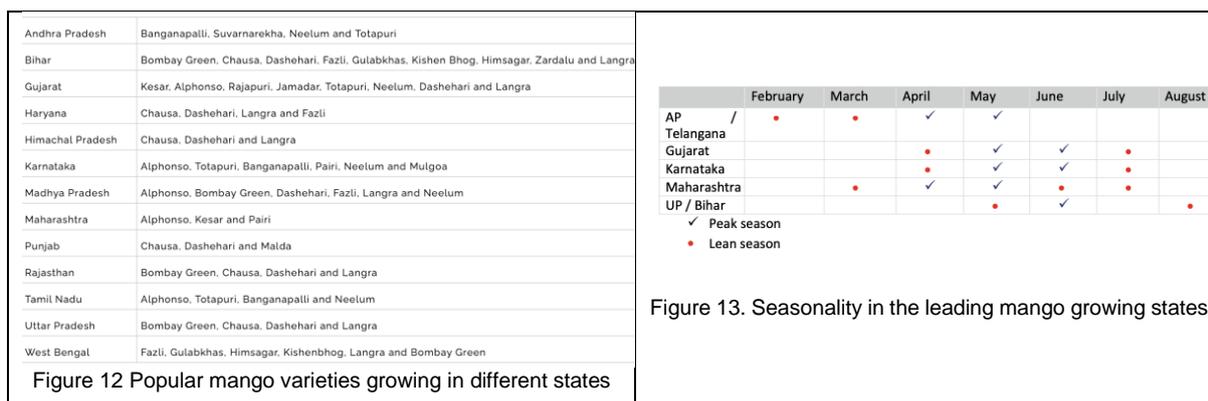


Figure 12 Popular mango varieties growing in different states

Figure 13. Seasonality in the leading mango growing states

Mango Product and Market Segmentation

Fresh Mangoes

- The central portion of the fresh fruit goes to distant markets as there is high demand during the lean season; about 16% of the produce is processed into various value-added products (FAO 2018^{viii})
- The majority do not market their products directly.
- The farmer share in consumer price is around 20%.
- The first stakeholder in the mango value chain is the pre-harvest contractor (PHC), who enters into a contract with a farmer around four months before the harvest season, based on flowering.
- PHC transports the harvested mangoes to the wholesale markets (APMCs) in big cities or consumption centres.
- The commission agent also provides facilities for sorting, grading, and overseeing auctions. Lastly, small or neighbourhood retailers sell the fruits to consumers after buying from the commission agent.

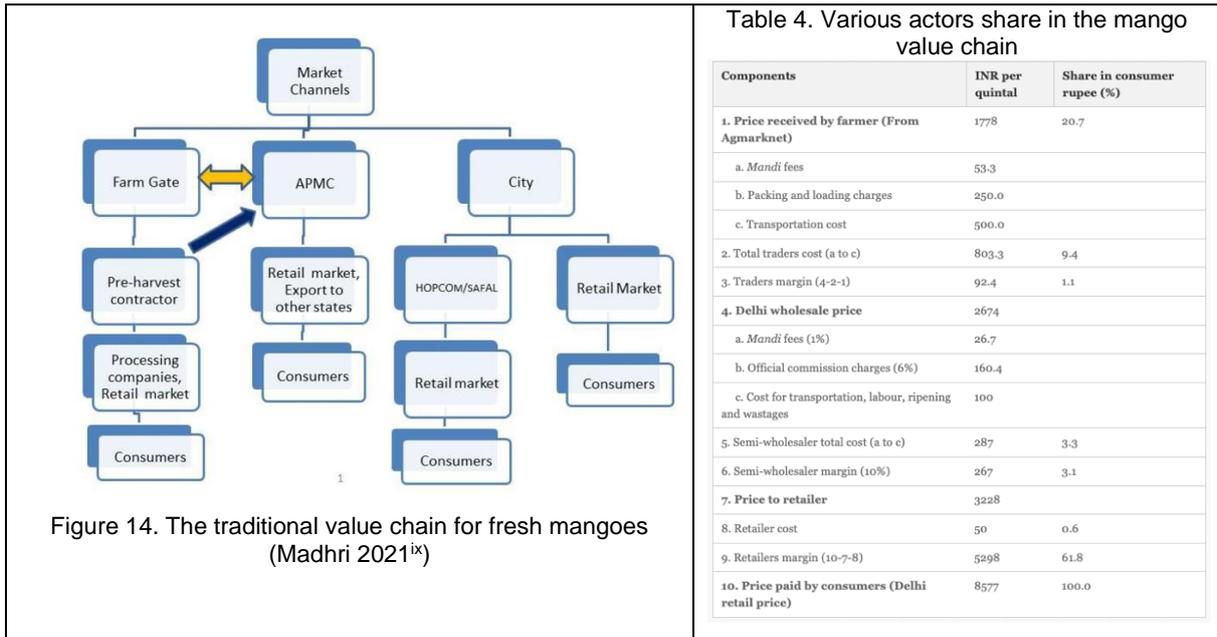


Table 4. Various actors share in the mango value chain

Components	INR per quintal	Share in consumer rupee (%)
1. Price received by farmer (From Agmarknet)	1778	20.7
a. Mandi fees	53.3	
b. Packing and loading charges	250.0	
c. Transportation cost	500.0	
2. Total traders cost (a to c)	803.3	9.4
3. Traders margin (4-2-1)	92.4	1.1
4. Delhi wholesale price	2674	
a. Mandi fees (1%)	26.7	
b. Official commission charges (6%)	160.4	
c. Cost for transportation, labour, ripening and wastages	100	
5. Semi-wholesaler total cost (a to c)	287	3.3
6. Semi-wholesaler margin (10%)	267	3.1
7. Price to retailer	3228	
8. Retailer cost	50	0.6
9. Retailers margin (10-7-8)	5298	61.8
10. Price paid by consumers (Delhi retail price)	8577	100.0

Mango pulp

- India is a major exporter of mango pulp, exporting to countries such as UAE, Europe, Singapore and Malaysia (Gulati 2021).
- Mango pulp is prepared from selected varieties like *Totapuri* and *Kesar*. Mango pulp or concentrate is used for making juices, jams and various other kinds of beverages. It is used for puddings, bakery fillings and flavours for food industry.
- Two main clusters of mango pulp industries are located in Chittoor, Andhra Pradesh, and Krishnagiri, Tamil Nadu. There are around 65 processing units with backward linkage facilities with farmers. Few processing units are located in Maharashtra and Gujarat..
- Jain Farm Fresh Foods, a subsidiary of Jain Irrigation Systems, is the largest Indian - and also the world's largest - processor of mangoes. The company processes 170,000 tonnes of mangoes per year. The key variety used for processing is the *Totapuri* mango, which accounts for about 100 thousand tonnes (CBI 2021^x).
- There are many other successful mango puree exporting companies in India. Some notable examples include the following: ABC Fruits (another large processor with a processing capacity of 30 tonnes per hour), Vimal Agro Products (exporter and supplier of canned pulps on the Indian market), Allana (also a very large processor), Mother Dairy (milk processing company with fruit processing operations), Tmn International (one of the largest exporters), Shimla Hills, Lion Group, Ghousia Food, Jadli Foods, Tricom Fruit Products, Capricorn, Galla Foods, Keventer, MR Fruits, Sunrise Naturals and Sahyadri Farms (CABI 2021).



Mango Promotional Schemes in India

Scheme for Agro-Marine Processing and Development of Agro-Processing Clusters: Scheme for Agro-Marine Processing and Development of Agro-Processing Clusters Government of India's SAMAPDA Yojana provides a subsidy for setting up of food processing industry and has boosted the food processing sector. Renamed as Pradhan Mantri Kisan SAMPADA Yojana,³ with an allocation of INR 60 billion for 2016 to 2020, the scheme provides a subsidy of 35% of the project cost up to INR 5 crores for setting up of food processing units. This scheme will not only help in setting up food processing units but will also include food parks, integrated cold chains, creation of backward and forward linkages, food safety and quality and other infrastructures. (MoFPI 2018).

Maharashtra's Agri-business and Rural Transformation Program: The government of Maharashtra tied up with World Bank for US\$300 million project, known as Maharashtra's Agri-business and Rural Transformation Program (SMART) Project. The project aimed to develop inclusive and competitive agriculture value chains, focusing on smallholders and agri- entrepreneurs in Maharashtra with active participation from the private sector. The scheme includes several agricultural commodities.

APEDA: To facilitate exports of mangoes by refrigerated vans, Agricultural & Processed Food Products Export Development Authority (APEDA), under the Infrastructure Development component of its export promotion scheme, provides financial assistance for the purchase of insulated/reefer transport/mobile pre-cooling units up to 40% of the cost subject to a ceiling of INR 100 lakhs. Assistance is available for the establishment of post-harvest infrastructure for fresh horticulture produce like integrated packhouse, cable handling system for banana, mango and other similar requirements for other crops, purchase of insulated and, reefer transport/mobile pre-cooling units.

Rashtriya Krishi Vikas Yojana (RKVY): Assists fruit processors with soft loans to upgrade technology at the plants.

Mega Food Park Scheme: Provides financial assistance through the Ministry of Food Processing Industries (MoFPI), to establish mega food parks to link production areas to markets with processing facilities, support infrastructure and improve value addition, minimizing wastage, increasing farmers' income and creating employment opportunities, particularly in the rural sector. There are two mega food parks in the mango pulp FSC: Srinidhi Food Park and Sricity Food Park, where there are improved processing facilities that have catalysed the increase in demand for pulp.

Credit Linked Capital Subsidy Scheme (CLCSS): The Ministry of Micro, Small and Medium Enterprises, has extended support by promoting small-scale industries and technology by providing a subsidy of up to USD 22 000 to upgrade plant machinery. Implementation of the Total Quality Management System including ISO 9000, ISO 22000, HACCP, GMP and GHP through the MoFPI assists in expansion by reimbursing up to 50 percent of expenditure for consultant fees charged to processing units by the Certification Agency, for plant and machinery, technical civil works and other expenditure covering implementation of the Total Quality Management System including ISO 9000, ISO 22000, HACCP, GMP and GHP.

Challenges in Mango Production

Productivity

There has been a slow increase in output, productivity, and area under mango cultivation across states, in the last few decades. The last mango variety was developed by CISH (Arunika) in 2008, and since then mango has not seen any significant breakthrough in varietal development. The development of long shelf-life mango varieties without compromising on the taste or flavour would ensure the scalability of mango production in India.

Post-harvest technologies

There is a large asymmetry in post-harvest and export-oriented infrastructure facilities across states. While Maharashtra State Agricultural Marketing Board runs irradiation facilities in Vashi and Lasalgaon and several Vapour Heat Treatment (VHT) facilities located in mango-growing regions in Maharashtra, other states lack such facilities. In the absence of such facilities, mango exporters from Uttar Pradesh bring in their produce to Vashi or Lasalgaon (Maharashtra) for these treatments, which is a mandatory requirement to cater to export markets in many countries. Setting up such infrastructure in Uttar Pradesh, which is the largest producer of mango, would help farmers in cutting cost of transportation, and ensure quicker shipments. All consignments to EU, South Korea, and Japan have to undergo hot water treatment (HWT) or VHT. Irradiation is mandatory for the mango consignment sent to the USA. Hence, ramping up such facilities in other states, such that exporters can avail them easily will have a positive impact on export.

Cold storage technologies

Logistics including cold chains, ripening chambers, reefer trucks, etc for perish- able commodities and in this context, mangoes, need to be developed and made accessible to the stakeholders in the value chain. Such logistics support will help improve the shelf life and quality of the fresh produce, reduce wastage, and enhance the marketability of the produce. Farmers can benefit from greater demand for mangoes as a result of robust value chains.

-
- ⁱ https://www.fao.org/faostat/en/#rankings/countries_by_commodity
- ⁱⁱ <https://www.tridge.com/intelligences/mango>
- ⁱⁱⁱ <https://www.cbi.eu/market-information/fresh-fruit-vegetables/mangoes/market-potential>
- ^{iv} <https://trade.ec.europa.eu/access-to-markets/en/results?product=080450&origin=IN&destination=DE>
- ^v <https://www.cbi.eu/market-information/fresh-fruit-vegetables/mangoes-0>
- ^{vi} https://www.tnagrisnet.tn.gov.in/dashboard/report/01_23.pdf
- ^{vii} Gulati, A., Ganguly, K. and Wardhan, H., 2022. Agricultural Value Chains in India: Ensuring Competitiveness, Inclusiveness, Sustainability, Scalability, and Improved Finance. Springer Singapore.
- ^{viii} <https://www.fao.org/3/BU688EN/bu688en.pdf>
- ^{ix} https://mpa.ub.uni-muenchen.de/95334/1/MPRA_paper_95334.pdf
- ^x <https://www.cbi.eu/market-information/processed-fruit-vegetables-edible-nuts/mango-puree/market-entry>