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Current situation and prospects of mangosteen (*Garcinia mangostana* L.) cultivation as an agribusiness in the Soconusco region, Chiapas, Mexico

Abstract

Mangosteen (*Garcinia mangostana* L.) is a tropical fruit with high commercial value and growing international demand. Global projections estimate a compound annual growth rate (CAGR) of 3.6% to 5.1% between 2025 and 2032. In Mexico, 90% of the cultivated area is concentrated in the Soconusco region, Chiapas. This study aimed to analyze the current status and technical-economic sustainability of mangosteen cultivation as an agribusiness in this region. A non-probabilistic convenience sampling was applied, selecting key informants based on their strategic role in the value chain. Data collection included structured surveys with producers, semi-structured interviews with intermediaries and exporters, physical characterization of plantations, and review of international sources. Results show a significant expansion of mangosteen cultivation in the last two decades. Most plantations are in the productive stage, with average yields of 3.1 t/ha, comparable to Asian benchmarks. About 76% of the fruit meets export quality standards, with the United States as the main destination. The crop exhibits high profitability, with a benefit-cost ratio of 3.26 from year 9 and a return rate of 104% by year 14, exceeding the profitability reported for other economically important crops in the Soconusco region, such as coffee, cacao, and rambutan. However, challenges persist, including translucent pulp disorder, price fluctuations, and limited agro-industrial transformation. The current global context—marked by rising demand, proximity to the U.S. market, market segmentation, and bioeconomic potential—offers favorable conditions for structuring a territorially integrated agro-industrial cluster for mangosteen in the Soconusco region.

Keywords: Mangosteen agribusiness, Soconusco region, agro-industrial cluster

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Introduction

Mangosteen (Garcinia mangostana L.), native to Southeast Asia, has long been regarded as the most exquisite tropical fruit. It is currently cultivated to varying extents across Asia, Latin America, Africa, and Oceania.[1,2] In Asia, it is grown in Thailand, Indonesia, Vietnam, Malaysia, the Philippines, Cambodia, Singapore, Laos, Myanmar, Sri Lanka, India, and China. In Africa, cultivation occurs in Côte d'Ivoire and Madagascar. In Latin America and the Caribbean, mangosteen is present in Guatemala, Mexico, Colombia, Honduras, Panama, Brazil, Puerto Rico, Trinidad and Tobago, Costa Rica, the Dominican Republic, Jamaica, and Ecuador.[3–5] Asia remains the leading global producer of mangosteen. However, in recent years, Latin American countries such as Mexico, Guatemala, and Colombia have expanded their cultivated areas, recognizing mangosteen as a profitable alternative for agricultural diversification in humid tropical regions.

In Mexico, mangosteen cultivation covers approximately 636 hectares, of which 90% (571 ha) are located in the Soconusco region of Chiapas. Although the crop is considered highly profitable—surpassing other economically significant crops in the region— there is growing uncertainty among stakeholders in the mangosteen value chain, particularly producers, regarding the long-term technical and economic sustainability of this profitability. Within this context, the present article analyzes the current status of mangosteen cultivation in the global and regional landscape, and its technical and economic prospects in the Soconusco region. The aim is to identify strategic opportunities for its consolidation and development as a high-value agribusiness, and to establish a baseline for the formation of a territorially integrated agro-industrial cluster for mangosteen.

Material and methods

This study corresponds to exploratory research with a mixed-methods approach, incorporating descriptive and analytical-perceptual components to integrate quantitative and qualitative data for the understanding of complex phenomena from multiple perspectives.[6,7] The research was conducted between October 2024 and September 2025 in the municipalities of Tapachula, Tuxtla Chico, Cacahoatán, and Huehuetán, Chiapas. The target population included producers affiliated with the Mangosteen Producers Committee of the Soconusco region, as well as intermediary traders and owners of export packing facilities.

A non-probabilistic convenience sampling method was employed, commonly used in exploratory studies involving key informants.[8,9] Data collection was carried out using the following instruments:

I. A structured survey administered to 12 producers, representing 40% of the total registered in the regional mangosteen producers' registry and collectively holding 36.4% of the cultivated area. The survey included items related to agronomic management practices, production costs, yields, and commercialization strategies;

II. Informal interviews with three intermediary traders and two mangosteen exporters from the municipality of Tapachula, focusing on market dynamics, distribution channels, and quality

criteria;

III. Physical and environmental characterization of eight plantations located in the municipalities of Tapachula, Tuxtla Chico, Cacahoatán, and Huehuetán, conducted through direct observation and recording of variables such as plantation age, altitude, soil type, and slope;

IV. Documentary review of secondary sources, including international scientific literature, governmental reports, and databases from mangosteen-producing countries.

Results and discussion

Global context of mangosteen cultivation

The data presented and analyzed correspond to the main mangosteen-producing countries in Asia (Thailand, Indonesia, Vietnam, Malaysia, and the Philippines) and Latin America (Guatemala, Mexico, Colombia, and Brazil), which together account for over 90% of the total cultivated area and global production of mangosteen. For other countries where mangosteen is currently grown, no updated or reliable information was found.

Since the 1980s, mangosteen cultivation has followed a sustained growth trajectory. Between 2009 and 2020, the global cultivated area increased by 37.5%, while production rose by 75.2%, indicating not only expansion in land use but also improvements in productivity and market orientation. These trends are driven by rising international demand, particularly in high-value markets such as China, the United States, and emerging destinations in Europe and the Middle East Figure 1.

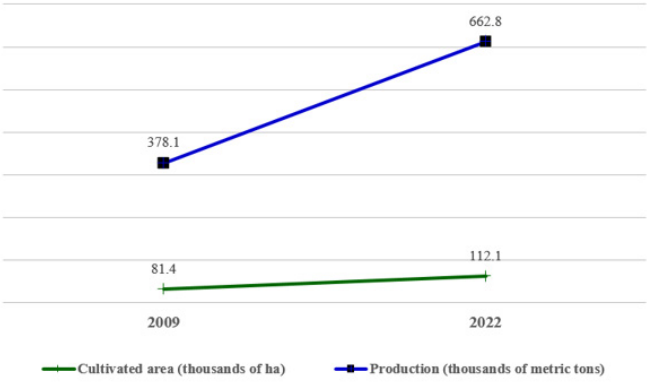

Figure 1 Trends in global mangosteen cultivated area and production 2009–2022. Source: Authors' estimates based on official reports from producing countries and complementary secondary data sources.

Main mangosteen-producing countries

Thailand stands as the leading global producer of mangosteen, both in terms of cultivated area and total output. Other major producers in Southeast Asia include Indonesia, Vietnam, Malaysia, and the Philippines. Together, these five countries account for over 90% of the global mangosteen cultivation and production, reflecting the crop's strong agroecological adaptation and commercial relevance in the region. In Latin America, Guatemala, Mexico, Colombia, and Brazil have emerged as key contributors, albeit with significantly smaller cultivated areas and production volumes.

Table 1 presents comparative data for the year 2022, highlighting the disparities in scale and output among producing countries. Thailand reported 69,654 hectares under cultivation and a production volume of 251,635 metric tons (MT), while Indonesia, with a smaller cultivated area of 27,425 ha, achieved the highest reported production at 343,660 MT, suggesting differences in yield efficiency and cropping systems. Vietnam, Malaysia, and the Philippines maintain moderate to small-scale production, with Vietnam cultivating 7,200 ha and producing 37,000 MT, and the Philippines reporting the lowest output at 1,540 MT from 3,021 ha.

Table 1 Main mangosteen-producing countries, 2022

Country	Cultivated area (ha)	Production (MT)
Thailand[10]	69,654	251,635
Indonesia[11]	27,425	343,660
Vietnam[12]	7,200	37,000
Malaysia[13]	3,151	23,508
Philippines[14]	3,021	1,540
Mexico[15]	636	859
Guatemala[16]	412	2,898
Colombia[17]	237	1,796
Brazil[18]	350	N/A
Total	112,086	662,896

In Latin America, Mexico cultivated 636 ha and produced 859 MT, positioning itself as a niche producer with export-oriented potential. Guatemala, with 412 ha, achieved a relatively high output of 2,898 MT, while Colombia reported 1,796 MT from 237 ha. Brazil's data on production remains unavailable, although 350 ha were reported under cultivation.

These figures underscore the dominance of Southeast Asia in the global mangosteen market, while also revealing the growing interest and expansion in Latin American countries. The comparative analysis suggests opportunities for yield improvement, technological adoption, and market integration in emerging regions such as Mexico and Guatemala.

Main mangosteen importing countries

China is currently the largest global importer of mangosteen, reflecting its dominant role in shaping international trade flows for this tropical fruit. In 2023, China imported approximately 242,000 metric tons (MT) of mangosteen, valued at USD 730 million. Thailand remains the primary supplier to the Chinese market, accounting for 85% of total imports—equivalent to 207,000 MT and USD 620 million in trade value. This trade relationship underscores Thailand's logistical efficiency and capacity to meet China's stringent quality and volume requirements.

Beyond China, other countries with significant import volumes include the United States, the United Arab Emirates, and Hong Kong. These markets exhibit strong consumer demand, particularly among diaspora communities and health-conscious segments that value mangosteen's nutritional and functional properties.[19] The United States, in particular, serves as a strategic destination for Latin American producers due to geographic proximity, established trade routes, and favorable seasonal windows that precede Asian harvests.

In recent years, mangosteen imports have also increased in several European and North American countries, including Germany, France, the United Kingdom, the Netherlands, and Canada. This emerging trend reflects broader shifts in consumer preferences toward exotic fruits, functional foods, and nutraceuticals. The expansion of these markets presents new opportunities for diversification and value-added strategies, especially for producers seeking to reduce

dependence on traditional buyers and penetrate high-income, health-oriented consumer segments.

Harvest periods

The mangosteen harvest calendar varies significantly across producing regions, offering distinct strategic advantages in international trade. In Southeast Asia, the production season typically spans from May to February, with peak harvests occurring between June and September. In contrast, Latin American countries such as Brazil and Colombia begin harvesting as early as January, while Guatemala and Mexico—whose harvests start in April–May—extend their production through September. This temporal differentiation provides Latin American producers with a comparative advantage in accessing key markets—particularly the United States and Canada—during windows when Asian supply is not yet available. By entering the market ahead of major Asian exporters such as Thailand and Indonesia, Latin American mangosteen can benefit from reduced competition, higher price margins, and increased visibility among importers and distributors seeking off-season tropical fruits.

Price behavior and market valuation

Since 2007, the international wholesale price of fresh mangosteen has remained relatively stable, ranging between USD 12 and USD 15 per kilogram in major terminal markets such as Boston, New York, San Francisco, and Los Angeles.[19] This price consistency over nearly two decades positions mangosteen as a high-value tropical fruit, outperforming other minor exotics such as durian, rambutan, lychee, and passion fruit in terms of commercial valuation. The sustained price range reflects both strong consumer demand and limited global supply, which together contribute to the fruit's premium status in international markets. Moreover, the price stability observed in U.S. markets suggests resilience to seasonal fluctuations and trade disruptions, making mangosteen an attractive crop for producers seeking consistent returns.

The global mangosteen market and its future outlook

An analysis of the international mangosteen market reveals a sustained upward trend in export volumes. Between 2007 and 2017, global exports increased from 17,113 metric tons (MT) to 51,000 MT, representing a growth of 198% over that period.[20] This trend has intensified in recent years, with estimated exports reaching approximately 300,000 MT in 2023. Rising income levels and shifting consumer preferences toward healthier diets have been key drivers of both supply and demand growth in the global mangosteen market.

While fresh fruit continues to dominate the international market segment, the development of value-added mangosteen products has fostered greater market segmentation and the inclusion of new consumer profiles, resulting in increased demand. Products such as frozen and freeze-dried pulp have gained commercial relevance due to their advantages in preservation, transportability, and quality standardization.[21] Freeze-drying, in particular, has proven effective in preserving bioactive compounds such as xanthones found in the pericarp, facilitating their incorporation into nutraceutical and cosmetic formulations.[22,23] In addition, the development of other derivatives—including jams, juices, extracts, freeze-dried pulp and pericarp powders, functional supplements, and natural cosmetics—has attracted health-conscious consumer segments. Among these, processed products such as juices, extracts, and cosmetics represent the fastest-growing segments within the mangosteen value chain, with annual expansion rates exceeding 8% in Asian and North American markets.[23] This dynamic is driven by technological innovation and the reconfiguration of consumption patterns, where functionality and perceived health benefits play a central role.[19,24] In this context—where rising demand for fresh fruit converges with increasing segmentation into emerging niche products—the global mangosteen market is projected to surpass USD 400 million by 2025, maintaining a compound annual growth rate (CAGR) estimated between 3.6% and 5.1% during the 2025–2032 period[25]. This scenario presents a strategic opportunity for mangosteen-producing countries in Asia and Latin America, not only to supply consolidated markets such as China and the United States, but also to expand into emerging destinations including the United Arab Emirates, Japan, France, Germany, the Netherlands, the United Kingdom, and Canada.

Mangosteen cultivation in the Soconusco Region, Chiapas

Cultivated area

Mangosteen was first introduced to Mexico in 1967 at the "El Palmar" Experimental Station, located in the municipality of Tezonapa, Veracruz[15]. The first commercial plantation was established in 2005 on a 1-hectare plot at Finca Santa Teresa in the municipality of Tapachula, Chiapas. By the year 2025, the total area cultivated with mangosteen in Mexico is estimated at 636 hectares, of which 90% (571 ha) are located in the Soconusco region. These plantations were established over a period of no more than 20 years (Figure 2). This expansion has been driven by the high market prices and profitability of mangosteen, which surpass those of other economically relevant regional crops such as rambutan, coffee, and cacao. The crop's favorable return on investment has positioned it as a strategic alternative for agricultural diversification in humid tropical zones, particularly in Southeastern Mexico.

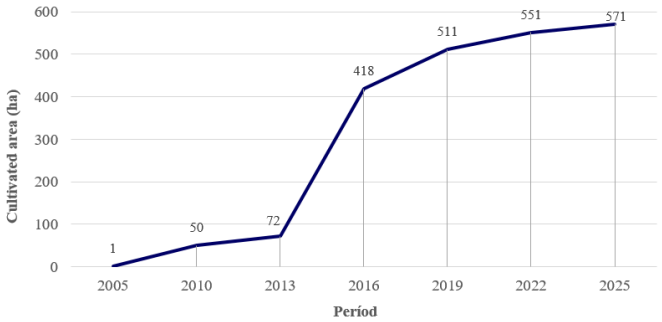

Figure 2 Expansion of mangosteen cultivated area in the Soconusco region, Chiapas. Period 2005–2025. Source: Producer survey.

Typology of mangosteen producers

According to the official registry of mangosteen growers, a total of 32 producers have been identified in the Soconusco region, each cultivating at least 0.5 hectares of this tropical fruit. A significant proportion of these producers manage plantations that are over ten years old, which has enabled them to accumulate substantial technical expertise in the agronomic management of the crop. Their long-term engagement with mangosteen cultivation reflects a deep understanding of site-specific practices and phenological cycles of mangosteen. In addition to mangosteen, all registered producers are involved in complementary economic activities linked to the agricultural, industrial, or commercial sectors. This diversification provides a stable financial base that allows them to cover the operational costs associated with plantation maintenance during the non-productive phase, which typically spans several years. Such financial resilience

is particularly relevant in perennial crops like mangosteen, where initial investment and delayed returns can pose barriers to entry for smallholders.

For those managing plantations older than a decade, mangosteen has become a significant source of income, contributing meaningfully to household and enterprise-level revenues. These experienced producers have expressed a clear interest in expanding their cultivated area, motivated by favorable market conditions, consistent demand, and the crop's high profitability relative to other regional alternatives such as rambutan, coffee, and cacao. This typological profile suggests the emergence of a semi-specialized cohort of producers with the capacity to scale operations, adopt technological innovations, and participate in coordinated value chain initiatives.

Producer organization

In 2023, the Mangosteen Producers Committee was established under the Local Agricultural Association of Fruit Growers of Soconusco, Chiapas (A.C.). The committee currently comprises 16 active members, all of whom are mangosteen growers in the region. Although still in its formative stage, the organization represents an initial step toward collective coordination and strategic representation within the emerging mangosteen sector. To date, the committee's actions have focused primarily on its legal constitution and the formulation of a unified position for price negotiations in the 2025 marketing cycle. While operational activities remain limited, the organization holds significant potential to evolve into a platform for technical collaboration, market integration, and institutional engagement.

Future opportunities for the committee include the development of shared agronomic protocols, coordinated post-harvest handling practices, and collective branding strategies aimed at positioning Soconusco mangosteen in premium national and international markets. Additionally, the organization could facilitate access to public funding, training programs, and certification schemes, which are often contingent upon formal group representation. The consolidation of this organization—despite its incipient nature—constitutes a key element in strengthening the competitiveness of the mangosteen value chain within both the Latin American and global market landscape.

Technological level of mangosteen cultivation

In the Soconusco region of Chiapas, the technological level of mangosteen cultivation is classified as medium to high. This classification is based on the partial mechanization of agricultural operations, the implementation of irrigation systems, access to specialized technical training, and a production model predominantly oriented toward international markets.[26,27] Various technology transfer activities implemented by the National Institute for Forestry, Agriculture and Livestock Research (INIFAP)—including field demonstrations, diagnostic visits, and producer workshops—have facilitated, to varying degrees, the adoption of agronomic management practices that contribute to raising the technological level and improving crop productivity.

Characteristics of mangosteen production units

In the Soconusco region of Chiapas, mangosteen plantations are predominantly established under private land tenure. These production units are distributed across an altitudinal range of 20 to 1000 meters above sea level, with plot sizes varying from 0.7 to 136 hectares. The most common plantation size ranges between 4 and 10 hectares, accounting for 52% of the total, while larger holdings exceeding 40 hectares represent approximately 20% of the area under cultivation. Plantations are primarily located on flat or gently undulating terrain, with slopes below 12%, often repurposed from previous agricultural or livestock activities. Approximately 80% of the plantations are equipped with irrigation systems, predominantly microsprinklers, which support water management during dry periods and contribute to yield stability. Planting distances typically follow 8 × 8 m or 7 × 7 m configurations between rows and trees, resulting in population densities of 156 and 196 trees per hectare, respectively. Around 40% of the plantations were established in intercropping systems with mature fruit trees such as mango or rambutan, which serve as shade providers during the early developmental stages of mangosteen. In these cases, shading is managed through gradual pruning and thinning of the companion species. Alternatively, some producers intentionally plant semi-perennial crops such as banana to provide shade and generate income during the non-productive phase. Another shading method involves constructing temporary structures covered with palm leaves or other organic materials.

During the pre-productive phase, mangosteen is relatively unaffected by pests and diseases. Consequently, maintenance activities during this stage focus primarily on weed control, fertilization, and irrigation—particularly during the dry season (January to April). Fertilization typically involves three to four applications per year of chemical fertilizers, occasionally supplemented with organic amendments such as manure or vermicompost. Irrigation volumes during the first year range from 10 to 15 liters per plant every third day, increasing by approximately 50% annually until the onset of the productive phase. In mature plantations, irrigation volumes vary according to tree age and soil moisture levels, ranging from 60 liters per tree in 6–7-year-old plantations to up to 330 liters per tree every third day in 14-year-old plantations. Irrigation frequency and volume are adjusted based on soil moisture monitoring, with the objective of maintaining field capacity throughout the dry season.

Mangosteen cultivation in the Soconusco region has demonstrated significant progress in terms of agronomic efficiency, driven by the gradual adoption of technical practices that optimize resource use and improve yield per unit area. From a sustainability perspective, the crop's inherently low phytosanitary requirements contribute to a reduced reliance on chemical inputs, minimizing environmental impact and production costs. In addition, the incorporation of organic amendments such as manure and vermicompost enhances the natural fertility of the soil and decreases dependence on external inputs. This low level of ecological disturbance, combined with the crop's compatibility with agroforestry systems, shapes a production model characterized by a high degree of environmental sustainability.

Harvest and post-harvest handling

In mangosteen plantations located at altitudes below 600 meters above sea level, the productive phase typically begins 5.5 to 6 years after establishment in the definitive field. The harvest period in these areas extends from the second half of April through the second half of July, occasionally reaching into early August. In contrast, plantations situated above 600 meters enter the productive phase later, generally between 7 and 8 years after establishment. In these higher-altitude areas, the harvest season spans from June to September, and in some years may extend to October.

Harvesting is carried out every third day, selecting fruits at varying stages of ripeness—typically those whose pericarp exhibits 75% to 90% pink coloration or is fully reddish. Once harvested, the fruits are transported to the packing area, where they undergo a preliminary selection based on physical appearance, maturity stage, and size. Following this selection process, the fruits are washed and placed in

30-kilogram plastic crates, then transported to packing facilities for commercialization.

Yield

Mangosteen yield increases with tree age, from an initial yield of 300–400 kg/ha^{-1} to 3.1 t/ha^{-1} in 14-year-old plantations (Figure 3). These yields are similar to those reported in other mangosteen-producing countries such as Vietnam and Malaysia, which is indicative of the productive potential of the Soconusco region for mangosteen cultivation.

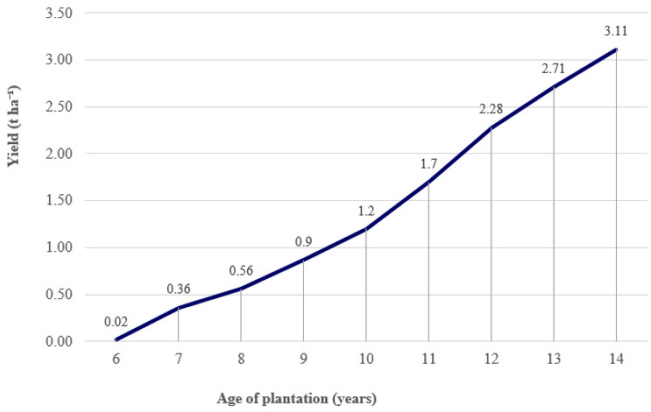

Figure 3 Average mangosteen yield in plantations of the Soconusco region, Chiapas. Source: Producer survey.

Regional production volume

Of the total 571 hectares planted with mangosteen in the Soconusco region, approximately 62.1% (equivalent to 354 ha) corresponds to plantations established prior to 2016. These areas are currently in the productive phase, with an estimated average yield of 3.1 t ha^{-1}, which in the 2025 agricultural cycle resulted in a regional production volume of 1,097.4 metric tons (MT). A significant increase in regional production volume is anticipated in the coming years, driven by two primary factors: (a) the progressive incorporation of plantation areas that are still in the vegetative development phase and are expected to enter production in the short to medium term, and (b) the gradual increase in yield among already established plantations, as a result of continued tree maturation and canopy expansion.

Marketing channels

Currently, 100% of the mangosteen production in Soconusco is marketed as fresh fruit, without undergoing any form of processing or transformation that could add commercial value. The harvested fruit is delivered by producers to various packing companies located in the municipalities of Tapachula and Metapa, Chiapas. Among the most prominent firms in terms of fruit volume handled are NGlobal, affiliated with NG Group JC; Naturafrut Bautista SAPI; and Marvellious Fruit International. While payment schemes vary slightly among companies, producers typically receive payment within 15 to 20 days following fruit delivery. The absence of value-added processing represents both a limitation and an opportunity for the regional mangosteen sector. Developing post-harvest transformation strategies—such as freezing and freeze-drying of the pulp or derivative product formulation—could enhance profitability, diversify market options, and strengthen the sector's resilience to price fluctuations in the fresh fruit market.

Fruit quality

Mangosteen fruit quality is defined by buyers based on specific criteria including individual fruit weight, external physical appearance, and internal damage caused by the physiological disorder known as translucent pulp. For the 2025 harvest, the company NGlobal established three commercial categories: a) First-grade fruits (≥64 g), b) Second-grade fruits (55–63 g), and c) Third-grade fruits (<55 g). In the evaluation conducted for the purposes of this study, based on marketing reports from two plantations, it was found that on average 76% of the fruits fell into the first and second categories (weighing more than 55 g), indicating a high proportion of export-quality fruit. These results are relatively consistent with findings reported in Indonesia, where it was observed that under moderate fruit load conditions (1,001–1,500 fruits per tree), 84.5% of the fruits exceeded 61 g in weight,[28] reinforcing the competitiveness of mangosteen production in the Soconusco region.

However, as in other mangosteen-producing countries, the physiological disorder known as translucent pulp remains one of the main challenges for commercial production in Soconusco, Chiapas. This phenomenon is characterized by the loss of the typical bright white color of the pulp, which becomes whitish and translucent, accompanied by a firm or crunchy texture. These changes hinder consumption and reduce market acceptance, particularly in export destinations.[28,29] A distinctive feature of this disorder is the absence of visible symptoms on the fruit's surface, making external inspection ineffective. Detection is only possible through internal examination at the point of consumption or via destructive sampling during commercial sorting processes. In the Soconusco region, packing companies routinely perform such sampling on fruit batches delivered by producers as a preventive measure to avoid shipping affected fruit. Although systematic records of its incidence are lacking, cases have been reported with up to 40% of fruits affected in certain lots (Ing. Antonio Vallejo Sonnelmann, personal communication). Several studies have attempted to clarify the causes of this disorder, though results remain inconclusive. Nonetheless, there is consensus that excessive water availability during the fruit's development and ripening stages is one of the most relevant predisposing factors.[28,29] This water surplus may disrupt osmotic balance and cellular structure within the pulp, leading to intracellular water accumulation and loss of firmness, which manifests as the translucent appearance observed.

Destination of production

The majority of mangosteen production in the Soconusco region is destined for export to the United States, managed primarily by specialized packing companies. Only limited volumes are marketed domestically, reaching cities such as Guadalajara, Monterrey, and Mexico City. Export logistics are conducted via land transport using refrigerated tractor-trailers, which ensure fruit preservation throughout the journey. Transit time from the city of Tapachula to key border points—McAllen (Texas), San Diego (California), and Nogales (Arizona)—ranges from three to four days (Source: Mangosteen exporter). These cities serve as strategic logistical nodes for the distribution of Mexican mangosteen within U.S. territory (Source: Mangosteen exporter). Once the product enters the North American market, it is distributed mainly to urban centers such as New York, San Francisco, and Los Angeles, which host high concentrations of migrant populations, particularly of Asian origin, who maintain dietary habits aligned with the consumption of this fruit. There are no official records of the volumes of mangosteen exported by Mexico, nor is such information accessible from exporting companies. However, for the Soconusco region, an approximate estimate of export volumes can be inferred based on the area in productive phase, average yields, and the proportion of fruit meeting export quality standards. In 2025, the area under productive mangosteen cultivation was estimated at 461 hectares, with an average yield of 3.1 metric tons

per hectare (Source: producer survey), resulting in a total production volume of 1,429.1 metric tons. During the same year, export-grade fruit (weighing >55 g) represented 76% of total production. Based on these figures, it is estimated that Mexican mangosteen exports in 2025 reached approximately 1,086 metric tons. However, it is important to note that exporting companies also source mangosteen primarily from Guatemala, which is subsequently exported under Mexican origin labeling. Therefore, it is highly probable that the volumes recorded as Mexican exports in international markets are significantly overestimated.

Selling price dynamics

During the 2020–2025 period, mangosteen prices have exhibited an upward trend. Price behavior follows a consistent pattern in which values are highest at the beginning of the harvest season (April–May) and gradually decline as the season progresses, reaching their lowest point toward the end of the harvest (July–August) (Figure 4). This pattern suggests an increased supply from Asian countries in U.S. markets—as previously noted, the primary destination for Mexican mangosteen exports—as the harvest season advances. It is also noteworthy that until 2022, the difference between initial and final prices did not exceed 30%. However, in the last three years (2023, 2024, and 2025), this gap has widened to as much as 49%, indicating either a greater supply and competitive pressure from other Latin American and Asian producers in U.S. markets, or a strategic pricing approach by marketing companies aimed at maximizing profit margins.

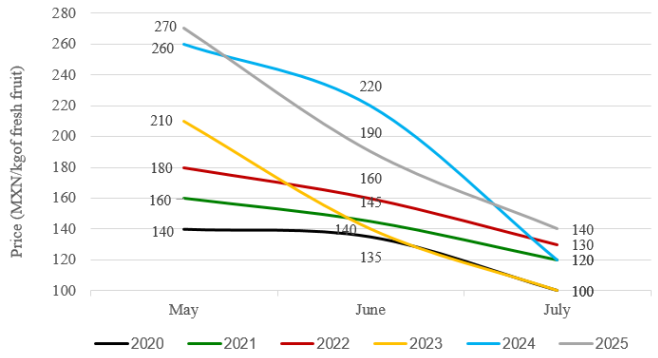

Figure 4 Historical annual behavior of mangosteen prices in the Soconusco region, Chiapas. Period 2020–2025. Source: Producer survey and sales receipts from NGlobal, NG Group JC.

Within the context of mangosteen price dynamics, the diversification of export markets toward emerging commercial destinations—such as Europe, the Middle East, and Canada—represents a strategic opportunity to reduce the sector's dependence on the U.S. market and to expand sales windows throughout the harvest season. By accessing alternative markets with different seasonal demands and consumer profiles, producers may mitigate the risks associated with price saturation and temporal oversupply in a single dominant destination. In parallel, the establishment of price monitoring mechanisms is essential to detect and prevent speculative practices that may adversely affect producers. Transparent and timely access to market information would enable stakeholders to make informed decisions and respond proactively to fluctuations in demand and pricing.

Profitability of mangosteen cultivation

Mangosteen cultivation in the Soconusco region has proven to be a highly profitable agricultural activity. Beginning in year 9 after establishment, plantations enter a phase of elevated productivity, reaching a benefit-cost (B/C) ratio of 3.26. This indicates that for every peso invested, producers obtain more than three pesos in gross revenue. Under this financial dynamic, full investment recovery is achieved by year 13, and by year 14, the return on investment reaches 104%, meaning that more than double the initial capital is recovered at that stage of plantation maturity. This level of profitability significantly exceeds that observed in other tropical crops cultivated in the region. For instance, coffee exhibits an average B/C ratio of 1.45,[30] cacao reaches 1.6 under traditional systems, and mango ranges between 1.8 and 2.2 depending on the variety and commercial destination.[31]

The superior economic performance of mangosteen is attributable to its increasing yield over time, stable market demand in export destinations, and relatively low maintenance costs once the plantation is established. These factors position mangosteen as a strategic crop for long-term investment, particularly in agroecological zones such as Soconusco, where climatic conditions and soil profiles are favorable for its development. Moreover, the extended productive lifespan of mangosteen trees —exceeding 60 years— and the potential for market diversification further enhance its financial viability. As such, mangosteen cultivation offers a compelling alternative for producers seeking to transition toward high-value perennial crops with export potential and sustained profitability.

Main constraints in mangosteen cultivation

In the Soconusco region of Chiapas, mangosteen producers face a series of agronomic and commercial challenges that directly affect crop performance and market viability. According to survey data, 100% of respondents identified the physiological disorder known as translucent pulp as the main problem in mangosteen cultivation. This disorder compromises the internal quality of the fruit without presenting visible symptoms on its surface, which hinders detection and significantly reduces acceptance in export markets. The absence of effective preventive measures makes it a persistent threat to profitability and post-harvest consistency.

The second most frequently reported issue, cited by 58.3% of producers, was fruit rejection by marketing companies. This rejection is usually associated with non-compliance with commercial standards related to fruit size, appearance, and internal quality. When the volumes of rejected fruit are high, the impact on producers' income is significant. Additionally, 25% of respondents reported damage caused by stingless bees (*Melipona* spp.), which affect the pericarp and diminish the external appearance of the fruit. Although this issue is less widespread, it represents a localized threat in certain mangosteen-growing areas. Finally, 16.7% of producers mentioned the small size of harvested fruits as a limiting factor, especially in young plantations or under suboptimal agronomic conditions. Reduced fruit caliber affects not only commercial classification but also yield per hectare and competitiveness in export markets. The problems identified by mangosteen producers highlights the need to strengthen local multidisciplinary research aimed at generating the knowledge and technological innovations required to address these challenges.

Conclusion

Mangosteen cultivation in the Soconusco region of Chiapas is currently undergoing a phase of productive and commercial consolidation which, combined with favorable international market conditions, creates an enabling environment for its development as a territorially integrated agro-industrial cluster. The growing global demand for mangosteen—particularly in markets such as the United States, China, the United Arab Emirates, and Europe—

represents a strategic opportunity for regional producers, who benefit from comparative advantages such as geographic proximity to North American markets, an earlier harvest window relative to Asian countries, and an exportable quality that exceeds 75% of total production.

The increasing segmentation of the market toward value-added products—such as freeze-dried pulp, nutraceutical extracts, and natural cosmetics—opens new avenues for value creation, commercial diversification, and positioning in emerging niche markets. The bioeconomic potential associated with mangosteen, derived from its bioactive compounds and functional applications, further reinforces its viability as a driver of agro-industrial innovation. The presence of production units with medium-to-high technological capacity, the adoption of modern irrigation systems, the emerging organization of producers, and an export-oriented approach constitute key elements for the formation of a cluster that integrates productive, commercial, logistical, and scientific actors. Such a cluster would enhance regional competitiveness and foster the development of technical and institutional capacities.

In this context, mangosteen not only remains a profitable economic alternative for the Soconusco region, but also represents a strategic platform for territorial development, agro-industrial innovation, and the competitive integration of Chiapas into international markets. The establishment of a mangosteen agro-industrial cluster in Soconusco thus emerges as a timely and necessary pathway to capitalize on global opportunities and ensure the long-term technical, economic, and social sustainability of the crop.

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Conflicts of interest

The authors declare no conflict of interest exists.

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