Colegio de Postgraduados

Cluster Analysis as a Strategy to Contribute to the Competitive Advantage of Mangos from Guerrero, Mexico

Romero-Romero, Yair[1]; Ruvalcaba-Sánchez, Loecelia[2]; Bautista-Santos, Horacio[3]; Sánchez-Gómez, Julia[1*]

[1] Consejo Nacional de Humanidades Ciencias y Tecnologías (CONAHCYT) comisionado al Centro de Investigación y Asistencia en Tecnología y Diseño del Estado de Jalisco A.C. (CIATEJ), Av. Normalistas 800, Colinas de La Normal, Guadalajara, Jalisco, México, C. P. 44270.
[2] Centro de Investigación en Ciencias de Información Geoespacial, A.C. (CentroGEO), C. Contoy 137, Lomas de Padierna, Tlalpan, Ciudad de México, CDMX, C. P. 14240.
[3] TecNM/ITS de Tantoyuca, TecNM/ITS de Chicontepec, México, Desviación Lindero Tametate S/N, La Morita, Tantoyuca, Veracruz, C. P. 92100.
* Correspondence: jsanchez@ciatej.mx

ABSTRACT

Objective: To analyze mango production and industrialization in Guerrero, Mexico, in order to identify its components, dynamics, and areas of opportunity, stimulating the development of a mango cluster.

Design/Methodology/Approach: This research is based on Porter's Five Forces methodology, adapted to the agri-food industry. Data were collected through semi-structured surveys in Técpan de Galeana and Cuajinicuilapa, Guerrero. In addition, a systematic literature review (SLR) was conducted along with database analysis.

Results: The Guerrero mango supply chain (SC) was mapped, identifying three main challenges: high input costs, lack of price regularization, and the lack of interest shown by young people in agricultural work. Sinaloa and Chiapas were also identified as the main competitors, both in terms of production volume and competitive advantages.

Findings/Conclusions: Enhancing the coordination within the supply chain and implementing strategies are important to mitigate high costs and power asymmetries in negotiations with suppliers and buyers. Furthermore, the significance of developing a cluster to enhance the competitiveness of the Guerrero mango against its competitors is emphasized.

Keywords: cluster, competitiveness, mango industry, agricultural producers.

Citation: Romero-Romero, Y., Ruvalcaba-Sánchez, L., Bautista-Santos, H., & Sánchez-Gómez, J. (2024). Cluster Analysis as a Strategy to Contribute to the Competitive Advantage of Mangos from Guerrero, Mexico. *Agro Productividad*. https://doi.org/10.32854/agrop.v17i10.3015

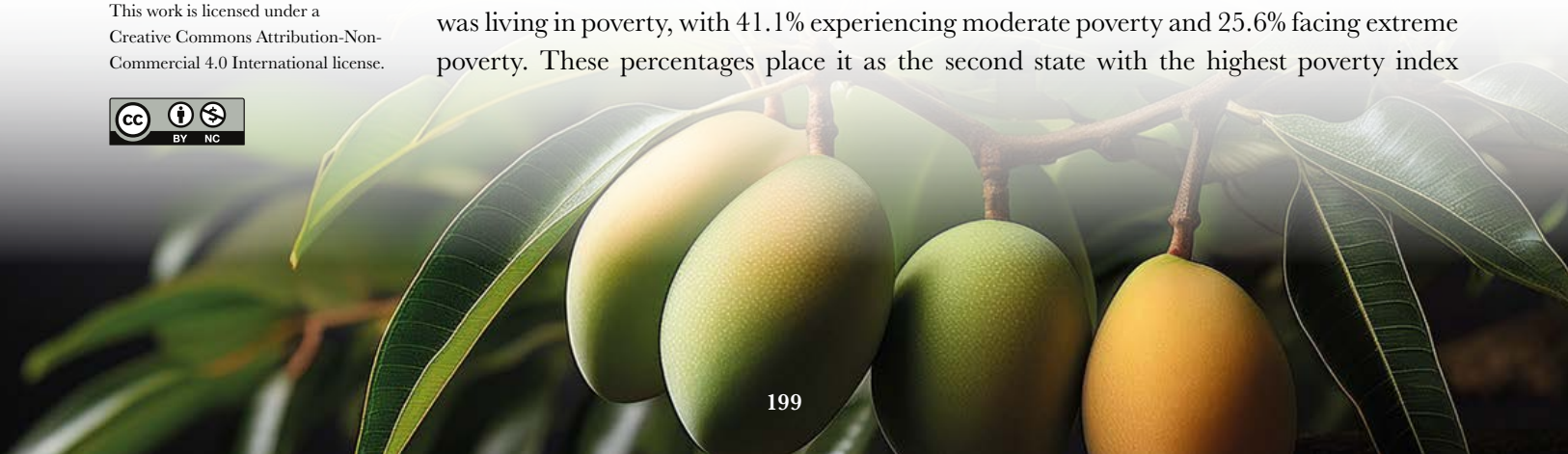
Academic Editor: Jorge Cadena Iñiguez
Associate Editor: Dra. Lucero del Mar Ruiz Posadas
Guest Editor: Daniel Alejandro Cadena Zamudio

Received: July 12, 2024.
Accepted: September 05, 2024.
Published on-line: November 12, 2024.

Agro Productividad, 17(10). October. 2024. pp: 199-210.

INTRODUCTION

The state of Guerrero is located in southwestern Mexico. It covers an area of 64,281 km^2 (3.2% of the national territory). In 2020, the state had 3,540,685 inhabitants, making it the thirteenth most populated state in the country. Nevertheless, 66.7% of the population was living in poverty, with 41.1% experiencing moderate poverty and 25.6% facing extreme poverty. These percentages place it as the second state with the highest poverty index



in Mexico, only below Chiapas (INEGI, 2020). In 2023, the primary sector, especially agriculture, was the main source of employment, with 24.6% of the state's total population engaged in this sector (Data Mexico, 2022). The average monthly income from this activity is estimated at 1.14 units of measure and update (UMA) per day ($3,551 MXN), which fails to cover the cost of the basic food basket and services, whose value amounts to 1.39 UMA per day ($4,332 MXN) (Observatorio Laboral, 2023; Statista, 2023). In 2022, mango was the most produced fruit in Guerrero, with a production value of $3,347,381,089 MXN (SIAP, 2022).

The association of rural issues with agriculture has led to the prioritization of agricultural strategies to tackle poverty and rural development. However, the Inter-American Institute for Cooperation on Agriculture (IICA, 2023) proposes a new focus on competitiveness, based on the relationships between the links in the value chain (Tapia, Aramendiz, Pacheco, & Montalvo, 2015). One of the strategies that has been shown to promote development in regions with high levels of marginalization and unemployment is the formation of clusters (Yekimov *et al.*, 2024). A "cluster" is a geographic concentration of interconnected companies and institutions in a particular field that complement each other (Porter, 1998). The strength of clusters lies in the improvement of the coordination and synchronization of its elements (López Jiménez *et al.*, 2016), reducing the probability of interruptions in the supply chain (SC) (Lis and Lis, 2023; Bao and Blanco, 2014). Similarly, it fosters competition among members, encouraging them to consider research, development, and innovation (R+D+I) as a strategy to differentiate themselves and be more competitive (Lehene *et al.*, 2024).

In light of the benefits of clusters and the circumstances of the population of Guerrero, this research analyzes the production and industrialization of mangos in Guerrero, Mexico. The aim is to identify the key components, dynamics, and areas of opportunity that could kickstart the development of a mango cluster.

MATERIAL AND METHODS

The project began with an analysis of the production and industrialization of mango cultivation in the state of Guerrero. This stage involved the collection and subsequent analysis of primary information obtained through semi-structured surveys conducted in two municipalities of the state in 2023. The said municipalities were selected due to the willingness of producers to participate and their representativeness in mango production. The first municipality and largest producer in the state was Técpan de Galeana, where five plantations located in the town of Luis San Pedro were visited. The second municipality and third largest producer was Cuajinicuilapa, where two workshops were held with the participation of 25 small-scale producers, who owned plantations between 1 and 10 ha.

Furthermore, a systematic literature review (SLR) was conducted using key databases, including Scopus, Web of Science, EBSCO and Google Scholar. At the same time, studies and databases from the official websites of the following agencies were analyzed: the Agrifood and Fisheries Information Service (SIAP), the Agricultural Consultation Information System (SIACON), the Ministry of Agriculture and Rural Development (SADER), the National Institute of Statistics and Geography (INEGI), Empacadoras de

Mango de Exportación A.C. (EMEX), the National Population Council (CONAPO), the National Employment Service (SNE), the Food and Agriculture Organization of the United Nations (FAOSTAT).

The information obtained was used in the application of Porter's Five Forces methodology (2017), with adaptations made to align it with the specific characteristics of the agri-food industry (Figure 1).

RESULTS

The favorable soil and climatic conditions for mango production, combined with its organoleptic properties, have contributed to the expansion of its cultivation to 23 of the 32 Mexican states. Its national production grew 112.91% from 2012 to 2022 (SIAP, 2023), while mango consumption per capita reached 13.8 kilograms (Secretaría de Agricultura y Desarrollo Rural, 2024).

Overall, small-scale production can be divided into five levels (Figure 2). The first level comprises suppliers, primarily of machinery, equipment, inputs, and services. The second

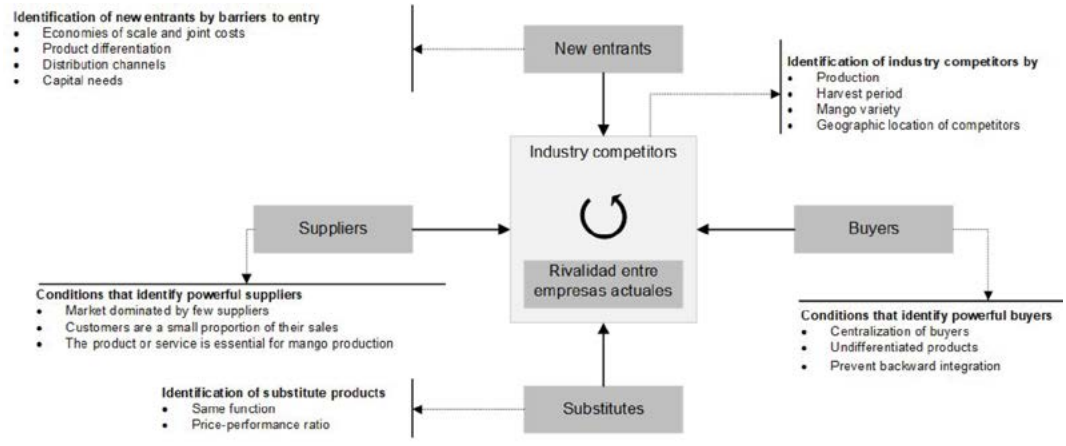


Figure 1. Porter's Five Forces (Porter, 2017).

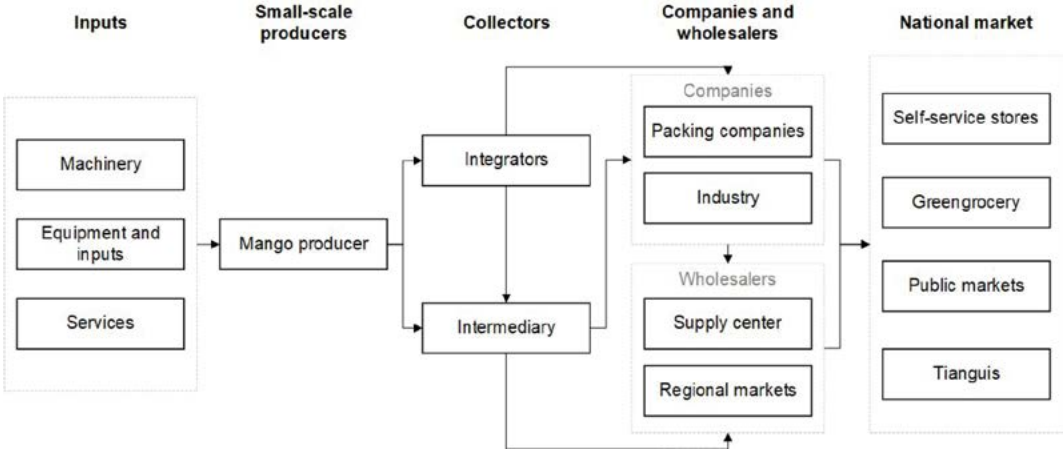


Figure 2. Supply chain of mango in Guerrero.

level consists of producers. The third level includes middlemen, who consolidate production through integrators or formally constituted companies, as well as intermediaries, who are mostly individuals who neither own or belong to an incorporated company. The fourth level encompasses companies that prepare or process mango, along with wholesalers who seek to distribute it in other markets. The final level is made up of the national market, which is accessed through supermarkets, markets, and grocery stores (SIAP, 2023).

Mango growers face several significant challenges, including high input and service costs, the impact of climate change, and the price at which their product is purchased (Figure 3).

Competition between existing companies

The following section summarizes the production, harvest season, variety, and geographic location of the main competitors of mangos from Guerrero.

Production

The states of Sinaloa, Guerrero, Nayarit, Chiapas, Oaxaca, and Michoacán are responsible for 84.7% of the Mexican mango production. Sinaloa is main producer, with 517,119.2 tons of mango in 2023 and a 128.8% growth rate in sown area (GRSA), reaching 49,133 ha at the end of the study period. It is also the leader in organic mango production and has the largest irrigated area (64.1%).

The increase in SA and production is attributed to the diversification of markets and the exploitation of key competitive advantages (Junaidi *et al.*, 2024; Egbadzor *et al.*, 2023). The 6,286 orchards registered in Sinaloa cover 46,710 ha whose produce is exported to the European Union, United States, and Japan, among others (SENASICA, 2024).

Chiapas recorded a 46.1% growth rate in sown area (GRSA), the second highest SA used to grow mango in the country (38,781.8 ha). This increase has driven the production growth rate (PGR) to 68.0%, resulting in the production of 272,174.5 tons of mango.

Although Guerrero is the second largest producer, it has the lowest PGR (22.1%) among the main producing states. Its production reached 415,688.8 tons, due to a yield of 15.72

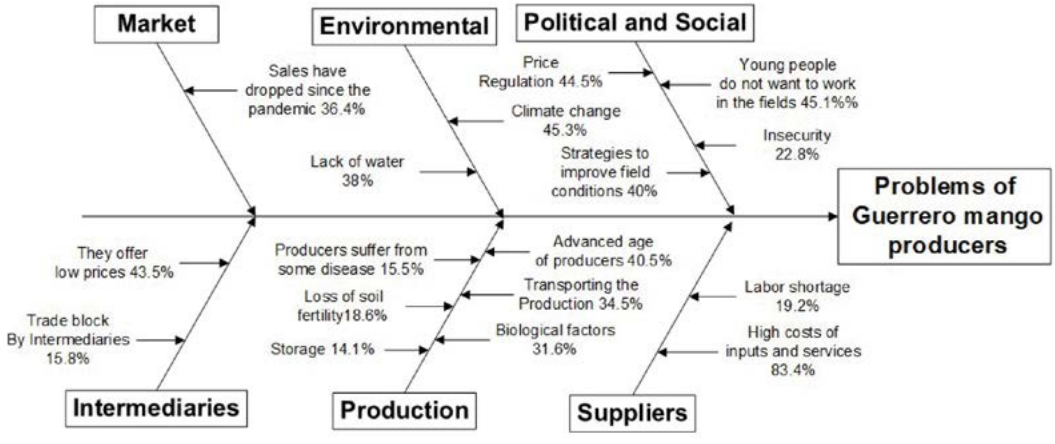


Figure 3. Problems of mango growers in Guerrero.

Table 1. States with the largest mango production in Mexico (2012-2022).

State [a]	TCSS [b]	TCP [c]	SS [d]	P [e]	MPR [f]	MPT [g]	TPC [h]	TPO [i]
Sinaloa	20.7%	128.8%	49,133.0	517,119.2	31,494.3	17,638.7	90.3%	9.7%
Guerrero	11.4%	22.1%	27,490.8	415,688.8	18,913.7	8,577.1	100.0%	0.0%
Nayarit	9.9%	35.6%	29,441.6	329,623.8	5,358.4	24,083.2	99.5%	0.5%
Chiapas	46.1%	68.0%	38,781.8	272,174.5	4,304.8	34,477.0	99.6%	0.4%
Oaxaca	9.7%	56.8%	19,344.3	214,478.6	2,418.0	16,926.3	99.8%	0.2%
Michoacán	15.8%	49.9%	26,110.9	200,119.3	25,510.3	600.6	89.2%	10.8%

SIAP (2023).
[a] Producing state. -[b] Growth rate of sown area. -[c] Production growth rate. -[d] Sown area in hectares. -[e] Production in tons. -[f] Irrigated production in hectares. -[g] Rainfed production in hectares. -[h] Type of conventional production. [i] Type of organic production.

t/ha —the second highest yield after Sonora (17.57 t/ha). Guerrero has 123 plantations (431.19 ha) whose produce is exported to the United States and the European Union (SENASICA, 2024). Since the mango industry of Guerrero has been surpassed by the production of Sinaloa and the GRSA of Chiapas, these two states are the main competitors of Guerrero, in terms of mango production.

Harvest season

In this heading, Guerrero competes with Nayarit, Chiapas, Oaxaca, Michoacán, Colima, and Veracruz (Figure 4). Sinaloa and Colima have gained competitive advantages with late production. According to Siller-Cepeda *et al.* (2009), mangos harvested at this stage lose less weight, are firmer, and have a tempting flesh color, making them more attractive and tastier. In addition, harvesting mangos at the end of the production cycles of other states reduces competition and facilitates their positioning in the market at better prices.

Mango variety and geographical location

Eight varieties of mango are grown in Guerrero, three out of which (Manila, Ataulfo and Haden) account for 85.0% of the state production. Veracruz, Chiapas, Oaxaca and Michoacan grow the same varieties and are therefore Guerrero's main direct competitors (Figure 5).

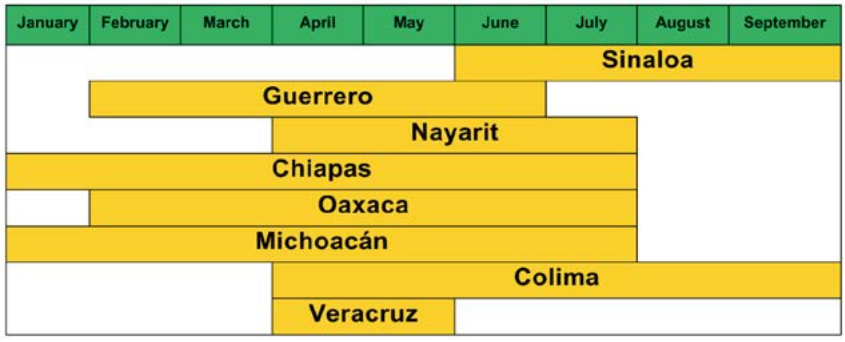


Figure 4. Months of mango production per state (Imagen del Golfo, 2019; Villanueva, 2016).

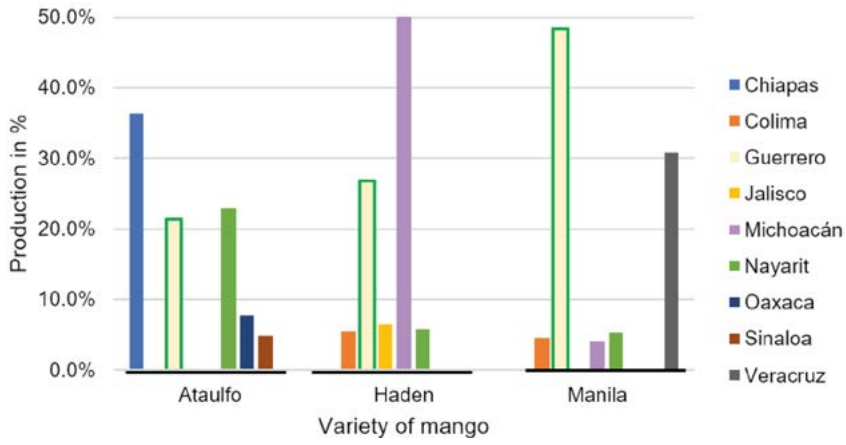


Figure 5. Main producers of Ataulfo, Haden, and Manila mangos.

Guerrero and Veracruz are the major producers of Manila mango, accounting for 79.1% of the domestic production. In the case of the Ataulfo mango, 85.4% of the domestic production comes from Chiapas, Nayarit, Guerrero, and Oaxaca. Finally, 77.2% of the Haden mangos are produced in Michoacán and Guerrero.

The joint production of these varieties, as well as the geographical closeness, promotes the competition for the main markets between Chiapas, Guerrero, Michoacán, Nayarit, Oaxaca, and Veracruz.

Suppliers

Identifying the existing bargaining power between suppliers and customers is important, because the profitability of the less powerful actor can be compromised, as can be seen in the case of small-scale mango producers from Guerrero. According to Michael Porter (2017), when the bargaining power is held by suppliers, the market is dominated by a few of them, customers are not a significant proportion of their sales, and the product or service offered by the supplier is essential for the customer.

In a market dominated by a limited number of suppliers, customers are forced to accept the prices, quality, and conditions of the transaction (Porter, 2017). In the mango industry of Guerrero, the availability of suppliers is not constrained by offer, but rather by the purchasing power of mango producers.

Astudillo-Miller *et al.* (2020) found that 36.5% of growers have their own machinery, while 52.7% use leased machinery. Meanwhile, producers with greater economic capacity tend to acquire equipment and inputs in the local informal market (INEGI, 2019). For their part, 63.6% of growers lack this capacity and consequently often rely on credit from packing companies or intermediaries, which frequently result in higher prices than those in the market. This financial dependence forces producers to sell their harvest to the lender, who also sets the purchase price, further limiting the bargaining power of the producer.

Another indication that suppliers are the primary decision-makers is that independent small-scale growers in Guerrero do not represent a significant proportion of the sales of the suppliers. In light of these circumstances, several authors, including Ahoda *et al.*

(2024), Guyalo and Ifa (2023), Ordóñez-Trujillo *et al.* (2023), and Zhu and Wang (2024) have proposed establishing or strengthening agricultural cooperatives as a strategic organizational approach. This organizational structure will enable them to make bulk purchases, share joint costs, be jointly represented, and open new markets, among other activities. As a result, suppliers will view the organization as a more important client, offering reasonable prices and other services (such as technical assistance).

When the product or service provided by the supplier is essential to the customer, the bargaining power of the supplier increases. According to SIAP statistics (2023), 100% of the mango production in Guerrero is conventional. Therefore, the most common method to control pests, weeds, and diseases and to fertilize the soil is the use of synthetic chemicals. Such practices have several disadvantages, including soil and water pollution, health risks to farmers and consumers, adverse effects on plants, and high input costs (Şener *et al.*, 2020). To reduce reliance on chemical products, Espinoza *et al.* (2022) suggest exploring agroecological alternatives for agricultural production. These measures could enhance the management capacity of the producers, reduce input purchase costs, and introduce them to the organic food production trend.

Buyers

Buyers have the power to set product prices, negotiate for better quality or additional services, and, in this case, confront producers with each other. Buyer empowerment is facilitated by the following conditions: centralization of buyers, undifferentiated products, and avoidance of backward integration.

In Guerrero, 70.3% of mango purchases are made through local middlemen, 21.6% through local markets, fruit processors, or sale points, and 8.1% through packers (Astudillo-Miller *et al.*, 2020). An alternative proposed by Balcom *et al.* (2023) and Connolly *et al.* (2022) is the use of short supply chains (SSC), which allow farmers to sell directly to consumers. This model is designed to promote family farming, improve their economic income, and avoid the monopoly of intermediaries.

Adding value along the supply chain is a strategic aspect that improves trading conditions, quality, variety, safety, and consumer access. However, most agricultural growers sell their harvest outside their own orchard, which results in a lack of differentiation in their production (IICA, 2014). This standard purchase option allows customers to have a wide range of choices, as the characteristics of the mango remain consistent.

Backward or forward integration in the agri-food supply chain reduces costs while also improving competitiveness. Furthermore, it reduces uncertainty and also fosters long-term relationships among participants, eliminates information barriers, and ensures equitable risk and profit sharing (Fusacchia *et al.*, 2022; Wang *et al.*, 2023).

However, some buyers engage in commercial blocking and abuse, and promote information asymmetries to achieve "significant appropriation," which is a term associated with an income that is proportionally higher than the service provided or the contribution to the value generated by the chain as a whole (Gaudin and Padilla, 2020). The supply chains of mangos produced in Guerrero frequently face this situation (Astudillo-Miller *et al.*, 2020).

Alternatives

Mango is a sweet, juicy, and fleshy fruit that is mainly consumed fresh. As a result, it is more expensive than other fruits and it becomes vulnerable to competition from other cheaper fresh and processed products. Mango is one of the most highly valued fruits in the market. In July 2024, the average price of Ataulfo and Manila mangso in the Central de Abasto (central market) of Iztapalapa, Mexico City, reached $26.8 MXN per kg, while Haden mango cost $14.29 MXN per kg (SNIIM, 2024). The high cost of this fruit leads consumers to choose cheaper alternatives, such as other fresh fruits or processed foods. Mexico has other popular fresh fruits that consumer can afford: orange (with a *per capita* consumption of 36.9 kg and an average price of $14.0 MXN per kg), lemon (with a *per capita* consumption of 18.6 kg and an average price of $13.2 MXN per kg), and banana (with a *per capita* consumption of 15.9 kg and an average price of $18.9 MXN per kg) (SNIIM, 2024; Statista, 2022).

The high demand for processed and ready-to-eat mango products can be attributed to their extended shelf life and their convenient storage and transportation. Furthermore, they are available out of season in a wide variety of presentations, including porridges, conserves, jams, ice cream, dried fruit, juices, and more. These products have innovative flavors and reduce waste (The Food Tech, 2024).

Since prices are subject to fluctuation in the Mexican market, considering the impact of competition is fundamental to enhance processes and diversify commercial strategies that contribute to the ongoing competitiveness of mangos produced in Guerrero.

New participants

In order to prevent the entry of new participants in the industry, Porter (2017) proposes the creation or reinforcement of six barriers to entry. In the case of the mango industry of Guerrero, four barriers were considered: economies of scale and joint costs, product differentiation, distribution channels, and capital needs.

Eighty-percent of small-scale mango producers have neither achieved economies of scale nor identified joint costs that can reduce the cost of mango production. The cost of production varies among plantations, between $3,520.9 to $8,689.2 MXN per ton (Cabañas, 2016). The price per ton in 2022 was reported at $8,141.0 MXN (Government of Guerrero, 2024).

Product differentiation

Three types of differentiators were considered. 1) Price differentiation. Growers in Guerrero have reported that, in order to sell their production, they often have to sell it cheaper than the competition, which results in minimal or no profit at all. However, cost differentiation does not necessarily entail lower prices. Instead, it involves providing added value to the customer (*e.g.*, service, quality, and experience), for the same price. 2) Differentiation through advertising and marketing. The mango from Guerrero has been advertised in various media, including television, radio, and internet websites. These advertisements are primarily the responsibility of the state government. However, in addition to the advertisement itself, an effective advertising and marketing strategy

requires a comprehensive plan, market research, segmentation, positioning, analysis, and adjustment. Therefore, no differentiation can be found between the advertising and the marketing. 3) Differentiation by quality and traceability. This step includes the monitoring of mangos throughout the supply chain, to guarantee the quality and safety of the product and consumer health. Small-scale mango growers are unable to achieve this level of differentiation, as they often lack the ability to identify their position within the supply chain.

Distribution channels

More exclusive distribution channels and a stronger trust (linkage) reduces the risk of new participants. However, in the mango industry of Guerrero, exclusivity between producers and middlemen is not reciprocal. The commercial blockade suffered by the mango growers and the imposition of prices by the middlemen cause distrust. Additionally, middlemen allow any products that give them a higher yield to go through the channels.

Capital needs

The capital required to join a supply chain is a significant barrier for mango producers in Guerrero, limiting their ability to participate in new markets, both domestic and foreign. Mexico is the sixth largest producer of mangos in the world, contributing 4.3% of the total production (FAOSTAT, 2022). It is the leading exporter-producer, with 14 countries as its main clients. However, the United States and Canada purchase 98.7% of Mexico's exports (EMEX, 2022), highlighting the significance of these markets for the Mexican mango industry. The Republic of India, the world's largest mango producer, poses a significant risk. Its production accounts for 43.2% of the global production (FAOSTAT, 2022). India exports mangos to 104 countries, mainly to Saudi Arabia, the Netherlands, the United Arab Emirates, and Nepal. An increased international competition could arise, if India seeks to expand its presence in the markets where Mexican mangos are currently positioned.

CONCLUSIONS

The mango industry of Guerrero must undergo a strategic restructuration, integrating key players into a cluster that will strengthen relationships within the supply chain. This proposal involves the use of alternative inputs to reduce dependence on suppliers, as proposed by Espinoza *et al.* (2022) and the creation of direct markets through short supply chains (Balcom *et al.*, 2023; Connolly *et al.*, 2022). In order to address the challenges of high costs and significant losses, both tactical and operational solutions must be implemented. If mangos from Guerrero are to compete on a global scale, losses in the chain, which currently reach 54% (Romero-Romero *et al.*, 2024), must be minimized and market diversification and quality certification mechanisms should be explored. The implementation of public policies that facilitate the access of small growers to financial and technological resources is essential to stimulate the growth of the industry. These initiatives will not only enhance the competitiveness of mangos from Guerrero, but will also boost economic and social development in the region, creating employment opportunities and reducing poverty in rural areas.

ACKNOWLEDGMENTS

The authors are grateful for the support received to carry out the field work through the FORDECYT-292474 project "Estrategias multidisciplinarias para incrementar el valor agregado de las cadenas productivas del café, frijol, agave mezcalero y productos acuícolas (tilapia) en la región Pacífico Sur a través de la ciencia, la tecnología y la innovación".

REFERENCES

Ahado, S., Hejkrlik, J., Ratinger, T., & Kepuladze, T. A. (2024). Supported cooperative groups and the economic performance of small farmers: evidence from Georgia. *Journal of Development Effectiveness, 16*(1), 101-117. https://doi.org/10.1080/19439342.2022.2158902

Astudillo-Miller, M. X., Maldonado-Astudillo, R. I., Segura-Pacheco, H. R., & Pallac, M. Y. (2020). Cadenas de comercialización de mango y potencial exportador en la Costa Grande, Guerrero. *Revista Mexicana de Ciencias Agrícolas, 11*(1), 111-124. https://doi.org/10.29312/remexca.v11i1.1769

Balcom, R., Yiridoe, E. K., & Hartt, C. M. (2023). Sustainable production and distribution practices in Atlantic Canadian short food supply chains: Explorative study. https://doi.org/10.3389/fsufs.2023.1121006

Bao, Cruz., & Blanco, Silva. (2014). Modelos de formación de clústers industriales: revisión de las ideas que lo sustentan. *Revista Galega de Economía, 23*(2), 179-198.

Cabañas, M. R. (2016). Rentabilidad y competitividad, la producción de mango ataulfo en el municipio de Técpan de Galeana, Guerrero. [Colegio de Postgraduados]. http://colposdigital.colpos.mx:8080/xmlui/handle/10521/3595

Connolly, R., Bogue, J., & Repar, L. (2022). Farmers' Markets as Resilient Alternative Market Structures in a Sustainable Global Food System: A Small Firm Growth Perspective. *Sustainability (Switzerland), 14*(18). https://doi.org/10.3390/su141811626

Data México. (2022). Guerrero. Data México. https://www.economia.gob.mx/datamexico/es/profile/product/figs-pineapples-avocados-guava-mangoes-fresh-or-dried?redirect=true&timeNetTradeSelector=Year

Egbadzor, K. F., Akuaku, J., & Aidoo, M. K. (2023). Potentials of baobab: A complement to cocoa production. En *Journal of Agriculture and Food Research* (Vol. 11). Elsevier B.V. https://doi.org/10.1016/j.jafr.2023.100496

EMEX. (2022). Emex | Importación y exportación de mango en México. https://www.mangoemex.com/exportacion-importacion-de-mango-de-mexico/

Espinoza, M. S., Calderón, S. M., & Altamirano, M. S. (2022). Aceptación y uso de tecnologías alternativas para mejorar la calidad de los productos agrícolas. *Revista de Investigación Académica Sin Frontera: División de Ciencias Económicas y Sociales*, 37, 11. https://doi.org/10.46589/rdiasf.vi37.453

FAOSTAT. (2022). Comercio de cultivos y productos de ganadería, exportaciones de México. https://www.fao.org/faostat/es/#data/QCL

Fusacchia, I., Balié, J., & Salvatici, L. (2022). The AfCFTA impact on agricultural and food trade: A value added perspective. *European Review of Agricultural Economics, 49*(1), 237-284. https://doi.org/10.1093/erae/jbab046

Gaudin, Y., & Padilla, P. (2020). Los intermediarios en cadenas de valor agropecuarias: un análisis de la apropiación y generación de valor agregado (Vol. 186). www.cepal.org/apps

Gobierno del Estado de Guerrero. (2024). La SEFODECO promueve darle un valor agregado al mango, a través del IMPI. Gobierno del Estado de Guerrero. https://www.guerrero.gob.mx/2024/01/la-sefodeco-promueve-darle-un-valor-agregado-al-mango-a-traves-del-impi/#:~:text=Durante%20la%20reuni%C3%B3n%20se%20dio,mil%20347%20millones%20de%20pesos.

Guyalo, A. K., & Ifa, L. T. (2023). Impact of agricultural cooperatives on the food security status of households in Oromia regional state, Ethiopia: The case of Halu Woreda. *Cogent Economics and Finance, 11*(2). https://doi.org/10.1080/23322039.2023.2237716

IICA. (2014). Manual de Capacitación Elementos para la formulación e implementación de políticas públicas. http://www.iica.int

Imagen del Golfo. (2019). Producción de mango en Veracruz, desplazada por caña y malanga. Imagen del Golfo. https://imagendelgolfo.mx/veracruz/produccion-de-mango-en-veracruz-desplazada-por-cana-y-malanga-/522681

INEGI. (2020). Población en situación de pobreza por entidad federativa según grado, 2018, 2020 y 2022. Instituto Nacional de Estadística, Geografía e Informática. https://www.inegi.org.mx/app/tabulados/interactivos/?pxq=Hogares_Hogares_15_9954f9c6-9512-40c5-9cbf-1b2ce96283e4&idrt=54&opc=t

Junaidi, A., Mashar, A. Zum, Basrowi, Muharomah, D. R., Situmorang, J. W., Lukas, A., Asgar, A., Herlina, L., Manalu, L. P., & Payung, L. (2024). Enhancing sustainable soybean production in Indonesia:

evaluating the environmental and economic benefits of MIGO technology for integrated supply chain sustainability. *Uncertain Supply Chain Management, 12*(1), 221-234. https://doi.org/10.5267/j.uscm.2023.10.003

Lehene, C. F., Jaradat, M., & Nistor, R. L. (2024). An Interdisciplinary and Multilevel Analysis of Local Economy Determinants and Their Impact on Firm Performance—Considering Porter's Diamond Model, Clusters, and Industry. *Systems, 12*(3). https://doi.org/10.3390/systems12030082

Lis, A. M., & Lis, A. (2023). Proximity and the Cluster Organization. En Proximity and the Cluster Organization. Routledge. https://doi.org/10.4324/9781003194019

López Jiménez, J., Martínez Gutiérrez, B., Emilio, P., Malpica, H., & Rodríguez Barquero, R. (2016). Desempeño de Clústeres. En TEC Empresarial (Vol. 10, Número 1).

Observatorio Laboral. (2023). Ocupación por sectores económicos Cuarto trimestre 2023. Observatorio Laboral/Servicio Nacional del Empleo. https://www.observatoriolaboral.gob.mx/static/estudios-publicaciones/Ocupacion_sectores.html

Ordóñez-Trujillo, K., Valdiviezo-Ocampo, G., Ayala-Ortiz, D., & Fletes-Ocón, H. (2023). Estrategias de los pequeños productores de mango de la región Istmo-Costa de Oaxaca y Chiapas ante los retos y problemática del auge agroexportador. Estudios sociales. *Revista de alimentación contemporánea y desarrollo regional, 33*(61), 1-25. https://doi.org/https://doi.org/10.24836/es.v33i61.1305

Porter M. (2017). Estrategia Competitiva. Técnicas para el análisis de los sectores industriales y de la competencia: Vol. 2da. (2da.). Patria.

Porter, M. E. (1998). Clusters and Competition: New Agendas for Companies, Goverments, and Institutions. Harvard Business School Press, 1(1).

Romero-Romero, Y., Sánchez-Gómez, J., & Olvera-Vargas, L. A. (2024). Análisis de la pérdida de alimentos en la cadena de suministros. Aprendizajes en la ruta hacia el Intercambio de saberes entre la comunidad y la academia en sistemas de producción de alimentos, 1. https://doi.org/https://doi.org/10.5281/zenodo.11043763

Secretaría de Agricultura y Desarrollo Rural. (2024). Panorama Agroalimentario. La ruta de la transformación agroalimentaria 2018-2024. https://drive.google.com/file/d/1oIztI_imbDmrRa6miTQjPVVaD1oXKaqm/view

SENASICA. (2024, abril 17). Huertos autorizados para exportación de mango. Servicio Nacional de Sanidad, Inocuidad y Calidad Agroalimentaria . https://www.gob.mx/senasica/documentos/huertos-autorizados-para-exportacion-de-mango?state=published

Şener, S., Türemiş, N. F., & Tanır, F. (2020). Agrochemical usage for sustainable fruit production and human health. En Agrochemicals Detection, Treatment and Remediation: Pesticides and Chemical Fertilizers (pp. 291-305). Elsevier. https://doi.org/10.1016/B978-0-08-103017-2.00012-X

SIAP. (2022). Anuario Estadístico de la Producción Agrícola. Cierre de la producción agrícola. https://www.gob.mx/siap/acciones-y-programas/produccion-agricola-33119

SIAP. (2023). Anuario Estadístico de la Producción Agrícola. Servicio de Información Agroalimentaria y Pesquera. https://nube.siap.gob.mx/cierreagricola/

Siller-Cepeda, J., Muy-Rangel, D., Báez-Sañudo, M., Araiza-Lizarde, E., & Ireta-Ojeda, A. (2009). CALIDAD POSCOSECHA DE CULTIVARES DE MANGO DE MADURACIÓN TEMPRANA, INTERMEDIA Y TARDÍA POSTHARVEST QUALITY OF MANGO CULTIVARS OF EARLY, MIDDLE AND LATE SEASONS. En Artículo Científico *Rev. Fitotec. Mex* (Vol. 32, Número 1).

SNIIM. (2024). Sistema Nacional de Información e Integración de Mercados. Secretaría de Economía. http://www.economia-sniim.gob.mx/nuevo/

Statista. (2022). Consumo anual per cápita de algunas frutas en México en 2022, por tipo(en kilogramos). Statista. https://es.statista.com/estadisticas/592164/consumo-anual-percapita-de-las-principales-frutas-en-mexico/#:~:text=Adem%C3%A1s%20de%20ser%20la%20fruta,36%2C9%20kilogramos%20en%202022.

Statista. (2023). Precio promedio de servicios del hogar y de telecomunicaciones en México en diciembre de 2023, por producto. Statista. https://es.statista.com/estadisticas/643343/precio-en-euros-de-los-diferentes-servicios-ofrecidos-mexico/#:~:text=El%20precio%20promedio%20de%20servicios,revelados%20en%20diciembre%20de%202023.

The Food Tech. (2024, enero 14). Alimentos procesados: tendencias, calidad y seguridad en el mercado Latinoamericano. The Food Tech. https://thefoodtech.com/nutricion-y-salud/alimentos-procesados-tendencias-calidad-y-seguridad-en-el-mercado-latinoamericano/

Villanueva, R. S. J. (2016, diciembre 15). Introducción a la tecnología del mango. Centro de Investigación y Asistencia en Tecnología y Diseño del Estado de Jalisco, A. C. https://ciatej.repositorioinstitucional.mx/jspui/handle/1023/388

Wang, G., Wang, J., Chen, S., & Zhao, C. (2023). Vertical integration selection of Chinese pig industry chain under African swine fever - From the perspective of stable pig supply. *PLoS ONE, 18*(2 February). https://doi.org/10.1371/journal.pone.0280626

Yekimov, S., Kontsevaya, S., Poltorak, A. S., Sharin, O., Verkhovod, I., & Kuris, Y. (2024). The importance of agricultural clusters for the development of rural regions. *E3S Web of Conferences*, 538. https://doi.org/10.1051/e3sconf/202453803004

Zhu, X., & Wang, G. (2024). Impact of Agricultural Cooperatives on Farmers' Collective Action: A Study Based on the Socio-Ecological System Framework. *Agriculture (Switzerland), 14*(1). https://doi.org/10.3390/agriculture14010096