

# Stakeholders and producers in the strawberry value chain: Perceptions and key challenges in Mexico's Bajío region

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## ABSTRACT

**Objective:** To analyze the relationships, current perspectives, and expectations of stakeholders and producers engaged in the strawberry value chain in the municipalities of Maravatío and Tarandacua, considering environmental, social, and economic aspects, with the aim of understanding the challenges and future of strawberry production in this important producing area.

**Design/methodology/approach:** Semi-structured interviews were conducted with stakeholders, focusing on three dimensions: their role and relationship with producers, perspectives on the sector, and their vision for the future. Producers completed a Likert-type survey on their environmental, social, and economic perceptions. The information was then transcribed, and relevant ideas, concepts, and patterns in the interviewees' narratives were identified.

**Results:** Stakeholders believe that the sustainability of the value chain depends on investment in technology, resource management, adaptation to climate change, and the adoption of innovations that improve production. However, producers do not usually consider environmental issues, but rather economic and social ones.

**Limitations on study/implications:** The small size of the stakeholder group limits the generalizability of the findings to other similar contexts.

**Findings/conclusions:** Although the activity has boomed and consolidated both nationally and regionally, it faces structural constraints such as climate variability, water availability, lack of logistics infrastructure, the presence of pests and diseases, and the need to standardize production practices. This could limit the long-term sustainability of production.

**Keywords:** sustainable agriculture, agri-food chain, strawberry production.

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## INTRODUCTION

Strawberry production in Mexico is considered an activity of high economic importance due to its intensive use of labor, not only at the production level but also in the industrial sector. In addition, it is linked to a high demand for inputs, marketing, and transportation, among other activities (Echánove Huacuja, 2001). Mexico leads strawberry production in



Latin America, with an output of 541,552 t, followed by Brazil, Colombia, Argentina, and Peru (FAO, 2023). In Mexico, the most important growing areas are located in Michoacán, Baja California, Guanajuato, Jalisco, and the State of Mexico (SIAP, 2023). The rapid growth in strawberry demand has been supported by advanced technologies, improved production practices, as well as genetic breeding programs (Agehara *et al.*, 2020). However, production also faces challenges such as climate variability, high use of agrochemicals and water, labor shortages, and land availability (Samtani *et al.*, 2019). In this context, value chain (VC) analysis has gained increasing importance in agri-food research. Rojas Rojas & Valencia Sandoval, (2022) mention that the description of a VC provides a detailed view of its functioning, examining in depth who the direct and indirect participants are, their roles, the market segments they target, the supporting services, and the governance dynamics that regulate its operation.

However, Liverpool-Tasie *et al.*, (2020) point out that there is a hidden link in agri-food value chains, such as food processors, wholesalers, and logistics companies, which, although they represent 40% of the VC, are often overlooked. This is despite the fact that they constitute the closest connection between small-scale producers and the market, and can encourage the adoption of sustainable practices, as well as contribute to higher producer incomes. This is the case in the study area, where an agro-industry identified the opportunity to incorporate small-scale producers into its value chain, generating a social impact and highlighting long-term productive and sustainability potential through the transmission of RA (regenerative agriculture) practices and the adoption of technologies.

The sustainable transition of food systems can be achieved through contract farming, as agro-industries facilitate the dissemination of climate-smart practices and technologies and enable small-scale farmers to meet phytosanitary, quality, and sustainability standards (Schoneveld & Weng, 2023).

In the specific case of strawberries, the main production-level challenges include extreme climatic conditions, the presence of pests and diseases, consumer preferences regarding quality, and labor shortages. Therefore, as strawberry demand continues to increase, production methods must adapt by incorporating new production systems and technologies (Hernández-Martínez *et al.*, 2023). This can be achieved through the interaction between producers and stakeholders; however, despite their importance, stakeholders' perspectives on current production have been poorly documented, as studies usually focus on the producer link of the value chain.

The main reasons for collaboration in agricultural value chains are to improve market access and product quality, and these collaborations are facilitated and encouraged when supported by governmental and non-governmental entities (Mishra *et al.*, 2024). For example, collaboration with research institutions has enabled the development of pest-resistant varieties. Integration with marketing-related stakeholders allows market diversification and brings producers closer to improved production practices as well as certification schemes, while input suppliers promote innovations and the adoption of technologies that increase productivity.

In the case of Mexico, it is crucial to promote collaboration with small-scale strawberry producers in order to address challenges such as the lack of financial infrastructure,

specialized machinery for harvesting, sorting, packing, and labeling, as well as the absence of purchase contracts, agricultural insurance, and compliance with export standards (Zamora Torres & Baez Figueroa, 2022).

The literature suggests that the establishment of new organizational mechanisms with the potential to facilitate knowledge transfer constitutes the basis of systemic approaches grounded in Agricultural Knowledge and Innovation Systems (AKIS). These systems play a key role in knowledge transfer and the adoption of innovations, involving scientific institutions, public and private entities, technical advisors, and farmers (Masi *et al.*, 2022).

This study analyzes the relationships, current perspectives, and expectations of stakeholders and producers involved in strawberry production in the municipalities of Maravatío and Tarandacuao, located in the states of Michoacán and Guanajuato, respectively. Environmental, social, and economic aspects are considered in order to understand the challenges and future of strawberry production in this important producing region.

## MATERIALS AND METHODS

The research was conducted through semi-structured interviews with five stakeholders involved in strawberry production in the municipalities of Maravatío and Tarandacuao, located in the states of Michoacán and Guanajuato (Figure 1). Stakeholders were selected through convenience sampling, considering the connections that producers had with them, their relevance in the sector, and their availability to provide information. To ensure representation of different roles in the activity, the sample included participants from fresh produce marketing, a fruit and vegetable processing agro-industry, a technical advisor affiliated with an NGO, the manager of a RA program, and an input supplier.

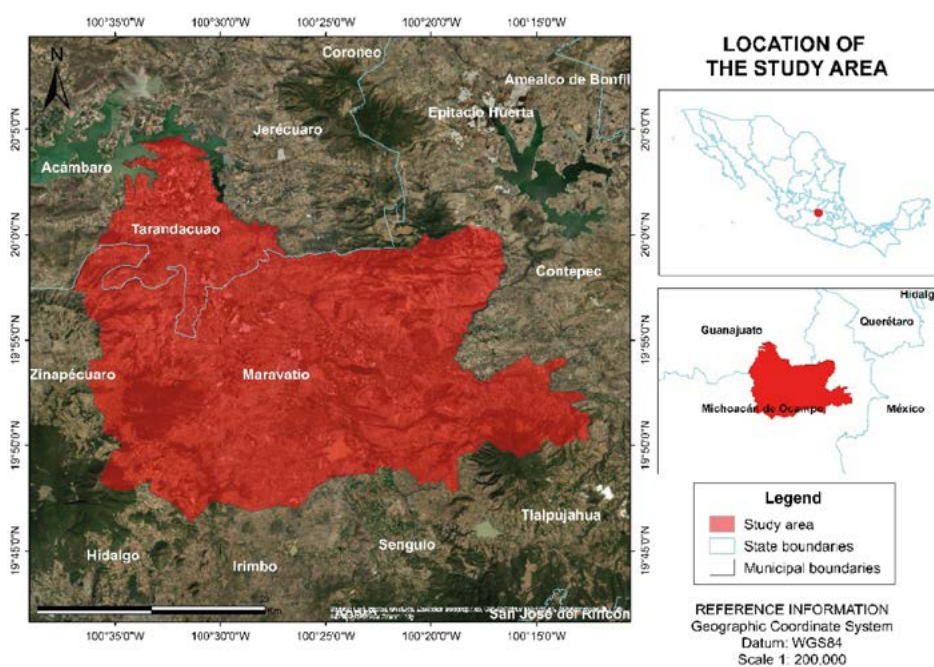


Figure 1. Spatial delimitation of the study.

In addition, a survey was administered to 30 small-scale strawberry producers participating in this program. The survey consisted of 15 items: 5 related to social identification, 5 to environmental aspects, and 5 to economic aspects. Perception variables were measured using a three-point Likert scale, with the following equivalence: 1 = disagree, 2 = neither agree nor disagree, and 3 = agree.

The selection allowed exploration of how stakeholders perceive their interactions with producers, their perspectives on the sector, and their views on the future of production in the area. Given the small number of interviews, priority was given to the depth of information obtained. Malterud *et al.*, (2016) note that qualitative interviews can shift the focus from the number of participants to the contribution of new knowledge derived from analysis. In this sense, the greater the relevance and quality of the information available for the study, the lower the need for a large number of participants. Therefore, the results should be interpreted as part of an exploratory study, paving the way for future research aimed at including a greater number of stakeholders per area, as well as stakeholders who were not initially considered.

The interviews were conducted from July to September 2024, with each interview lasting approximately 90 minutes. Interviews were carried out both in person and online, and were recorded with the stakeholders' consent, who were informed of the research objectives and the importance of their participation.

The interview guide was designed based on literature on value networks and structured around three main pillars: 1) the role and relationship of stakeholders with strawberry producers; 2) perceptions of the current production situation; and 3) perspectives and strategies for the future. This approach allows understanding not only the role of each stakeholder but also the sustainability of the sector.

Each interview was transcribed, and the data were subsequently coded so that each element received a representative attribute capturing the essence of the interviews. In a second step, the codes were reviewed and organized to identify patterns within each interview and to structure all relevant data (Saldaña, 2013). Stakeholder anonymity was ensured by assigning a general description of their role, avoiding the use of the interviewee's name or the company where they work (Table 1).

For the surveys, the data obtained were organized and processed in Excel<sup>®</sup> for Microsoft 365. Absolute frequencies were calculated for each response category of each

**Table 1.** Characterization of interviewed and surveyed stakeholders.

Actor	Position/role	Relationship with producers
Fresh strawberry marketer	Supply Manager	Direct purchase of fresh strawberries
Agroindustry	Project Manager	Regenerative agriculture project management
NGO	Project Manager	Regenerative agriculture project management
NGO	Agricultural coordinator	Technical advice
Input supplier	Independent consultant	Technical advice
Producers	Strawberry growers (30)	Primary production

item. This analysis allowed the distribution of producers' perceptions regarding each item to be identified.

## RESULTS AND DISCUSSION

### Role and Relationship with Producers

Stakeholders agreed that the strawberry value chain in the region involves stakeholders who add value and increase the efficiency of production processes. The agronomist coordinator of the NGO highlighted the importance of supporting producers in the implementation of good agricultural practices, as this not only results in high-quality fruit but also improves the producers' position in the market. Additionally, they emphasized that:

*“Technical monitoring allows producers to comply with food safety standards and obtain better prices for their fruit.”*

On the other hand, the fresh fruit buyer considers that their relationship with producers is direct and based on trust, ensuring that the company they work for has a consistent supply of fresh, high-quality strawberries. In this sense, although producers export through intermediaries, long-term personal relationships are a fundamental pillar in the integration of the value chain. In this regard, Pham & Anh, (2024) mention that there are two stages in the buyer-supplier relationship: the first is the initial stage, formed through empirical evidence and relational evaluation, and the second is a maturation stage, in which trust is maintained through emotional ties and personal experiences.

The agro-industry emphasizes its relevance in the chain by transforming and processing fruit that is not marketed fresh, adding value to the product and ensuring food safety before distribution. As Schoneveld, (2022) notes, inclusive agro-industries that connect small-scale farmers help mitigate coordination difficulties as well as improve access to inputs and markets.

One of the most important links in the agri-food supply chain lies at the interface between farms and agro-industries, as this is the source of the raw materials necessary to produce the current range of food products for human consumption. A significant portion of the environmental impact at this point is due to the use of agrochemicals, water, land, and energy associated with agriculture. For this reason, there is interest in both sustainable agricultural practices and the transition to RA (Miranda-Ackerman *et al.*, 2019)

Consequently, the NGO and the agro-industry have implemented an RA program with a group of small-scale producers. The NGO acts as a facilitator and coordinator, connecting producers with buyers, providing training on sustainable value chains, and offering technical support in the implementation of practices that enable this goal. The NGO considers that through its activities, information asymmetries are reduced and producers are kept informed about the quality standards required by the markets.

### Perspectives on Strawberry Production in the Area

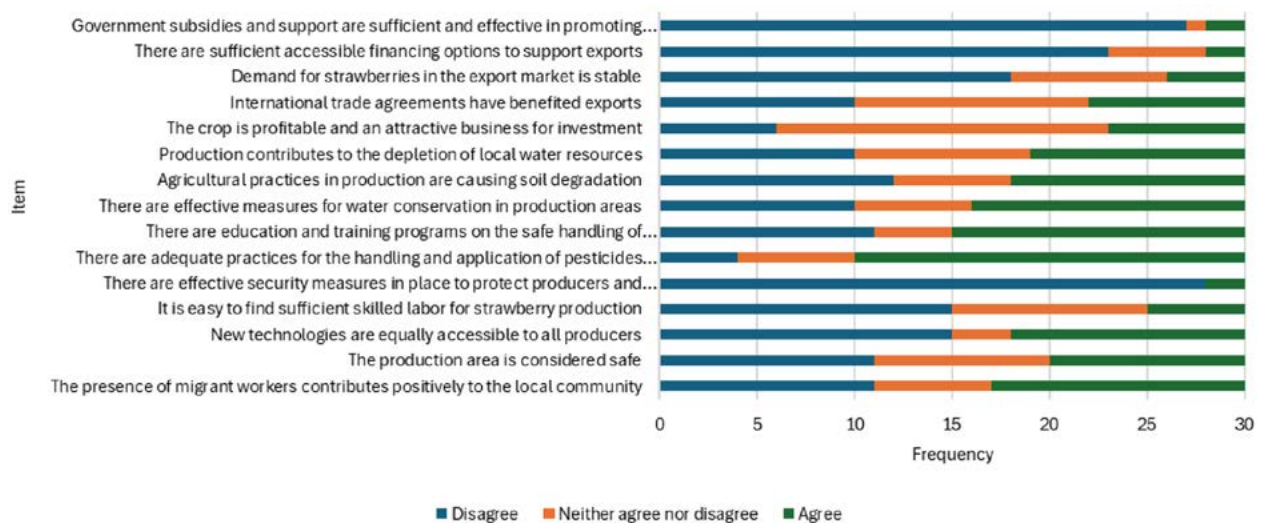
Stakeholders agree that strawberry production in the area has experienced growth in recent years, driven by both national and international demand. However, they are aware that this rapid growth is not without challenges, such as the availability of inputs, the current climate variability, water scarcity due to its irrational use in this and other crops in the region, as well as logistical and transportation difficulties that hinder producers' ability to adapt to current demand.

The coordinator of the organization emphasizes that:

*“Producers face challenges in quality standardization, but the training programs implemented through the program have significantly improved their performance.”*

Additionally, he emphasizes that technical training and continuous monitoring of producers are of utmost importance, so that they adopt not only the practices but also the technologies promoted by the program. Currently, producers lack awareness of the proper management of pesticides and fertilizers and tend to use them excessively, as well as water, due to inefficient irrigation control. However, producers do not perceive it this way, as 66.6% of participants report that they implement appropriate practices for pesticide and fertilizer management and application.

Regarding water resources, 46.6% of producers consider that there are effective measures for water conservation in production areas, and 33.3% disagree that strawberry production contributes to the depletion of local water resources (Figure 2). Romero-Gómez & Suárez-Rey (2020) mention that measures should be taken to improve environmental performance, such as optimizing fertilizer use through systems that support decision-making on soil nutrient management, accompanied by training programs for producers.



**Figure 2.** Economic, environmental, and social perceptions of producers. \*The first five items refer to the economic dimension, followed by the environmental items, and finally the social items.

In addition, efficient water-use strategies should not only be directed at production practices, but also involve the agro-industry promoting sustainability programs within the value chain. Cano-Gómez *et al.*, (2025) note that increasing difficulties arise from freshwater scarcity and the high generation of agro-industrial waste, particularly that derived from fruit and vegetable processing.

For its part, the agro-industry added that the adoption of technologies that ensure uniformity and food safety is an indispensable requirement for accessing more competitive markets at both the national and international levels. Producers recognize the need to adopt technologies and innovations in strawberry production; however, half of them mention that new technologies are not equitably accessible to all producers.

These findings relate to the concept of the “twin transition,” which seeks to link digital technologies with sustainable development, highlighting the importance of developing appropriate strategies aligned with the characteristics, objectives, and technological capacities of companies in order to overcome challenges in digitalization. This approach also emphasizes that the transition requires strategic guidance to manage technological expansion according to the nodes and stakeholders within the supply chain, since their scope and efficiency may limit or enhance the capacity to achieve sustainability and, consequently, the Sustainable Development Goals (Myshko *et al.*, 2024). In this sense, the results of the study show that the implementation of the “twin transition” in food value chains depends not only on the availability of technology, but also on the adoption capacity of small-scale producers.

Stakeholders highlight that relationships among themselves and with other stakeholders can directly influence the improvement of producers’ competitiveness. In this regard, Peña *et al.* (2008) mention that value chains in the agri-food sector must go beyond simple vertical integration, as they require coordinated efforts from all companies involved in the chain. In addition, the availability of information is vital at each link of the chain, as it allows stakeholders to identify changes in consumption trends. The objective of these dynamics is to increase product valorization by promoting added value through innovation.

For example, the fresh strawberry buyer mentioned that ensuring product quality from the field allows logistics planning and reduces losses from farm to table, which in turn guarantees market stability.

### **Future Perspectives in Production**

Stakeholders identified opportunities to strengthen the strawberry value chain and ensure its long-term sustainability. These include crop diversification to maintain soil health, digitalization of marketing processes, and the opening of new international markets. The NGO’s technical advisor emphasizes that:

*“The use of digital platforms allows producers to reach buyers who were previously inaccessible.”*

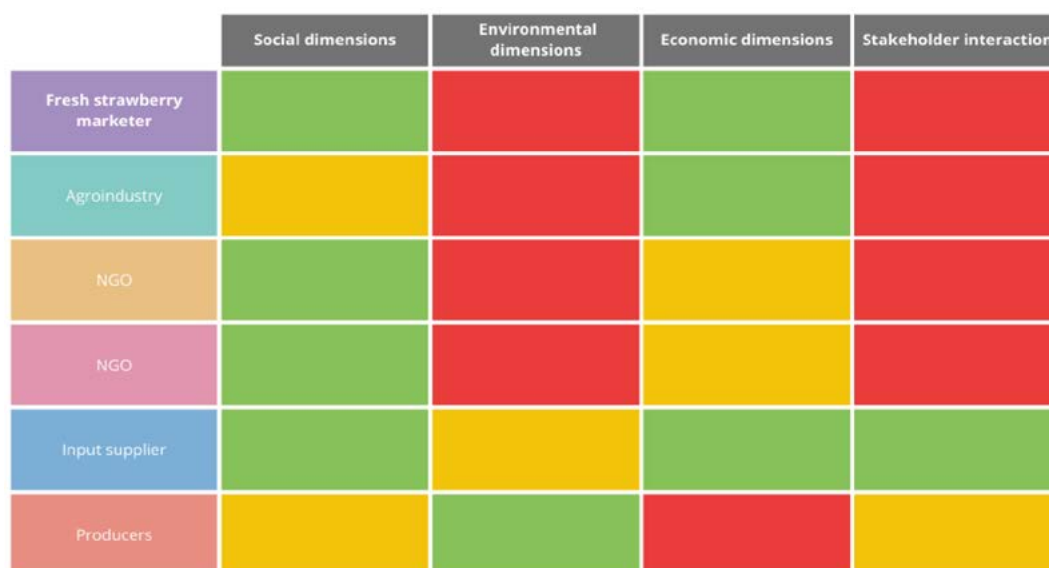
Consequently, it is evident that the use of technology would help reduce the trade barriers faced by small-scale producers. On the other hand, significant structural challenges were

also mentioned, such as: water availability and climate variability affecting production cycles and fruit quality; limited access to inputs and specialized services necessary to improve production methods that ensure soil and environmental health; competition for land use due to the specialization of other crops; and the need for adequate infrastructure to reduce losses and maintain fruit quality.

Regarding the continuity of strawberry production in this area, opinions suggest that if producers maintain good production practices, the region will continue to be a reference for strawberry production at the national level. This aligns with Ilari *et al.* (2021) who indicate that by managing the type and quantity of pesticides used in production, residues can be minimized not only in the product but also in the soil, thereby obtaining a safer and more sustainable product, while also strengthening cooperation mechanisms among stakeholders.

However, they consider that the sustainability of the value chain depends on investment in technology, resource management, adaptation to climate change, and the adoption of innovations that improve production. To achieve the transition to sustainable agri-food value chains, the focus should be on improving agricultural practices and consumer food choices, making it necessary to integrate stakeholders situated between producers and consumers to act as active agents of this transformation (Barrett & Gómez, 2025).

Regarding the long-term continuity of producers, environmental issues are not usually prioritized; rather, economic aspects are considered. Currently, 60% of interviewees perceive that export market demand for strawberries is unstable, 76.6% indicate that there are few accessible financing options to support strawberry exports, and 90% consider that government subsidies and support are insufficient. In addition, they identify production-related problems linked to insecurity in production areas. Therefore, they consider it necessary to include other stakeholders and actions oriented toward the economic and social dimensions of sustainability (Figure 3).



**Figure 3.** Traffic-light diagram of thematic axes among stakeholders and producers.

## CONCLUSIONS

The analysis of stakeholder interviews allowed the identification of their interactions with producers in the region. Each stakeholder performs differentiated but connected functions, as their role focuses on ensuring fruit quality, facilitating market access, and promoting practices and innovations that enable the sustainability of the value chain. Consequently, competitiveness in the sector depends not only on the producers but also on the coordination among stakeholders.

Although the activity has experienced growth and consolidation at both the national and regional levels, it faces structural constraints such as climate variability, water availability, lack of logistical infrastructure, the presence of pests and diseases, and the need to standardize production practices. These factors could limit long-term sustainability in production. Therefore, efforts should be combined to foster greater cooperation among all stakeholders involved in the sector, including government entities and others that can provide producers with access to financing. In addition, investment is needed in the adoption of sustainable practices and technologies that strengthen producers' technical skills. However, the future will not depend solely on knowledge transfer by stakeholders, but also on the adoption capacity of producers. Therefore, collective efforts are required to address environmental, organizational, and commercial challenges.

Understanding and recognizing the links within the sector is key to designing strategies that strengthen regional competitiveness and ensure its long-term sustainability. In addition, to achieve the objectives set by the NGO and the agro-industry, a series of tasks must be undertaken, including improving access to financing, promoting greater adoption of technologies and RA practices, incorporating biofertilizers and biostimulants, implementing efficient irrigation, rotating crops, and ensuring supplier commitment to the agro-industry. Furthermore, the establishment of associations and collaborative networks will help strengthen the adoption of good production practices without compromising yield, while improving marketing conditions.

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