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Why do producers decide not to join agricultural associations? The case of the Ataulfo mango in southern Mexico

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Abstract

The Ataulfo is an economically valuable mango variety originating in the Soconusco region of Chiapas, Mexico. Some, but not all, producers are members of marketing organizations. This study sought to evaluate how membership in a marketing organization impacts the livelihood viability of producers in the Soconusco and Istmo-Costa regions. From January 2020 to December 2021, we surveyed 126 producers (34 association members and 92 nonmembers), representing 3% of all Ataulfo producers in the study area. Using cluster analysis, we identified five unique groups of producers: Group 1 (G1), Packing-linked producers (2 producers, 1.6%); Group 2 (G2), Resource-limited producers (48 producers, 38.1%); Group 3 (G3),

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Intermediate commercial producers (55 producers, 43.7%); Group 4 (G4), Multimarket producers (12 producers, 9.5%); and Group 5 (G5), Export-specialized producers (9 producers, 7.1%). We found that social capital, as represented by association membership, appears to influence the viability of mango growers in diverse and international markets. However, among nonmember producers, those in G3 obtained high profits despite not being organized. While association membership enhances the profitability of G4 and G5, it did not limit the reserves of financial capital in G3. Contrary to the literature suggesting that lack of organization undermines viability, our findings indicate that some nonmember producers achieved high profitability. This result suggests that Ataulfo growers can be successful without belonging to a producer organization. However, socio-environmental threats, such as the advanced age of producers, lack of generational succession, low income, and varying levels of insurance among nonmember groups, pose risks to their long-term viability.

Keywords
producer organizations, producer types, system diagnosis, mango orchards, economic evaluation, market diversity, Ataulfo mango

Introduction

Fruit production, particularly mango, is an important sector of the Mexican export economy. In 2022, Mexico produced 2.17 million tons of mango, with its principal export destinations being the U.S., Canada, and Japan (Sistema de Información Agroalimentaria y Pesquera [SIAP], 2024). Ataulfo mango originated from the Soconusco and Istmo-Costa regions (De la Torre González, 2013), which extend along the Pacific Coast of Chiapas, Mexico. This variety received a denomination of origin granted by the Mexican Institute of Industrial Property and published in the Official Gazette of the Federation (Diario Oficial de la Federación [DOF], 2003). The fruit is prized for its high quality and notable health benefits (Vélez-de la Rocha et al., 2024). In 2024, 31,116 hectares of Ataulfo mango were harvested in these regions, yielding on average 7.79 tons per hectare per year with an average price of approximately US$299.90 per ton. Among mangoes, the Ataulfo ranked first nationally in production (242,419 t) and production value (US$72 million) (SIAP, 2024).

Research shows that mango farmers can derive many benefits from forming an association. Organized producers can benefit from competitive advantages in the production and marketing of fruit, which can contribute to improved living standards (Czapiewska, 2021; García, 2000; Rodríguez-Herrera, 2020; Rondot & Collion, 2001). Studies from Ethiopia show that mango producers in associations are 56% more likely to sell more (Hagos et al., 2020). Similarly, Musyoka et al. (2020) reported that group membership increases the probability of engagement in mango value-addition activities by 1.93 percentage points in Kenya.

On the other hand, the literature suggests mango producers who are not members of an association are at a disadvantage compared to member producers. Muthini et al. (2017) and Rasmikayati et al. (2020) independently showed that nonmember mango producers experience reduced power to negotiate sale prices, lack market information, suffer excessive costs for transportation and logistics, and lack access to markets.

The situation in Mexico is similar to that in other countries. Studies by government agencies and producer associations indicate inadequate organization among producers. According to the National Master Plan for the Mango Product System (Comité Nacional Sistema Producto Mango [CONASPROMANGO], 2012; Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación [SAGARPA], 2004), lack of organizational structures results in poor coordination along the value chain; dependence on intermediar-

Author Note
Sumuano-Barragán's graduate thesis is the basis for this article (Sumuano-Barragán, 2025).

Conflicts of Interest
The authors declare no conflicts of interest.

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ies for commercialization; limited adoption of post-harvest quality standards; and insufficient infrastructure for storage, packing, and processing. These deficiencies reduce producers' bargaining power, restrict access to credit and government programs and hinder competitiveness in both national and export markets.

Moreover, a report by the Mexican federal government concerning the production of Ataulfo mango in Chiapas recommended improving producer organization to consolidate the market, that is, improving coordination among growers so that they can pool harvests, ensure consistent quality, and negotiate better prices. Such collective action reduces fragmentation in the value chain and allows producers to compete more effectively in national and export markets (SAGARPA, 2017).

Although becoming a member of an agricultural association can provide several advantages, studies suggest many producers are reluctant to join. In Venezuela, for example, only 15% of 95 smallholder farmers of different types of crops were members of a producer association (Rincón et al., 2004). In Nigeria, Mbah (2018) found that most of the smallholder poultry farmers he interviewed were not integrated into a producer association (93.8% of 80 interviewees). In Slovakia, Michalek et al. (2018) found that 54% of 939 agricultural producers did not belong to any organization. In Mexico, 77% of the interviewed amaranth (*Amaranthus* spp.) producers were not members of an organization (Ayala-Garay et al., 2016). Also in Mexico, Coutiño et al. (2017) reported that 32.3% of the coffee producers (62 interviewees) were not integrated into an organization and that they suffered significant competitive disadvantages compared to member producers. Similar situations have been reported for mango production. For example, in Kenya (Muthini et al., 2017), Indonesia (Rasmikayati et al., 2020), and Bangladesh (Kok et al. 2021), 54.2, 55.0% and 63.3% of the producers, respectively, were not members of a mango producer organization.

If membership in a producer association appears to provide many benefits to its members, then why do producers decide not to join? To answer this question, we investigated the socio-environmental system of the Soconusco and Istmo-Costa regions with the following objectives: (1) to categorize Ataulfo mango producers of the Soconusco and Istmo-Costa regions, and (2) to compare the competitive advantages of member producers to those of nonmember producers. Accordingly, we analyzed the differences between producer groups through the concept of capital reserves and propose strategies to improve organization among producers in the region.

We employed the capitals framework of the Wageningen Center for Development Innovation (WCDI) (2020) for use in an agricultural context. Accordingly, capital reserves can be classified into human capital, which refers to the skills, knowledge, and health of the producers; social capital, which encompasses relationships, networks, and social norms; and financial capital, which refers to monetary resources, including income, savings, and access to credit. WCDI extends the capitals frameworks to organizational decision-making. When farmers join an association, they invest part of their financial and social capital, and the organization manages this contribution and decides whether to reinvest profits into infrastructure and services or to distribute them among members. In both cases, the outcome can increase the value of membership and broaden livelihood opportunities. These approaches underscore the relevance of financial and social capitals in the organizational dynamics of agricultural associations, as well as the relationship between the investment of capital and the welfare of the organization's members.

Methods

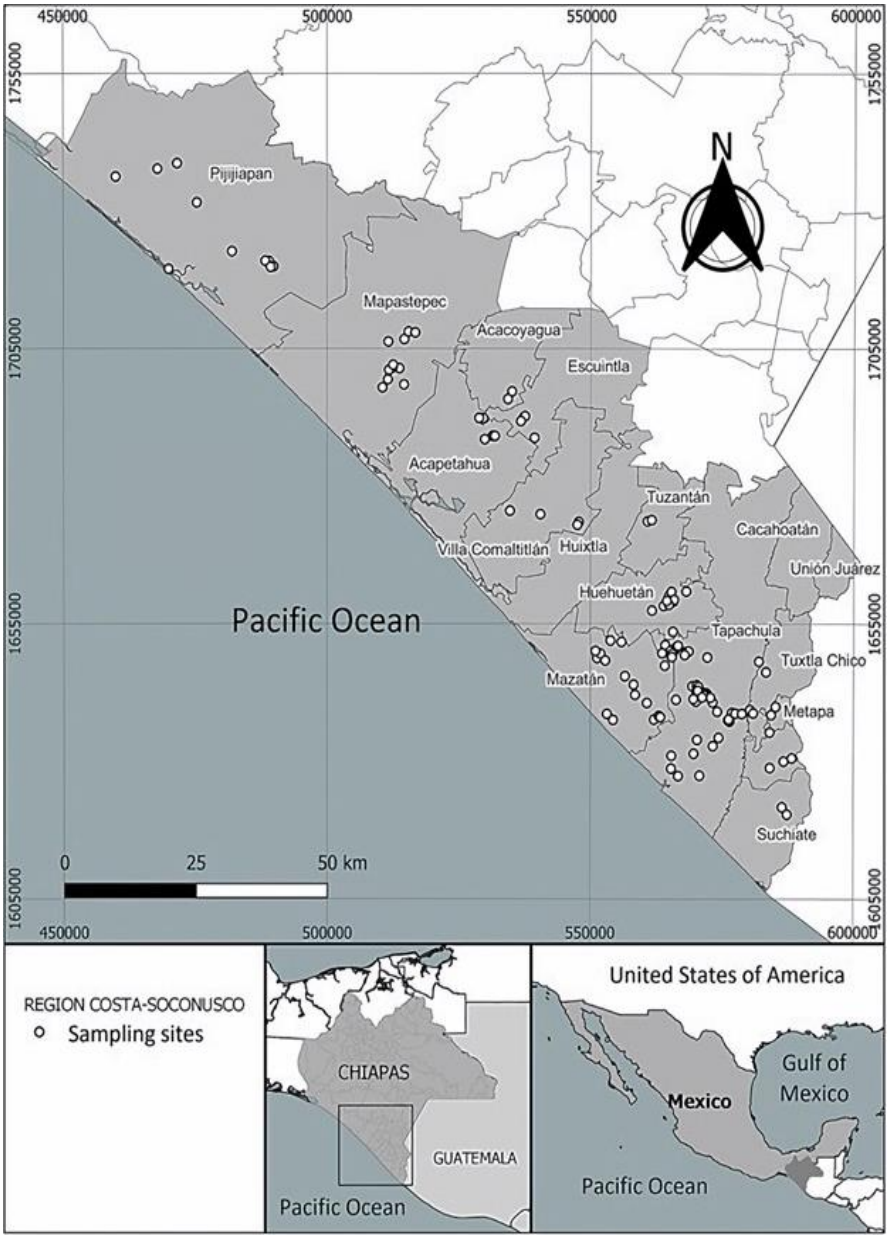
This section describes the geographic setting of the study, the interview and sampling procedures, and the analytical framework used to classify Ataulfo mango producers according to their human, social, and financial capital reserves, as well as the statistical approach used to compare producer groups and evaluate their economic performance.

Study Area

The study was conducted from January 2020 to December 2021 in Ataulfo mango orchards in the Soconusco and Istmo-Costa regions, which are located in the south of the State of Chiapas, Mexico and extend along the Pacific Coast. Our

study included 103 orchards in municipalities in the Soconusco region: Acacoyagua (2 orchards), Acapetahua (4), Escuintla (5), Frontera Hidalgo (5), Huehuetán (11), Mazatán (15), Suchiate (2), Tapachula (52), Tuxtla Chico (1), Tuzantán (2), and Villa Comaltitlán (4); and 23 orchards in municipalities in the Istmo-Costa region: Mapastepec (12) and Pijijiapan (11) (Figure 1). These regions are characterized by tropical and subtropical climates. The predominant climate type is warm and subhumid with abundant summer rains. The average annual temperature ranges from 22.5 to 28.5ºC (72.5º to 83.3º F). Rainfall ranges from 1200 (47.2 in) to more than 3000 mm (118.1 in) (Comité Estatal de Información Estadística y Geográfica de Chiapas [CEIEG], 2011; Escalante-Sandoval & Amores-Rovelo, 2014).

Figure 1. The Distribution of Sampled Mango Orchards in the Soconusco and Istmo-Costa Regions, Chiapas, Mexico



The surveyed orchards ranged from 6 to 183 meters (19.7 to 600.4 feet) above sea level (m.a.s.l.), with an average altitude of 46.12 m (±4.36 m standard error), mostly located in lowland areas below 60 m. According to the Ataulfo mango denomination of origin, the predominant soils are chromic luvisols and eutric fluvisols, which are fertile and well-drained (DOF, 2003).

Qualitative Interviews

In total, 126 producer interviews were conducted, representing approximately 3% of the existing Ataulfo mango producers of the study area (P. Leal, personal communication, February 12, 2022). Of the interviewees, 34 reported being members of a local producer association and 92 reported being nonmembers. These 34 members were distributed across six producer associations. These organizations were legally diverse: one was a civil association, four were rural production societies, and one was union of *ejidos*, an organization that brings together several communities of communal landowners. The survey was

based on a 68-question questionnaire that addressed socioeconomic, financial, and organizational aspects ordered by type of capital reserve. Each interview lasted between one and two hours.

Because data collection took place during the COVID-19 pandemic, interviews were conducted outdoors, in the orchards, following the health measures recommended by health authorities (use of masks, physical distancing, and small group sizes) to prevent contagion. During the interviews, no behavioral changes associated with COVID-19 were observed among producers that could affect data collection or the research results.

Data Analysis

This section describes the statistical procedures used to identify producer groups, classify their characteristics by type of capital, compare variables across groups, and evaluate the economic performance of each group.

Identification of Producer Groups

Data from the 126 producers was compiled in Microsoft Excel and analyzed using the software package R (R Core Team, 2021). Cluster analysis was used to determine producer groups. This method was selected because it is an exploratory, data-driven technique that identifies producer groups based on multivariate similarity without requiring the number or composition of groups to be specified in advance (Everitt et al., 2011). Per the approach recommended by Zar (2010), the number of groups was defined based on the first major jump in the dendrogram. This approach is well suited to livelihood-capital studies where the structure of heterogeneous producer populations is not known a priori; it has been applied in comparable typology studies of smallholder agricultural systems and in broader farming systems research (Alvarez et al., 2018).

Classification of Variables by Type of Capital

Variables related to producers and their orchards were classified by type of capital (human, social, and financial) within each of the identified producer groups.

The variables included in each capital domain were selected based on two criteria: (1) their conceptual alignment with the Sustainable Livelihoods Framework (SLF) (Department for International Development [DFID], 1999; Serrat, 2017), and (2) their documented relevance to mango producer characterization in the empirical literature (Kok et al., 2021; Muthini et al., 2017; Rondot & Collion, 2001). Human capital variables reflect productive capacity and skills at the individual and household level, as defined by the SLF; social capital variables capture the relational and institutional dimensions that mediate market access and collective action; and financial capital variables characterize monetary resources and financial management capacity, which are primary determinants of viability in smallholder systems (DFID, 1999; Serrat, 2017).

The variables of human capital include gender, age, level of schooling, number of children who help their parents in the orchard, number of people living at home, health status, and knowledge and implementation of agroecological strategies.

The social capital variables in the study include the importance of mango in the household economy, homeownership, membership in an organization, and technical assistance.

Financial capital includes tracking production costs, saving or investing, percentage of savings, sources of financing, insurance, sources of income, methods of selling the harvest, sales market, buyers, income from mango harvest per hectare, cost of production per hectare, and daily income.

Comparison of Variables Between Producer Groups

Chi-square contingency tables (χ^2) were generated in the software package R to determine differences between producer groups based on variables related to producers and their orchards. The degrees of freedom were calculated using the formula $(r - 1)(c - 1)$, where r and c represent the number of rows and columns, respectively. To compare producer groups, contingency tables were subjected to correspondence analysis for $c \geq 3$ (Mardia et al., 1979) and examined with standardized residuals for $c = 2$ (Agresti, 2012). Groups with five or fewer producers were excluded from the analyses.

Economic Analysis

The value of production and profit per ha and per

orchard are based on information obtained from 52 interviewed producers (41.3% of the total number of producers) who knew their cost of production and yield of mangos. Calculations started from a regional average selling price of MX$7000 (US$348.78) per ton of Ataulfo mango in 2021–2022 (P. Leal, personal communication, February 2022). Mexican pesos (MX$) were converted to U.S. dollars (US$) using an exchange rate of MX$20.07 per U.S. dollar (Statista, 2024). Chi-square contingency tables (Pearson's χ^2, $P \leq 0.05$) were used to compare economic variables (production costs, production value, and profit) between producer groups.

It should be noted that the 52 producers included in the economic analysis do not constitute a random subsample of the 126 interviewed, because the producers with knowledge of their production costs were disproportionately concentrated in G4 (multimarket producers) and G5 (export-specialized producers), whereas the vast majority of G2 (resource-limited producers) and G3 (intermediate commercial producers) did not record this information (Table 1).

Results

The following sections present the classification of producer groups, their characteristics according to type of capital, and the economic analysis of mango production across groups.

Classification of Producer Groups

Cluster analysis yielded five distinct producer groups (Figure 2; Appendix Table A1).

G1 (**Packing-linked producers**), although small in number, are characterized by direct integration with packing facilities (100%), enabling participation in national (50.0%) and international (50.0%) markets. Their commercial integration illustrates one pathway of market access that does not necessarily depend on having large scale but instead on strategic positioning within commercialization channels.

G2 (**Resource-limited producers**) are characterized by small-scale orchards (87.5% ≤10 ha), lower schooling levels, minimal technical assistance (2.1%), limited organizational participation (18.7%), and strong orientation toward local markets (77.1%). This configuration results in the lowest profits per hectare and per orchard, reflecting structural constraints in capital accumulation.

G3 (**Intermediate commercial producers**) occupy an intermediate structural position. Despite limited organizational membership (16.4%), they achieve the highest profitability per hectare and strong participation in national markets (87.3%),

Table 1. Statistical Comparison of Groups of Ataulfo Mango Producers with Respect to Variables Related to Financial Capital in the Soconusco and Istmo-Costa Regions of Chiapas, Mexico

	Chi-square test [a]		
Variable	χ^2	df	*P*
Tracking production costs	53.81	3	<0.001
Saving or investing	22.60	3	<0.001
Percentage of savings	6.27	6	0.393
Sources of financing	41.96	15	<0.001
Insurance	54.48	12	<0.001
Sources of income	16.44	9	0.058
Ways of selling the harvest	40.21	3	<0.001
Sales market	73.73	18	<0.001
Buyers	78.03	15	<0.001
Income from mango harvest per ha	25.00	9	<0.002
Cost of production per ha	35.07	9	<0.001
Daily income	69.67	15	<0.001

[a] Chi-square contingency tables (χ2) were generated to determine differences between producer groups. G1 was excluded from the analysis due to its small size (n = 2) of producers.

with partial participation in international markets (41.8%) through indirect commercialization channels.

G4 (**Multimarket producers**) are characterized by higher organizational integration (75.0%), diversified market participation (66.7% national and 66.7% international), and regular access to technical assistance (41.7%). Their larger orchard sizes and diversified commercialization strategies reflect a combination of productive and organizational capital.

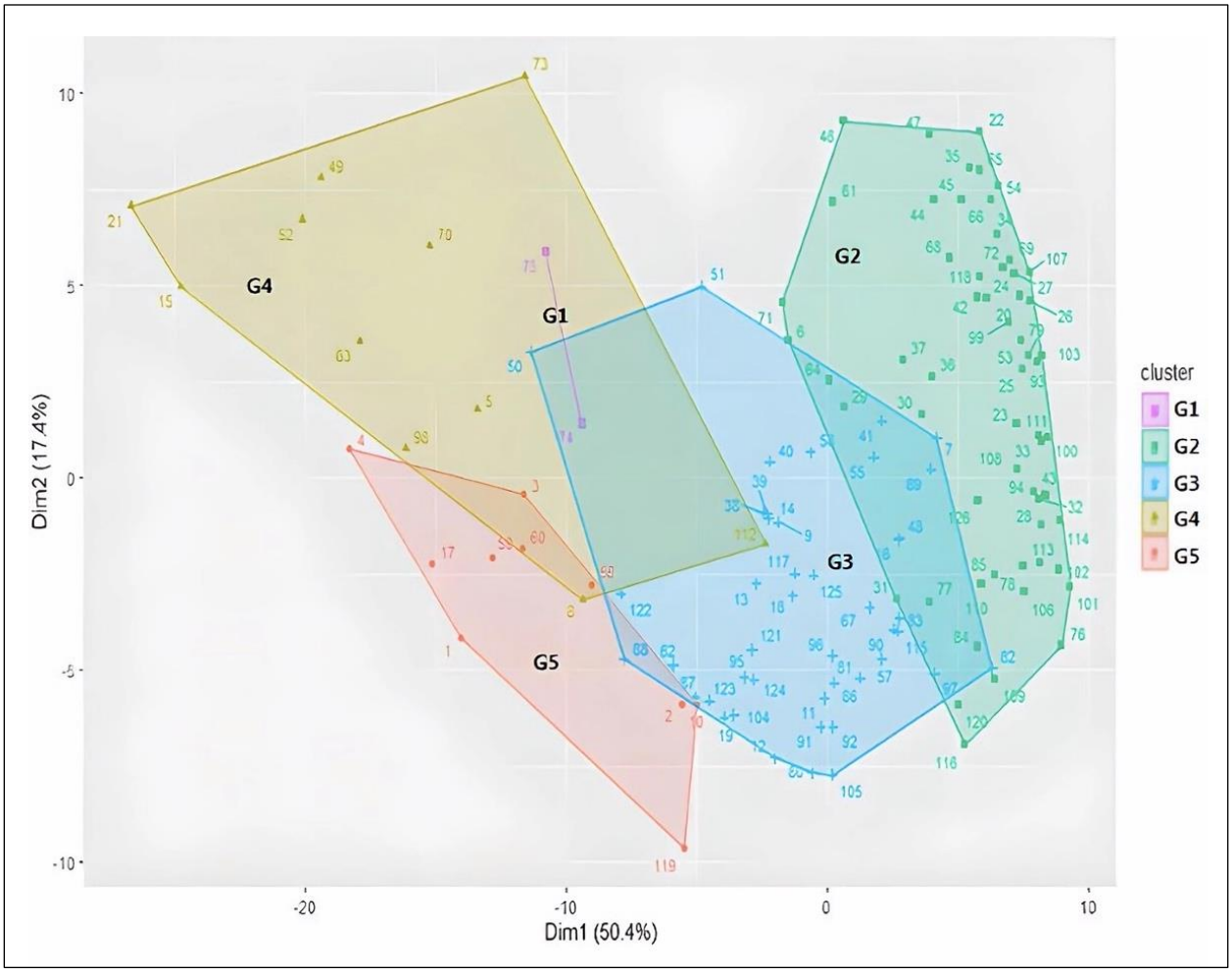
Finally, **G5** (**Export-specialized producers**) represent the highest level of commercial specialization, with large orchards (55.6% ≥ 31 ha), strong technical support (100%), organizational membership (66.7%), and full participation in international markets (100%). This group achieves the highest total profits per orchard, reflecting advanced integration into export-oriented value chains.

The number of producers per group was as follows: G1: 2 producers (1.6%); G2: 48 producers (38.1%); G3: 55 producers (43.7%); G4: 12 producers (9.5%); and G5: 9 producers (7.1%).

For the cluster analysis, orchard sizes were as follows: smallest orchards were found in G2 (resource-limited producers) with 2.86 ± 0.34 ha, followed by G3 (intermediate commercial producers) with 8.89 ± 1.46 ha. G1 (packing-linked pro-

Figure 2. Cluster Analysis of 126 Ataulfo Mango Producers in the Soconusco and Istmo-Costa Regions, Chiapas, Mexico

G1, packing-linked producers (2 producers, 1.6%); G2, resource-limited producers (48 producers, 38.1%); G3, intermediate commercial producers (55 producers, 43.7%); G4, multi-market producers (12 producers, 9.5%); and G5, export-specialized producers (9 producers, 7.1%).



ducers) averaged 16.75 ± 3.42 ha, while G4 (multi-market producers) averaged 20.6 ± 8.02 ha. The largest orchards were observed in G5 (export-specialized producers), with 43.44 ± 12.70 ha.

Characteristics of Producer Groups by Type of Capital

This section describes the characteristics of each producer group with respect to human, social, and financial capital.

Human Capital

Although mango producers across the region shared similar demographic characteristics—such as gender distribution, age, family size, and health status—they differed notably in educational attainment and knowledge of agroecological practices (see Table 2; Appendix Table A2). G2 and G3 had the lowest education levels (high school or less), while G5 included university-educated producers, and G4 had members with postgraduate degrees. Similarly, producers in G5 showed higher awareness and implementation of agroecological strategies, distinguishing them from the other groups that had lower engagement with sustainable practices.

Social Capital

Although the importance of mango in household economies and homeownership rates was similar across all five producer groups, notable differences were observed in dimensions of social capital (Table 3; Appendix Table A3). Producers in G4 and G5 had significantly higher organizational participation, with 75% and 67%, respectively, belonging to mango production and marketing associations, in contrast to the lower and statistically similar membership rates in G2 and G3. The

Table 2. Statistical Comparison of Groups of Ataulfo Mango Producers with Respect to Variables Related to Human Capital in the Soconusco and Istmo-Costa Regions of Chiapas, Mexico

	Chi-square test [a]		
Variable	χ^2	df	*P*
Gender	1.66	3	0.653
Age	3.19	3	0.362
Level of schooling	44.44	18	<0.001
Number of children who help their parents in the orchard	4.63	6	0.590
Number of people living at home	4.01	9	0.910
Health status	6.43	6	0.376
Knowledge and implementation of agroecological strategies	14.42	3	<0.002

[a] Chi-square contingency tables (χ2) were generated to determine differences between producer groups. G1 was excluded from the analysis due to its small size (*n* = 2) of producers.

Table 3. Statistical Comparison of Groups of Ataulfo Mango Producers with Respect to Variables Related to Social Capital in the Soconusco and Istmo-Costa Regions of Chiapas, Mexico

	Chi-square test [a]		
Variable	χ^2	df	*P*
Importance of mango in the household economy	15.33	9	0.082
Homeownership	6.77	3	0.790
Membership of an organization	26.25	3	<0.001
Technical assistance	43.27	3	<0.001
Had received technical assistance	43.70	3	<0.001

[a] Chi-square contingency tables (χ2) were generated to determine differences between producer groups. G1 was excluded from the analysis due to its small size (*n* = 2) of producers.

most common reason for nonmembership was a personal preference not to join (n = 34; 37%; Figure 3). Access to technical assistance also varied among groups. Nearly all producers in G5 reported receiving current or past technical support, whereas only a small proportion of G2 receive (2.1%) or received (4.2%) technical assistance. G3 and G4reported intermediate and similar levels of assistance. These patterns indicate that organizational affiliation is closely linked to improved access to technical knowledge and institutional support, which can enhance productivity and integration into formal markets.

Financial Capital

Significant differences in financial capital were observed among the five producer groups, despite similar savings percentages and sources of income (see Table 1; Appendix Table A4). Only 19.8% of producers tracked production costs, with G4showing the highest awareness and G2 the lowest. Most producers (76.2%) reported neither saving nor investing income, except in G4, where this was more common. Nearly half (43.1%) lacked access to financing, and among those who had access, family support was predominant, especially in G2, G3, and G4. G5 producers stood out by using formal credit (bank and/ or government loans) and mixed financing schemes. Insurance coverage was very low: no producer held agricultural insurance, and only a few (7.9%) had health, life, or social security coverage (Mexican Social Security Institute, Institute for Social Security and Services for State Workers, or Popular Health Insurance), mostly outside G2 and G3 producers. Most producers (65.9%) relied on mango sales plus one additional income source, though G4 and G5 producers had more diversified incomes. Sales practices varied: Overall, 63.5% sold unharvested fruit to intermediaries ("coyotes"), especially in G2. In contrast, G5 harvested and sold mangoes themselves, selling internationally. Most producers sold to orchard-renters (buyers who lease orchards from producers to harvest and sell the fruit themselves) in G2, but G3, G4, and G5 had more direct or formalized sales to packhouses or national and/or regional markets.

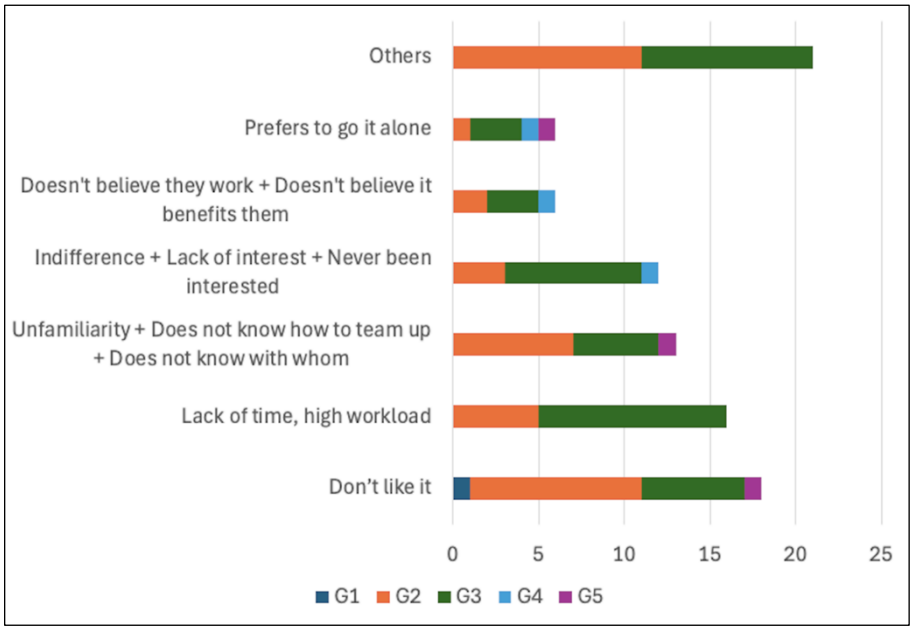
Economic Analysis of Mango Production

Analysis of the economic variables of the producer groups showed that export-oriented and organized members generally achieved higher profitability (see Table 4; Table A5).

Production Costs per Hectare per Year (US$)

Mean production costs (± standard error) of Ataulfo mango orchards varied between US$219.67 (± 68.96) and US$1,070.77 (± 267.39) per ha. It is important to note that a relatively large fraction of the producers (58.7%) said they did not know their costs of production, a situation that was especially prevalent in G2 and G3. The production costs were lower than US$800 per ha per year (which is the average production cost) across

Figure 3. Number of Producers per Group, Reasons for Not Being Members of an Association in the Soconusco and Istmo-Costa Regions of Chiapas, Mexico



G2, G3, and G4. Orchards of G5 had the highest production cost.

Production Costs per Orchard per Year (US$)
The highest production costs per orchard were found in G5, followed by G4, G3, and G2.

Production Value per Hectare per Year (US$)
The highest production value per hectare was observed in G3, followed by G5, G4, and G2.

Production Value per Orchard per Year (US$)
The highest production value per orchard was found for G5, followed by G4, G3, and G2.

Profit per Hectare per Year
G2 made lower profits compared to G4, G5, and G3.

Profit per Orchard Per Year
G5 realized the highest profit, followed by G3, G4, and G2.

Profit per Day per Producer
The highest profit per day was noted in G5, followed by G3, G4, and G2.

Profits and Minimum Wages
In 2022, the daily minimum wage in the State of Chiapas was MX$172.87 (US$8.61) (Secretaría del Trabajo y Previsión Social [STPS], 2022). The average profit of G3, G4, and G5 corresponded to multiples of the minimum wage of 9.50, 8.55, and 12.32 per producer per day, respectively. In G1 and G2, daily profit per producer was lower than the minimum wage: 0.50 and 0.89, respectively.

Discussion

The collection of data through producer interviews (N = 126) allowed us to construct groups of Ataulfo mango producers in the Soconusco and Istmo-Costa regions. Hanemann et al. (2008) published a characterization of the region that was based on the size of Ataulfo mango orchards. Our research, however, presents the first research effort to characterize the producers of this region by taking into account their capital reserves.

Using cluster analysis, we identified five different producer groups. In total, 92 producers (73%) were not members of any organization. Most of the producers of G2 and G3 had no membership of any producer organization or association (n = 85, 82.5%). G4 and G5, however, were members of associations (21 producers, 16.7% of the total number). G1 comprised only two producers, one with membership in an organization and the other not. Although very few producers were included in this group, we preferred not to exclude it from the research because its heterogeneity of association strategies for production and marketing may represent potentially emerging producers who merit a specific study.

Table 4. Statistical Comparison of Groups of Ataulfo Mango Producers with Respect to Variables Related To Costs, Value, and Profits of Production in the Soconusco and Istmo-Costa Regions of Chiapas, Mexico

	Chi-square test [a]		
Variable	χ^2	df	*P*
Production costs per ha	35.07	9	<0.001
Production costs per orchard	15.27	6	0.018
Production value per ha	14.64	6	0.023
Production value per orchard	48.36	3	<0.001
Profit per ha	11.82	6	0.066
Profit per orchard	20.07	6	0.002
Profit per day per producer	14.60	3	0.002
Profits and minimum wages	22.19	6	0.001

[a] Chi-square contingency tables ($\chi 2$) were generated to determine differences between producer groups. G1 was excluded from the analysis due to its small size (n = 2) of producers.

Producer associations offer many advantages to their member producers, such as the sharing of information and new production skills, access to markets, and the marketing of value-added products (Astudillo-Miller et al., 2020; Sánchez Osorio & Prado Ramírez, 2019; Velázquez & Torres, 2019). And yet, remarkably, Ataulfo mango producers of the Soconusco displayed a profound disinterest in organizing themselves into associations. Similar observations have been made about mango producers in Indonesia (Rasmikayati et al., 2020), Kenya (Muthini et al., 2017), Bangladesh (Kok et al., 2021) and Burkina Faso (Parrot et al., 2022).

"I don't like it" was the most frequently encountered argument from nonmember producers against joining an organization. This response reflects past bad experiences many of the producers may have had when they were affiliated with a producer association. Such distrust in associations makes those other reasons for not joining—such as lack of time, high workload—take on importance. Developing awareness-raising initiatives is a necessary step toward regaining trust in the organizations. Nugussie (2010) found that such initiatives improve producer participation in and their perception about cooperatives. As they regain their trust in these organizations, Chaddad and Iliopoulos (2013) report, producers will come to accept the fixed and variable costs sustained by such organizations, as well as the expenses to organize assemblies for collective decision-making.

Our results suggest that organizational processes (social capital), and the producer's economic situation (financial capital) are largely determined by how producers recognize the emergence or existence of opportunities and exploit them (Chaddad & Iliopoulos, 2013; Czapiewska, 2021; Rondot & Collion, 2001). These opportunities would have allowed the producers to run their orchards more efficiently and include, but are not limited to, the acquisition of new land to enlarge the orchard, association with other producers (Astudillo-Miller et al., 2020; García, 2000), acquiring new technical knowledge, investing in the agronomic management of the orchard, saving or investing part of their earnings, access to financing, and income diversification (Guien Chay et al., 2019; Muthini et al., 2017). For example, several high-yield mango growers reported performing post-harvest pruning to maintain a suitable tree canopy structure. Another grower used rejuvenation pruning combined with canopy pruning of Ataulfo mango trees to interplant them with improved varieties of the same Ataulfo mango (e.g., Citlali or Diamante) or pollen-donor mango trees (e.g., native or creole trees, Tommy or Kent) to improve Ataulfo mango fruiting. In another case, two growers said they adopted high-density planting systems (400 trees per hectare), which, although more difficult to maintain, produce high yields. Some growers also indicated that using drones for foliar applications of agrochemicals was more efficient and precise than using airplanes or tractor-mounted sprayers. In addition, some growers stated that they apply plant growth regulators (such as paclobutrazol) to induce or synchronize fruit production during periods of higher market prices.

In this sense, differences in capital reserves can be understood as sources of competitive advantage. For example, social capital derived from organizational membership allows producers in G4 and G5 to access technical assistance, negotiate collectively, and reach export markets. These advantages align with previous studies that highlight how collective action increases market competitiveness and reduces transaction costs in rural economies (Czapiewska, 2021; Rondot & Collion, 2001).

Reports from other countries have discussed differences in social and financial capital among mango producers. In Indonesia, Kenya, and Bangladesh, for example, a low rate of participation in associations—a social capital variable—negatively affected the marketing and buying of supplies (Kok et al., 2021; Muthini et al., 2017; Rasmikayati et al., 2020). In Bolivia (Aparicio & Díaz, 2015) and Ethiopia (Teka et al., 2019; Neguse et al., 2019), a lack of market information and poor orchard management skills hurt producers' financial capital. Financial capital variables, such as the lack of access to sources of financing and financial technical support, and the loss of revenue due to fungal damage to flowers and fruit, post-harvest fruit deterioration, or sudden drops in market prices reduced the resources available for reinvestment in

mango orchard maintenance in Benin, Burkina Faso, and Ghana (van Melle & Buschmann, 2013). In the study region, similar financial vulnerabilities were observed among nonmember producers, who faced severe crop losses during off-season windstorms. These producers were unable to recover production costs because most lacked crop insurance or access to emergency credit, and they were forced to reduce orchard maintenance in the following season.

G3, G4, and G5 emerged from our economic analysis as the groups with the highest daily profits. Using the daily minimum wage in the State of Chiapas as a reference (MX$172.87 or US$8.61 per day in 2022; STPS, 2022), the profits of G3 (US$81.81), G4 (US$73.62), and G5 (US$106.13) corresponded to multiples of the minimum wages of 9.50, 8.55, and 12.32 per producer per day, respectively. However, the daily profit per producer in the two other groups was much lower than one multiple of the minimum wage: 0.50 (US$4.30) and 0.89 (US$7.32) in G1 and G2, respectively. According to these data, 41% of Ataulfo mango producers in the region had an income less than the minimum wage. Similarly, studies from Indonesia and Ethiopia show that mango producers have low profitability and limited economic returns, despite being active in well-established production regions (Guien Chay et al., 2019; Sulistyowati et al., 2015). This pattern is consistent with our results in Chiapas and mirrors reduced income in smallholder mango production, where limited profitability constrains reinvestment and contributes to persistent productivity gaps.

Such differences also reveal distinct competitive advantages across producer groups. G3 achieved high profitability by focusing on the national market, even without organizational membership, while G4 and G5 leveraged their association-based networks to gain access to technical knowledge, financing, and international buyers. As Porter's theory of competitive advantage suggests, farmer groups may achieve superior performance either through cost advantages or through differentiation in product quality and market access (Porter, 1980; see also Chaddad & Iliopoulos, 2013, for applications in agricultural cooperatives and Sumuano-Barragán et al., 2024, for the value network of the Ataulfo mango in Southern Chiapas).

Analysis of the higher profit groups showed that G3 consisted of a majority of nonmember producers, whereas G4 and G5 were composed of producers who belonged to an organization. Hence, financial capital reserves (income, savings, access to credit, or investment) are strengthened, but not limited, if producers join an association (social capital). Fruit marketing was a key factor that differentiated high-profit in G3 (55 producers, 43.7% of the interviewees) from low-profit G2 (48 producers, 38.1% of the interviewees). The former group sold their mangoes into the national market, while the latter sold them into the local market.

No statistical difference was observed in profits between G3 and G5. However, the mango marketing model and operating methods of the producers of G5 show the potential of export markets as a means to improve profitability. For example, the positive impact of exporting on the income of members of G5, which comprised only exporting producers, stood in stark contrast with the low income of producers of G2 and G3, which comprised 4% and 38% exporting members, respectively. However, as was also observed in Indonesia (Sulistyowati et al., 2015), profit generation through exports in G5 was only within the reach of a small number of producers who were organized in business-like associations (9 producers, 7.1% of the interviewees). Compared to producers of G3, the entrepreneurial character of G5 provided opportunities to its member producers that enabled them to run larger (in terms of area) and to possess greater financial capacity.

However, other forms of mango marketing that can increase the profits of lower-income Ataulfo mango producers in the Soconusco are still in need of exploration. For example, mangoes can be industrially processed to create added-value products, such as mango puree, juice, nectar, wine, frozen mango chunks, dehydrated mango, marmalade, gelatines, pickled mango, or canned mango, as has been shown by mango producers in Burkina Faso (Parrot et al., 2022). As mango producers in Haiti demonstrated (Hyppolite et al., 2013), marketing opportunities also arise from integrating other value chains and from certified organic production. Organic certification could be a viable

option for Ataulfo mango producers in the Soconusco and Istmo-Costa regions. Not only does organic certification guarantee the health of the system, but it also opens new market opportunities to obtain better prices and to create a valued product that is recognized nationally and internationally.

Overall, our findings show that competitive advantages among Ataulfo mango producers emerge from different pathways: through market orientation as G3, through collective organization and access to external resources as G4 and G5, or through a combination of both. By linking capitals to competitive advantage, this study highlights that profitability and sustainability are not determined solely by orchard size or yields, but rather by how producers mobilize their human, social, and financial resources within the value chain. Similar dynamics have been reported in mango sectors of Kenya and Indonesia, where organizational membership or innovative marketing channels shaped producers' competitiveness (Muthini et al., 2017; Rasmikayati et al., 2020).

Conclusions

This study aimed to characterize Ataulfo mango producers in the Soconusco and Istmo-Costa regions of Chiapas, Mexico, through the lens of their social, human, and financial capital. By moving beyond conventional agronomic variables and yield-focused analyses, we uncovered the systemic inequalities and resource asymmetries that shape the economic trajectories of smallholder mango producers in a region with high export potential. Inequalities refer to measurable differences among producers in access to resources, market opportunities, income, orchard size, and organizational membership, which collectively affect their economic outcomes.

While they represented only a fifth of our sample, producers who were members of associations occupied the best positions in the production and marketing of mango. We found that technical support, selling into international markets, diversified sources of financing and income sources, effective bookkeeping, saving a portion of profits, and adopting agroecological practices were more common in member producers.

Although it is commonly believed that a lack of organization compromises producer viability, our results indicate that one of the groups (G3, intermediate commercial producers), mainly composed of nonmember producers, achieved remarkably healthy profitability levels. This contradiction shows us that some nonmember producers have independently developed successful financial management and marketing strategies. While membership in a producer association can serve as a starting point for improvement and provide various benefits, it alone does not guarantee greater profitability, even though organized producers generally have greater financial and social capital than nonmembers.

While some challenges remain, such as the reluctance to join an association, lack of time, or unawareness of its benefits, our findings suggest that the decision to not associate with an organization did not necessarily have an adverse impact, as some producers were successful even without being members of an organization.

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Appendix

Table A1. Key Leverage Variables that Defined the Names of Ataulfo Mango Producer Groups in Chiapas, Mexico

Variable	G1 Packing-linked producers (*n* = 2)	G2 Resource-limited producers (*n* = 48)	G3 Intermediate commercial producers (*n* = 55)	G4 Multi-market producers (*n* = 12)	G5 Export-specialized producers (*n* = 9)
Mean orchard size (ha ± SE)	16.75 ± 3.42	2.86 ± 0.34	8.89 ± 1.46	20.6 ± 8.02	43.44 ± 12.70
Orchard size distribution	1–10 ha: 50% 11–30 ha: 50% ≥31 ha: 0%	1–10 ha: 87.5% 11–30 ha: 10.4% ≥31 ha: 2.1%	1–10 ha: 81.8% 11–30 ha: 12.7% ≥31 ha: 5.5%	1–10 ha: 50.0% 11–30 ha: 16.7% ≥31 ha: 33.3%	1–10 ha: 33.3% 11–30 ha: 11.1% ≥31 ha: 55.6%
Producer's education [a]	NF: 0.0% ES: 0.0% MS: 0.0% HS: 0.0% UN: 100% GE: 0.0%	NF: 2.1% ES: 45.8% MS: 29.2% HS: 18.8% UN: 4.2% GE: 0.0%	NF: 3.6% ES: 29.1% MS: 16.4% HS: 16.4% UN: 32.7% GE: 1.8%	NF: 0.0% ES: 25.0% MS: 0.0% HS: 8.3% UN: 50.0% GE: 16.2%	NF: 0.0% ES: 0.0% MS: 22.2% HS: 0.0% UN: 77.8% GE: 0.0%
Organization membership	Yes: 50% No: 50%	Yes: 18.7% No: 81.3%	Yes: 16.4% No: 83.6%	Yes: 75.0% No: 25.0%	Yes: 66.7% No: 33.3%
Mean profit per ha (US$ ± SE)	448.43	1,293.86 ± 218.66	3,309.18 ± 611.70	2,677.93 ± 608.37	2,619.03 ± 841.20
Mean profit per orchard (US$ ± SE)	1,569.50	2,800.07 ± 461.04	29,875.20 ± 13,165.07	26,872.82 ± 9,522.06	38,720.72 ± 11,684.45
Technical assistance	Yes: 50% No: 50%	Yes: 2.1% No: 97.9%	Yes: 27.3% No: 72.7%	Yes: 41.7% No: 58.3%	Yes: 100% No: 0.0%
Type of market [b]	LM: 0.0% NM: 50.0% IM: 50.0%	LM: 77.1% NM: 47.9% IM: 4.2%	LM: 56.4% NM: 87.3% IM: 41.8%	LM:25.0% NM: 66.7% IM: 66.7%	LM: 0.0% NM: 55.6% IM: 100.0%
Use of packing facilities as a commercialization channel	100% use packing facilities for national and international commercialization.	0% use packing facilities; commercialization limited to local markets.	41.8% international markets via indirect use of packing facilities.	66.7% use packing facilities for national markets and 66.7% for international markets.	100% use packing facilities for international markets; 55.6% also participate in national markets.

[a] NF= non-formal education; ES= elementary school; MS= middle school; HS: high school; UN= university; GE: graduate education.
[b] LM= local market; NM= national market; IM= international market.

Table A2. Number of Producers per Group and per Variable of Human Capital in Ataulfo Mango Orchards in the Soconusco and Istmo-Costa Regions of Chiapas, Mexico

Variable	Producer groups [a]					
	G1 [b]	G2	G3	G4	G5	χ^2; df; *P*
Gender						
Men	2	42	49	12	8	1.66; 3; 0.653
Women	0	6	6	0	1	
Age						
≤ 59	2	15	21	7	4	3.19; 3; 0.362
≥ 60	0	33	34	5	5	
Level of schooling						
Non	0	1	2	0	0	44.44; 18; <0.001
Primary	0	22	16	3	0	
Secondary	0	14	9	0	2	
Highschool	0	9	9	1	0	
University	2	2	18	6	7	
Master´s	0	0	0	1	0	
Doctorate	0	0	1	1	0	
Number of children who help their parents in the orchard						
0	1	29	37	6	4	4.63; 6; 0.590
1	1	17	14	4	4	
2–4	0	2	4	2	1	
Number of people living at home						
1–2	0	15	18	5	3	4.01; 9; 0.910
3–4	2	22	22	4	5	
5–6	0	9	14	2	1	
≥ 7	0	2	1	1	0	
Health status						
Good	2	17	26	6	5	6.43; 6; 0.376
Fair	0	28	29	6	4	
Poor	0	3	0	0	0	
Knowledge and implementation of agroecological strategies						
Yes	1	0	4	2	3	18.21; 4; <0.001
No	1	48	51	10	6	

[a] G1, packing-linked producers (2 producers, 1.6%), G2, resource-limited producers (48 producers, 38.1%); G3, intermediate commercial producers (55 producers, 43.7%); G4, multimarket producers (12 producers, 9.5%); and G5, export-specialized producers (9 producers, 7.1%).

[b] G1 was excluded from all chi-square and correspondence analyses due to its small size of producers (n = 2).

Table A3. Number of Producers per Group and per Variable of Social Capital in Ataulfo Mango Orchards in the Soconusco and Istmo-Costa Regions of Chiapas, Mexico

Variable	Producer groups [a]					χ^2; df; *P*
	G1 [b]	G2	G3	G4	G5	
Importance of mango in the household economy						
High	1	29	35	6	8	15.33; 9; 0.082
Moderate	1	12	17	4	1	
Low	0	7	3	1	0	
Negligible	0	0	0	1	0	
Homeownership						
Yes	2	47	51	12	7	6.77; 3; 0.79
No	0	1	4	0	2	
Membership of an organization						
Yes	1	9	9	9	6	26.25; 3; <0.001
No	1	39	46	3	3	
Technical assistance						
Yes	1	1	15	5	9	43.27; 3; <0.001
No	1	47	40	7	0	
Had received technical assistance						
Yes	1	2	20	8	9	43.70; 3; <0.001
Never	1	46	35	4	0	

[a] G1, packing-linked producers (2 producers, 1.6%), G2, resource-limited producers (48 producers, 38.1%); G3, intermediate commercial producers (55 producers, 43.7%); G4, multi-market producers (12 producers, 9.5%); and G5, export-specialized producers (9 producers, 7.1%).

[b] G1 was excluded from all chi-square and correspondence analyses due to its small size of producers (n = 2).

Table A4. Number of Producers per Group and per Variable of Financial Capital in Ataulfo Mango Orchards in the Soconusco and Istmo-Costa Regions of Chiapas, Mexico

Variable	Producer groups [a]					χ^2; df; *P*
	G1 [b]	G2	G3	G4	G5	
Tracking production costs						
Yes	1	1	8	11	4	53.81; 3; <0.001
No	1	47	47	1	5	
Saving or investing						
Yes	1	5	11	8	5	22.60; 3; <0.001
No	1	43	44	4	4	
Percentage of savings						
5–10	0	1	7	2	1	6.27; 6; 0.393
15–20	0	3	3	3	2	
25–50	1	1	1	3	2	
Sources of financing						
Bank loans	0	1	0	0	1	41.96; 15; <0.001
Government loans	0	1	0	1	2	
Family	0	18	35	8	2	
Mixtures	0	0	0	1	1	
None	0	27	20	2	3	
Other	2	1	0	0	0	
Insurance						
Agricultural	0	0	0	0	0	54.48; 12; <0.001
Life	0	1	1	2	1	
Major medical expenses	0	0	0	1	0	
Mixtures	0	0	0	1	1	
Social security	0	0	0	0	2	
None	2	47	54	8	5	
Sources of income						
Mango sales	1	4	5	0	1	16.44; 9; 0.058
Mango sales + other income	1	34	33	8	7	
Mango sales + 2 additional incomes	0	9	17	2	0	
Mango sales + 3 additional incomes	0	1	0	2	1	
Ways of selling the harvest						
Box	2	2	26	8	8	40.21; 3; <0.001
Orchard	0	46	29	4	1	

Table A4 continued

Table A4 continued

Sales market						
Local	0	23	7	0	0	73.73; 18; <0.001
National	1	7	7	1	0	
International	1	0	2	2	4	
Local, national	0	14	20	3	0	
National, international	0	2	15	4	5	
Local, national, international	0	0	4	2	0	
Unsure	0	2	0	0	0	
Buyers						
Orchard intermediary	0	46	30	4	0	78.03; 15; <0.001
Box intermediary	0	1	10	0	0	
Packing house	2	1	12	6	6	
National supply center	0	0	2	1	1	
Regional markets	0	0	0	1	0	
International intermediary	0	0	1	0	2	
Income from mango harvest per ha (US$)						
≤ $3,086	1	40	22	8	6	25.00; 9; <0.002
$3,087–$6,179	0	4	14	2	3	
≥ $6,180	1	2	14	1	0	
Unsure	0	2	5	1	0	
Cost of production per ha (US$)						
≤ $249	0	8	5	1	0	35.07; 9; <0.001
$250–$998	1	3	12	7	3	
≥ $9,991	0	0	7	2	3	
Unsure	1	37	31	2	3	
Daily income (US$)						
< $3.74	0	1	0	0	0	69.67; 15; <0.001
$3.75–$7.48	2	41	23	2	1	
$7.49–$11.22	0	5	16	3	3	
$11.23–$14.97	0	0	7	0	0	
$14.98–$18.71	0	1	5	1	0	
> $18.72	0	0	4	6	5	

[a] G1, packing-linked producers (2 producers, 1.6%), G2, resource-limited producers (48 producers, 38.1%); G3, intermediate commercial producers (55 producers, 43.7%); G4, multi-market producers (12 producers, 9.5%); and G5, export-specialized producers (9 producers, 7.1%).

[b] G1 was excluded from all chi-square and correspondence analyses due to its small size of producers (n = 2).

Table A5. Number of Producers and Average (±standard error) of the Economic Analysis Variables by Group in Ataulfo Mango Orchards in Soconusco and Istmo-Costa Regions of Chiapas, Mexico

Range of variables (US$)	Producer groups [a]					
	G1 [b]	G2	G3	G4	G5	χ^2; df; *P*
Production costs per ha (US$)						
≤ $249	0	8	5	1	0	35.07; 9; <0.001
$250–$998	1	3	12	7	3	
≥ $9991	0	0	7	2	3	
Unsure	1	37	31	2	3	
Mean± standard error	596.57	219.67± 68.96	794.33± 146.94	$720.94± 139.89	1,070.77± 267.39	
Production costs per orchard (US$)						
≤ 5,000	1	11	17	4	2	15.27; 6; 0.018
$5,001- $25,000	0	0	5	3	1	
≥ $25,001	0	0	2	3	3	
Mean± standard error	2,095.13	532.46± 127.11	6,516.57 ± 2,535.48	20,884.63± 12,703.50	43,506.31± 22,213.64	
Production value per ha (US$)						
< $2,500	1	40	31	7	4	14.64; 6; 0.023
$2,501 - 5,000	0	4	9	3	4	
>$5,001	1	2	10	1	1	
Mean± standard error	3,505.23± 2,458.89	1,634.14± 243.25	4,081.97± 477.04	2,625.52± 526.75	2,974.35± 614.70	
Production value per orchard (US$)						
< $21,225	1	46	40	4	1	48.36; 3; <0.001
>$21,226	1	0	10	7	8	
Mean± standard error	91,292.97± 87630.79	3,826.15± 584.53	22,949.01± 7,720.28	42,291.07± 11,267.69	72,548.99± 13,025.64	
Profit per ha (US$)						
≤ $2,500	1	11	11	4	3	11.82; 6; 0.066
$2,501 - 5,000	0	0	5	3	1	
≥$5,001	0	0	8	1	1	
Mean± standard error	448.43	1,293.86± 218.66	3,309.18± 611.70	2,677.93± 608.37	2,619.03± 841.20	
Profit per orchard (US$)						
≤ $7,500	1	11	12	2	0	20.07; 6; 0.002
$7,501 - 15,000	0	0	5	1	1	
≥$15,001	0	0	7	5	4	
Mean± standard error	1,569.50	2,800.07± 461.04	29,875.20± 13,165.07	26,872.82± 9,522.06	38,720.72± 11,684.45	

Table A5 continued

Table A5 continued

Profit per day per producer (US$)						
≤ $60	1	11	18	3	1	14.60; 3; 0.002
≥$61	0	0	6	5	4	
Mean± standard error	4.29	7.66± 1.26	81.81± 36.02	73.62± 26.08	106.08± 32.01	
Profits and minimum wages (US$)						
≤ 1	1	9	8	2	0	22.19; 6; 0.001
1.1 - 5	0	2	11	1	1	
≥5.1	0	0	5	5	4	
Mean± standard error	0.50	0.89± 0.15	9.50± 4.19	5.55± 3.03	12.32± 3.72	

[a] G1, packing-linked producers (2 producers, 1.6%), G2, resource-limited producers (48 producers, 38.1%); G3, intermediate commercial producers (55 producers, 43.7%); G4, multi-market producers (12 producers, 9.5%); and G5, export-specialized producers (9 producers, 7.1%).
[b] G1 was excluded from all chi-square and correspondence analyses due to its small size of producers (n = 2).