

Identification and characterization of small dairy producers from San Miguel Coatlinchán and their relationship with their socioeconomic structure

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ABSTRACT

Objective: To identify the total number of small dairy producers and to characterize their socioeconomic structure, land ownership status, production system, and the effects of urban growth.

Design/Methodology/Approach: Mixed-method research with non-probability sampling was applied through a survey to 32 dairy producers, based on the registry of ejidos of San Miguel Coatlinchán.

Results: The total number of small dairy producers, their spatial distribution, and the problems generated by urban growth were identified, as well as prospects for the survival of the production.

Study Limitations/Implications: Internal and external factors (*e.g.*, urban growth) that condition primary activities must be identified.

Findings/Conclusions: The lack of government support for training activities and technical advice, along with the abandonment of producer organizations, limits the capacity of the producers to boost their activity, to produce dairy by-products, and to improve their income.

Keywords: small milk farmers, socioeconomic structure, urban growth.

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INTRODUCTION

Small-scale dairy production is one of the most common activities carried out by rural families throughout Mexico. Small production units work with 3 to 30 cows and ≤ 4.5 ha to feed their livestock (SADER 2022; Hernández *et al.*, 2013; and Hemme *et al.*, 2007). According to FAO (2010), small-scale dairy producers should be a priority in public policies, because they generate income and employment, thus alleviating poverty and vulnerability. Likewise, they guarantee food security in rural areas.

In their 2024 livestock inventory, SIAP (Agri-Food and Fisheries Information Service) estimated a dairy production of 13.333 billion liters of milk per year —58% of which is



produced by small producers who have up to 100 milking cows. However, this percentage does not differentiate between types of production systems. Mexican milk production systems have been identified and characterized according to their productive, economic, agroecological and social importance as follows: specialized intensive system (SIS), family-backyard system (FBS), and dual-purpose system (DPS) (Avilés, 2024). Gallegos (2023) considered various aspects to differentiate production systems, including the type of livestock, technology applied, geographic location, type of feed, and the characterization of national production systems. SIS, FBS, and DPS account for 70%, 21%, and 9% of the national production, respectively (Robledo, 2018).

The aim of this study was to identify the total number of small dairy producers in the town of San Miguel Coatlinchán. A survey was conducted to determine socioeconomic data, including age, educational level, production systems, local market ties, and land ownership.

Dairy producers in Coatlinchán do not establish their pens following a specific location order. Producers usually set up pens in their homes, which allows them to take care of them and sell their products directly to the population. Nowadays, these pens have been absorbed by urban dynamics and growth, generating new relationships of coexistence between producers and residents and leading to conflictive relationships that did not previously exist. This situation has modified productive and organizational forms. Nevertheless, rural processes and identities have not been lost.

MATERIALS AND METHODS

Location and characteristics of the study area

The town of San Miguel Coatlinchán is located within the southern perimeter of the municipality of Texcoco in the State of Mexico, near the old Lake Texcoco, on the bridge

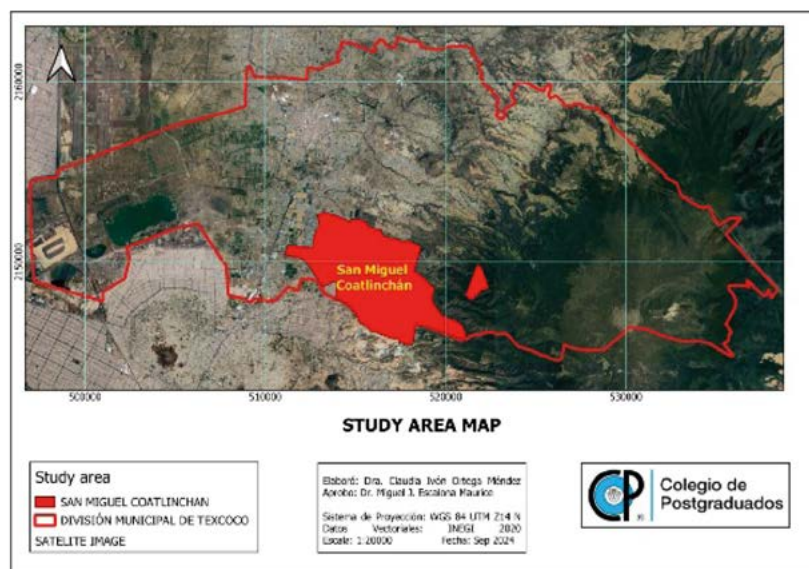


Figure 1. Location of the study area. Figure developed by the authors based on vector data from INEGI (2020).

path to Mexico City. According to the 2020 census conducted by Mexico's National Institute of Statistics and Geography (INEGI), the town has a total population of 13,705 inhabitants, out of which 6,700 are men and 7,005 are women, making it the second most populated town in the municipality.

The samples were selected based on the *ejidatario* registry, which was made up of a universal set of 295 *ejidatarios* (*ejido* landowners) using non-probability sampling (Hernández *et al.*, 2018). The reliability level was 95%.

$$n = \frac{npq}{(N-1)D + pq}$$

Where n = sample size, N = population size, p = probability of success = 0.5, $q = 1 - p$, $D = (B/z)^2$, B = maximum acceptable error = 0.10, Z = 90% confidence interval = 1.64.

Only 10 surveys were applied to the sample value ($n = 55$), because the rest of the *ejidatarios* has another activity.

Direct fieldwork enabled the identification of 22 additional small-scale producers, bringing the total to 33 completed surveys. No other producers in the entire area engaged in this activity. To validate the survey topics, an exploratory work was conducted with key stakeholders to define the main topics. Fieldwork was carried out from March 11 to May 20, 2024, and producers and their families were surveyed directly at the milking sites.

RESULTS AND DISCUSSION

A total universal set of local small milk producers allowed the research team to determine the overall situation of the dairy activity, therefore obtaining a concentrate of an updated registry, which included the following information: total number of cows, estimated production, production management strategies, and, above all, socioeconomic characteristics based on which each producer can be evaluated.

Demographics

Demographic data can help to determine the statistical characteristics of the target population. In this stage, identification data was collected from small dairy producers, including: age, sex, marital status, highest level of education, and number of children. Out of the 32 small dairy producers, 30 were men and 2 were women. According to the following age graph, 53% had between 41 and 59 years old.

According to Table 1, 12.5% of all the producers did not finish primary school, 28.125% finished primary school, 50% finished secondary school, and 9.375% have an incomplete bachelor's degree.

Typification of dairy producers

Small producers who belong to the second or third generation in dairy production families have dedicated practically their entire lives to this activity, which has always been their main occupation. They have been immersed in dairy production, because their

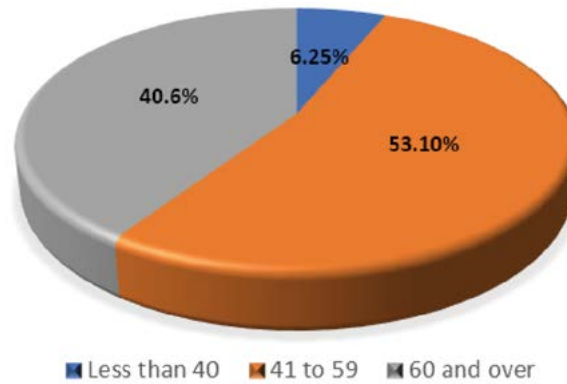


Figure 2. Age of the dairy producers.

Table 1. Educational level of the dairy producers.

Level of education	Frequency	Value (%)
Unfinished primary school	4	12.5
Primary school completed	9	28.125
Secondary	16	50
Unfinished degree	3	9.375
Total	32	100

father and/or grandfather were already engaged in this labor and they were expected to participate in their family business (agriculture and livestock).

For all producers and their ancestors, dairy activity has been their main source of income. They do not work —nor have they ever worked— in any government department and, therefore, if they are older than 60, they do not have a pension.

In this sense, 59.375% of small dairy producers would prefer if their children did not continue with this activity. They believe that it is a very arduous activity that does not only prevent them from spending time with their family, it also involves high expenses and low income. However, their main reason is that they want their children to study, become professionals, and work in places where they are provided with medical services, social security, and a fixed salary. Therefore, they support their studies and, whenever possible, they send them to private schools to achieve higher education.

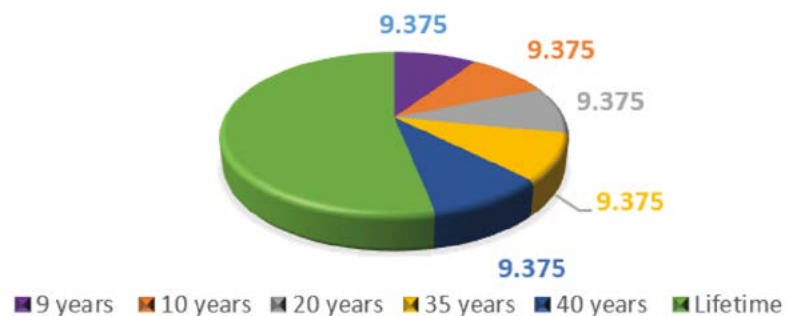


Figure 3. Years of dairy activity.

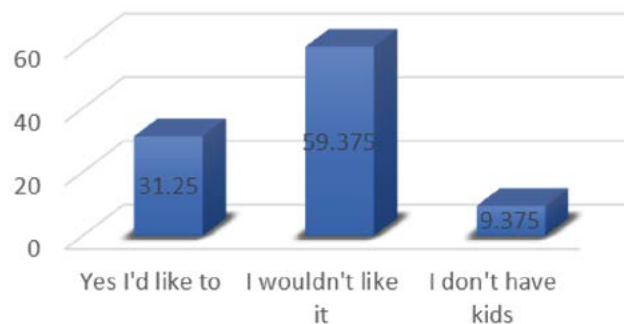


Figure 4. Percentage of producers who would like their children to continue or not with dairy production.

The following table identifies some variables that could prevent dairy producers from carrying out this activity.

Dairy production

Seven producers owned 1 to 5 milking cows, while eleven had between 6 and 10 cows, twelve had between 11 and 15 cows, one had 30 cows, and another had 45 cows. All producers owned some Holstein cows, 9.4% owned only one Jersey or Canadienne cow, and 6.25% owned only one Holstein×Swiss cross.

The participating farmers mentioned that, before 2018, they received technical assistance from the Mexican Ministry of Agricultural Development (SEDAGRO, currently SADER) for their milking, vaccination, deworming, medication, and/or insemination activities. However, when the left-wing government that refers to itself as the “Fourth Transformation [of Mexico]” came to power, that support was no longer available. Producers report that students and workers from COLPOS - Montecillo and the Universidad Autónoma de Chapingo (UACH) sometimes visit them and give them advice or suggestions on the management and health of their livestock.

The producers feed their livestock mainly with pasture, corn silage and stover, alfalfa (hay and green), agro-industrial by-products (bran, corn gluten feed, brewer grains), supplements (minerals, vitamins, additives), concentrates (corn, soybean, wheat, oats,

Table 2. Causes that dairy producers consider will prevent them from continuing with the activity.

Cause	Frequency	%
Age	6	18.75
Age and not being able to cover the expenses	14	43.75
Age, not having space for my livestock and not being able to cover the expenses	3	9.375
Not having land for agriculture and not being able to cover the expenses	3	9.375
Not being able to cover the expenses	3	9.375
None	3	9.375
Total	32	100

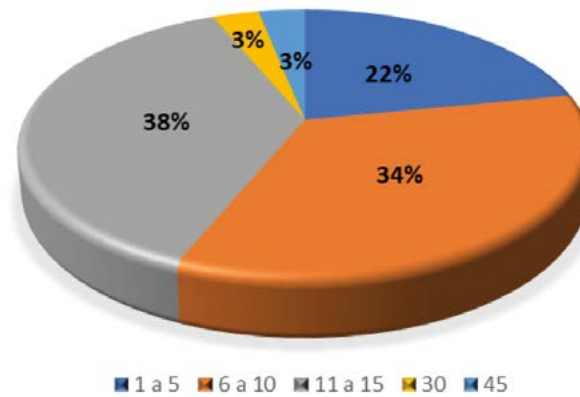


Figure 5. Percentage of dairy producers per number of milking cows.

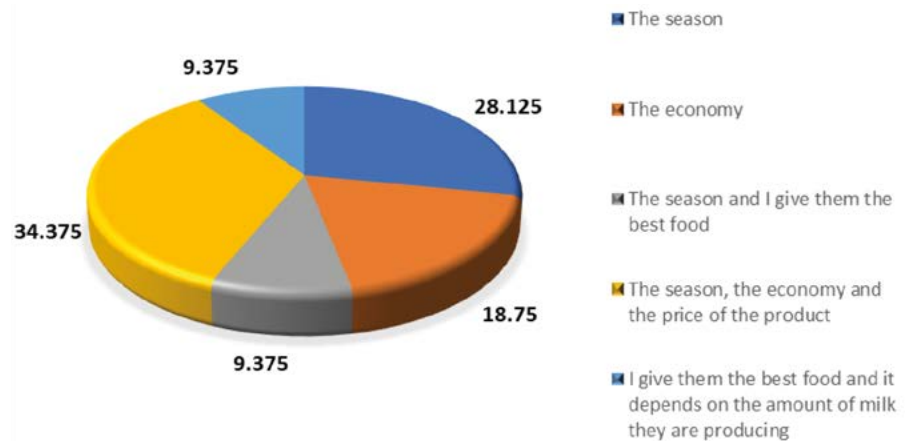


Figure 6. Type of feed for dairy cattle.

bread, ground straw), salt blocks, silage made from other forages, concentrated feeds, and ground bakery waste with bran and other fodder grains. This feed depends mainly on the performance of the harvest in a given season, the price of the products, and their savings.

Producers pointed out that, in a good season, cows produce 15 to 32 liters of milk per day, while, in a bad season, they only produce 2 to 15 liters of milk per day. These figures are used to estimate production indicators. Technique-wise, 90.375% of the small producers milk by hand and only 9.375% have a milking machine. The milking supplies they use include 20-L plastic containers where the milk is stored during the milking process, water to wash the cows' udders, disinfectants, and the post-milking teat sealant.

Cows that permanently stop producing milk are sold at a loss to local or outsider butchers. The price depends on the age of the cow and ranges from MXN\$2,000 to MXN\$12,000 pesos. Male calves are sold for MXN\$3,000 pesos or they are kept for fattening and then sold at MXN\$17,000 to MXN\$33,000 pesos. Any profits are used to buy food or medicine for the rest of the livestock or for family emergencies. "Male calves are our piggy bank," the producers say.

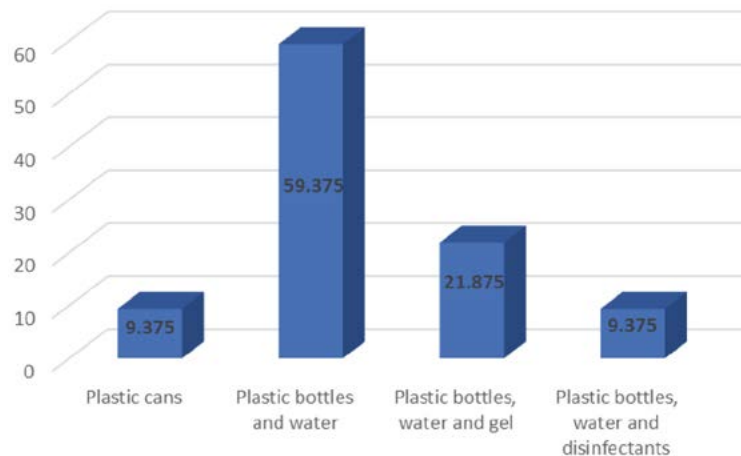


Figure 7. Milking supplies.

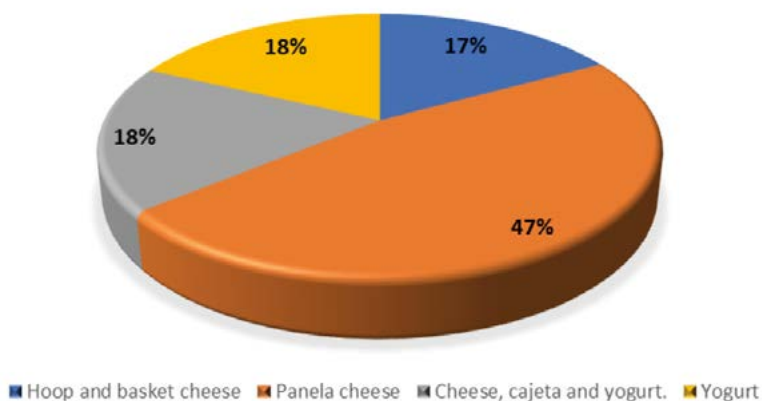


Figure 8. Percentage of small producers who manufacture some type of dairy by-product.



Figure 9. Pen infrastructure.

Milk commercialization

Producers do not hire personnel for the handling of dairy cattle or related production activities: 46.8% of the producers are directly in charge of these tasks, while 53.2% involve their families. Children milk the cows, sweep the pens, and feed the cattle, wives sweep the pens, and daughters-in-law and brothers help to harvest and milk.

The price of milk depends on to whom and where it is sold. The highest price ranges from MXN\$12 pesos to MXN\$16 pesos per liter. Milk is sold door-to-door in the same locality. They can also sell it at a local milk collection center, where they are paid MXN\$8 pesos per liter. Outsider or local buyers who process dairy by-products to make cheese, yogurt, etc., arrive at this place to collect milk from several producers and pay MXN\$9 pesos per liter. The average price of a liter of fresh milk is MXN\$10.50 pesos, but the price in rural areas ranges from MXN\$8 to MXN\$9 pesos (SIAP, 2023).

More than half (53.1%) of producers make some kind of dairy by-product. *Panela* cheese is produced by 47% of them, while *cajeta* (caramel sauce), yogurt, *queso de aro* (a type of fresh cheese), and *canasto* cheese are each manufactured by 18% of producers. They learned to make these by-products through courses offered by SEDAGRO or through training provided by UACH. These by-products are sold to local families and kept for personal consumption. Their sale is mainly the responsibility of the wives of the producers.

More than half (53.1%) of the producers would like to be trained in how to make some dairy by-products, while less than half (46.9%) are not interested, do not have the time, or have already tried and consider that the products and supplies are very expensive and they cannot afford to buy them.

Pen infrastructure

Based on the visits and surveys, the infrastructure is of low-medium quality. Producers typically lack the capital to maintain pens in optimal conditions for dairy production management. Good livestock practices must be implemented to ensure food safety, livestock management, livestock feeding, and waste management. The purpose of these measures is to manufacture dairy products in the best conditions possible and to reduce the risks posed by physical, chemical, or microbiological agents that diminish milk quality (SENASICA, 2019). Table 3 shows the surface area that producers allocate for their pens. A minimum of 50 m² is required for 5 cows. Sixty-eight percent of producers have cement pens, covered by corrugated metal sheets. Their walls are made of concrete blocks and some have rustic cement floors. Most producers (78%) have their own pens and the rest rent them. All pens contain drinking troughs, a roof, and a fence (at least made of wooden sticks). Consequently, this infrastructure is classified as semi-rustic.

Land ownership

Regarding the number of plots owned by dairy producers, 28% have one plot, 34% have two plots, and 38% have three plots. In terms of ownership, 33.3% are private property and 66.7% are *ejidos*.

According to the national agrarian distribution, to own land in Mexico, people need to comply with the following requirements: to be Mexican; to be an adult or of any age if they are in charge of a family or they inherited an *ejido*; to have lived at least a year in the vicinity of the corresponding *ejido* (except when they inherited the *ejido*); or to meet the internal requirements established by each *ejido* (L.A., 2024). Land ownership is proven with the agrarian rights certificate and the smallholding certificate.

Table 3. Pen infrastructure.

Characteristic	Data	Producers (%)
Surface	50-100 m ²	34.375
	101-200 m ²	18.75
	201-400 m ²	18.75
	401-600 m ²	18.75
	800 m ²	9.375
Structure	Built	68.75
	Semi-rustic	31.25
Facilities	Own	78.125
	Loaned	21.875
Content	Drinking fountains, Feeding troughs, roof.	18.75
	Perimeter fence, drinking fountains, feeders, roof.	81.25
Condition	Good	46.875
	Regular	43.75
	Bad	9.375
Antique (years)	3-15	21.872
	16-30	40.625
	31-45	28.125
	46-60	9.375

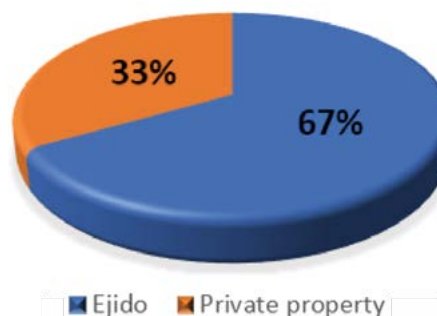


Figure 10. Type of land ownership system.

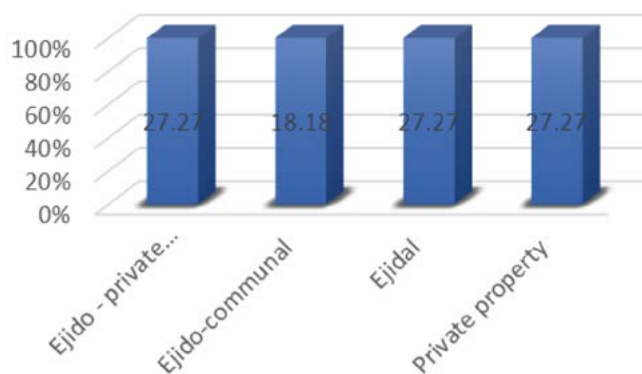


Figure 11. Producer land ownership system.

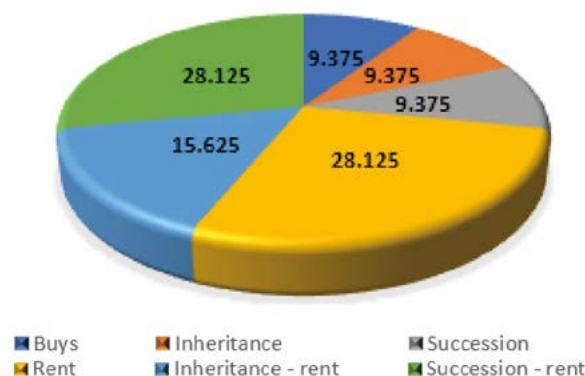


Figure 12. Origin of the ownership of the production plots.

The land is used as a small agricultural property, where cattle sheds are established and the animals are allowed to graze. The crops are managed under a rainfed system, while the water for the livestock is extracted from wells (drinking water). The producers have acquired the land through one of the following options: purchase, inheritance, succession, and rental.

Agriculture

The main crops of the last agricultural cycle are corn, forage corn, beans, oats, wheat, vegetables, barley, and tomatoes, which are primarily grown for livestock and family consumption.

Under previous governments, dairy producers received some level of support for the fields (*e.g.*, fertilizers or seeds) through direct support programs for agricultural areas such as PROCAMPO or “Producción para el Bienestar” and for the livestock (*e.g.*, new acquisitions, technical assistance, or insemination) from SEDAGRO. The left-wing government that came into power in late 2018 terminated the limited subsidies or support programs available for agricultural producers. Now they only have access to the pension for senior citizens, a program that is not aimed at farming, much less at livestock, and which only benefits small dairy producers who meet the required age.

CONCLUSIONS

Dairy production is a family activity that has been passed on from generation to generation within the town; however, the sons and daughters of small producers believe that the physical and economic costs of continuing with this activity are too high and that it does not generate a “decent” income that would allow them to have a better quality of life. Instead, they look for a more secure income, based on non-agricultural activities. The current government has clearly abandoned small dairy producers to their fate. The lack of an internal organization shows a total lack of interest, which hinders the creation of a local market that allows them to sell milk or other dairy by-products. This situation has a negative impact on the family economy. Advice and government programs would be necessary to strengthen the capacities of the producers. However, they report that with the

price of MXN\$10.50 per liter of milk established by the SIAP, they would achieve balance and their income would improve.

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