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DIAGNOSIS OF CATTLE FARMING IN THE MUNICIPALITY OF COAPILLA, CHIAPAS, MEXICO

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Abstract. In the state of Chiapas, cattle are mainly raised for milk, meat, and dual purposes. The objective of this research was to characterize cattle production systems in the municipality of Coapilla, Chiapas, Mexico. Considering that the Coapilla Livestock Association's registry of livestock producers in 2015 contained only 25 producers, it was decided to conduct a census, which generated 100% reliability. A questionnaire with 113 questions related to technological and socioeconomic factors was administered. Frequencies of individual variables were calculated, and some were correlated in pairs and/or triads using SPSS software (2016). The results indicated that in the municipality of Coapilla, Chiapas, the majority (96%) of cattle ranchers are between 46 and 85 years old. Fifty-six percent have been raising cattle for 20 years. Eighty percent completed primary school, 16% completed secondary school, and 4% completed high school. Eighty percent, 16%, and 4% own between 15 and 40, 10 and 14, and 90 hectares, respectively. Their main source of income is extensive cattle ranching (100%), and 56% of them also have income from other activities. The majority (80%) own communal land, and 20% own private property. Sixty-four percent have Swiss dairy breeds; 56% select their cattle for milk production or appearance. Only 32% supplement their cattle during dry seasons, and 60% offer mineral salts. 88% milk manually in rustic facilities with dirt floors; 76% milk once a day; 60% clean the udder and 56% do not milk cows with mastitis. Ninety-six percent vaccinate against certain diseases; 32% have veterinary services; 88% deworm; 48% control ticks; 44% said that 11 diseases affect all their animals, particularly diarrhea. Milk production (60%) is used for cheese. Seventy-two percent produced heifers that they used for replacement; 80% sold calves at weaning; 72% sold between one and three cull cows; and 24% purchased bulls. Finally, 76% said that their production was profitable. The information obtained made it possible to design a Comprehensive Technical Assistance System for livestock farmers in the municipality, which will be implemented in an inter-institutional and interdisciplinary manner.

Keywords: livestock farming, cattle, factors, systems, production.

INTRODUCTION

Cattle production is key to the economy and food security, providing meat, milk, and leather. It generates employment in rural areas and contributes to sustainable resource management by utilizing marginal land and recycling nutrients, maintaining ecological balance. Globally, there are 1.552 billion head of cattle, with Brazil having the largest inventory (234), followed by India (194), the United States (92), Ethiopia (68), China (61), Argentina (54), Pakistan (53), and Mexico (36) (SENASICA, 2025).

Mexico is a country with a strong livestock tradition, where 56% of the national territory is dedicated to extensive livestock farming (108.9 million hectares), with different meat and dairy production systems (Murray-Tortarolo, 2022; SADER, 2023). Hence the importance of promoting its sustainability, productivity, and competitiveness so that it continues to contribute to economic growth and the generation of foreign exchange and jobs (SADER, 2023).

Preliminarily, in 2023, the Agrifood and Fisheries Information Service reported a cattle inventory for meat and milk of 36.6 million head (33.9 cattle for meat and 2.7 cattle for milk). It should be noted that, during the period 2014-2023, this inventory showed an average annual growth rate of 1.2%, respectively. The five states with the largest inventories in millions of head of cattle

are: Veracruz (4.6), Jalisco (3.5), Chiapas (2.7), Chihuahua (2.6), and Michoacán (2.1), while the rest are grouped into 27 entities with 21.2 million head of cattle for meat and milk (DGSIAP, 2024; SENASICA, 2025).

Livestock farming is an ally in the fight against malnutrition and helps combat the effects of climate change, as livestock lands have enormous potential for mitigating greenhouse gases through carbon capture and storage. The main challenge is to increase the production of animal-based foods with the least environmental impact in order to provide future generations with a viable, productive, and competitive nation, as well as to work on the inclusion of small-scale livestock farmers (SADER, 2023).

Assessing the economic viability of livestock farming in Mexico is essential due to the high demand for animal products from a growing population. Variations in profitability are caused by factors such as rising input prices, variable weather conditions, and changes in market demand. A crucial aspect for the success of livestock units is sustainability. With this in mind, the livestock sector must adopt innovative practices and new technologies to balance productivity and efficiency with environmental responsibility and animal welfare, thus ensuring the continuity and prosperity of the business (Club ganadero, 2024).

In recent years, these livestock production systems have gained importance in light of the need to supply food for human consumption. Therefore, the characterization of livestock systems is one of the strategies that can be used to identify the causes that are affecting the production system. It also provides guidelines for analyzing them in a comprehensive manner, from the management carried out on farms, such as the development of preventive medicine protocols, as well as socio-economic aspects; with reference to the productive infrastructure, livestock, ecosystems, among other aspects that determine the productive sustainability of livestock farms, where comprehensive solution options can be derived through the development and application of a comprehensive technical assistance system (SATI) in the sector.

The state of Chiapas is characterized by its livestock production, which is the second largest economic activity generating foreign exchange for the state and income for producers. In this sense, characterizing a production system is of great interest because through this process it is possible to analyze how raw materials (milk and/or meat) are produced, to identify the main common doubts in livestock farming that limit or deteriorate productive efficiency per unit of area exploited, to intervene through a SATI, and thereby resolve unknowns involved in production.

In the state of Chiapas, cattle farming is part of the production systems that are exploited in different ways, such as beef, milk, and dual purpose, with the aim of supplying the demand that exists within the market for beef consumption. It is also very important to consider that the relevance of production systems in Chiapas has had a major impact on their high-level, high-quality production (Osorio and Segura, 2005).

In Coapilla, there is no overview of interest in cattle farming, which is why the objective of this study was to characterize the cattle farming production systems in the municipality of Coapilla, Chiapas.

MATERIALS AND METHODS

LOCATION OF THE STUDY AREA

This research was conducted in the municipality of Coapilla, Chiapas, located in the northern mountains of Chiapas. Its geographical coordinates are 17° 08" north latitude and 93° 10" west longitude, and

its altitude is 1560 m. It has a population of 9900 inhabitants, a uniformly semi-warm subhumid climate with rainfall in summer, an average annual temperature ranging between 11 and 27°C, and annual rainfall of 1800 mm (INAFED, 2009; INEGI, 2021). The municipality is made up of Eocene and Upper Cretaceous tertiary terrain. The predominant soil types are feozem and livosol, and the land is mainly used for pasture and forest, with 70% corresponding to communal land and the rest to private property (INAFED, 2009).

METHODOLOGY

Considering that the Coapilla Livestock Association (Asociación Ganadera A.C. de Coapilla) had only 19 members in 2015, it was decided to conduct a census of them through a survey, which provides virtually 100% reliability in the results for that population. However, as there are six producers who were not members, they were also included, making a population of 25 livestock farmers, which increased the accuracy and reliability of the results. In addition, the livestock farmers were informed of the objectives of the survey in order to reduce bias in the information obtained.

SURVEY STRUCTURE

The preliminary questionnaire was designed with 120 questions on five fundamental aspects: general information, productive, social, economic, and technological impact, in order to obtain information that would allow recommendations for improvement in livestock production systems to be proposed. After conducting two surveys in the selected units, inappropriate questions were identified, and the final questionnaire consisted of 113 questions divided into 11 blocks: (1) personal data ; (2) land tenure; (3) cattle inventory; (4) production aspects; (5) reproductive aspects; (6) nutrition; (7) health; (8) genetic aspects; (9) basic costs; (10) production costs; and (11) sales.

ANALYSIS OF THE INFORMATION

After coding and capturing the data in digital files, the database was analyzed using the statistical program SPSS (Statistical Package for the Social Sciences, 2016). The frequencies of all individual variables were calculated, and some, considered appropriate, were correlated in pairs and/or triads.

RESULTS AND DISCUSSION

PERSONAL DATA

The municipal capital of Coapilla was representative, as it is home to the 25 cattle producers who were surveyed, equivalent to 100% of the population. Eighty-four percent of producers practice the Catholic religion; 28% of them are women who have zero (4%), one (12%), and two (12%) dependents in their care; while the remaining 56% are men who have zero (16%), one (20%), two (16%), and three (4%) dependents. To a lesser extent, 12% of men practice the Adventist religion and have zero (4%) and one dependent (8%); while 4% are Jehovah's Witnesses with three dependents.

The majority (76%) of producers are between 51 and 75 years old; 12% are between 36 and 50; and 12% are between 76 and 85. One hundred percent have been raising cattle for between 5 and 60 years, and 84% of them for between 10 and 40 years, with 56% having 20 years of experience. Likewise, schooling was unstable, with 80% having completed primary school, 16% secondary school, and 4% high school. These results do not coincide with those presented by corn producers in Coapilla, the majority of whom (38.3%) completed primary school; 35.1% completed between 1st and 5th grade; 3.3% completed 2nd or 3rd grade of secondary school; and 3.3% completed vocational school. however, 20% were illiterate (León-Velasco *et al.*, 2021). According to 2010 data for Mexico, Chiapas ranks first in illiteracy among the population

aged 15 and over, with an average of 17.8% (INEGI, 2014); Chiapas remains in first place in 2020 , with 13.7% illiteracy and 48.12% of the population aged 15 and over having not completed basic education (SH, 2021).

The criteria for marginalization relating to education show that, at the national level, 8.3% of the population over the age of 15 is illiterate. In marginalized and indigenous territories, the proportion of illiteracy for those ages doubles or triples. On the other hand, there are factors that prevent people from completing primary school, such as the high opportunity cost that education represents for poor families, who see their children as additional labor, or simply the lack of adequate and comprehensive educational opportunities. This has led to higher dropout rates at the primary level in marginalized and indigenous municipalities and localities. In this regard, nationally, 23% of people over the age of 15 did not complete primary school; in municipalities with very high and high levels of marginalization, the proportions were 57% and 43.9%, respectively; while in localities with very high and high levels of marginalization, the percentages are close to the average, and in indigenous municipalities, on the contrary, the proportion increases to 34.8% (SEDESOL, 2012).

The main source of income for those surveyed was livestock farming (44%), which is practiced extensively, with cattle farming as the main activity; similarly, 56% obtain their income from cattle farming, as well as from other activities that were not mentioned. In this regard, Wikipedia (2025) indicates that in the municipality of Coapilla, people are mainly engaged in planting corn and beans, as well as raising backyard animals for their own consumption.

LAND TENURE

Table 1 shows that 100% of livestock farmers use a total area of 666 ha for cattle farming. This area ranges from 10 to 90 ha, with 80% owning between 15 and 40 ha, 16% between 10 and 14 ha, and one person (4%) with 90 ha. In terms of land tenure, 80% of producers own communal land and 20% own small properties, which means that the majority practice communal cattle farming.

With regard to land distribution, producers cultivate a variety of pastures, with native pastures (32%), improved and native pastures (20%), improved pastures (12%), Estrella and Gigante pastures (12%), and Gigante grass (12%) being the most common. In terms of land area, most farmers devote 20 ha to native pastures (8%), improved pastures (4%), Estrella and Gigante pastures (4%), and Gigante grass (4%); Similarly, another majority devotes 35 ha to native pastures (4%), improved and native pastures (4%), Estrella and Gigante (4%), and Gigante grass (4%). In addition to pastures, most (80%) producers grow corn and beans; corn (12%); as well as corn and coffee (4%). One drawback is the large area of grazing land covered by native grasses, which have lower production capacity than introduced grasses. Incorrect grazing practices lead to poor establishment of grasses, their depletion, and the growth of weeds. Pastures are generally very large and poorly distributed (Román, 2005).

CATTLE INVENTORY

When cross-analyzing the number of hectares (666) and animals (649) owned by the 25 producers, no directly proportional relationship was observed; howev , most have an approximate ratio of one animal per hectare, which is equivalent to the grazing coefficient recommended for Chiapas by SEMARNAT (2020). Forty percent of producers have between 33 and 39 animals; 44% have between 17 and 31; and the remaining 16% have between 8 and 16 (Table 2). In addition, 96%

are engaged in other crops, predominantly (80%) the corn-bean system; therefore, the overall exploitation is defined as extensive livestock farming, which is consistent with González *et al.* (2015), who mention that cattle production systems in tropical regions are extensive.

There are 11 breeds raised by livestock farmers, with 44% of producers raising Swiss cattle, followed by 12% raising American Swiss cattle, 8% raising American Swiss crossbreeds, and 8% raising Simmental cattle, with 269, 85, 71, and 51 animals, respectively (Table 3).

The number of females available for mating ranged from five to 25, and the number of studs from zero to three. When both variables were crossed, it was observed that the majority (88%) of farmers use one bull to mate their females; however, 4% use two studs for 16 females; another 4% have three bulls for 14 females; while 4% have five females without a stud. The majority (88%) of producers have an average ratio of 14 females per stud, which coincides with the consensus in the literature, which generally suggests a ratio of one bull for every 25 to 30 cows, although this can be adjusted according to the age and condition of the bull, as well as the duration of the mating period (Gestión Pecuaria SAS, 2022; Salverson, 2023). On the other hand, 8% have an excess of bulls, which can influence maintenance and reproduction costs.

PRODUCTIVE ASPECTS

44% of producers excel in milk production with the highest number of animals using Swiss cattle, followed by American Swiss (12%), American Swiss crossbreeds (8%), and Simmental cattle (8%), with 75, 23, 25, and 11 animals, respectively. The remaining 28% corresponds to seven other breeds (Table 4), similar to the trend shown in Table 3 regarding breeds and animals exploited.

When associating (1) milk production, (2) the destination of production, and (3) the respective price, the results indicated that 60% of farmers use milk production to make cheese; therefore, Table 5 only associates production and its price. Thus, 56% of those who process cheese sell it at a price ranging from 55 to 75 MXN per piece, with the majority (24%) selling it at 60 MXN per piece; however, 4% consume it. On the other hand, 4% sell milk at MXN 4 per liter and another 4% consume it, while 28%, absent from Table 5, did not respond.

Sixty-eight percent of producers obtained between one and ten heifers, which were used for replacement; 4% produced six heifers, which they left at their Production Unit (UP); however, 28% did not respond.

In contrast, 76% of cattle farmers obtained between one and 11 calves at weaning, which were sold to private individuals; 4% obtained five calves at weaning, which were sold to the slaughterhouse; and 20% did not respond.

Thirty-two percent of producers sold a cull cow, with a value ranging from 6 to 21 MXN, and 4% sold three cows at 18 MXN, in both cases per kilogram of meat; as well as 24% between 4000 and 8000 MXN per animal. Similarly, other producers sold one animal to the slaughterhouse at MXN 20 (4%) per kilogram of meat; as well as MXN 4500 (4%) and MXN 6000 (4%) per cow, respectively; but 28% did not sell any cows.

REPRODUCTIVE ASPECTS

Regarding the type of reproduction, 100% of livestock farmers stated that they use "direct mating," meaning they do not use semen or embryos. However, when asked "who detects estrus," 72% of producers responded that it was the cowboy, and 28% said it was the "marker bull." This is contradictory because they all have studs for direct breeding, as they said, and they do not perform artificial insemination.

The percentage of births among the different breeds varied greatly, with an overall

Area	Tenure			Area
(ha)	Communal	Private property	Total	Total (ha)
10	1		1	10
12	1		1	12
14	1	1	2	28
15	2		2	30
17		1	1	17
19		1	1	19
20	4	1	5	100
22	1		1	22
24	1		1	24
30	2		2	60
34	1		1	34
35	3	1	4	140
40	2		2	80
90	1		1	90
Total	20	5	25	**666**

Table 1. Land tenure and area where producers carry out their activities.

Animals	Area (ha)															Animals
	10	12	14	15	17	19	20	22	24	30	34	35	40	90	Total	Total
8												1			1	8
10				1											1	10
11			1												1	11
16										1					1	16
17										1	1				2	34
18		1													1	18
19	1														1	19
20							2								2	40
24								1							1	24
25			1												1	25
29							1								1	29
30									1						1	30
31													1		1	31
33							1					2			3	99
34														1	1	34
35				1	1							1			3	105

38							1								1		38
39						1							1		2		78
Total	1	1	2	2	1	1	5	1	1	2	1	4	2	1	25		649
Total	10	12	28	30	17	19	100	22	24	60	34	140	80	90	666		

Table 2. Areas and cattle exploited by producers.

Breed	**Animals**																		
	8	10,	11,	16,	17,	18,	19,	20,	24,	25	29	30	31	33	34	35	38	39	Total
Brahman																		1	1
Cebu							1												1
Cebu																			
Indubrasil															1				1
Dutch									1										1
Simmental								1					1						**2**
Swiss Swiss	1		1	1	1			1		1		1		1		2		1	**11**
American					1									1		1			**3**
Swiss Creole											1								1
Swiss Cross																			
American														1			1		**2**
Swiss																			
Dutch						1													1
Swiss Cebu		1																	1
Total	1	1	1	1	2	1	1	2	1	1	1	1	1	3	1	3	1	2	25
Total	8	10	11	16	34	18	19	40	24	25	29	30	31	**99**	34	105	38	78	649

Table 3. Cattle breeds and numbers of animals raised by livestock farmers.

Breed	**Cows in production**											
	1	2	4	5	6	8	9	10	12	13	15	Total
Brahman								**1**				1
Cebu			**1**									1
Cebu Indubrasil											1	1
Dutch			**1**									1
Simmental				1	1							2
Swiss	**1**	**1**	**1**	**1**	**2**		**1**	**3**	**1**			**11**
Swiss American			**2**								1	**3**
Swiss Criollo Swiss American crossbreed						1			1	1		1 2
Swiss Dutch				1								1
Swiss Cebu			**1**									1

Total	1	1	6	3	3	1	1	4	2	1	2	25

Table 4. Breeds of cows in production exploited by livestock farmers.

Production (L day^{-1})	Cost per liter (MXN)		Value per cheese (MXN)					Total
	0	4	0	55	60	70	75	
0	1							1
8	1							1
15			1					1
16					2			2
25		1			1			2
30						2	1	3
34				1				1
40				2				2
45						1		1
50					1			1
60					1			1
80					1			1
100						1		1
Total	2	1	1	3	6	4	1	18

Table 5. Destination and value of milk production obtained by producers.

Ingredient	**Type of animal**		**Total**
	All	**None**	
Molasses	1		1
Molasses with chopped grass	1		1
Molasses, salt, corn, mineral salt, vitamins	1		1
Poultry manure	1		1
Mineral salt	2		2
Mineral salt and vitamins	1		1
Did not respond	1	17	18
Total	8	17	25

Table 6. Feed supplements that producers provide to animals.

average of 65.38%. One might think that this is due to the age or diet of the animals; however, it is attributed to the variation in the number of dry cows each producer has; that is, as the number of dry cows decreases, the percentage of births increases, and vice versa. Therefore, there is no doubt that any factor was negatively affecting the percentage of calving rates for the different breeds, which is confirmed when 88% of producers stated that they have observed an interval between calving of 10 to 13 months, which is outstanding. According to Sánchez (2010), for dual-purpose livestock to be profitable, cows must have an interval between calving of 12 to 13 months, wean as many calves as possible, and produce an adequate amount of milk for sale.

FEEDING ASPECTS

With regard to the availability of forage, 96% of farmers produce it and 4% purchase it, in both cases throughout the year. Only 28% supplement all animals during the dry season, while 4% do so throughout the year. Table 6 describes the supplements used by the 32% of farmers who do so, as well as the 68% who do not provide supplements to their animals. Finally, 100% of producers believe that the diet they use is not balanced.

Table 7 shows that 40% of producers provide freely accessible mineral salt, while 16% use different amounts and frequencies of Bovitina; 4% use 1 kg of mineral salt every 3 days; and 36% did not respond. It is noteworthy that 4% said molasses, which consists mainly of sugars (such as sucrose, glucose, and fructose) and water. Although molasses contains some minerals such as iron, calcium, magnesium, and potassium, it is not classified as a mineral salt. In general, the way in which Coapilla livestock farmers use mineral salts is inconsistent, making their need for technical assistance evident.

HEALTH ASPECTS

88% of producers have a brucellosis and tuberculosis (*Mycobacterium bovis*) certificate, with start dates ranging from 1995 to 2008. Notably, 28% have had the test since 2000 and 12% since 2008. However, it is noteworthy that 8% responded in 1950 and 1958, when such testing did not yet exist. Only 32% of producers had access to veterinary services in the year 2015. On the other hand, 96% said they vaccinate their animals for the diseases listed in Table 8, with the majority (72%) vaccinating for the prevention of brucellosis (*Brucella abortus)*.

100% of producers deworm all animals in their production units, with the most common drugs being Ivermectin (52%) and Levamisole (44%); coinciding with producers in Tonalá (27% and 35%) and Pijijiapan (19% and 30%), Chiapas, respectively (González *et al.*, 2015). According to the deworming schedule, 16% deworm every 4 months, 60% every 6 months, and 24% every year. In addition, the majority (48%) control ticks every 15 days, 28% every week, 20% every month, and 4% every 3 months. On the other hand, the majority (80%) are accustomed to weaning calves. The deworming schedule does not agree with the studies by González *et al.* (2015), since according to those authors, in Tonalá and Pijijiapan they do so every 6 months.

Forty-four percent of producers stated that 11 diseases affect all animals. In general, diarrhea (44%) is characteristic of calves and cows in production, which is controlled with emicin and penicillin, as well as piroplasmosis (*Babesia bovis)* (24%) and anaplasmosis (*Anaplasma marginale*) (20%), which are also controlled with ampicillin and penicillin, respectively. However, the latter two cases can be prevented by keeping cattle free of ticks (*Rhipicephalus microplus*), which, according to Celi (2013) and Rodríguez-Vivas *et al.* (2017), are the main vectors of .

Mineral salt	Frequency and quantity							
	Free access	Every 3 days (1 kg)	Daily (2 kg)	Every 4 days (5 kg)	Every 8 days (5 kg)	Every 4 days (6 kg)	No Known	Total
Bovitina	5		1	1	1	1		9
Phosphorite	2							2
Molasses	1							1
Mineral salt	3	1					1	5
Don't know	7						1	8
Total	18	1	1	1	1	1	2	25

Table 7. Amount and frequency of mineral salts that producers offer to animals.

Vaccine	Type of animal		
	All	Did not respond	Total
Brucella	1		1
Brucella and Clostridium	2		2
Brucella and Dengue	9		9
Brucellosis, Dengue, and Triple	1		1
Brucella, Derriengue, and Clostridium	5		5
Dengue	5		5
Derriengue and Clostridium	1		1
Did not respond		1	1
Total	24	1	25

Table 8. Various vaccines that producers administer to cattle on the farm.

GENETIC ASPECTS

The majority (56%) of producers stated that they select their livestock; 48% of them make the selection themselves, using milk production (28%) and the appearance of the animals (20%) as criteria; and for the remaining 8%, the selection is made by a veterinarian based on milk production. Given that the vast majority (88%) of livestock farmers are adults (aged 51 to 85) and 80% have a low level of education (primary school), as 48.12% of the population aged 15 and over in Chiapas has not completed basic education (SH; 2021); González *et al.* (2015) consider these to be two critical points for carrying out technological innovation and livestock technology transfer activities. On the other hand, 100% said they were not familiar with any animal selection system, and 52% of them said they would like to use a selection program. Finally, they were asked about the quality of the genetic material produced and sold by our country, to which the farmers responded that there are good studs (32%), good cows (20%), good bulls and good cows (12%), as well as good semen (4%).

RECORDING SYSTEM

Twelve percent of respondents use a reproductive registry, 4% use a production registry, and 84% do not use any registry,

which indicates little interest and/or a lack of training and technical assistance in this area.

OPERATING EXPENSES AND SALES REVENUE

A positive linear relationship has been observed between operating costs and sales revenue for 76% of livestock farmers, whose respective UPs are considered profitable. However, the remaining 24% reported income lower than the cost invested, and 12% of them had no income, as might be expected in any business; that is, income should exceed operating costs for the business to be profitable. In this case, it could be considered that there was no effective profit because the UP also required investment.

GENERAL MANAGEMENT

88% of producers milk manually and 12% do not milk at all. 100% do not test for mastitis. 60% disinfect the udder; 4% wash the udder with water; and only 12% maintain an order when milking. On the other hand, 56% do not milk cows with mastitis and 36% milk them last. Seventy-six percent of producers milk cows once a day. Eighty-four percent of producers mentioned that mastitis is a sporadic problem, and 100% have not had any deaths due to mastitis.

Regarding cattle management, 4% said they do so based on the age of the animals; another 4% based on age and sex; and 4% based on age and breed; while the remainder (88%) do not consider these aspects. Animals are culled out of necessity (36%); because they are old and difficult (28%); and because they are old and have poor characteristics (8%).

Now, regarding the management of cows before calving, 100% said that they calve alone in the pasture. Water availability is sufficient (80%) and abundant (16%). Eighty percent of producers said that calves wean on their own, and 20% did not respond.

In the case of dehorning, 76% said they do it all year round, using ointments (24%), dehorning tools (24%), saws (20%), while 32% do not do it. Finally, for manure management, 76% said they incorporate it into the soil and 24% did not respond.

With regard to milking, the results coincide with those of Tonalá and Pijijiapan, Chiapas, since in both municipalities the majority (98%) do so manually, in rustic facilities with 88% and 76% on dirt floors, respectively (González *et al*., 2015).

FACILITIES

Regarding handling pens, 96% of producers stated that they are in good condition, with wooden and sawn posts, as well as live fences and wire. The feeders are made of good quality wood (56%) as well as concrete and tires (12%).

Twenty-eight percent have wooden storage sheds and 4% have concrete ones; the rest (68%) did not respond. As for tick baths, 68% use backpack sprayers; the rest did not respond. Only 28% said that the sheepfolds are the lambing pens. González *et al.* (2015) indicate, in general, that it is necessary to work harder and implement actions to improve livestock production infrastructure, as this is related to animal welfare and productivity. Likewise, this infrastructure is essential for increasing milk quality and the added value of dairy products.

OTHER ACTIVITIES TO IMPROVE FARMING

In addition, livestock farmers grow corn (40%); corn and beans (32%); corn, beans, and squash (4%); beans (4%); squash (4%); and coffee (4%); whose production is for self-consumption (80%) as well as for self-consumption and sale (8%).

In relation to forestry activities, 68% plant timber trees; 20% plant fruit trees; 8% plant hedges; and 4% did not respond.

With regard to watershed management, 68% reforest water sources and around pastures (8%), while 24% did not respond.

CONCLUSIONS

In the municipality of Coapilla, Chiapas, the majority (96%) of cattle ranchers are between 46 and 85 years old. Eighty-four percent have been raising cattle for between 10 and 40 years. Eighty percent completed primary school, 16% secondary school, and 4% high school. Eighty, 16, and 4% of cattle ranchers own between 15 and 40, 10 and 14, and 90 hectares, respectively.

Their main source of income is extensive cattle farming (100%), and 56% of them also have income from other activities. The majority (80%) have communal land and 20% have private property.

Thirty-two percent grow native grass, 20% grow improved and native grass, 12% grow improved grass, another 12% grow star and giant grass, and 12% grow giant sorghum. In addition, the majority (80%) grow corn and beans.

The total number of producers has 649 head of cattle and 666 hectares, with a ratio of one animal per hectare; in addition, 96% are engaged in other crops. Forty-four percent of producers raise Swiss cattle; 12% raise American Swiss; 8% raise American Swiss crosses; and 8% raise Simmental, with 269, 85, 71, and 51 animals, respectively.

The majority (88%) have an average ratio of 14 cows per bull. Milk is produced by Swiss (44%), American Swiss (12%), American Swiss crossbreeds (8%), and Simmental (8%) cows, with 75, 23, 25, and 11 cows, respectively.

Milk production (60%) is used to make cheese, sold for between 55 and 75 MXN per piece. Seventy-two percent produced heifers that they used for replacement; 80% sold calves at weaning; and 72% sold between one and three cull cows.

Mating is carried out through direct mounting (100%). The average number of births was 65.4%, and the interval between births was 10 to 13 months.

All have forage available year-round, and only 32% supplement their animals' diet. In addition, 60% administer mineral salts. 100% do not balance the diet they use.

Ninety-six percent vaccinate mainly for brucellosis; 100% deworm all animals. The main diseases were diarrhea (44%), piroplasmosis (24%), and anaplasmosis (20%), which are treated with emicin, ampicillin, and penicillin, respectively.

Fifty-six percent of respondents select their animals based on appearance or milk production. Only 12% keep reproductive records, and 4% keep production records. The relationship between "operating costs and income" was linearly positive for 76% of producers, concluding that livestock farming was profitable.

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