Analysis of backyard agriculture and livestock production activities in the South Huasteca Region in San Luis Potosí, Mexico

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ABSTRACT

Objective: To carry out a diagnosis and assess the importance of backyard agriculture and livestock production in rural communities of the XV District in the South Huasteca Region of the State of San Luis Potosí, Mexico, on the social, economic and nutritional context of the population.

Design/Methodology/Approach: The study was carried out with two blocks of surveys, the first with the local government and the second with peasants, evaluating the socioeconomic status, importance of livestock and agriculture, nutritional status and culture. The method was deductive and descriptive; the information was with multivariate analysis of principal components.

Results: Government support does not reduce poverty. Families feel secure with their material goods. The nutritional status of the population is lacking. Raising chickens, turkeys and Creole pigs prioritizes livestock activity. Self-consumption and the commercialization of plant species is a traditional activity. There is a culinary culture.

Limitations on study/Implications: The restriction of information by the municipal government; the pandemic problems to generate more information from the surveys.

Conclusions: It is necessary to create efficient programs that improve agricultural and livestock production in the region, with the purpose of improving the nutritional status of the population and generating economic resources to reduce poverty.

Keywords: Agricultural, livestock and backyard farming.

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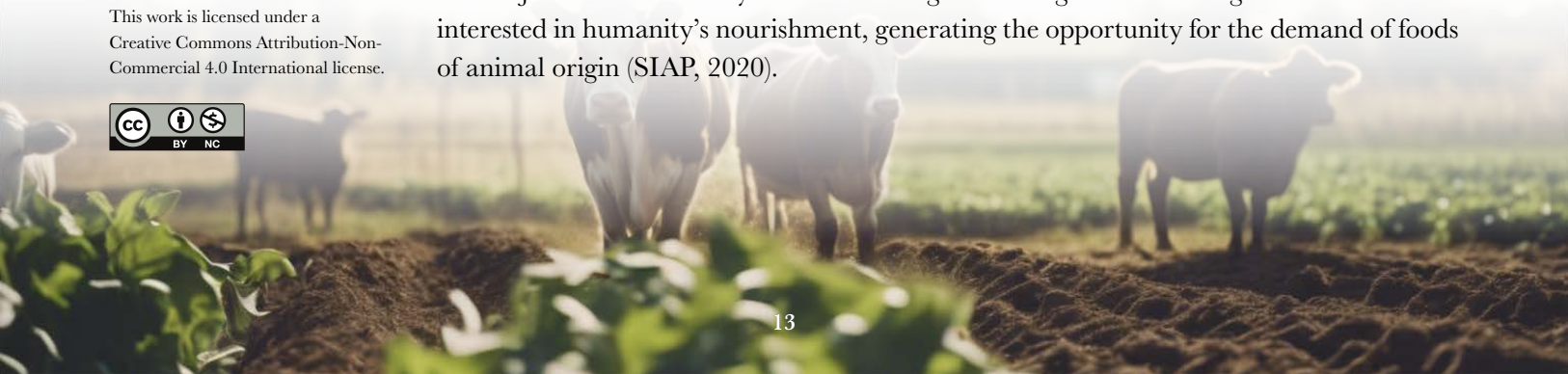
INTRODUCTION

Globally, livestock production and agriculture are part of the first link of the productive chain, and throughout history these two sectors have subsisted and contributed foods to the population. Recently, 170 countries which belong to the United Nations have become committed with the Agenda 2030 to promote sustainable development, establishing the priority of ending poverty and fulfilling the objectives of zero hunger, as well as strengthening the subject of food security. The different goals have given rise to organizations that are interested in humanity's nourishment, generating the opportunity for the demand of foods of animal origin (SIAP, 2020).



In Mexico, the situation of poverty in the country ranges from 43.9% of the population to 8.5% in extreme poverty, 23.7% vulnerable to social deprivation, 8.9% vulnerable from income, and only 23.5% of the population are not poor and vulnerable (CONEVAL, 2021b).

In particular, agriculture and livestock production known as small-scale, backyard or social predominates in the rural sector, and they are associated to the lifestyle of peasants or small-scale farmers, with a subsistence system where they continue to preserve the vicious cycle of poverty among their descendants. However, it has been shown that backyard agriculture and livestock production are associated and participate ambiguously in maintaining food security of rural families, generating some foods and a participation of 9.3% of the family economic income (Jaramillo-Villanueva *et al.*, 2017). In the agricultural sphere, the SADR (2015) has established backyard agriculture as a priority means to strengthen food security and to foster the sustainable development of rural regions.

In the livestock production scope, FAO (2012) also mentions that domestic animal breeding is part of family strategies, since it functions as a social and economic cushion that participates in the program for food security. In particular, for families on the poverty threshold, backyard livestock production is an opportunity for survival. As has already been mentioned, backyard farming generates very few resources, and its main activity is to promote auto-consumption; it uses family labor without a compensation plan, the production is low, and there are no national programs that guarantee fostering productivity. Regional and seasonal crops predominate in backyard agriculture in rural zones; corn is the predominant grass and it is associated to the dietary habits of the population. Meanwhile, backyard livestock production is characterized by having native or Creole animals of several domestic species. In both, there are no efficient production programs and they are primarily efficient sources for auto-consumption and intermittent income when there are economic needs.

The characterization of backyard systems depends on the region, and several social and cultural aspects; therefore, the objective of this study was to conduct a diagnosis of backyard agriculture and livestock production in the rural communities of the South Huasteca Region in the state of San Luis Potosí, Mexico, taking into consideration the analysis of social, economic and nutritional variables of the rural population under poverty conditions.

MATERIALS AND METHODS

The study was conducted in the ejido of Chapulhuacanito (Colonia, Limajtitla, Taxicho, Laurel, Maguey, Chichictla, Ahuehuet, Ahuimol) of the municipality of Tamazunchale, which belongs to District XV in the South Huasteca Region of the state of San Luis Potosí, Mexico (CEEPAC, 2018), located in the municipality of Tamazunchale (98° 56' 33.00" W to 98° 37' 16.32" W, Latitude 21° 09' 36.72" N to 21° 19' 37.92" N), with an altitude of 140 meters above sea level. The mean annual temperature is 25.5 °C, with an absolute maximum of 44 °C and an absolute minimum of 11 °C. The annual rainfall is 2,168.3 mm. Figure 1 (INEGI, 2020).

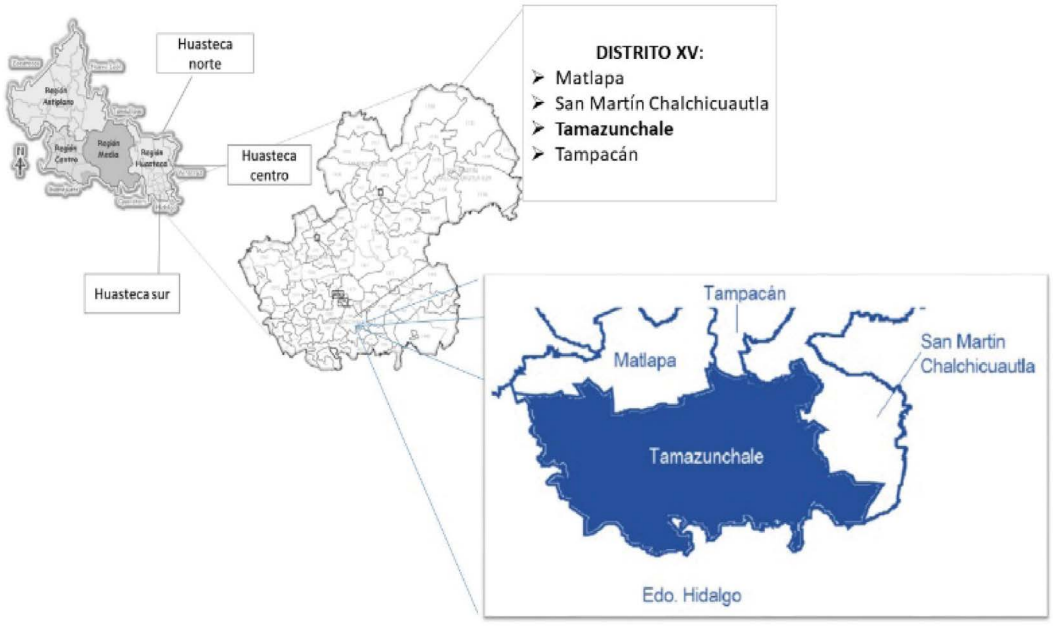


Figure 1. Location of the study, municipality of Tamazunchale, District XV in San Luis Potosí. Source: Prepared by the authors with data from INE (2007).

The place has 95,037 inhabitants, 78.2% of the population is in situation of poverty, while 25.9% has deprivation from lack of access to food (CONEVAL, 2021a). Historically, the families in this municipality have been devoted to backyard animal breeding and to sowing agricultural products in a traditional way for auto-consumption; there are not enough data currently to allow characterizing the backyard productive sector of the population. Two blocks of surveys were carried out in the study: the first block of surveys was applied directly with the secretary of the municipal government and the members of the departments of Economic Development, Rural Development, and Indigenous Affairs. The questions made were focused on the backing granted at the municipal level to the population. Likewise, the directives gave a certificate of authorization for the application of the second block of surveys to the population. In the second block, 100 surveys were applied in the ejido containing a series of questions (Table 1, Q1 to Q19), whose questionnaire attempted to identify the importance of livestock production and agriculture on the following groups, classified as: A) socioeconomic status of the family; B) importance of livestock production and agriculture on the dietary and nutritional status of the family; C) cultural and traditional status of livestock production and agriculture in the family; D) importance of livestock production and agriculture on auto-consumption and the possibility for an agribusiness. All the surveys were carried out in person, visiting the authorities and each of the homes of the population to be surveyed, and these surveys were applied in a maximum time of 15 minutes. The research method was deductive and descriptive. The size of the sample complied with the reliability requirements of 95%. The people interviewed showed willingness to be part of the sample, and sampling was done with the snowball process, corroborating that the sample fulfilled similar characteristics of the backyard agriculture and livestock production sector.

Table 1. Variables (P1…P19) of the second block of surveys carried on groups of families with agricultural purposes.

SOCIAL MEDIA	Nutritional status of the population	Agricultural and livestock sector	LIVESTOCK: Species, management, consumption			AGRICULTURAL: Species, management, consumption			
			Birds		Pig	Citrus	Corn	Beans and lentils	Pumpkin
			Management	Consumption	Management and consumption				
What is your gender?	How many people live in your home?	What is your agricultural and livestock activity?	What type of animal species do you have?	Do you market or consume your product?	What purpose does animal husbandry have?	What citrus species do you have?	What system do you use for your corn cultivation?	What kind of bean do you have?	What is the purpose of growing pumpkin?
What is your age range?	Is the water you consume drinkable or from a well?	How many animal species does it have?	What is its zootechnical purpose?	Do you sell chicken meat and eggs?	Do you have specialized breeds, Creole or both?	What system do you use for your crops?	What is the area used for growing corn?	What system do you use for growing beans?	What system do you use when growing pumpkin?
What is your educational level?	What type of meat do you consume most in your family?	Do you receive advice for your livestock?	What production system do you use?	How do you consume chicken meat?	How do you raise animals?	What is the area for your type of crop?	What is the situation of the land for growing corn, own, borrowed or rented?	What is the area for growing beans?	What is the area for pumpkin cultivation?
The source of economic income	How often do you eat that type of meat?	Do you receive government support?	What is the condition of the animals like?	What percentage of meat and eggs do you consume?	How much space does the corral have?	Do you use fertilizer for your crop?	Do you use herbicides for corn cultivation?	Do you use herbicides for your crop?	Do you use herbicide for your pumpkin crop?
Relatives who migrated abroad and send support	How many kilos of meat does the family consume per week?	What type of support do you receive?	How much space do you have for your pen?	Do you sell the turkeys or consume them?	How is the floor?	Do you use organic fertilizer for your crops?	Do you use organic fertilizer for growing corn?	Do you use organic fertilizer for growing beans?	Do you use organic fertilizer on pumpkin?
Whose house is inhabited?	What food does the family consume the most?	Is the material received for corrals?	What type of material does the floor have?	Where do you sell turkey meat and eggs?	Do you have feeders?	Do you produce or buy organic fertilizer?	Do you produce or buy organic fertilizer?	Does bean production sell or consume it?	Do you sell pumpkin production or do you consume it yourself?
Identify if the inhabitants have electricity service.	How often do you consume that species?	What animal species have you received?	Do you have feeders?	How do you consume turkey meat or eggs?	How do you feed your animals?	Do you sell citrus production or is it for self-consumption?	Is the production for sale or self-consumption?	Where do you market the beans?	Where do you market pumpkin?
How many lights are there in the house?	Has the Health Center detected any adult with malnutrition?	How many crops do you have?	What food do you give your animals?	What percentage does turkey meat occupy in your diet?	How many times a day do you give them corn?	Where do you sell your citrus?	Where do you market your corn?	How do you consume the Castelan bean?	How do you consume pumpkin?
Does it have a drainage service?	Are there children in the family?	Do you receive advice for your cultivation?	How many times a day do you give them corn?		How many times a day do you feed commercial food?	What is the commercial presentation of the orange?	In what presentations do you consume corn?	How do you consume lentils?	What percentage of pumpkin is for self-consumption?
Do you have contracted internet service?	If the answer is A. How many children are there in the family?	Have you received fertilizer support?	How many times a day do you feed commercial food?		How many times a day do you take them to eat in the mountains?	What is the commercial presentation of the mandarin?	What percentage of corn is for self-consumption?	What percentage of beans and lentils is for self-consumption?	

Table 1. Continues...

SOCIAL MEDIA	Nutritional status of the population	Agricultural and livestock sector	LIVESTOCK: Species, management, consumption			AGRICULTURAL: Species, management, consumption			
			Birds		Pig	Citrus	Corn	Beans and lentils	Pumpkin
			Management	Consumption	Management and consumption				
	How often do children consume milk?		How many times a day do you graze them?		What type of water do you give your animals?	What is the commercial presentation of lemon?			
	How often do children consume Creole eggs?		What type of water do you give your animals?		Who cares for animal diseases?	What percentage of citrus fruits is for self-consumption?			
	How often do children eat vegetables?		Who or how cares for animal diseases?		Do you sell or consume the animals?				
	How often do children eat junk food?				Where do you sell your animal products?				
	Has the Health Center detected any children with anemia?				How do you consume animals?				
	Has the Health Center detected any children with obesity?								
	Has the Health Center detected any children with malnutrition?								
	Does the Health Center give nutritional nutrition talks?								
	What diseases do children currently have?								
What is your gender?	How many people live in your home?	What is your agricultural and livestock activity?	What type of animal species do you have?	Do you market or consume your product?	What purpose does animal husbandry have?	What citrus species do you have?	What system do you use for your corn cultivation?	What kind of bean do you have?	What is the purpose of growing pumpkin?
What is your age range?	Is the water you consume drinkable or from a well?	How many animal species does it have?	What is its zootechnical purpose?	Do you sell chicken meat and eggs?	Do you have specialized breeds, Creole or both?	What system do you use for your crops?	What is the area used for growing corn?	What system do you use for growing beans?	What system do you use when growing pumpkin?

Table 1. Continues...

SOCIAL MEDIA	Nutritional status of the population	Agricultural and livestock sector	LIVESTOCK: Species, management, consumption			AGRICULTURAL: Species, management, consumption			
			Birds		Pig	Citrus	Corn	Beans and lentils	Pumpkin
			Management	Consumption	Management and consumption				
What is your educational level?	What type of meat do you consume most in your family?	Do you receive advice for your livestock?	What production system do you use?	How do you consume chicken meat?	How do you raise animals?	What is the area for your type of crop?	What is the situation of the land for growing corn, own, borrowed or rented?	What is the area for growing beans?	What is the area for pumpkin cultivation?
The source of economic income	How often do you eat that type of meat?	Do you receive government support?	What is the condition of the animals like?	What percentage of meat and eggs do you consume?	How much space does the corral have?	Do you use fertilizer for your crop?	Do you use herbicides for corn cultivation?	Do you use herbicides for your crop?	Do you use herbicide for your pumpkin crop?
Relatives who migrated abroad and send support	How many kilos of meat does the family consume per week?	What type of support do you receive?	How much space do you have for your pen?	Do you sell the turkeys or consume them?	How is the floor?	Do you use organic fertilizer for your crops?	Do you use organic fertilizer for growing corn?	Do you use organic fertilizer for growing beans?	Do you use organic fertilizer on pumpkin?
Whose house is inhabited?	What food does the family consume the most?	Is the material received for corrals?	What type of material does the floor have?	Where do you sell turkey meat and eggs?	Do you have feeders?	Do you produce or buy organic fertilizer?	Do you produce or buy organic fertilizer?	Does bean production sell or consume it?	Do you sell pumpkin production or do you consume it yourself?
Identify if the inhabitants have electricity service.	How often do you consume that species?	What animal species have you received?	Do you have feeders?	How do you consume turkey meat or eggs?	How do you feed your animals?	Do you sell citrus production or is it for self-consumption?	Is the production for sale or self-consumption?	Where do you market the beans?	Where do you market pumpkin?
How many lights are there in the house?	Has the Health Center detected any adult with malnutrition?	How many crops do you have?	What food do you give your animals?	What percentage does turkey meat occupy in your diet?	How many times a day do you give them corn?	Where do you sell your citrus?	Where do you market your corn?	How do you consume the Castelan bean?	How do you consume pumpkin?
Does it have a drainage service?	Are there children in the family?	Do you receive advice for your cultivation?	How many times a day do you give them corn?		How many times a day do you feed commercial food?	What is the commercial presentation of the orange?	In what presentations do you consume corn?	How do you consume lentils?	What percentage of pumpkin is for self-consumption?
Do you have contracted internet service?	If the answer is A. How many children are there in the family?	Have you received fertilizer support?	How many times a day do you feed commercial food?		How many times a day do you take them to eat in the mountains?	What is the commercial presentation of the mandarin?	What percentage of corn is for self-consumption?	What percentage of beans and lentils is for self-consumption?	
	How often do children consume milk?		How many times a day do you graze them?		What type of water do you give your animals?	What is the commercial presentation of lemon?			

Table 1. Continues...

SOCIAL MEDIA	Nutritional status of the population	Agricultural and livestock sector	LIVESTOCK: Species, management, consumption			AGRICULTURAL: Species, management, consumption			
			Birds		Pig	Citrus	Corn	Beans and lentils	Pumpkin
			Management	Consumption	Management and consumption				
	How often do children consume Creole eggs?		What type of water do you give your animals?		Who cares for animal diseases?	What percentage of citrus fruits is for self-consumption?			
	How often do children eat vegetables?		Who or how cares for animal diseases?		Do you sell or consume the animals?				
	How often do children eat junk food?				Where do you sell your animal products?				
	Has the Health Center detected any children with anemia?				How do you consume animals?				
	Has the Health Center detected any children with obesity?								
	Has the Health Center detected any children with malnutrition?								
	Does the Health Center give nutritional nutrition talks?								
	What diseases do children currently have?								

Information analysis

The research and validation of the factors were designed in the surveys to be answered with Likert-scale responses (1-10), where one is the lowest value. Before starting the research, the survey was validated with the understanding of the questions and the time to answer them. The blocks of questions were integrated as follows:

Block One: The questions of the surveys were analyzed qualitatively and only percentages were determined.

Block Two: The information of the groups classified in the surveys were verified with an existing correlation between the different variables, the Kaiser-Meyer-Olkin (KMO) measurement was determined as the indicator of the proportion of variance, indicating that the values close to 1.0 are useful for a factorial analysis. On the other hand, Bartlett's test of sphericity indicated that the correlation level between the variables was significant and a principal components analysis was done to retain 65.5% of the information presented by the variables. The questions applied in the surveys were named original variables (v) in terms of the origin of non-observable variables (nv) and they were analyzed with the technique of factor analysis (F). The sample size n of a population, where each element of the sample was measured and the v variables of interest were quantified. Therefore, the data matrix with dimension $n \times v$ was expressed in the following way:

$$X_{v(1,2,...n)} = a_{v(11,21,...n)}F1 + ... + a_{v(1,2,...n)m}Fm + E_{v(1,2,...n)}$$

Later, the information was introduced into an Excel worksheet and transferred to a sheet on the statistical software SPSS ver. 21 to carry out their analysis.

RESULTS AND DISCUSSION

Block One

The director of the Department of Economic Development revealed that 34% of the communities that belong to the municipality are classified as highly marginalized areas; they are Tezapotla, Santiago Centro, San Francisco, Mecatlan, Chapulhuacanito, Tecomate, Cuixcuatitla, La Vega, Palitla. On the other hand, the interview with the director of Indigenous Affairs indicated that 72% of the population in the municipality is indigenous and the municipality is ruled by 33 commissaries. The interview with the director of the Department of Rural Development cited that the backing offered to peasants is the teaching of material, implements to support the farmland, and modules for livestock production. The main species that they back are poultry (chickens), double-purpose cattle, and meat-producing sheep; they also support the agricultural sector and offer training, backing species for citrus, coffee, corn, bean, nopal, sugarcane, palm and vanilla production. However, they did not provide statistical data for the backing cited.

Block Two

The results from the principal components analysis determined the main factors in each classified group, showing the percentages accumulated of variance (Table 2).

Table 2. Principal components analysis, accumulated variance.

		Questions	Variable	Accumulated (%)
BLOCK 1: Social media		P5	Are there relatives abroad who support you financially?	17.979
		P9	Do you have drainage service?	35.083
		P4	What is the main source of income?	50.712
		P8	How many light bulbs do you have?	62.692
BLOCK 2: Nutritional status of the population		P12	What is the frequency of Creole egg consumption in children?	44.611
		P18	Does the Health Sector give talks on good nutrition?	53.319
		P14	What is the frequency of junk food consumption in children?	61.173
		P19	What diseases do children currently have?	68.990
		P11	What is the frequency of children's milk consumption?	75.691
BLOCK 3: Agricultural and livestock sector		P1	What agricultural and livestock activity do you do?	30.771
		P6	Did you receive support for pens, feeders or waterers?	54.884
		P5	What type of support did you receive?	78.394
BLOCK 4: Livestock activity, species, management and self-consumption	Birds, management	P1	What type of species did you receive?	41.103
		P6	How is the floor?	54.109
		P3	Do you use specialized breeds of animals, Creoles or both?	64.593
		P9	How many times a day do you feed corn to your animals?	73.886
	Birds, consumption	P1	Is the chicken sold or for self-consumption?	34.623
		P5	Do you market the turkeys or is it for self-consumption?	59.654
		P7	How do you consume turkey meat or eggs?	75.623
	Pig	P2	Do you use pure breeds of turkey, Creoles or both?	63.601
		P12	When your animals get sick, who treats them?	73.810
		P11	What type of water do you give to animals?	81.426
BLOCK 5: Agricultural activity, species, management and self-consumption	Citrus	P3	How much is the area destined for its cultivation?	50.079
		P1	What species of crops do you have?	61.692
		P4	Do you use fertilizer for your crop?	71.138
		P8	Where do you market your crop?	80.407
	Corn	P9	How do they consume their crops?	65.190
		P2	What is the area destined for your crops?	83.134
	Bean	P3	What is the area destined for each type of crop?	71.883
		P4	Do you use herbicides for your crop?	88.269
	Pumkin	P8	How do you consume their crops?	87.323
BLOCK 6: Program or project proposal		P1	Do you belong to a government program in the agricultural sector?	51.229
		P5	How would you like government support to be given to you?	86.076

Social medium

A KMO value of 0.527 was obtained and for Bartlett's test close to 0. The covariance and anti-image correlation selected the variables in the first order: Do they have close family members working outside the state or in a foreign country who support the family economically? The second variable was: Do you have drainage service? The third variable was: What is your main source of economic income? And the fourth variable

was: How many lightbulbs are there in the household? The four variables indicated the accumulated variance of 62.692%. Based on the results reported, there is indication that in the South Huasteca Region of San Luis Potosí there are households that prioritize the activity of close family members, working outside the state or the country, and who provide financial backing to cover part of the basic expenditure on food, as has been reported by Vaquiro and Contreras (2018). The authors mention that the population of families in a situation of poverty in Mexico was 61.1% and the work of family members is important to cover part of the economic needs in the rural families. Similarly, in the communities and localities of the ejido of Chapulhuacanito, economic incomes are contributed by children, siblings, aunts and uncles who have migrated to the city of Monterrey or to the United States of America.

Nutritional status of the population

The KMO was 0.88 and in the total variance explained, 5 variables were selected with 75.69% from the accumulated variance. The nutritional status of the population surveyed from the South Huasteca Region is focused on the child population, and it is necessary for children to consume Creole eggs (Saldaña & Malaga Cruz, 2017) since they suffer from anemia and malnutrition; the daily consumption benefits the nutritional status providing proteins, omega 3 acids and vitamins A, D and E (Vera Rodríguez *et al.*, 2021). A field egg contributes approximately 13.5 of protein, 12.3 of fat, and 0.8 of carbohydrates (Quitral *et al.*, 2009). On the other hand, the population argues that the health centers from each community do not carry out campaigns on the healthy diet in children, and this deficiency is justified due to the problems of the COVID-19 pandemic. However, the World Health Organization recommends governments to promote a healthy diet in public facilities, schools, nursery schools, hospitals, dining rooms, prisons, and any public establishments. The practice of backyard livestock production can improve the nutrition of the population in rural zones with marginalization; the families should foster the consumption of poultry and pigs, but those species are more widely used when celebrations take place such as weddings, baptisms, birthday parties and religious celebrations (González *et al.*, 2013).

Farming sector

The KMO was 0.640. The total variance explained was with three variables: What farming activity do you perform? Is the material backing that you received for pens, feed troughs or drinking troughs? What type of support does the government give? The farming sector indicates that the families at least practice a breeding activity of some livestock species or some crop from the agricultural sector, or even better, they carry out both backyard activities. These results are similar to other reports (Aguilar *et al.*, 2019) where the relevance of backyard animal breeding is mentioned, which offers seasonal products that are used in the family's diet, for festivities, exchanges and sale. Primarily, government backing is directed to this type of backyard activities and access is given to free materials such as pens, feed troughs and drinking troughs, with the objective of improving the nutritional and economic quality of rural families.

Livestock production activity, species, management and auto-consumption

Within the livestock production activity, the following species were taken into account: a) cattle, b) poultry (chickens, turkeys), c) sheep, d) goats, e) pigs, f) rabbits, and g) bees. However, the scarce practice breeding some of the species did not result in enough information, specifically in cattle, sheep, goats, rabbits and bees; therefore, their statistical analysis was not possible. Poultry breeding predominates in all the families and a KMO of 0.076 was obtained from the information analyzed. The anti-image matrix in poultry breeding considered four main variables from the thirteen analyzed; the first variable was: What type of species do you breed? a) chickens, b) turkeys, or c) both. The second variable was: What is the floor like? The third variable was: In your system which do you use? (breed, pure breed, Creole, or crosses). And the fourth variable was: How many times per day do you feed them corn? These variables recorded 73.886% of the information. In particular, poultry breeding is relevant for auto-consumption, and three main variables were selected: The first variable was: Is what you produce in chickens to sell or for auto-consumption? The second variable was: Is what you produce in turkeys to sell or for auto-consumption? And the third variable was: If the answer is B, in what presentations do you consume the turkey meat? The responses confirmed again the importance of this species for auto-consumption.

Swine: The factorial analysis in backyard pig breeding obtained a KMO of 0.759. The anti-image matrix was with fifteen variables, analyzing breeding, management and auto-consumption. The total variance explained was 81.426% and the three main variables that the families considered were: First, in your system, do you use breeds, Creole or both? The second was: What disease is the most common in your animals and how do you recognize it? The third: What type of water do you give your animals? The results confirm that in the South Huasteca Region of *ejido* Chapulhuacanito, the activity of backyard poultry production (chickens and turkeys) and pig breeding are important, compared to the low breeding of cattle, sheep, goats, rabbits and honey production. Other studies indicate that the Maya communities perform mainly poultry and swine breeding to satisfy part of the basic needs of food, and to generate income, additional savings and their use for future emergencies (Aguilar *et al.*, 2019). In general, the households with more farming vocation have a lower income, they depend on government backing and on auto-consumption, and resort to diversification of their income as family survival strategy (Vaquiro and Contreras, 2018). In the process of this study, it was detected that the backyard pens hold Creole chickens and turkeys, and it was also seen that the spaces destined to pens and free spaces are soil floors, and the main feed is corn, once or twice per day (García *et al.*, 2015). Although the backyard poultry can pick up leaves, tender weeds, fodder, insects, fruits, tortillas and food scraps, under this type of backyard conditions there is low or null sanitary management in the pens.

For the population of this region, auto-consumption and trading poultry and byproducts is important. The traditional productive activity helps the families primarily for feed and as a source of income for emergency situations. The population also indicates that food preparation with these birds and byproducts is important (Magaña *et al.*, 2022). Therefore, the use of backyard animals is a family subsistence strategy in

the rural sphere. In the South Huasteca Region, women who are mothers agree that the most frequently cooked dishes are chicken broth with vegetables and red mole with chicken or turkey.

In the case of backyard pig breeding, there are Creole races, which are more adaptable to the climate, and they mention that when their animals get ill, they mostly treat them with home remedies based on the use of plants (Lepe *et al.*, 2023), since it is not possible for them to request a veterinarian, because of the distance and lack of economic resources for their attention. Most families do not have drinking water for these animals, and they give them water from rivers, streams, ditches and wells, and they are fed primarily with corn (García *et al.*, 2022).

Agricultural activity, species, management and auto-consumption

The following crops were considered: citrus trees, coffee, and corn, bean and squash crops. Because of the lack of practice in the zone, the data for coffee growing could not be analyzed.

Citrus trees: The production of orange, mandarin and lime was considered. The KMO was 0.769. Squash: The KMO was 0.660. The total variance explained was with two principal variables, 86.076%. The first variable was: Currently, do you belong to an association or government program that is directed to the farming sector? The second variable was: What would you like the backing to be?

The South Huasteca Region has the highest production and sale of orange compared to mandarin and lime. Orange growing is one of the main sources of economic income for these families and they trade them to second parties that are devoted to cutting and selling directly to juice-makers that are near the *ejido*. Most of the population surveyed does not use fertilizer and the place where they have this crop is in the ejido itself and close to their homes. Most have at least ½ a hectare of land for this crop. In Mexico, 23 states cultivate and harvest citrus trees, and among the ones that stand out there are Veracruz, San Luis Potosí and Tamaulipas (Producción de Cítricos en México, 2022). The consumption of fresh citrus fruits contributes good fiber content, helps digestion, and improves the absorption of fats because it decreases the cholesterol levels (Gómez *et al.*, 2018).

Other agricultural products that are consumed in the Huasteca Region of San Luis Potosí are corn cobs, *xamit*, *atole* and byproducts of the corn crop (tortilla, corn for animal feed); this cereal is considered to be one of the most important in the world, and its main form of consumption is in tortillas (CEDRSSA, 2020). Bean: The population cultivates two species of beans. The first species is *Vigna unguiculata* (sarabanda/castelan bean) better known as *zarabanda* in the communities, and the second species is lentil. The families cultivate both species in the same place, where they have the orange orchards and the milpa; in most of the crops they do not use herbicides, the peasants carry out manual cleaning of the area (Ubiergo-Corvalán *et al.*, 2020). The families from *ejido* Chapulhuacanito use the Castelan bean and lentil, and they are both used to prepare food, primarily for tamales, empanadas and adobo.

Squash: The cultivation of *Cucurbita pepo* L. (calabaza/chu'jm) is practiced primarily within the *milpa* and it is consumed in different dishes (Ubiergo-Corvalán *et al.*, 2020).

Squash is cultivated in backyards with association to the *milpa*; the flowers, fruits and seeds are used for the elaboration of foods, desserts, and beverages.

CONCLUSIONS

A third of the population is classified in an area of high marginalization, and 70% of the community is indigenous. The backing given by the government does not have the objective of decreasing poverty; they are superficial and abrupt programs that make the population believe that with the economic help with resources in cash, materials and small animal species they will exit poverty. The families feel they have a safety support with their material goods and value the economic income provided by family members who have migrated from the region to other countries. The nutritional status of the population is lacking, primarily in the child population which presents anemia and malnutrition; there are no campaigns to improve the population's nutrition. Breeding chickens, turkeys and Creole pigs prioritizes the livestock production activity in the region. Auto-consumption and the commercialization of these species is a traditional productive activity that helps the family economy and solves dietary problems in the short term. The South Huasteca Region presents favorable conditions for citrus production, coffee production, and corn, bean and squash crops. However, the short-sightedness in strategies for cultivation and commercialization make these products only traditional. The culinary culture is rooted in the region and there are traditional dishes, where livestock production and agriculture actively influence the customs. It is necessary to create efficient programs that guarantee a better agriculture and livestock productivity with the purpose of improving the nutritional status of the population and generating economic resources that decrease poverty.

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