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## Family livestock of backyard in an indigenous totonaca community

Ganadería familiar de traspatio en una comunidad indígena totonaca

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### Abstract

Backyard livestock raising by Mexican peasant and indigenous families is part of the livelihood strategies to achieve food security. With the objective of providing information on the productive management of the livestock component in the backyard of Totonaca families, an investigation was carried out in the community of Lipuntahuaca, located in the Totonaca municipality of Huehuetla, Puebla, in a sample of 76 families selected at random. We worked with three groups of producers and conducted a cluster analysis, Fisher's exact test, a Chi-square test and the calculation of means to determine the variance and establish differences between groups, as well as Fisher's exact test to analyze the variables: animal ownership and whether the producer is considered poor. The results indicate that the number of species owned by the families is low, with an average of 10 birds, and only 17% have pigs. It was observed that this activity contributes mainly to self-consumption, since the income obtained is very low. Due to the economic precariousness faced by the families in the community, this production constitutes an important source of food that plays a fundamental role in their subsistence.

**Keywords:** livestock production, self-consumption, subsistence, poverty.

### Resumen

La ganadería de traspatio realizada por familias campesinas e indígenas mexicanas forma parte de las estrategias de vida para conseguir la seguridad alimentaria. Con el objetivo de aportar información sobre el manejo productivo del componente pecuario en el traspatio de las familias totonacas se realizó una investigación en la comunidad de Lipuntahuaca, ubicada en el municipio totonaco de Huehuetla, Puebla, en una muestra de 76 familias seleccionadas al azar. Se trabajó con tres grupos de productores y se realizó un análisis de conglomerados, una prueba exacta de Fisher, una prueba de Chi-cuadrada y el cálculo de medias para determinar la varianza y establecer diferencias entre grupos, así como una prueba exacta de Fisher para analizar las variables tenencia de animales y si el productor se considera pobre. Los resultados indican que la tenencia de las especies encontradas en las familias es baja, con 10 aves en promedio, y solo 17% cuenta con cerdos. Se observó que esta actividad contribuye principalmente al autoconsumo, pues el ingreso que obtienen es muy reducido, y debido a la precariedad económica que enfrentan las familias de la comunidad, esta producción constituye una importante fuente de alimentos que juega un papel fundamental en su subsistencia.

**Palabras clave:** producción pecuaria, autoconsumo, subsistencia, pobreza.



## INTRODUCTION

Milpa and the backyard or plot are fundamental in the peasant production system, in which agricultural and livestock activities converge next to the house and they are intended to provide families, mainly rural and indigenous, with basic foodstuffs such as meat, eggs, vegetables, among others (Cuca *et al.*, 2015). In the backyard, it is possible to find a wide infrastructure that, depending on the region and cultural aspects. It can be integrated by the dwelling house; one or more areas of cultivated plants; corrals and other types of facilities for animals; water source (well or intake); washing and personal hygiene area; storage areas for grains, tools, and some materials; as well as recreation and work area (Mariaca, 2013).

Backyard livestock raising is one of the most traditional and widespread activities in Mexico, especially among peasant families, which consists of small-scale breeding and management of a group of animals, generally native animals such as poultry, horses, cattle, pigs, goats and sheep (Mariaca, 2013). Animals are usually confined in rustic facilities, made with local materials, and in some cases of industrial origin. They are fed mainly with corn and agricultural and domestic waste; which constitutes a saving in the family economy (Montero, 2015).

For the conservation of this practice, the participation of the whole family continues to be of utmost importance, where in addition, according to Montero and Martínez (2015) the female role is preponderant. Vieyra *et al.* (2004), point out that women's participation in backyard farming is essential, since they are mainly in charge of the care, management and integrated use of natural plant and animal resources, which are indispensable for family survival.

In Mexico, the indigenous population is mostly rural, as six out of every ten people who speak indigenous languages live in rural localities; consequently, family economic sustenance, predominantly comes from agricultural activities, where most obtain incomes below two minimum wages per day (CONEVAL, 2018). According to CEDRSSA (Centro de Estudios para el Desarrollo Rural Sustentable y la Soberanía Alimentaria) (2015), 74% of the indigenous population reports an income below the welfare line, and 42% below the minimum welfare line; that is, an insufficient economic income to acquire the basic food basket. The Economically Active Population (EAP) in the indigenous municipalities is 49%, significantly lower than the 57% national average, on the contrary, a greater proportion of the population is engaged in non-market activities, where the Non-Economically Active Population (NEAP) is 51%; that is, only half of them receive some income. In the case of indigenous women, the vast majority



(82%) are engaged in domestic chores, so it is considered that they do not receive formal income, and only 14% of them study.

Consequently, livestock production is of incalculable value for farming families, since it provides them with income from product sale, which is indispensable in case of emergency and useful in precarious economic situations, in addition to its importance for self-consumption (López *et al.*, 2013). The diversity of animals raised on the plot for domestic consumption is considered of high biological value (Montero, 2015), as it provides protein, vitamins and energy to the family diet throughout the year, during which there are periods of scarcity (Alayón, 2015). Hernández *et al.* (2011) consider that the farmer's interest in backyard rests on a different worldview, which goes beyond a simple productive or economic approach, since its management is considered a social practice, based on experience and knowledge that generates identity; at the same time, it facilitates obtaining food on a constant basis. In this sense, raising domestic animals is a social, subsistence and savings activity that is part of the life strategy of families, mainly in rural areas living in poverty. The broad base of available resources, agroecological practices and adaptation to the environment of animal species, strengthen the sustainability and self-sufficiency of backyard food production (Vargas *et al.*, 2017).

FAO (2012), points out that livestock farming is part of the family strategy, by functioning as a social and economic. It contributes to food security, where households below the poverty line or close to it are particularly vulnerable and having this form of food production allows them to cope with crises; hence, backyard livestock farming constitutes an opportunity (Alayón, 2015) and therefore, a mechanism for survival.

Poverty conditions existing in rural areas of the Sierra Norte de Puebla motivated the elaboration of this study in one of its communities, whose objective was to provide information on the productive management of the livestock component in the backyard of Totonaca families. For this purpose, the types of livestock producers were characterized, as well as the conditions in the use of the backyard in an indigenous community in the state, and the role of animals in poverty alleviation was broadened. It is hypothesized that backyard livestock is a strategy of the indigenous families of the community to face poverty, through self-consumption, and as a source of income in times of economic emergency.



## METHOD

### Community

The work was carried out in Lipuntahuaca community, located in the Totonac municipality of Huehuetla, in the Sierra Norte region of Puebla, Mexico (20° 02' and 20 10' N; and 97° 35' and 97° 40' W). The topography is characterized by a wide variety of elevations in a rugged high sierra landscape, with altitudes of 200 - 1,100 m a.s.l, which makes access difficult. The predominant climate is semi-humid and humid with rainfall year-round, with a temperature range of 18 - 24°C and rainfall ranging from 2,900 to 3,600 mm (INEGI, 2009).

Huehuetla has 18,803 inhabitants, settled in a dispersed and atomized manner, whose main economic activity is agriculture, based mainly on corn, coffee and pepper crops (SIAP, 2017). Most belong to the Totonaco ethnic group (89.8%), and live in conditions of poverty (86.4%), and extreme poverty (46.2%), with a very high degree of marginalization. It means that, in addition to having an insufficient income to acquire the precise goods and services to meet their food and non-food needs, or below the minimum welfare line (1.9 dollars *per capita* per day). A big part of this population also lacks three or more goods and services corresponding to food, education, health, social security, economic security and basic services and housing quality (SEDESOL, 2017; CONEVAL, 2018). This shows the vulnerable situation in which they find themselves, and the precariousness of their living conditions.

### Methods and techniques

Since the backyard was the unit of analysis, the sample size was calculated from the total number of houses in Lipuntahuaca community (N=378) (INEGI, 2010). Statistical sampling (qualitative) was used and the variable presence of traditional housing was considered as the maximum variance ( $p_n=.5$  and  $q_n=.5$ ), with a reliability of 95% ( $Z_{\alpha/2}=1.96$ ), and a precision of 10% ( $d=0.1$ ). The final sample size was 76 households, which were randomly selected.

The information was obtained through visual observation and the application of a questionnaire, which recorded aspects related to socio-demographic, economic, land, and agricultural production and livestock characteristics. The data collected were captured and were processed in Excel and SPSS Statistics, version 25. Descriptive statistics were calculated to characterize the livestock activities carried out in the Totonaca household.

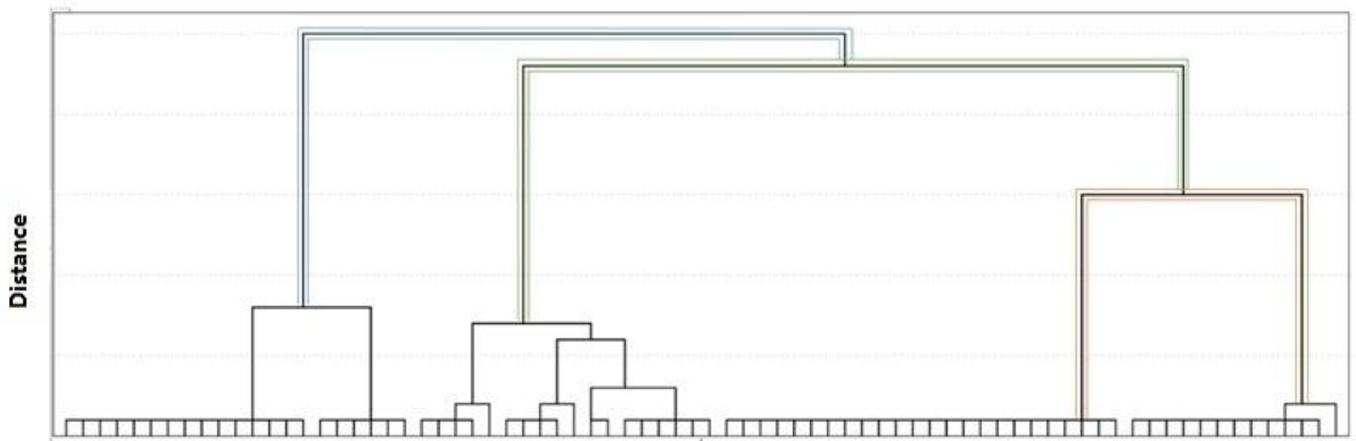
For the analysis, a classification of the types of livestock production by community families was made, considering the presence of the existing animal species in the backyard. A cluster analysis was used for this typology. Once the groups were defined, we proceeded to the statistical analysis, where we performed a Fisher's exact test, a Chi-square test and the calculation of means to determine the variance between the numbers of animals per type of producer. Also, to determine differences between



groups, as well as a Fisher's exact test to make an analysis between variables animal ownership and whether the producer is considered poor or not.

## RESULTS AND DISCUSSION

In order to classify the typology of family livestock in Totonaca community, families were classified according to the number of livestock species kept in their backyards. Pigs, chickens, turkeys and ducks species were found. Using this variable, a multivariate analysis was carried out to group the ownership of livestock in the backyard of the families. A cluster analysis using Ward's method and Euclidean mean squared was used. Three groups were found as shown in the dendrogram in Figure 1.



Source: Self-elaboration based on fieldwork, 2018

**Figure 1. Dendrogram to define the typology of family livestock in the backyard of indigenous families in Lipuntahuaca, Huehuetla, Puebla**

Group 1 is made up of 18 families that have pigs and poultry in their backyard. In this stratum, almost all of them (0.94) have pigs, but also all of them have different types of poultry. In stratum two, there are 37 families with a small number of animals. Group three there are 21 families with only poultry. A summary of the characteristics of each group and their proportion is presented in the following table.

The conformation of groups allowed us to identify the importance of backyard animal ownership for families in the community under study. Group 1 is characterized by the greater number of animal species and the greater importance of this activity, group 3 has basically poultry, which complements the families' diet, and finally group 2, where backyard species are reduced and of less nutritional and economic importance for the families.



**Table 1. Proportion of species per stratum and characteristics of the typology defined in the cluster analysis**

Group	n	Pigs	Hens	Turkeys	Ducks	Stratum characteristics
1	18	.94	.89	.28	.33	Families with pigs and poultry
2	37	0	.65	.03	0	Minimal presence of animals in backyards
3	21	0	1.00	1.00	.29	Households with only poultry
Total	76	.22	.80	.36	.16	

Source: Self-elaboration based on fieldwork, 2018

Households in Lipuntahuaca community have a mainly traditional nuclear-type organization (70%), with an average of five members. They are made up of the head of the family and main breadwinner, whose income comes only from agricultural activities as a day laborer, with a salary that barely reaches \$9.60 *per capita* per day for each of the five family members. Another employment modality is as a temporary service provider in the construction industry and in local businesses; these activities earn \$11.20 *per capita* per day. Finally, heads of household's income comes from providing their services in local businesses located in the municipality capital. It obtains an average salary of \$12.60 *per capita* per day (Table 2). The income in all cases is well below the institutionally established poverty line is observed (SEDESOL, 2017), placing them in the extreme poverty range; in addition, those who only work in agricultural activities receive the lowest salary; while those who have abandoned the field manage to increase the family income.

**Table 2. Household income in Lipuntahuaca community, by activities outside the production unit**

Economic activity	Participants (%)	Average weekly salary (\$)
Agricultural laborer	65	473
Moonlighting*	30	550
Service provider	5	618

\*Performs agricultural activities as a day laborer and provides services in temporary jobs. Source: Own elaboration based on fieldwork, 2018

For their part, female heads of household take care of the children, as well as household chores and all activities related to the backyard, where food production is vital to supplement the diet and family expenses. The children dedicate themselves to studying and, when they reach adolescence, they contribute to the activities carried out by their parents. According to Salazar *et al.* (2015), this type of family organization is vital for their economic subsistence, because the diversification of sources of salaried income for farmers is a survival strategy in the face of poverty. It allows them to cover basic expenses that cannot be produced in the family production units (health, education, housing); while the backyard is a constant source of food that provides them with income in difficult or unforeseen situations (López *et al.*, 2012).



The extension of farms is in a process of atomization, promoted by generational subdivision through inheritance. This situation has been reported elsewhere by [Guarneros \*et al.\* \(2014\)](#) and [Salazar \*et al.\* \(2015\)](#), where this phenomenon is due to the custom of parents to distribute part of their land to their children who marry, directly affecting agricultural and livestock production activities. In the community under study, 35% of the houses are less than 400 m<sup>2</sup>, and only 5% are larger than 6,000 m<sup>2</sup>. The average backyard is 95 m<sup>2</sup>, and it is located, as is customary, next to the house. It is composed of elements and areas such as sheds for firewood and grains, washing and cleaning areas, bathrooms, as well as agricultural (family gardens and crop plots) and livestock components. They complement each other, since the production, in addition to being destined for self-consumption, allows feeding the animals, and together with the human component that manages, harvests, preserves and lives in it, form an agroecosystem ([Mariaca, 2013](#); [González \*et al.\*, 2014](#)).

The backyard livestock component of Totonaca families is characterized by having poultry management, such as hens and chickens (*Gallus gallus*), turkeys (*Meleagris gallopavo*), and ducks (*Anas platyrhynchos*), as well as pigs (*Sus scrofa* ssp.). The data show that 80.5% of the families have some type of poultry in their backyard, with an average of ten while only 17% have pigs, with an average of two animals.

The infrastructure where they confine them is very basic, and their location is due to the existence of elements that serve as protection, such as dense vegetation, trees or walls of houses. The bird corrals are made with fences of local plant species (jars, corn cane or wood), or with wire mesh on the ground. Poultry houses have more solid structures, where walls are built with concrete blocks or thick jars, on a cement foundation to facilitate cleaning. These characteristics are constant in communities where small-scale cattle ranching is practiced, and are due to the easy access to these materials and their low cost ([Gutiérrez \*et al.\*, 2012](#); [Góngora \*et al.\*, 2016](#); [Novelo \*et al.\*, 2016](#)).

The 85.7% of poultry houses and 73.5% of the chicken coops present materials and conditions in good condition, that is, fences or walls are well installed, clean and working properly, which indicates the importance that Totonaca families give to their backyard animals; this is due to the significant role they play in their subsistence. These results are positive, if compared with studies conducted by [Gutiérrez \*et al.\* \(2012\)](#) and [González \*et al.\* \(2014\)](#), where regular and poor conditions predominate in the quality of facilities, as most of them are deteriorated. The difference may be due to various factors, such as environmental conditions that provide local resources that can be used by families throughout the year, and the greater attention that animal caretakers can give them.

Feeding is based on corn produced by families or acquired in the community, and on leftover food; pens are cleaned regularly, as well as pigs are bathed to avoid bad odors.



It is mainly the heads of household, with the help of their spouses (44%) or their children (9%), who take care of animals. Several studies report the participation of the whole family in these tasks; however, the mother or head of household is the main person in charge of backyard care (Centeno *et al.*, 2007; Cuca *et al.*, 2015). These tasks are the direct responsibility of women, who play a predominant role in these production systems. According to Viveros *et al.* (2016), this is due to a cultural pattern on the non-established allocation of activities, where women play the main role in the conservation and use of biodiversity, and actively contribute to production decisions in their communities (Vieyra *et al.*, 2004).

Waste generated by animals is applied as fertilizer to orchard and plot crops by 65% of families, as is the case in other regions (Centeno *et al.*, 2007; Cuca *et al.*, 2015; Mendoza *et al.*, 2014). Duché *et al.* (2015), Duché *et al.* (2017), y López *et al.* (2012), point out that this type of practices in backyard management are related to agroecology; through them, a series of beneficial effects are achieved, such as soil conservation and fertilization. This activity allows the process of complementarity between agriculture and livestock to be carried out, since this incorporation encourages the growth of crops that will eventually become animal feed.

According to the data resulting from the stratification among producers (Table 3), there was a constant presence of poultry, mainly chickens, and to a lesser extent turkeys and ducks, in the three groups. Group 1 is the most favored group, since 94.4% of the producers have pigs, and is the only one that registered the possession of this species; while group 2 is the most vulnerable, since in addition to not having pigs, the possession of poultry among the families is very low, with 64.9% of hens and 2.7% of turkeys. The predominance of poultry farming is similar to that reported in other rural communities in the country, in states such as Oaxaca, Yucatan, Guerrero and Chiapas (Viveros *et al.*, 2016; Gutiérrez *et al.*, 2012; Vargas *et al.*, 2017; Mendoza *et al.*, 2014). Here the predominance of these species is attributed to the constant levels of poverty, as the fragile economy does not allow access to other species.

**Table 3. Percentage of families with the species, by livestock producer group**

Group	Pigs	Hens	Turkeys	Ducks
1	94.4	88.9	27.8	33.3
2	0	64.9	2.7	0
3	0	100	1.00	28.6
Total	22.4	80.3	35.5	15.8
p	<0.001*	0.002*	<0.001**	<0.001*

\*Fisher's exact test; \*\*Chi-square test. Source: Self-elaboration based on fieldwork, 2018

These results show that very few families have all four species and all are in-group 1. The predominant species is the hens. In addition to the number and proportion, it is important to know the averages, which are presented in Table 4.



**Table 4. Average number of animals per species, by livestock producer group**

Group	Pigs		Hens		Turkeys		Ducks	
	Mean	N	Mean	N	Mean	N	Mean	N
1	1.94	17	12.71	17	2.80	5	2.50	6
2			10.17	24	1.00	1		
3			10.76	21	2.81	21	2.83	6
Total	1.94	17	11.06	62	2.74	27	2.67	12

Source: Self-elaboration based on fieldwork, 2018

Regarding the ownership of animals of each species, it was found through an analysis of variance that there was no significant difference in the average number of hens between groups ( $F=.735$ ;  $p=.484$ ), and it was observed that the number of hens is reduced, with an average of 11 per family. In the case of the ducks, only groups 1 and 3 were compared, and a t-test showed that there was no significant difference ( $t=-.370$ ;  $p=.719$ ) with respect to the average number of ducks. However, the average number of animals per farmer group is very low (Table 4), and this is due to the prevailing poverty conditions in which the families find themselves.

The analysis between the variables animal ownership and whether the producer considers himself poor or not, showed a statistical difference between groups (Fisher's exact statistic= $7.332$ ;  $p=0.025$ ) (Table 5). Producers who consider themselves poor predominate in groups 1 and 3, in 94.4% and 95.2% respectively. The groups with the highest number of backyard animals; while 29.7% of the most vulnerable group of producers do not assume a condition of poverty; although according to [Consejo Nacional de Evaluación de la política de Desarrollo Social \(CONEVAL\) \(2018\)](#) all families are in conditions of poverty due to the low levels of well-being they present. Not all are assumed poor, even though they own fewer animals; or they are considered poor even though they have a greater number of animals than the rest of the sample studied. This is because the consideration of individual poverty according to [Checa \(1995\)](#) and [Dakduk et al. \(2010\)](#), is a relative concept and subject to various elements that include material and non-material goods, and to norms socially constructed by each group, whose meaning varies according to societies and over time ([MacEwan, 2010](#)). In this regard, [Sen \(1983\)](#) argues that poverty can be understood in terms of resources and capabilities, as occurs in Totonaca community, and that it is subject to social circumstances that are delimited by specific needs in each context.

This social representation and perception of poverty is constituted by a set of information, beliefs, opinions and attitudes, such as the bonds of solidarity and mutual aid that are woven among community members. These acquire a symbolic value and summarize socio-affective, social and ideological dimensions ([Pont, 2010](#)), which are taken into account when establishing the state of poverty in which they live.

In this sense, [MacEwan \(2010\)](#), points out that poverty is not a certain amount of goods, nor is it only a relationship between means and ends, but it is above all, a relationship



between people. Thus, the schemes of reciprocity, mutual aid and collaborative forms of organization typical of this ethnic group are fundamental in the assessment of their poverty. These are immaterial elements with a symbolic value that cannot be quantified in real terms, their perception can be positive, or vice versa, as occurs with 70.3% of the producers who have a greater number of animals, but consider themselves poor.

**Table 5. Percentage of livestock producers who consider themselves poor**

Group	The following are considered poor				Total	
	Yes		No		n	%
	n	%	n	%		
1	17	94.4	1	5.6	18	100
2	26	70.3	11	29.7	37	100
3	20	95.2	1	4.8	21	100
Total	63	82.9	13	17.1	76	100

Source: Self-elaboration based on fieldwork, 2018

However, poverty conditions predominate among Totonaca families because the income they receive places them below the poverty line, so having animals is considered a strategy to cope with their difficult living conditions, as [Alayón \(2015\)](#) points out, backyard livestock is an important element that contributes to self-sufficiency in the diet and provides an income opportunity in times of economic emergency.

Raising poultry and pigs provides a direct economic benefit through their sale to neighbors and in local markets, and represents an aid to supplement family spending; however, this is very low. The results indicate that only 5% of the families sell poultry, for which they receive an income of \$60.00 to \$100.00 pesos per month; on the other hand, only 29% of the families that raise pigs sell them when they have reached maturity, for a price of \$1,200.00 to \$1,500.00 pesos, an action that occurs once a year. [Guarneros et al. \(2014\)](#) and [Viveros et al. \(2016\)](#), who point out the scarcity of economic income from backyard production, since this space, have studied this situation rather than strengthening the economy of families through income from the sale of products, does so through the food itself and savings through family labor.

The above indicates that animal husbandry constitutes an important source of food intended primarily for family self-consumption, through meat and eggs, which turn out to be one of the few sources of protein to which low-income families have access ([Centeno et al., 2007](#); [López et al., 2013](#); [Montero, 2015](#)). Thus, the backyard has the potential to complement a good part of the diet and nutritional requirements of family members ([Duché et al., 2017](#)). Such consumption is carried out during family and religious celebrations, at the beginning and end of planting, and in times of economic emergency; that is, when they lack money to buy food.

Backyard livestock is considered as a subsistence and savings production unit, whose diversity of plant and animal species are the basis of life strategies of the peasant household unit, in relation to their subsistence and welfare, and constitutes a complementary source of income in times of emergency ([López et al., 2013](#); [Salazar et](#)



*al.*, 2015). Mariaca (2013), states that backyard production is one of the agroecosystems that most contribute to peasant food autonomy, since it is a means to ensure a minimum self-sufficiency throughout the year; it is also a space for habitation, environmental protection, work, recreation, prestige and cultural and biological reproduction of the peasant family.

## CONCLUSIONS

The main results indicate that family livestock raising in the Totonac backyard is a productive activity that contributes mainly to self-consumption, since the income obtained from it is very low, between \$9.60 and \$11.20 *per capita* per day, and constitutes a strategy to mitigate the poverty conditions in which the population lives. It mainly involves raising poultry and, to a lesser extent, pigs, which are managed and are cared for mainly by heads of household, who are responsible for feeding and grooming them. Animals in corrals built mainly of local materials are confined, which are in good condition, and are fed on corn and agricultural and domestic waste, inputs generated by the family itself, which constitutes a saving. This family organization plays a very important role in their perception of their state of poverty and the possibility of generating joint strategies to overcome it, since the social relationships generated around backyard production are essential to contribute to the generation of food. It is possible to conclude that although the data provided indicate that production is low, because of the precarious economic conditions faced by the families of the community, it is an important source of self-managed food, which plays a fundamental role in their subsistence and constitutes a strategy capable of providing food security.



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