

## SEASONAL AGRICULTURE AND FOOD SECURITY AMONG PEASANT FAMILIES, A CASE STUDY IN PUEBLA-MEXICO

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### ABSTRACT

We analyze inputs related to different strategies of social reproduction that help ensure food security, among provincial peasant families. Methodology employed qualitative techniques such as: *in situ* observation, semi-structured interviews, and quantitative techniques including: a closed-ended questionnaire that was applied to a statistically significant sample, along with statistical tests. The findings indicate efficiency for the strategies of those families who prioritize agricultural activities. Peasant families employ four strategies to guarantee their food security: monetary income, agricultural systems, collection of wild produce and the exchange of food products. In conclusion, identity and food culture in Calpan are affirmed by milpa cultivation and the home garden.

**Keywords:** food culture, home gardens, milpa.

### INTRODUCTION

Given the civilizational, economic and environmental crisis that currently afflicts the world, sustainable practices have been proposed as suitable strategies for mitigating the disasters of the crisis generated by the prevailing economic model in the globalized world. Specifically in Mexico, sustainable rural development has become a matter of national priority, as stated in the National Development Plan (2019-2024), where the following is specified: “The government of Mexico is committed to promoting sustainable development, which in the present era has emerged as an indispensable factor in terms of well-being” (Diario Oficial de la Federación-DOF), 2019:37).

Legal provision for sustainable rural development in Mexico is based on the Sustainable Rural Development Law (SRDL), regulated by article 27 of the Constitution. The overriding objective involves the promotion of economic activities in rural areas, specifically considering numbers I and II of article 32 of the SRDL, where the following are referenced: “Promotion of agricultural research and technological development, technological appropriation and its endorsement, as well as sustainable practices and the production of improved seeds, including native ones” as well as “the development of human resources, technical assistance and the promotion of economic and social organization among members of rural society” (Sustainable SRDL, 2019:17).

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Therefore, the need for improved labor in relation to sustainability, the development of environmentally friendly agricultural practices, the appropriation and dissemination of knowledge and techniques used in seasonal agricultural production, forms part of the reason for the current economic and environmental crises in Mexico.

Operationally and in-line with sustainable rural development as a priority in Mexico, various programs are being implemented, aimed at those in the agrarian sector to encourage their effective participation in comprehensive rural development. However, national policy presents significant challenges, because objectives that correspond to the specific characteristics of each territory must be established and planned, as evidently Mexico is a megadiverse and very heterogeneous country. In this regard, the Food and Agriculture Organization of the United Nations (FAO, 2018), specifies that the eradication of poverty and food insecurity requires comprehensive understanding of the causes that generate and reproduce them. In this sense, a systemic vision that facilitates understanding of the interaction between food production and consumption, as well as interaction between territories, can be very useful for identifying effective solutions.

Inadequate assessment of the urban/rural relationship translates into incoherent legal schemes and designs in terms of sectoral public policies for the area. Diagnostic studies of the Mexican countryside are generally sectoral. Local resources, practices and knowledge must also be considered, as well as the type of native seeds. Likewise, each territory's potential and the cultural, economic, social and environmental aspects that govern these contexts must not be forgotten.

Therefore, the current challenge facing research on sustainable rural development in Mexico and Latin America must contribute to this area of public policy, by identifying territorial characteristics; analyzing potentialities, while also evaluating agricultural practices based on traditional peasant knowledge. And we mention these as a challenge, as it may be that this type of research differs radically from conventional research that prioritizes the modernization and implementation of chemical inputs in agriculture. However, various studies worldwide scientifically demonstrate the agronomic, economic, environmental and social advantages of sustainable agricultural systems based on traditional peasant knowledge and practices (Altieri, 2018; FAO, 2018).

Therefore, given the importance of sustainable agricultural systems, we should recognize the predominant role played by traditional smallholder peasant agriculture in Mexico. However, until 2018, it is evident that priority was given to planting economically profitable crops, using chemical inputs and agricultural mechanization, as a way of modernizing and developing the Mexican agricultural sector. This strategy was unsuccessful for certain states of the Mexican Republic, specifically for those states with the highest percentages of population in poverty, during the decade 2008-2018, according to data from the National Council for the Evaluation of Social Development Policy (CONEVAL, 2020). These are: Chiapas (77.0% to 76.4%), Guerrero (68.4% to 66.5%), Oaxaca (61.8% to 66.4%), Veracruz (51.2% to 61.8%), Puebla (61.5% to 58.9 %), and the state of Mexico (43.6% to 42.7%).

Therefore, considering these findings, the objective of the research was to analyze the relationship between seasonal agriculture managed by peasant families and how they guarantee their food security in the municipality of Calpan, Puebla, Mexico. In this way, we seek to contribute to the field of studies that provide information and alternatives to guarantee food security among rural families, who are marginalized from the neoliberal economic model.

Specifically, this study contributes to the analysis of the conditions and practices developed by peasant families to ensure their food and moreover their social reproduction. The unit of analysis is represented by peasant families, who plant seasonal maize in the municipality. We considered families producing seasonal maize because this represents the predominant crop in the study area; and because maize is the most substantial food in the diet of Mexicans, as *per capita* consumption of white corn is 196.4 kg, consumed mainly in the form of tortillas, a food which represents 20.9% of overall consumption (Secretaria de Agricultura y Desarrollo Rural (SAGARPA, 2016).

## METHODOLOGY

Due to the particular details of this research, we undertook a case study in the municipality of Calpan, Puebla, which due to the type of agriculture directly corresponds to the proposed objective. Similarly, due to the particularities of the study, quantitative and qualitative research techniques were combined.

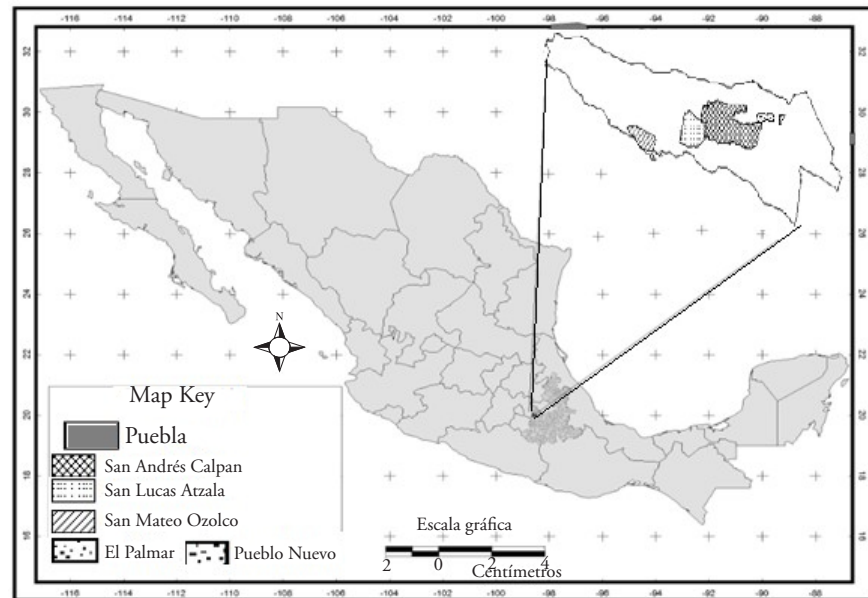
### Study area

The municipality of Calpan is located between parallels 19° 03' and 19° 09' north latitude; and meridians 98° 23' and 98° 35' west longitude. It covers an area of 67 km<sup>2</sup>, and in addition to the municipal town centre consists of the community of San Mateo Ozolco and San Lucas Atzala with ranches scattered throughout the area (Palmar and Pueblo Nuevo) (National Institute of Statistics and Geography (INEGI), 2020a) (Figure 1). Its orography is determined by its location with respect to the Sierra Nevada, and its elevation compared to sea level ranges between 3,000 and 2,240 meters. Regarding hydrology, the municipality is located in the upper western part of the of the Atoyac River basin, with intermittent and permanent streams emanating from the foothills of Iztaccíhuatl. Most of the arable land is dedicated to seasonal agriculture (INEGI, 2020a).

Demographic indicators report that Calpan has a population of 15,271 inhabitants, 52% of whom are women and 48% men. Likewise, a certain degree of marginalization exists, with 80.3% of the population experiencing some degree of poverty, but only 17.5% extreme poverty (INEGI, 2020b).

Social indicators from CONEVAL (2020) indicate that 36% of the population have no access to health services, and 86% have no access to social security, likewise 27% are educationally backward.

The Economically Active Population (EAP) according to sex in the municipality for the year 2020, consists of 61% men, and 31% women. By 2020, 55% of the EAP was



Source: self elaborated from INEGI data, 2020a.

**Figure 1.** Geographical location of the municipality of Calpan, Puebla, Mexico.

employed in the primary sector, 16% in the secondary sector, and the remaining 29% in the tertiary sector (INEGI, 2020b). The primary sector in Calpan mainly consists of agriculture and livestock. The seasonal maize crop stands out as the most important, both in terms of planted area –representing 67% of the total–, and according to production value, contributing 56% of the total. Concerning importance in terms of production value, maize is followed by crops such as gladiola, beans, spinach, cauliflower, peas, green chili and onion, which together contribute 40% of the total (Food and Fisheries Information Service SIAP), 2020a). According to data from SIAP (2020b), livestock production in the municipality comprises 44% cattle, 25% pigs and 13% sheep; in addition to 18% fowl.

### ***In situ* observation**

Initial work involved *in situ* observation during field trips, a technique that intends to observe reality as a factual aspect of existence, or on a 1:1 scale (González, 2005). This technique allowed obtaining first-hand information concerning socio-productive processes, as well as territorial and cultural aspects of food and consumption habits.

### **Design and application of questionnaire**

130 questions referring to food and food culture were included in the design of the questionnaire, for example physical and economic access, availability, stability, production, consumption, practices, techniques and customs related to food; besides this, questions relating to the identification of social reproduction strategies were included, such as the

sociodemographic characteristics of the family, economic activities they are involved in, and also income, expenses and government support, among others. Likewise, the Latin American and Caribbean Food Security Scale (ELCSA) was included, which contains questions that refer to self-reported objective situations that household members experience, such as reduction in the amount of food served, omission of one of the daily meals, hunger suffered by a household member, and the suspension of meals due to lack of money or other resources (ELCSA, 2012).

To determine food insecurity in the household, ELCSA asks 15 questions, divided into two sections: the first consists of 10 questions referring to various situations that lead to food insecurity as experienced by households and the adults in those households. And a second section includes 5 items referring to conditions that affect those under 18 years of age at home. It also has four categories of possible answers: never, almost never, almost always and always. Each response was assigned a score ranging from zero to three points, measured according to the liker scale. For the “never” category, the score is zero, increasing by one point until reaching three when answering “always”. According to various previous investigations (Shamah *et al.*, 2021; Rodriguez *et al.*, 2021) the ELCSA score can fluctuate between zero and forty-five points. An overall score of zero indicates that the home is safe; if it scores between 1 and 15 points, there is slight insecurity; from 16 to 27 points it is moderately insecure; and from then on these homes suffer severe insecurity (ELCSA, 2012).

### Sample calculation

As families producing seasonal maize in the municipality of Calpan represented the unit of analysis for which sample size was determined, using simple random sampling (Cochran, 1982):

$$N = \frac{S_{\alpha/2}^1 S_n^2}{d^2 + Z_{\alpha/2}^2 S_n^2}$$

where  $N$ : Sample size (110 peasant families);  $n$ : 546 total number of families benefitting from the PROAGRO Productive in the municipality Calpan;  $d=0.14$  (Precision);  $Z_{\alpha/2}=1.95$  (Reliability 95%);  $S_n^2=0.25$ .

Simple random sampling was applied with distribution that was proportional to the municipal sample, based on the number of maize farmers in the communities (San Andrés Calpan 334, San Lucas Atzala 146, San Mateo Ozolco 62 and Pueblo Nuevo 5). The sample group consisted of farmers who participate in the PROAGRO Productive and the selection of the sampling units was undertaken randomly, one by one and without substitutes. Sample size consisted of 110 families, with the following distribution: San Andrés Calpan 42, San Lucas Atzala 36, San Mateo Ozolco 27 and finally, for Pueblo Nuevo 5.

### **Semi-structured interviews**

12 semi-structured interviews were applied to key informants in the municipality (municipal president, ejido commissariat, agricultural producers). Key questions concerning economic, social, cultural and agricultural production aspects were included, as well as on food consumption habits.

### **Typology**

The Peasant Families (PF) interviewed were classified according to food security, as follows: Peasant Families with Food Security (PF-1) and Peasant Families with Food Insecurity (PF-2). This typology compared families, which made it possible to assess the particularities of the different social reproduction strategies, as well as their contribution in terms of food.

### **Statistical analysis**

For the analysis of the results, descriptive statistics were applied for the quantitative variables and for the qualitative variables, frequencies were applied, in addition t-student tests were applied to verify significant differences and the calculation of the Pearson correlation coefficient.

## **RESULTS**

In Calpan, the practice of peasant agriculture has implemented traditional knowledge and local resources since ancient times. Authors such as López *et al.* (2018) mention that, in the municipality of Calpan, prior to the conquest and colonialism, the agricultural landscape maintained a certain homogeneity, manifested in the cultivation of the milpa (maize, beans and squash).

The peasant family in this municipal study, represents a production and consumption unit that diversifies its activities to guarantee its social reproduction, entailing evident pluriactivity. In addition to being maize planting peasants, they perform salaried jobs, for example as construction workers, day laborers, domestic workers, in animal husbandry and via migration. However, agriculture is the predominant activity, maintaining plots that year after year are planted with seasonal maize, which in some cases is interspersed with fruit trees.

In this sense, Pantoja (2022) mentions that family agriculture in the municipality of Calpan provides significant food security to peasant families due to the high diversity of crops they produce.

The lands are prepared using farming tools such as the traditional digging stick (coa), a pick, and a yoke for draft animals (oxen, donkeys, and horses). 69% of peasants own sloping properties, which makes it difficult for them to use the tractor, while 31% have properties with no slope and use a tractor. On average, land with the most inclined slopes is found in San Mateo Ozolco with a 10% inclination, which is to be expected considering its proximity to the transversal neo-volcanic axis.

Some of the farmland surrounds the houses, while other areas are more distant; maximum ownership is four hectares, made up of several scattered plots. The most common planting (95%) consists of a polyculture that includes native maize, beans and squash, with significant family labor employed, whereas 5% plant hybrid maize. In the municipality of Calpan, government support is a constant for families. These data coincide with that reported by other investigations that highlight the characteristics of seasonal agriculture and the social and demographic aspects of peasant families (Magdaleno *et al.*, 2014; Andrade *et al.*, 2019).

In Calpan, the families interviewed have an average age of  $49.7 \pm 10.5$  years, with  $6.1 \pm 3.2$  years of schooling and are made up of  $5.7 \pm 1.73$  people. This concurs with that reported by Carcaño (2021), who specifies that on average, producers employed in the Mexican primary sector, are 50-year-old men. Families dedicate an average area to planting maize of  $2.6 \pm 1.03$  hectares, and obtain an average yield of 2,441 kg/ha, which provides them with an average of 434 kg of maize per person, annually. The predominant type of soil dedicated to agriculture at these locations is Arenosol, with a depth in the maize cultivation area of 25 cm. These soils have high permeability but very low capacity to retain water and store nutrients.

#### **Food security among peasant families in Calpan**

ELCSA reliability was evaluated independently, with reference to household composition; the scale showed high internal reliability concerning aspects dealt with in the questions (Cronbach = 0.921); likewise the factorial analysis of the ELCSA using Kaiser Meyer Olkin's test reported a value of  $p = 0.867$ , indicating that the principal component analysis is adequate. This analysis identified the dimensions and variables that comprise ELCSA, identifying three components: 1. Quantity and quality of food; 2. Uncertainty in terms of access and availability of food and, 3. Distribution and means of acquiring food. This assigned 30% to the first component, 33% to the second, whereas the third contributes 25% to the scale configuration and combining these three shows a predictive capacity of 88%.

Results from applying ELCSA in this study, reveal that 68% of families have food security (PF-1) and 32% have food insecurity (PF-2). This coincides with those reported by Appendini and Quijada (2013), who comment that the importance of growing maize and the use of Creole seed in the municipality relates to food security and preferences for a quality tortilla compared to an industrialized tortilla.

Concerning families who suffer from food insecurity, 89% report a slight level of insecurity, and 11% moderate insecurity. As can be seen in Table 1, among families suffering from food insecurity, the highest percentages of affirmative answers are found in the "almost never" category. It appears that when there is a need to limit food, adults are the ones who restrict consumption, while prioritizing food for the youngest in the family.

Likewise, when evaluating ELCSA with the Rasch model, this presented a decision criterion of 0.84. Thus, it was found that there is a pattern of affirmative responses that

**Table 1.** Percentage of affirmative answers with respect to the total number of ELCSA interviews applied in the municipality of Calpan.

Questions	PF-1		PF-2	
	75=100%		35=100%	
	Never	Almost never	Almost always	Always
P1. Have you ever worried about running out of food in your home?	0	76%	24%	0
P2. Is there insufficient money in the household for food purchases?	0	72%	28%	0
P3. Has your household ever lacked a healthy diet?	0	54%	46%	0
P4. Have you or any adult in the household ever had a diet based on limited variety?	0	59%	41%	0
P5. Do some people in the house eat less than they want for lack of money to buy food?	0	86%	14%	0
P6. Are the number of meals per day at home reduced because of lack of money to buy food?	0	98%	2%	0
P7. Are the number of meals for an adult ever reduced because of lack of money to buy food?	0	93%	7%	0
P8. Are the number of meals for a child ever reduced because of lack of money to buy food?	0	0	0	0
P9. Does an adult ever consume less in the evening because food is insufficient?	0	95%	5%	0
P10. Does a child ever consume less in the evening because food is insufficient?	0	0	0	0
P11. Does an adult ever remain hungry because of lack of food in the home?	0	94%	6%	0
P12. Does a child ever remain hungry because of lack of food in the home?	0	0	0	0
P13. Is less food bought for the children because money is insufficient?	0	0	0	0
P14. Does an adult ever go to bed hungry because of insufficient money for food?	0	95%	5%	0
P15. Does a child ever go to bed hungry because of insufficient money for food?	0	0	0	0

Source: data taken from a survey applied in the municipality of Calpan, Puebla in 2018, reflecting the situation concerning family food over a three month period (January, February and March).

tend to decrease as the severity of the questions increases. These data coincide with other investigations such as that of Castell *et al.* (2015), who report that the application of ECLSA, indicates that the correlation between degrees of food insecurity increases when questions regarding the limitation of food for children in the household, begin to be answered.

Families who enjoy food security constitute a mature population, made up of 7 members on average, meaning that they have a greater transferable labor force, which is associated

with greater resources that result in food security. Whereas families with food insecurity are younger and are made up of 5 members, finding significant differences ( $t=2.703$ ,  $p=0.0063$ ) between these groups.

These results indicate that families with food security in Calpan are mainly dependent on agriculture and that they maintain a peasant tradition. Likewise, the mature age of the family members translates into knowledge about the management of the maize crop and the home garden that amplifies food production (Altieri and Nicholls, 2012). For this, ample labor is required, which is provided by all members of the family; men and women (Magdaleno *et al.*, 2014). Their children are on average 27 years old and help with agricultural activities, but they also contribute income that they obtain outside the family production unit to the household, and with this, they facilitate access to food. Pluriactivity can be an effective survival strategy to improve the income of rural households; this has been demonstrated by other authors who have studied this phenomenon (De Grammont, 2006; Aries and Ribes 2019).

Families that suffer from food insecurity are younger and prioritize obtaining monetary resources, working part-time in agriculture, which results in loss of knowledge about caring for the plot and home garden (Anseeuw and Laurent, 2007). In addition, they are employed in temporary economic activities, meaning that they do not have job stability during the year. This group of families with food insecurity have small or very young children, which, as indicated by Cuevas *et al.* (2014) and Muñoz *et al.* (2010) represent a vulnerable population and their families are the most likely to suffer from food insecurity, because the youngest do not contribute income and depend on the contribution from heads of family for their food.

According to Pearson's correlation coefficient, a positive correlation ( $r=0.252$ ,  $p=0.0126$ ) was found between the age of family members with food security and the amount of plants and animals, but not with food-insecure families where age did not correlate with the amount of plants and animals found in their home gardens ( $r=-0.0780$ ,  $p=0.0570$ ).

#### **Specifications for strategies of social reproduction among peasant families in Calpan**

The analysis of physical and economic access to food, identified three strategies deployed by peasant families in Calpan to ensure their physical access: by participating in the agricultural production process, by collecting wild edible produce, and from the network of exchange for food products between families in the municipality; and an economic strategy, which also employs annual income for the purchase of food. Mastache *et al.* (2018), affirm that family livestock is the most important supply guarantee in Mexico, as a considerable portion of income in peasant communities derives from and depends on this, while also fulfilling a number of requirements for their benefit.

Economic strategy is represented by the total annual income of peasant families, and is comprised of labor hire, sales from agricultural and livestock production, remittances, and government support (Table 2). Using the typology proposed in this study, apparently

**Table 2.** Procurement and composition of annual income in thousands of pesos (Mexican national currency) on the part of peasant families according to their typology, in the municipality of Calpan, Puebla, Mexico.

Income	PF-1	PF-2	Municipal/Average
Labor hire (\$)	27,600	23,511	19,945
Sale of agricultural and animal produce pecuaria (\$)	8,000	0	4,000
Remittances (\$)	6,137	0	3,100
Government support (\$)	4,400	2,000	2,100
Total (\$)	46,137	25,511	30,445

Source: self elaborated from the survey carried out in 2018.

for PF-2; labor hire constitutes 89% of their total income, whereas for PF-1, it represents 60%. Sale of agricultural produce represents 30% for PF-1 and 6% for PF-2. Remittances represent 17% for PF-1 and only 4% for PF-2. According to Ramírez (2022), agricultural diversity is essential for ensuring the basic food requirements of the population and livelihood security, with farmers controlling agricultural biological diversity. In Calpan, government support in March 2018 consisted of three assistance programs: PROAGRO Productive, PROSPERA, and Support for Older Adults. Magallan (2022) point out that in Mexico, the availability of resources for small producers in the agricultural sector is minimal. However, these resources are destined, not only to supplement family income, but also to cover investment in agricultural expenses.

Information from the survey indicates that 91% of the PF-2 income is destined to the purchase of food, whereas for PF-1, this represents 58% of their income. This is because the PF-1, by focusing their strategies mainly on the production of agricultural goods, obtain the food required for their reproduction; but they must also invest part of their income in their agricultural production (Table 3). In this regard, Pat *et al.* (2010) mention that the domestic groups who own more land represent those who dedicate the least

**Table 3.** Agricultural area planted according to crop, size of home garden, vegetable preference and average number of large and small livestock, according to type of family in towns within the municipality of Calpan, Puebla, Mexico.

Indicators	PF-1	PF-2	Average/ Municipality
Maize production (kg/ha)	2,599	1,628	2,240
Area planted with maize (ha)	3.07	1.87	2.07
Bean production (kg/ha)	600	200	300
Area planted with beans (ha)	1.01	.398	.804
Size of home garden (m <sup>2</sup> )	452	107	308
Average preference for edible vegetables	21	4	11
Average for head of cattle	4	0	1
Greatest average for head of cattle	55	15	27

Source: self elaborated based on 2018 survey data.

proportion of their expenditure to the purchase of food, in addition to having greater diversity in terms of the foods they consume.

However, current income to acquire food translates into a vulnerability problem, because the type of work that the members of PF-2 have access to is temporary, meaning that they do not have a permanent contract that ensures them job stability with a constant fixed income, meaning they risk unemployment and associated food problems. This factor does not affect PF-1 in the same way, as they dedicate space and time to obtaining food through agricultural production, with which they can feed themselves in times of crisis, and generating productive diversification - they also carry out activities in several sectors of the economy - which benefits them. In this regard, Ramírez (2008:38) indicates that “some peasant families depend on income outside the farm because agriculture alone does not guarantee their reproduction. In addition to this, their socioeconomic condition is associated with less availability of productive assets or little diversification in term of productive systems, as well as limited availability of labor force”.

The structure consisting of three strategies for physical access to food in Calpan, includes the agricultural productive structure, consisting of traditional production from the milpa and management of the home garden (Table 3). This is similar to that found by López *et al.* (2018) in the municipality of Calpan, who state that the least profitable crops include: hawthorn, apple and peach, resulting in decreased production. In the milpa, there is production of maize (*Zea mays*), beans (*Phaseolus vulgaris*) and squash (*Cucurbita argyrosperma*) which is interspersed with fruit trees, whereas management of the home garden involves nurturing a diversity of edible plants and animals. In contrast, Reyes *et al.* (2020) mention that the different fruit trees such as hawthorn, peach, plum, pear, and capulín (wild cherry) in the municipality of Calpan are destined for the market in order to generate income.

Animal rearing or backyard livestock are divided into larger cattle –cows (*Bos taurus*) and bulls (*Bos primigenius taurus*)– and smaller –hens (*Gallus gallus domesticus*), turkeys (*Meleagris*), pigs (*Sus scrofa domestica*), sheep (*Ovis orientalis aries*) and goats (*Capra aegagrus hircus*)–.

Data from Table 3 show that the PF-2 have less surface area for planting maize and beans, while at the same time that they obtain lower yields for both crops than the PF-1. This suggests that pluriactivity in economic sectors not related to agriculture can cause the producer, to abandon or neglect crops (temporarily or permanently), undermining their management specialization, which is reflected in lower yields (Damian *et al.*, 2004).

Frequency for plant and animal diversity is greater among peasant families (PF-1). The importance of livestock for families lies mainly in the fact that the products obtained can be used for self-consumption but, in case of economic necessity can be sold, thus partially ensuring the survival of the family (Gutiérrez *et al.*, 2007). In this activity, the need for inputs is low, and labor is provided by family members (Licea, 2019). In addition to this, the larger cattle that are kept in the home garden are essential among the PF-1, as they are used in agricultural work as labor force.

Concerning home garden livestock, domestic fowl represent the largest number; correspondingly Alfonso (2022), comments that chickens are the animal species most commonly managed by peasant families. Portillo (2019), states that the main purpose of the production of these birds is to provide animal protein for peasant families. It is possible to deduce from the Table 4 data that the most significant products for the PF-1 diet (maize, beans, squash, vegetable sprouts, eggs, meat and fruit) are produced; whereas in the case of PF-2 these are purchased.

The second strategy for physical access to food is the culture involving gathering of wild products. Thus, results from the survey indicate that 100% of the PF-1 collect wild products and maintain knowledge related to the type, use and consumption of edible plants in the region, unlike the PF-2 group for whom only 12% carry out this practice. Among the

**Table 4.** Peasant families according to type, most common foods produced and consumed in their diet over a 7 day period, expressed in percentages with respect to the total consumed and according to the origin of these foods in the municipality of Calpan.

Foods	PF-1				PF-2			
	P.	B.	E.	C.	P.	B.	E.	C.
Milk	20	80	-	-	-	100	-	-
Eggs	50	30	20	-	20	80	-	-
Chicken	40	40	20	-	10	80	10	-
Pork	70	30	-	-	10	90	-	-
Beef	10	90	-	-	-	100	-	-
Lamb	20	80	-	-	5	95	-	-
Beans	100	-	-	-	50	60	-	-
Maize tortillas	95	5	-	-	70	30	-	-
Pears	100	0	-	-	50	50	-	-
Peaches	50	50	-	-	20	80	-	-
Oranges	20	80	-	-	-	100	-	-
Guavas	25	75	-	-	-	100	-	-
Nopales	70	10	10	10	5	75	-	20
Tejocotes	100	-	-	-	100	0	-	-
Plum	80	20	-	-	60	40	-	-
Squash	80	-	10	10	20	60	10	10
Tomatos	20	80	-	-	-	100	-	-
Onion	25	75	-	-	-	100	-	-
Plant shoots	40	-	-	60	25	65	-	10
Green chiles	40	60	-	-	-	100	-	-
Carrots	10	90	-	-	-	100	-	-
Broad beans	100	0	-	-	-	100	-	-
Radishes	10	90	-	-	-	100	-	-
Chayotes	90	-	-	10	50	50	-	-
Apples	100	-	-	-	90	10	-	-
Pomegranites	100	-	-	-	70	30	-	-

Source: self elaborated based on data from the 2018 surveys. P: Produced, B: Bought, E: Exchanged, C: Collection of Wild Products, O: Other (this can be C or acquired through government support).

principal foods acquired from nature are nopales (*Opuntia ficus-indica*), vegetable sprouts (in Nahuatl “*quilitil*”), squash flowers (*Cucurbita maxima*), and some seasonal plants, either eaten or used for infusions. These data concur with what was reported by Gonzalez (2019), who specifies that home gardens and the collection of wild food help guarantee food security.

Finally, the third strategy for ensuring physical access to food in Calpan, involves the social network for exchange of products derived from agricultural production in the community, which is influenced by ties of friendship and “*compadrazgo*”. This activity is usually carried out at gatherings or to remedy situations of economic instability faced by families. Moreno *et al.* (2021) comment that festive events are widespread and varied, and societies are distinguishable from one another, by their content and intensity concerning certain elements and characterized by different forms of festive expression, among which parties, festivals and fairs stand out. Fairs are mainly commercial in nature, as the main aim of these events is to promote products and services that generate economic income for participants (Pizano *et al.*, 2004).

The PF-1 group mainly exchange products derived related to poultry and to a lesser extent, vegetable products (Table 4). Vieira *et al.* (2004) comment that in the social context, the exchange of agricultural goods makes it easier for the producer to maintain contact with other people dedicated to the same activity, exchanging ideas or products; thus promoting greater knowledge of their environment. These exchange meetings, generate an ambiance that favors the socialization of information related to political, economic, social and educational matters, among others.

Finally, concerning aspects of identity common to peasants from the municipality of Calpan, adherence to the land stands out as one of the most accentuated traits among the population. Being a peasant in the municipality implies traditional knowledge about cultivation of the milpa, cultural and social codes and religious beliefs that motivate the reproduction of daily life, which when shared by the majority of inhabitants in the region, constitute a local identity that is nourished by the ways of thinking and acting, as well as the ways of interpreting reality, which are very similar. Thus, the peasants in Calpan live together and recognize each other as equals, that is they identify themselves as peasant workers, sharing experiences and knowledge about crop management and religious practices, in addition to having common experiences that transcend local and regional borders. Don Celerino, 62 years old, a farmer by profession, originally from San Mateo Ozolco, points out: “Here we know that we are equal because we are peasant workers and that’s how well we all know each other around here, we know how to work the land and we enjoy doing it” (2018). Some authors consider that: “The peasant identity is fundamentally constructed from their relationship to the land, a relationship that has been inherited from generation to generation. Without this it does not exist. Their identity loses its *raison d’être*” (Hernández *et al.*, 2013:100).

## CONCLUSIONS

In order to analyze contributions to the diet related to varied strategies for social reproduction displayed by the PF groups in the municipality of Calpan, this typology proved to be an adequate instrument for understanding the general and particular characteristics of the different PFs.

Generally in Calpan, peasant families (PF) have four strategies for physical and economic access to food: 1) income obtained for the purchase of food, 2) the agricultural means of production, 3) the collection of wild edible products, and 4) the exchange of food products between PFs in the municipality. However, it is particularly apparent that benefit from each of these strategies depends on the priority and capacity which each PF assigns to them.

The identification and comparison of strategies for access to food used by PF-1 and PF-2, allowed us to understand that there is differentiated use of productive activities, indicating that the strategies used by the PF-1 group are more efficient for maintaining greater plant and animal diversity, as well as for obtaining higher yields from their crops, unlike the PF-2 who prioritize strategies based on obtaining income for the purchase of food and subordinate their production, and are thus subject to job instability over time

The most significant products in the PF diet are maize, beans, squash, plant shoots, eggs, meat and fruit; which the PF-1 group produce; but the PF-2 group mostly purchase.

A fundamental part of the identity and food culture in the municipality is based on the cultivation of the milpa and the family orchard or home garden, as these areas provide the produce from which the food is prepared, using products obtained by the agroecological system of the milpa, planted in an associated and overlapping manner, the most important being maize, beans, squash, plant shoots and aguamiel (unfermented pulque).

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