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A STRATEGIC DEVELOPMENT PLAN FOR A TOTONAC COMMUNITY IN MEXICO

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ABSTRACT

Food insecurity in Mexico is a problem more frequently found in rural communities. Hence, the main objective of this article was to define a strategic local development plan through production schemes proposed by households of a Totonac indigenous community aimed at satisfying nutritional needs in the community through the use of readily available natural resources. A questionnaire was applied to 328 households in the municipality of Filomeno Mata in Veracruz, Mexico. Small-scale reproduction strategies focused aimed at self-sustainability were formulated through a semi-structured survey, and a cluster analysis was used to determine associated factors. The results suggested a strategic plan of eleven local development strategies that seek to influence the implementation of native foods in the community. Based on the analysis of socioeconomic variables affecting households four groups were defined, and the strategy most likely to succeed for each was determined. Moreover, the strategies presented are linked to processes where social, economic, and cultural practices are closely related. Thus, these actions establish a proposal to satisfy the household food needs in support of price volatility in the food market.

Keywords: Food insecurity, reproduction strategies, native foods.

INTRODUCTION

Food security is defined as the state in which all people have, at all times, physical, social and economic access to sufficient, safe and nutritional foods that satisfy their dietary need and food preferences for a healthy and active life (Food and Agriculture Organization of the United Nations, (FAO) 1996). However, a large part of the population cannot acquire the necessary foods in the amount and quality that a minimum of level of welfare demands (Salazar and Godoy, 2018). In 2019, the World Health Organization (WHO) mentioned that almost 690 million people went hungry (an increase of 10 million people since 2018 and of nearly 60 million in the last five years) (OMS, 2020). Overcoming hunger and malnutrition in all its forms (including malnutrition, lack of micronutrients, overweight and obesity) goes beyond attaining sufficient foods for survival; that is, people's diets should also be nutritious. However, one of the main obstacles is the high cost of nutritional foods and the scarce affordability of healthy diets for a large number of families (OMS, 2020). Although it is true that other concepts such as food sovereignty are important, it was considered that an initial point to eradicate hunger should address the phenomenon of food security, as a complex process that is related to poverty, culture, vulnerability,

among others. This term is relevant for the development of strategies and policies with greater efficacy, and it has taken on relevance in the study of population groups.

In Mexico, in 2014, there were 24.6 million people who did not have enough income to purchase the food basket, which had a value of $1,227 (91.5 USD) per person in an urban zone and of $868 (64.7 USD) in a rural zone (Gonzáles *et al.,* 2019). Despite the implementation of multiple policies and plans for poverty combat in the last four decades (Consejo Nacional de Evaluación de la Política de Desarrollo Social, [CONEVAL], 2019), the number of people in poverty in 2018 was 51.9 million people, reaching a figure of 55.7 million people in 2020, understood as 43.9% of the population in Mexico (CONEVAL, 2021). Because of this, peasant households in multiple regions of Mexico have been forced to develop strategies for survival and reproduction.

The concept of strategy can be analyzed from different optics. In this sense, Borsotti (1981) suggests that strategies emerge from isolated encounters, combining with different activities to reach an objective, and those who participate in them have relationships of reciprocity. Cariola (1992) explains that survival strategies are defined as those that involve daily life and the forms in which the domestic income transforms this daily life. Therefore, these strategies involve practices destined to obtaining income to ensure the material reproduction of the households. Likewise, the reproduction strategies are defined as the mechanisms developed by domestic groups according to the resources they have (Hernández and Martínez, 2016). They symbolize the way in which reproduction adapts to the global conditions of society, to the needs and possibilities of communities and family units (Saldaña, 2019). Regardless of the type of collective, they are conceived as a response mechanism that seeks to buffer the effects of successive crises (Ayala *et al.,* 2019). Oliveira and Salles (2007) and Rojas *et al.* (2014) suggest that reproduction strategies also include social relationships of solidarity and reciprocity, which include loans of monetary resources, foods, workforce, and mutual help in the tasks to grow crops, as well as community works to provide domestic services or other works of common service.

Building on this, rural zones have as defense mechanisms the multiple cultural elements that protect the changing traditional culture and which make up a broad and complex mosaic of worldviews, knowledge, rites, practices, social networks, among others, which are basis and part of the cultural wealth of a whole country (Guzmán and León, 2014). At the same time, these elements can be used to generate focalized interventions in vulnerable groups.

With this singularity of approaches, the studies about family strategies in rural communities have contributed qualitative and quantitative knowledge about the various activities and actions that families and individuals in contexts of poverty display, with the objective of reproducing and living daily (Arteaga, 2007).

An example of this is the studies by Orozco and López (2007), where the role of agriculture and livestock purchase-sale as strategy for diversification of peasant economics is covered. Juárez (2008) analyzes the reproduction strategies of the valley of Puebla, Mexico. For their part, Rojas *et al.* (2014) analyze the reproduction strategies developed by domestic groups of the Zapotec ethnic group. Magdaleno-Hernández *et al.* (2014) show the mechanisms

that peasant families use for the satisfaction of basic food needs to ensure their survival.

Del Amo and Moctezuma (2008) suggest that the living conditions in the Totonac rural area and their survival can happen through agriculture and livestock production. Likewise, Moctezuma (2009) mentioned that in the Totonac group of Veracruz, commercial agriculture was transformed into subsistence agriculture to face the vulnerability of the market. Therefore, the Totonac people have strategies that are primarily for survival due to changes in the fall of prices and exhaustion of resources (Moctezuma and Murguía, 2014).

In this sense, the municipality of Filomeno Mata, Veracruz, Mexico, houses a latent phenomenon of food insecurity. Approximately 60% of the total population were in some of the levels proposed by the Mexican Scale of Food Security (*Escala Mexicana de Seguridad Alimentaria*, EMSA), which forces them to shape differentiated survival strategies (García *et al.,* 2021). The municipality belongs to the Totonac ethnic group, which is characterized by having a close relation with the flora of the locality where the natural capital is a source of food and medicine for inhabitants (López *et al.,* 2019).

However, the reproduction strategies have not been approached in the Totonac community based on the use of food resources. Therefore, this study attempts to generate a proposal for reproduction strategies, seen as initiatives to evaluate and to determine the options that are available in the community, with the aim of finding those that allow conducting a development process.

The main objective of this study was to define a strategic plan of local development through the reproduction strategies proposed by households of a Totonac indigenous community to satisfy their nutritional needs in relation to the use of the natural resources that they have. What is sought is the generation of activities that include the domestic and the productive part, where strategies are covered that are circumscribed from the agricultural activity to the commercial part.

Therefore, this study contributes to the literature by using the conglomerate analysis as a relevant factor to explain the reproduction strategies of highest impact. The strategies allow the households to become organized based on self-supply, satisfying their basic needs and allowing them to generate strategies for changes in the socioeconomic conditions.

METHODOLOGY

Study area

The study was carried out in the municipal township of Filomeno Mata, Veracruz, Mexico, which is characterized by being an indigenous municipality and home to the Totonac culture. The House of Representatives (N.A.) suggests that the concept of "indigenous" is defined in the following way: "Indigenous communities, peoples and nations are those which, having a historical continuity with societies previous to the invasion and pre-Colonial ones that developed in their territories, are considered different from other sectors of societies that now prevail in these territories or in part of them. They constitute non-dominant sectors of society and have the determination to preserve, develop and transmit to future generations their ancestral territories and their ethnic identity as a basis of their continued existence as a people, according to their own cultural patterns, their

social institutions and their legal systems". They are totally or partially ruled by their own customs or traditions.

According to the *Real Academia de la Lengua Española* (RAE) (2022), the term community refers to the group of people linked by common characteristics or interests. The place of study is considered a community because they have a language, customs, traditions, and a geographic location in common.

According to the data from the Statistics and Geography Information System of the state of Veracruz de Ignacio de la Llave (SIEGVER) (2020), the indigenous population of the municipality has a total of 14,565 people of whom 7,249 are men and 7,316 are women. Of the people who speak the indigenous language (Totonac), 97.2% speak Spanish and 31.6% only speak the indigenous language. This segment of the population is representative of multiple ancestral strategies for the use of wild and domesticated plants.

The municipality is located between parallels 20° 10' and 20° 16' of latitude North; meridians 97° 38' and 97° 45' of longitude West; with altitude between 194 and 800 masl. It borders to the north with the municipalities of Coahuitlán, Coyutla and Mecatlán, Veracruz; east with the municipality of Mecatlán and the state of Puebla; south with the state of Puebla; west with the state of Puebla and the municipality of Coahuitlán (Secretaria de Finanzas y Planeación, [SEFIPLAN], 2019). The climate is semi-warm humid with rains throughout the year (92%) and warm humid with rains throughout the year (8%), showing a temperature range between 20 and 26° C. Rainfall is between 2.900 and 3.100 mm[1] (SEFIPLAN, 2019).

Sociodemographic conditions

By the year 2020, there were a total of 18,076 people. In terms of proportion, there were 8,918 men and 9,158 women inhabitants. The age groups present in the area were made up in the following way: 7,814 child inhabitants (0-14 years), 9,763 youth and adults (15-64 years), and 782 elderly (65 years and more) (SIEGVER, 2020). The population of study (328 survey respondents) was distributed in 53.1% women and 46.8% men.

Economic activities

Agriculture is the main source of work in the municipality. There is a land endowment, in which they work with the rainfed system. There are a total of 276 plots (Instituto Nacional de Estadística, Geografía e Informática [INEGI], 2009). There are records of a continental surface of 43.2 km^2. Agriculture covers 32.0 km^2, grasslands 9.7 km^2 with secondary vegetation of 1.1 km^2, and the urban area 0.5 km^2 (SIEGVER, 2020).

Livestock production is distributed among backyard livestock. López (2020) determined that the family units have the following backyard livestock: 79% raise chickens, 46.5% pigs, 13% turkeys for fattening, and 4.6% sheep. Within the secondary activities there are no important records.

Tertiary activities such as commerce are characterized by numerous shops at the small and medium scale to satisfy the basic needs of the population.

Natural resources

There are several studies that refer to the natural wealth of the zone. On this point, studies such as those by López *et al.* (2019), López (2019), and García *et al*. (2021) were found, which describe the food resources of the place and the intrinsic relationships of the community with nature.

In this sense, García *et al.* (2022) pointed out that families consume a total of 35 products of plant and animal origin that are produced by the population. On average, each household consumes at least seven products of those it reports (Table 1). This table was the reference of the food products that were considered within the strategies presented.

Population and sample size

To define the population of study, a population stratum of private inhabited households was used; the information was provided by the catalog of localities of the Ministry of Social Development. The total size corresponded to 2,178 households belonging exclusively to

Table 1. Indigenous foods consumed by Totonac households

Food group	Common and scientific name
Fruits	Avocado (*Persea americana Mill.*), sweet potato (*Ipomoea batatas (L.) Lam.*), sugar cane (*Saccharum officinarum*), assorted fruit trees (no scientific name), tomato (*Solanum lycopersicum*), pahua (*Persea schiedeana Nees*),
Vegetables	Chives (*Alliun choenoprasum*), chayote (*Sechium edule*),chayote guide (no scientific name), peppermint (*Mentha spicata*), blackberry grass (*Solanum nigrum L.*), prickly pear leaves (*Opuntia ficus-indica*), pichoco (*Erythrina americana Mill.*), tomatillo (*Physalis gracilis Miers*), tree chili (*Capsicum annuum L.*), pequin chili (*Capsicum annuum 'Pequin'*), cilantro (*Coriandrum sativum L.*).
Cereals, roots and tubers	Pumpkin (*Cucurbita argyrosperma K. Koch*), mushrooms (wild mushroom) (*Agaricus campestris*), corn (*Zea mays L.*), cushaw pumpkin (*Cucurbita argyrosperma*), yucca (*Manihot esculenta Crantz*).
Eggs	Wild eggs (no scientific name).
Meats, chicken, and sausages	Armadillo (*Dasypodidae*), pig (Sus), chicken (*Gallus gallus domesticus*).
Legumes and legumes	Green beans (*Phaseolus vulgaris*), asparagus *(Asparagus officinalis*), beans (*Phaseolus vulgaris L.*) River tamarind (*Leucaena leucocephala*), araceae (*Xanthosoma robustum Schott*), papalo herb (*Porophyllum ruderale (Jacq.) Cass.),* green amaranth (*Amaranthus hybridus L.*).
Sugar	Honey (no scientific name).
Beverages	Coffee (*Coffea arabica L.*).

Source: García *et al.* 2022.

the municipal township (INEGI, 2015). The size of the sample was obtained applying the formula for finite populations (Wayne, 2017).

$$n = \frac{N * Z_{\alpha}^{2} * p * q}{d^{2}\left(N-1\right) + Z_{\alpha}^{2} * p * q}$$

where *N*: size of the population; *Z*: level of confidence 1.96; *p*: probability of success, or proportion expected 0.5; *q*: probability of failure 0.5; *d*: accuracy (maximum admissible error in terms of proportion) 0.05.

The final size of the sample was 328 households, which was divided proportionally between 8 sectors (neighborhoods) which is the form of distribution of the municipal township. As consequence, the number of questionnaires applied per sector was 41 conducted completely randomly.

Instrument used

The information was gathered through a questionnaire of 15 closed questions with open responses, since the place houses illiterate inhabitants and this technique is applicable to any individual, for it allows obtaining clear information (Malhotra, 2008). This type of questions allow the researcher to question the survey respondent when there are doubts about the responses and this way there is the opportunity to clarify them, ensuring a better response. Before the use of the instrument, pilot tests were carried out to ensure the clarity of the questions and to minimize errors (n = 10). The questionnaire was answered by the person responsible in the household and by women homemakers. It was structured following the classification presented by Zárate *et al.* (2016): questions related to the diet, native foods, foreign foods, and socioeconomic characteristics (sex of the interview respondent, age, occupation, degree of studies, economic income and government supports). The questionnaire was applied during the months of July and August, 2018.
Within the study area, a household structure predominates based on men as heads of households and women as homemakers. Although phenomena such as migration have caused for numerous women to occupy the conjecture of the household, women play an important role in the decisions, since they are in charge of the management and yield of the economic and material inputs of the family, establishing the dietary patterns. On the other hand, the families where there is agricultural activity as the main economic activity, women play a double role, since they are integrated in different moments of the agricultural cycles, becoming suppliers and forming dynamics of family work.

Indicators and variables

The indicators of the reproduction strategy were obtained through the perceptions of the population in the matter of food. This was carried out by setting out questions where they were asked how they could implement the use of native foods for daily use, their importance based on their knowledge, the frequency of substitution of foreign products

by self-supply, and the strategies that they carry out or would develop for a greater use of these.

Statistical analysis

The strategies were obtained from the organization of data gathered and their codification, and response trends were generated from similar or common responses. The socioeconomic variables were codified and concentrated in an Excel 2016 worksheet database. The information analysis was carried out through a non-hierarchical conglomerate analysis with the method of K means as a way of splicing and Euclidean distance square as a similarity measure between individuals (Peña, 2013). To test and validate the results obtained in the cluster analysis, a Kruskal-Wallis analysis of variance by ranges was used ($p \leq 0.05$) (Díaz, 2013). The statistical analysis of the data was done with the Infostat software.

RESULTS AND DISCUSSION

Perception of families interviewed regarding native food resources

Relationships in the matter of the inhabitants' diet and their natural resources were identified. These relationships generate more environmentally sustainable livelihoods, since they maintain and improve the local assets of those on which the livelihoods depend and they have net beneficial effects on other areas (Chambers and Conway, 1992).

The approach is related to the theme when considering that the livelihoods function to overcome adversities, although rural family dynamics are in constant change so it suggests that this concept is limitative in some moments, although it serves to explain some base phenomena.

Of the sample, 90% considered that native foods substitute the consumption of exogenous supplies (industrialized products) in the families. This assumption was verified when analyzing that the families of the place use traditional foods from the region in some percentage within the daily diet, whether they are fruits, vegetables, legumes, among others.

Likewise, they respect and take care of native foods from their community and 100% considered important to include them in the daily diet. Some studies have shown that the use of native foods includes nutritional and cultural benefits, which is why it brings to light the preoccupation over changes in dietary patterns (Walch *et al.,* 2021). Of the inhabitants from the Popoloca Todos Santos Almolonga, Puebla, Mexico, 36% mentioned that the native species fight and prevent diseases (Santos *et al.,* 2019). On the other hand, in the Rai community of eastern Nepal, they are used to feeding children with wild vegetables as a complement to their base diet because they provide nutrients that other foods do not have (Daniggelis, 2003).

It was found that the appropriation of resources that nature offers are part of the identity and are part of a strategy of dietary self-sufficiency and permanence of peoples (Ayala *et al.,* 2014). The knowledge and use of natural resources represents a key factor for the execution of the strategies proposed by inhabitants, since they are part of the ancestral knowledge being a support in times of scarcity and a source of income in some domestic

units. Therefore, the strategies require a study and a careful analysis to fully understand the opportunities and threats related to sustainability (Placet *et al.,* 2005).

In this sense, families make direct or indirect use of the food resources around them to various degrees (Table 2). Of the survey respondents, 43.9% considered that the consumption of local food resources benefits the health of the inhabitants, since they have more nutrients and a better flavor, and they are also part of the daily consumption. Likewise, the economic indicator was also important because the consumption of native products represented a source of income for the families. The ecosystems and natural resources generate goods and services to human society that are of great ecological, sociocultural and economic value (Millennium Ecosystem Assessment [MEA], 2005).

Figure 1 shows the main strengths described by inhabitants of the community for the use of these foods and their incorporation to the daily diet in a higher percentage. It explains that the preferential consumption of local products, the diversification of agricultural lands, as well as the knowledge of nutritional benefits are key tools to develop strategies that lead to improving food security.

The results presented in Figure 2 contextualize the ideas from the population studied about how to execute a readjustment of the forms of consumption with local foods. The data gathered allowed to identify a range of possibilities to work on the strategic local development plan. They indicated that self-sufficiency, as a strategy to reach food security, constitutes a viable alternative. The families have increasingly more difficulties to achieve a correct diet, which forces them to maximize their capacities, resources and efforts through diverse strategies based on understandings, knowledge and technologies (De Groot, 2008). However, in the 1980s, some Totonac indigenous people from Veracruz opted for migration derived from the fall in the price of coffee. These indigenous people settled in cities with higher need for workforce and with possibilities of creating higher income than those obtained in their regions (Moctezuma, 2011). Although migration provided economic stability, what is true is that the diet changed and became based on pre-cooked foods of easy preparation. Del Amo and Moctezuma (2008) consider that the Totonac communities of Veracruz could overcome marginalization, migration and poverty through the rescue of traditional knowledge related to the use and management of natural resources.

Thus, food culture is part of the social, productive and nutritional revaluation. At the same time, these understandings and knowledge through historicity are necessary to

Table 2. Importance of native food resources in the community.

Indicator	Arguments	Percentage
Environmental	Contributes to the region's ecological balance	2.7
Cultural	It is part of ancestral knowledge and belongs to consumption customs, favoring cultural wealth	20.7
Economic	It results in resilience to food price increases, helping in times of scarcity and representing a source of income for families	32.7
Social	It benefits the health of inhabitants since its use is part of survival, these organic foods are rich in flavor and have more nutrients	43.9

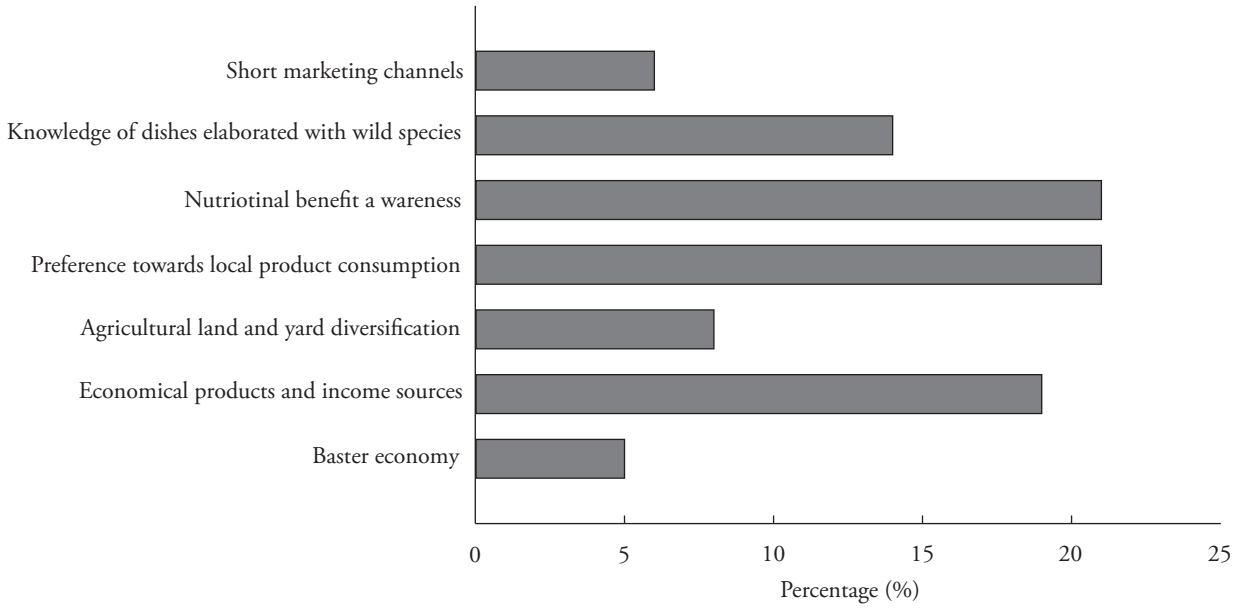

Figure 1. Strengths defined by the community for the use of native foods in the diet.

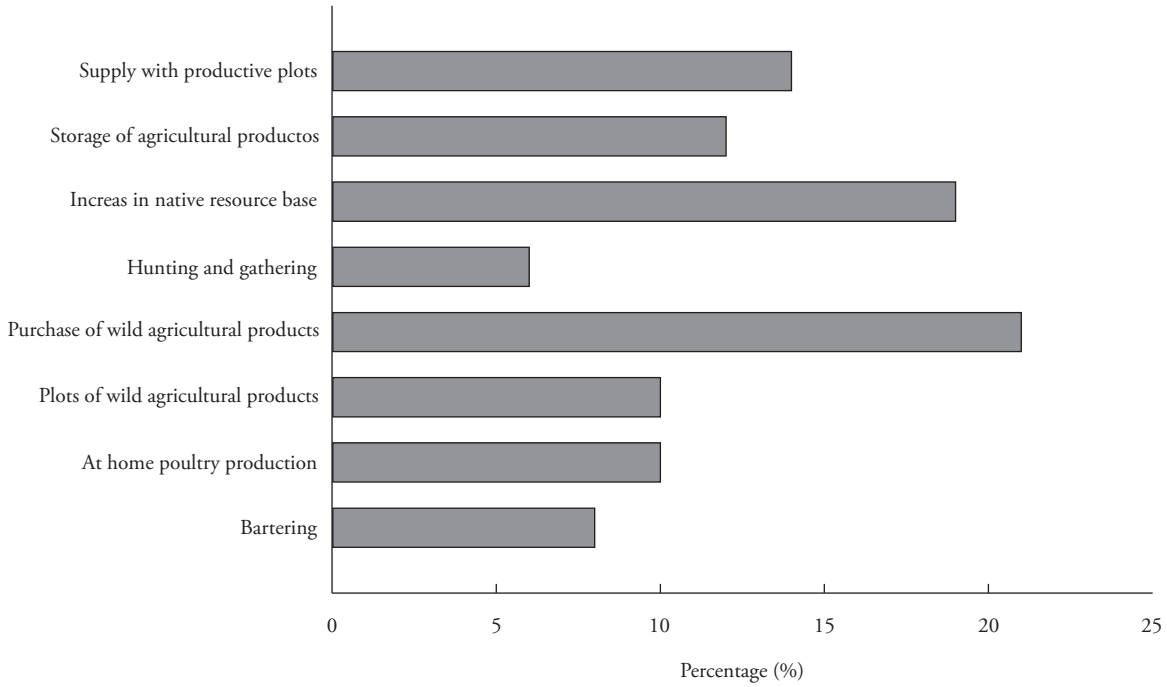

Figure 2. Means to make the readjustment of forms of consumption in the community possible.

achieve the reproduction of the strategies they develop (Gómez and Gómez, 2006). Short commercialization channels through the purchase of wild foods, the productive increase of the base of natural resources, as well as the productive plots, become more important since they are useful for times of crisis and scarcity.

In this regard, in the Central Mexican Plateau it was observed that the consumption of herbs and vegetables through peasant traditional practices such as family gardens complements the diet, contributes to food security and minimizes the social vulnerability of families (García *et al.,* 2016). In this type of indigenous communities, the exploitation of natural resources is fundamental, since they are connected with local culture and opens a door to diverse strategies for usage (García *et al.*, 2022).

Strategic local development plan through the formulation of strategies and the characterization of groups by conglomerates

According to the information gathered, 34% of the survey respondents considered that it is impossible to return to or generate a readjustment of the dietary forms of their ancestors when facing times of economic insolvency. These arguments are based on the logic of change that dietary patterns have had in the zone, where the incorporation of industrialized foods has a direct relation with the decrease in the use of natural resources in the zone.

Within the questions included in the questionnaire, a section was generated called "open questions to obtain dietary strategies". Based on various ideas proposed by interview respondents, trends of responses were established. This resulted in a strategic local development plan through eleven strategies to influence the implementation of native foods in the community (Table 3). However, it was considered that they are related, since they are all based on the use of natural resources directly or indirectly, although differentiating them gives a guideline for the generation of different activities. The resulting responses were addressed as trends and served to define the strategies in agreement with the ideas of the population.

The results agree with those found both by Rojas *et al.* (2014) and González and Barriga (2019), who determined that agriculture is the main reproduction strategy, because it is connected to other social and economic practices, such as relationships of solidarity, mutual help between groups and collective unpaid work. Likewise, Magdaleno *et al.* (2014) concluded that the most representative strategy of peasant families is self-supply, because it complements the family sustenance to ensure peasant subsistence, indicating that agriculture continues to be the main strategy for household organization.

The reproduction strategies in this study had the backbone of agriculture, although it is also necessary to develop complementary activities. In this sense, Hernández and Martínez (2016) indicated that the diversification of activities is manifested in a large number of practices, with agricultural or extra-agricultural nature, and can be carried out when the strategy of self-supply is not enough.

This type of strategies have some relationships with the approach of livelihoods, and it is suggested that the definition that best explains this type of initiatives is the one from the United Nations High Commissioner for Refugees (ACNUR, 2014) which defines that

Table 3. Reproduction strategies proposed by the inhabitants of the community.

Proposals of the studied population	Strategies
1. Government support	An updated bibliographic reference of the organizations that support and maintain food security through actions, programs and projects.
2. Learning new dishes with regional food resources.	Proposal and development of nutritional education programs based on viable practices that can be easily adapted. Generating a didactic program format for easy transmission.
3. Preference towards local product consumption.	Implement an action plan with a focus on the use of available resources through family gardens, the use of productive plots, and environmental education workshops, (this strategy is complemented by strategy number 7).
4. Publicizing the economic benefits on households.	Informative meetings with the neighborhood through based on member participation. This will create a bond between adults and the younger community based on the principles of continuing education and contribution to a link in relation to nature-economy.
5. Generating a market for regional products	The execution of this activity and its development is aimed at promoting local potentialities through a municipal agricultural social program that includes activities such as: the establishment of a space within the regional market, municipal agri-food fairs, green markets, creating communication network units for marketing among the entire population, strengthening production capacity and organizational structures.
6. Harvesting of fruits and wild products	The execution will be achieved through an action plan that includes collection techniques and give added value for these products. In addition, institute a reference of the times and spaces of collection by means of a calendar.
7. Home gardens	Characterization of an integration agriculture model through family gardens for the diversification of agricultural products in the region.
8. Use of god parenting relationships for the purchase of products	The execution guideline is based on diversified home gardens to obtain products for self-consumption and small-scale sale to neighbors and acquaintances, this strategy manages to combine with the previous ones for additional household income.
9. Accessibility and increase of local products	Formation of active committees with meeting spaces in the search for alternative network paths. It requires the formation organic agriculture knowledgeable members and technicians through the use and increase of natural resources.
10. Nutrition workshops	The specific population that is intended to reach is the student population and mothers. Through nutrition campaigns and the use of natural resources for quality food and adaptive models in their management.
11. Barter	Establish a "bartering network" and the realization of fairs where the exchange of agricultural products and other products in general such as handicrafts, books, clothing, etc. is sought.

the livelihoods have activities that allow people to guarantee the basic needs of life such as food and housing. These activities help to gain knowledge, abilities, social networks, raw materials and other resources to satisfy their (collective and individual) needs in a sustainable manner.

It was also pointed out that it is necessary to develop strategies that increase the economic income and food self-sufficiency with interventions in nutritional education that promote production and consumption of local foods, of good nutritional quality and accepted culturally (González and Barriga, 2019). In this sense, it was also indicated that family

orchards constitute a life strategy for peasant families (García *et al.,* 2016). Likewise, the weight of strategies based on self-supply was mentioned, as well as those of conservation and exploitation of natural resources based on local knowledge (Hernández and Martínez, 2016). In 2019, different studies determined the importance to guaranteeing family food self-sufficiency and to promote the consumption of varied diets based on the production of local foods (González *et al.,* 2019). These studies have a direct relationship with the strategies proposed in this study which determines their reliability in rural spaces.

The conglomerate analysis allowed identifying four groups (Figure 3). To be certain of the definition of groups, the results obtained in the cluster analysis were tested and validated through a Kruskal-Wallis analysis of variance by ranges ($p \leq 0.05$). The variables were: occupation, economic income and government support that fulfilled this condition (Table 4).

The groups were established in the following way: sector 1 and 3; 6 and 7; 4 and 5; 2 and 8. From this, the inhabitants of the place of study established into groups were analyzed through value trends of the strategies mentioned in Table 3: preferential consumption of local products (Group 1 and 3), learning new dishes with food resources from the place (Group 2), nutrition workshops (Group 4).

Group 1 was established by sector 1 and 3. The study determined that government support is limited and economically the family is conditioned by an income that is not higher than $2,000 per month.

The strategy for this group was number 3, which was called preferential consumption of local products. Its execution will be achieved through informative meetings, school

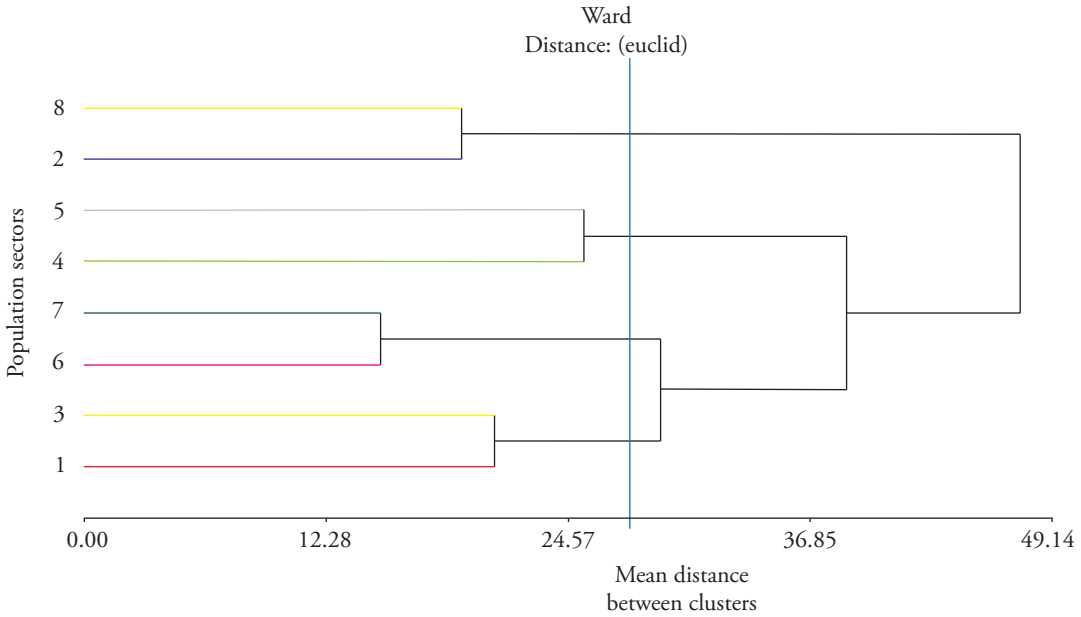

Figure 3. Dendrogram of characteristic groups based on socioeconomic variables.

Table 4. Kruskal-Wallis test statistics with the grouping variable "Population sectors".

	Occupation	Income	Government support
H	14.29	40.90	16.52
Gl	8	8	8
P	0.0297	<0.0001	0.0043

courses, and participative diagnosis workshops, where the primordial content is the transmission of the importance of local producers and the optimization of livelihoods through their use. The steps that should be taken are the following: diagnosis of the food situation, delimitation of an increase in production, and consumption of local foods, development plans that have as a guiding axis their use, and in addition, food workshops for preferential consumption.

In group 2 (sectors 6 and 7), the main economic activity was commerce (small businesses mainly for groceries), presenting a significant difference between all the groups formed, since it is the only one that has an occupation different from agriculture. It was considered that the location of the sectors within the municipality allows for them to develop into activities that refer to trade, since they are in the central part of the location. Despite the absence of government support, their economic income was slightly higher, between $2,000 and $3,000.

The strategy with possibilities of success was the one defined as learning new dishes with food resources from the locality (Strategy 2). This strategy is based on two primordial activities: the first being courses to learn dishes that fulfill the function of having nutritional properties and using food resources from the zone; at the same time, generating a didactic format of easy transmission to people (recipe books), recording all the dishes that they know about, in addition to some others that they could implement. The foundation is based on the improvement of issues of sovereignty and food security.

Regarding group 3 (sectors 4 and 5), it has government support, which derives into complementary income for the families. Without taking into account such support, their income ranges between $1,000 and $2,000. The main occupation of the family heads of households is agriculture. The problem of the domestic economy of the place gives rise to the generation of survival strategies and social reproduction, which is strategy 3; that is, the preferential consumption of local products was the one with highest score for the group analyzed. This strategy has already been described in the description of group 1.

In group 4 (sectors 2 and 8) it was determined that the strategy to be used ought to be based primarily in nutrition workshops (Strategy number 10), through nutrition campaigns and adaptive models in the management of natural resources. The suppliers of the household have a primary economic activity, mostly agriculture. In addition, they have cash transferences through government support. Still, the households report amounts lower than $1,000. The government programs that are in the zone have worked through participatory action techniques, which make the group proactive to develop this type of strategies. This strategy is based on the use of participatory action techniques that they

will execute through workshops at the sector level and in schools. The steps that should be followed are: food and nutritional training, exchange of experiences in better agricultural practices, strengthening of agrifood fairs, and family production of backyard orchards and livestock. This is taking into account the use of natural resources for a good diet and adaptive models in the management of natural resources.

In this context, the strategies are response to the need of satisfying the basic needs and the changing economic, political, social and cultural contexts that the community suffers directly and indirectly.

Although the reproduction strategies are based primarily on local knowledge and access to resources from the territory, they have the capacity to adapt to specific sociodemographic conditions of specific sectors (Hernández and Martínez, 2016). Therefore, the identification of groups through the specific characteristics of each and the need for differentiated strategies is of utmost importance. That is, for the strategies to be used to have greater potential for success they ought to be worked through the particular traits of each group and being different for each (Gómez and Alcázar, 2019). In terms of the conglomerate analysis, it has not been used in this type of work, although it is a useful tool to determine feasible strategies that may be applied in differentiated population strata.

Also, since there is low income it is fundamental to mention the role that subsidies, transferences and family composition have. Family structures are extended when there are also high indexes of migration. According to López *et al*. (2022), for the location it is necessary for there to be public policies where the agriculture and livestock sector is reactivated. In this context, it is necessary to incentivize the productive investment of international remittances, and in their case decrease the dependency of this source of income, which has been a palliative but has not entailed an improvement in the conditions of poverty of the place.

CONCLUSIONS

The study determined and formulated a series of strategies based on the natural resources available for the population. This contributes to the construction of a healthier, more affordable and culturally appropriate food system. To articulate the use of local foods as a fundamental reproduction strategy in the area, it is important to implement a strategic plan such as the one mentioned in this study. For its implementation, it is necessary to formulate broader strategies, since it is considered that this is an approach in broad terms. From the findings, it is pointed out that they can impact the improvement of family, individual and municipal life.

Primarily, these strategies take on relevance in the study zone, since they were formulated through ideas from the population. At the same time, the main axis that articulates them is the respect and use of local foods in the space studied. In addition to this, differentiated strategies were generated for each group formed, which also represents an advantage to consider.

In general terms, they are associated to dietary and cultural identity. Although this type of activities have been present from generation to generation, they have decreased in

relevance throughout the years, which is why they represent a friendly and integral use of resources from the zone, becoming a potential axis for their reproduction if they are used. The findings contribute to the growing literature about the value and the importance of native food systems to revitalize culture, improve the diet of inhabitants, and generate welfare for the study area. This is why this study represents a first approach to these themes for their later development in the region and functions as a reference in places with similar characteristics.

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