Ciência Rural, Santa Maria, v.53:8, e20220397, 2023
http://doi.org/10.1590/0103-8478cr20220397
ISSNe 1678-4596
RURAL SOCIOLOGY

Backyards: typology and contribution to food security in Mexico

Francisco Guevara-Hernández[1*] Manuel Alejandro La O-Arias[1] Emilio Herasto Aguilar-Vázquez[2] Esaú Ruiz-Sánchez[3] Franklin Martínez-Aguilar[1] Carlos Ernesto Aguilar-Jiménez[1]

[1]Facultad de Ciencias Agronómicas Campus V, Universidad Autónoma de Chiapas (UNACH), 29050, Villaflores, Chiapas, México, CP 30470. E-mail: francisco.guevara@unach.mx. *Corresponding author.
[2]Programa de Posgrado en Ciencias en Producción Agropecuaria Tropical, Universidad Autónoma de Chiapas.
[3]Tecnológico Nacional de México, Conkal, Yucatán.

ABSTRACT: Backyards are family settings adjacent to the house, characterized mainly by being small-scale and diversified productive spaces. The research typologically characterized the backyards and their contribution to family food security in La Concordia municipality, Chiapas, Mexico. The research was descriptive and mixed, quantitative, and qualitative, and semi-structured interviews were applied to 130 families. For the typification, 21 variables were used, and the statistical techniques of Factorial Analysis and Clusters were applied. The cases studied were classified, according to the relevance of their production and contribution to food security, into two general groups: a) a group of backyards that is more productive and contributes to food security, which in turn includes three subtypes of backyards that differ from each other by their profile towards vegetable or poultry production for subsistence, and/or pigs as a form of savings; b) a group of less productive backyards in which other management strategies for food security are assumed and differ from each other by the level of expulsion of labor force and types of families, nuclear or extended. Poultry and plant species for multiple uses was the most frequently characteristic, regardless of the type of backyard.
Key words: typology, diversity, families, food production.

Quintais: tipologia e contribuição para a segurança alimentar no México

RESUMO: Os quintais são ambientes familiares adjacentes à casa, caracterizados principalmente por serem espaços produtivos de pequena escala e diversificados. A pesquisa teve como objetivo caracterizar tipologicamente os quintais e sua contribuição para a segurança alimentar familiar no município de La Concordia, Chiapas, México. A pesquisa foi descritiva e mista, quantitativa e qualitativa, na qual foram aplicadas entrevistas semiestruturadas a 130 famílias. Para a tipificação foram utilizadas 21 variáveis e aplicadas as técnicas estatísticas de Análise Fatorial e Clusters. Os casos estudados foram classificados, de acordo com a relevância de sua produção e contribuição para a segurança alimentar, em dois grupos gerais: a) um grupo de quintais mais produtivos e que contribuem para a segurança alimentar, que por sua vez inclui três subtipos de quintais que diferem entre si pelo seu perfil para a produção de hortaliças ou aves para subsistência, e/ou suínos como forma de poupança; b) conjunto de quintais menos produtivos em que se assumem outras estratégias de gestão da segurança alimentar e diferem entre si pelo nível de expulsão de mão de obra e tipos de famílias, nucleares ou extensas. Aves e espécies vegetais de uso múltiplo foi a característica mais encontrada, independente do tipo de quintal.
Palavras-chave: tipologias, diversidade, famílias, produção alimentar.

INTRODUCTION

Backyards are family settings, adjacent to home that are highly relevant in rural and suburban areas as socio-productive spaces (SÁNCHEZ & TORRES, 2014). Women have an outstanding role in its administration and management, based on family labor and practical value associated with local culture and knowledge (MARIACA & GONZÁLEZ, 2007).

As productive spaces, historically they have been linked to feeding low-income families. However, there is a great diversity in its composition and operation, because of environmental, cultural, and socioeconomic factors (LÓPEZ et al., 2013; VIEYRA et al., 2004). Backyards can integrate a high diversity of animal and plant species that complement each other for better use of both, space and available resources and nutrient flows. For food production, the raising of minor species such as birds, rabbits, pigs, and small ruminants predominates, but species of other functional values such as pest controllers, guardians, affective animals, and aesthetic value are also integrated (COBO & PAZ, 2017). In terms of plant species, analogous objectives can be identified with a great diversity that is classified in terms of importance and uses. Some species are ornamental and contribute to the emotional, psychological, spiritual, and physical well-being of people (GONZÁLEZ et al., 2014).

Received 07.13.22 Approved 09.26.22 Returned by the author 11.10.22
CR-2022-0397.R1
Editors: Rudi Weiblen Janaína Brandão

In this spectrum of uses and values, where tangible and intangible objectives are externalized in interaction with external factors and survival strategies, it is a challenge to specify the real contribution of these productive spaces to food security. Any evaluation of this contribution must have a systemic approach that avoids the disarticulation of the components, processes, and strategies. Such evaluation must consider the qualitative and subjective aspects due to its guiding function within this system; and, lastly, it must include the quantitative aspects due to the feasibility that it offers in the measurement of the concrete contributions (MÉNDEZ et al., 2019; GUARNEROS et al., 2014).

In the state of Chiapas, 75.50% of the population is classified in a state of poverty, according to their income below the cost of the basic basket, for which they present a high social lag (CONEVAL, 2020). Likewise, 40.4% of the state population is in a situation of mild, moderate, and severe food insecurity (MARTÍNEZ et al., 2015). In this sense, CONAPO (2010) for several years, has stratified the municipality of La Concordia in high and very high degree of marginalization, since in the municipality 36.4% of population have mild, moderate, and severe food insecurity. This situation caused it to be declared a rural municipality of priority attention (DOF, 2018).

Therefore, the implementation of programs for food security in La Concordia municipality requires a comprehensive and precise understanding of the diversity of the context and the implementation of strategies that consider backyards as part of public policies that promote local development. The present research identified and characterized types of backyards in relation to variables of interest for food security in La Concordia municipality, Chiapas, Mexico.

MATERIALS AND METHODS

Study area

The study was developed in La Concordia municipality, state of Chiapas, Mexico. The municipality has 49,920 inhabitants and has a warm sub-humid climate, with summer rains, and semi-warm humid, with rainfall of 1,450 millimeters per year. It is in the Frailesca Region, Central Depression (Figure 1). Its territory is mountainous and semi-plain at 550 masl with the following coordinates: 16°07’00″N 92°41’00″W (INAFED, 2021).

Population and sample

The population studied is the universe of families in La Concordia municipality. The sample size was 130 families and was estimated using the formula suggested by GALLEGO (2004) for populations of unknown size, while the sampling was carried out in a stratified random manner.

Study method

A descriptive and exploratory study was carried out from a mixed approach (qualitative and quantitative). The types of backyards were identified from their systemic representation using the method proposed by ESCOBAR & BERDEGUÉ (1990). In this case, a general systemic approach of these was carried out, followed by the process of selecting variables, reducing the dimensionality of the information, and finally the formation and validation of groups. The primary information was obtained from interviews with producers and review of their production records. The variables studied were the following:

Animal production (kg)
Animal protein produced (kg)
Animal energy (MJ)
Animal production value ($)
Production cost per month ($)
Animal production utility ($)
Crop production (kg)
Crop production value ($)
Production costs per month ($)
Animal production utility ($)
Crop protein produced (kg)Crop energy (MJ)

Persons (%)
Student (%)
Works at home (%)
Total area (m²)
Backyard area (m²)
Salaried (%)
Time at backyard (%)
Frequency of consumption of animal production (%)
Number of animal species

The economic variables are represented in Mexican pesos, which at the time of the investigation had an equivalence of 0.0491 with respect to US dollar.

Statistical analysis

For the reduction of variables, the multivariate statistical technique of Factor Analysis was used. Variables with coefficient of variation greater than 25% were included in the analysis and components with eigenvalues greater than one were extracted. Formation of groups was carried out using the factorial scores of these components through

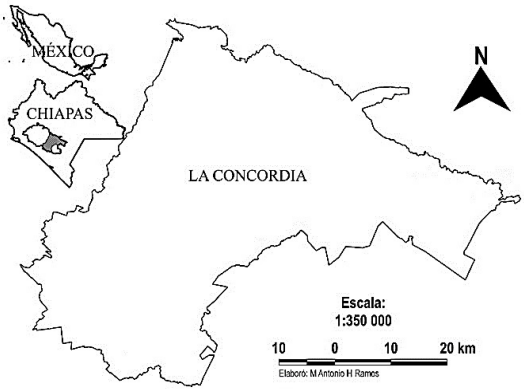

Figure 1 - Location of La Concordia municipality in Chiapas, Mexico.

cluster analysis. Then, the groups were characterized using descriptive statistics of the original variables and factorial scores. Finally, Regarding the analysis on gender orientation among backyard types, three categories were established according to gender relations for production (backyards managed by men, managed by women, and shared management). Statistical association was performed by using Factor Analysis for Simple Correspondences.

RESULTS AND DISCUSSION

Through factor analysis, six components were extracted, which explained 83% of the total variance contained in the original matrix of 21 variables and 130 cases (Table 1). The analysis of these components from the labels assigned according to the variables associated with them allowed us to define three important dimensions to establish backyard typologies:

a) Productivity. It includes Components I and II, animal and plant production, respectively, and they explain more than 50% of the total variability.

b) Holding. It includes Components III and IV, family size and available area, respectively.

c) Strategies. Components V and VI, which refer to the export of labor force and diversification, respectively.

It is important to consider the criterion of non-correlation of the components. This indicates that a backyard can be very productive in its entirety or with a tendency to specialize in one of its components, animal, or vegetable. With this same criterion, the size of the families is not related to the available backyard area.

The tenure and productivity components are frequent in the typologies of agricultural systems. In the context of Mexico, Latin America and the Caribbean, various investigations focused on production systems used indicators of farm size, number of animals and technological approaches as the most relevant for the differentiation of the samples they studied (MÉNDEZ et al., 2019; ROCHA et al., 2016) because they include the most relevant aspects of production.

From the factorial scores calculated by components for each case studied and through cluster analysis, six groups or types of backyards were defined (Figure 2 A and B). Groups G1 and G5 stand out as the most representative of the sample, while groups G2 and G6 are in the minority.

The analysis of the factorial scores by components made it possible to distinguish the characteristics of each group and establish a classification organization chart (Figure 3 and figure 4). The most important classification criterion is the productivity of the backyards. In this case, three of the identified groups are considered productive backyards that contribute to the food security of the families that constitute them, while three other groups are less productive backyards, with less relevant contributions.

Productive backyards represent 46% of the sample studied and differ from each other by their product profile. The G5 group is the most represented among the farms that contribute to food security and is characterized by having greater diversity and contributing to the family's self-sufficiency of animal protein through the production of eggs and poultry

Table 1 - Main components extracted for the classification of backyards in the municipality of La Concordia, Chiapas.

Component (Assigned label)	Original variable	Component Correlation	Variance explained	% total variance
Animal production	Animal production (kg)	0.983	29.57	29.57
	Produced animal protein (kg)	0.986		
	Animal energy (MJ)	0.974		
	Animal production value ($)	0.966		
	Monthly production cost ($)	0.943		
	Animal production utility ($)	0.909		
Crop production	Crop production (kg)	0.927	23.01	52.57
	Crop production value ($)	0.927		
	Monthly production cost ($)	0.902		
	Crop production utility ($)	0.904		
	Produced crop protein (kg)	0.918		
	Crop energy (MJ)	0.912		
Family size	People (%)	0.804	11.20	63.77
	Students (%)	0.874		
	Work at home (%)	-0.752		
Available area	Total area (m²)	0.878	7.17	70.94
	Backyard area (m²)	0.918		
Labor force export	Salaried (%)	0.802	6.29	77.23
	Time at backyard (%)	-0.703		
Diversity and animal consumption	Frequency of animal production consumption (%)	0.906	5.90	83.13
	Number of animal species	0.703		

Source: self-elabotarion (2021).

meat. Group G6 is the least representative of the sample in general, with only four cases, they are backyards that are distinguished by their larger area and animal production for sale, which is fundamentally based on pig farming. Group G4 corresponds to backyards that contribute to food security with their crop production.

Backyards with little contribution to food security represent 54% of the total sample and differ from each other by family composition and subsistence strategies. The most representative are the group G1 whose families decide to export their labor force, a third of the total cases of the sample have this characteristic. The remaining groups are distinguished by the types of families associated with them: the G2 group with nuclear families and the G3 group with extended families.

This classification, based on factorial scores by components for each group, was validated by analysis of variance with the original variables most correlated with their respective components. The preponderance of productive and tenure variables as classification criteria coincides with many processes of characterization and typification of agricultural systems in Mexico and Latin America MÉNDEZ et al. (2019) and ROCHA et al. (2016). Under any logic that guides the design of an agricultural system, tenure will impose limits and the arrangement and design of its components will be summarized in its productivity.

The G4 group, oriented to agricultural production, showed a significantly higher behavior ($P < 0.05$) in the original variables related to products of crop origin in the backyard.

The most relevant were crop production, value of crop production, usefulness of crop production and Frequency of Consumption. In this aspect, it is highlighted that the use of backyard crop resources transcends food and is projected on a broader cultural spectrum, whose use value includes religiosity, traditional medicine, and other utilitarian uses in

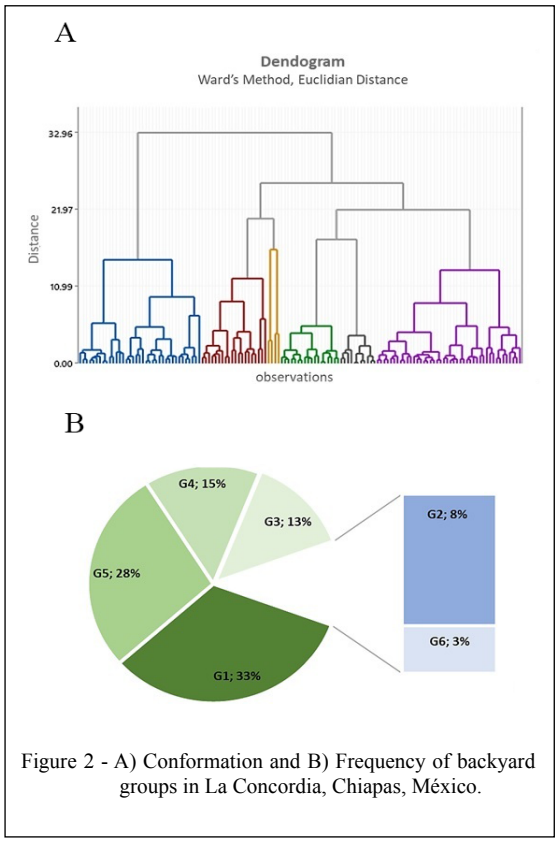

Figure 2 - A) Conformation and B) Frequency of backyard groups in La Concordia, Chiapas, México.

the home. This coincides with what was reported by OLVERA et al. (2017 a and b) who reported ten ways of using backyard crop resources in the state of Puebla (Mexico), highlighting self-consumption, food value, economic value, ornamental, and medicinal value. In general, households are identified as having an average of 4.60 members. These are nuclear and extensive families like those found by MUÑOZ et al. (2017). They have an area of 415.75 m^2 on average for crop production and animal production, of which they obtain for family consumption and sale of surpluses, with monthly income of $1,364.35 Mexican pesos (USD $69.25), mainly from the sale of crop species (fruits).

Group 5 is characterized by being oriented to the production of the poultry species. This is the second group with the largest area available for the backyard (453.17 m^2) and in number of animal species, mainly birds such as chickens, turkeys, and ducks. Part of their production is for family consumption; however, they sell live birds or the by-product (egg) from which they obtain monthly income (Mexican pesos) of $1,403.74 (USD $ 71.25) and $158.84 (USD $8.06) from vegetable production. Therefore, animal production in this backyard group constitutes an important source of food for families, in addition to contributing to the family economy. The poultry component in the backyard is projected in many investigations as the most promising in terms of nutritional contributions, subsistence, and family economy (PORTILLO, 2019). From the systemic point of view, birds are a component of small size, little demanding in terms of time and external resources, as well as very prone to the use of residual resources from the home and plant resources from the backyard. Within the animal species, birds have the shortest production cycles and conversion capacity (MORALES et al., 2018). For this reason, this type of family yard showed a significant frequency of consumption of backyard products for more than 28 days each month.

Group G6, the smallest in the sample, is characterized by being oriented towards animal production with an emphasis on swine species. It showed significant superiority ($P < 0.05$) in the variables associated with income from animal production and ownership, income of $6,114.34 pesos (USD $ 311.89) and 3,175 m^2 of area. In this case, the

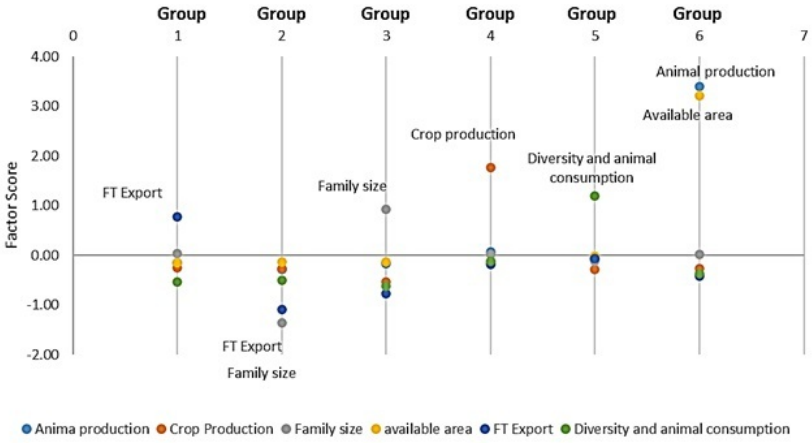

Figure 3 - Characterization of groups based on the average factorial scores for each component.

backyard contribution responds to a cumulative logic or form of family savings that in many contexts of low-income families is associated with small-scale pig farming (MIRANDA et al., 2020). From a systemic point of view, this species also has the capacity to take advantage of household waste, but with a longer and more cumulative breeding cycle that favors its strategic use (MANZANERO & VILLEGAS, 2017).

The G1 group, with a low productive profile, is characterized by its strategy aimed at exporting the labor force outside the family unit. In this backyard group, 24.23% of the members of the families seek economic income with the income from labor. With this, they obtain access to food economically. These results agree with SALAZAR & MAGAÑA (2016); VIEIRA et al. (2004); TRIGUEROS (1994), who point out that in families there is cooperation and contribution of labor among the members, since economic, social and gender role activities are determining factors in the family structure.

Likewise, 57.55% of the members of the family dedicate some time to the activity of the

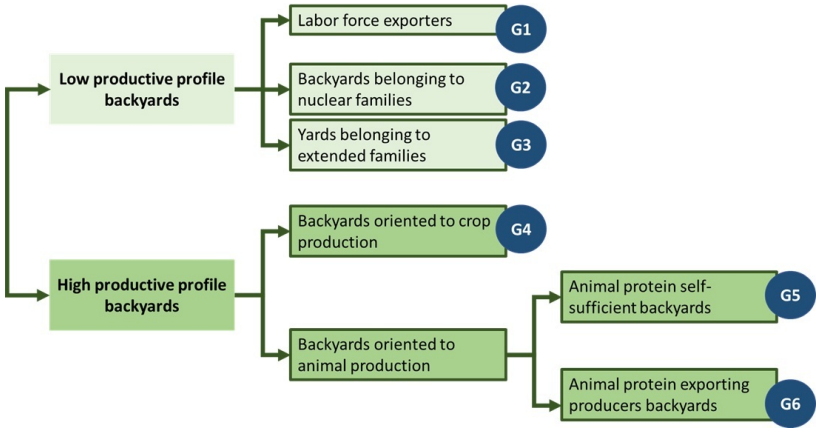

Figure 4 - Backyard classification organization chart in La Concordia based on variables associated with their contribution to food security.

backyard. The main destination of the production is for family consumption, but they make sales that can reach $744.66 pesos (USD $ 37.8) per month from a production of 14.59 kg of meat and $168.07 pesos (USD $ 8.53) from 21.68 kg of fruit. The average productive area is 330.64 m^2.

The G2 group is characterized by nuclear families. These are scenarios where households are identified as having an average of 1.64 members, mainly older adults, and are single-generation families. With an area similar to the GI group of 321.27 m^2, the productive level is much lower. Monthly crop production reaches 25 kg, while animal production only reaches 7 kg. From the commercialized fraction of these productions, they reach a total monthly income of $480.00 pesos (USD $ 24.36)

The G3 group is characterized by extended families, and has an average of 5.22 members, statistically higher than the rest ($P < 0.05$). This agreed with the data reported by MUÑOZ et al. (2017); SALAZAR & MAGAÑA (2016) who indicated that Mexican and Chiapas households, present a family structure made up of parents, children, and relatives such as grandparents, uncles, cousins, among others, classified in extended families. The members of these families (97.04% of the members) contribute to the use of the backyard. Despite this, production is limited, compared to the types described above, 11.00 and 8.59 kg/month for crop and animal production, respectively. The income generated reaches about $800.00 pesos per month (USD $ 40.60), in an average area of 314.17 m^2.

Regarding family size, the contribution of the backyard to meet food and basic needs in general is insufficient. These are families of high socioeconomic vulnerability because only 5.93% of their members have external income and 47.59% are students.

Groups G1, G2 and G3, all of them with a low productive profile, represent a management trend dependent on resources outside the family unit. This fact is based on the logic of the concept of opportunity cost in which conventional food products, produced intensively, can impose low prices that do not reflect the environmental and social impacts related to a production approach that does not consider food safety as a core element. The abandonment of the backyard as a productive and utilitarian space is also linked to welfare development policies that distort the principles of sustained access to food enacted among the principles of food security (GUZMÁN et al., 2019).

I)t is necessary to highlight that the presence of birds of different species (chickens, turkeys and ducks) as well as pigs to a lesser extent, respond to a generalized pattern in backyard production according to FAO reports (2018); VARGAS et al. (2017); COBO & PAZ (2017); GONZALEZ et al. (2014); RODRÍGUEZ et al. (2012). Similarly, multipurpose in crop species is a common element in the generality of these family systems (CHABLÉ et al., 2015; GONZÁLEZ et al., 2014; MARIACA & GONZÁLEZ, 2007). The variants and typologies reported in this research are based on diverse combinations of economic-productive and sociocultural variables that provide diverse responses to the complexity of the challenge of subsistence and food security.

In relation to gender aspects, there was a significant statistical association ($P = 0.0009$) between the backyard type and the gender of those responsible for their management (Figure 5). Dimension 1 expressed 92.9% of these relationships; it means that backyard types with values close to 1 are associated with a men-management relation. Those backyards close to -1 are backyards associated to a more women-management relation; and those close to 0 are associated with a shared management.

According to this association differentiated by gender, the backyards management could be based on the financial resource availability and the decisions made within the family regarding it. In this sense, the G6 backyard group is oriented to the strategic pork production and commercialization, where income is the main objective. However, the G5 is a poultry production-oriented group to with a shared objective between family consumption and the sale of surpluses through the local market. This result confirmed a recurring idea in various gender studies in which women were linked and more focused on reproductive roles and men on income management (DÍAZ & SILVA, 2019; SALDAÑA, 2018).

CONCLUSION

The backyards in La Concordia municipality, Chiapas, can be classified, according to the relevance of their productions and contribution to food security, into two general groups according to their productive contribution. The most productive group and contributor to food security includes three types with different profiles: 1) crop production, 2) poultry for their own subsistence, and 3) pigs as a savings option. The less productive backyard group assumes other strategies for managing their food security through the management of external resources. They differ from each other by the level of export of labor force and types of families, nuclear or extended.

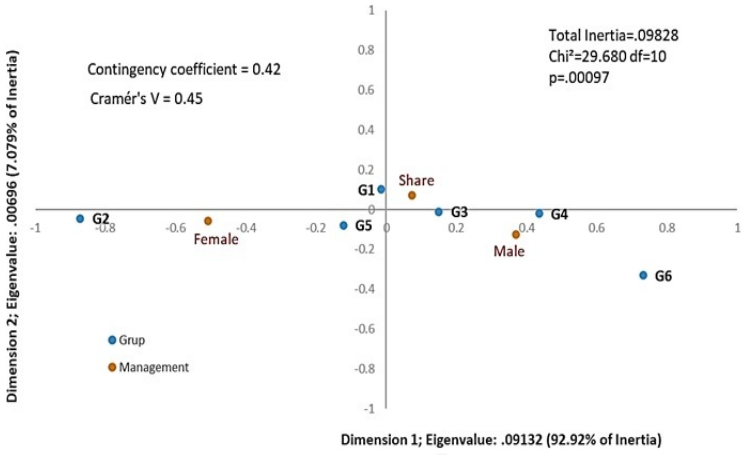

Figure 5 - Association between type of backyard and gender of person responsible for the production.

The production of fowl of various species and multipurpose crops was the most common characteristic found, regardless of the type of backyard. However, those oriented to pig production are not very representative, even though they generate higher economic income.

ACKNOWLEDGEMENTS

The authors thanks to the Instituto de Ciencia, Tecnología e Innovación del estado de Chiapas (ICTI) for the support given to the first author for a short academic stay at the Colegio de Posgraduados, which gave rise to this article.

DECLARATION OF CONFLICT OF INTEREST

The authors declare no conflict of interest. The founding sponsors had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, and in the decision to publish the results.

AUTHORS' CONTRIBUTIONS

All authors contributed equally for the conception and writing of the manuscript. All authors critically revised the manuscript and approved of the final version.

REFERENCES

COBO, R; PAZ, P. Traspatios campesinos de Morelos. Textual: análisis del medio rural latinoamericano. **Economía y Políticas Públicas**, n.70, p.51-68. 2017. Available from: <https://www.scielo.org.mx/scielo.php?pid=S2395-91772017000200051&script=sci_abstract>. Accessed: Mar. 18, 2021. doi: 10.5154/r.textual.2017.70.004.

CONSEJO NACIONAL DE POBLACIÓN. **Índice de marginación por entidad federativa y municipio-CONAPO 2010**. Available from: <http://www.conapo.gob.mx/es/CONAPO/indice_de_marginacion_por_localidad_2010>. Accessed: Jun. 19, 2022.

CONSEJO NACIONAL DE EVALUACIÓN DE LA POLÍTICA DE DESARROLLO SOCIAL-CONEVAL. **Medición de la pobreza**. Estadísticas de pobreza en Chiapas. 2020. Available from: <https://www.coneval.org.mx/coordinacion/entidades/Chiapas/Paginas/principal.aspx>. Accessed: Dec. 26, 2021.

CHABLÉ, P., et al. Estructura, diversidad y uso de las especies en huertos familiares de la Chontalpa, Tabasco, México. **Ecosistemas y recursos agropecuarios**, Villahermosa, v.2 n.4, p.23-39, 2015. Available from: <https://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S2007-90282015000100003>. Accessed: May. 29, 2022.

DÍAZ, A. M.; SILVA, A. C. Modelo de empoderamiento socioeconómico con enfoque de género: la experiencia de Corambiente con mujeres rurales en Santander. **Reflexión Política**. v.21, n.42, p.163-175. Available from: <http://hdl.handle.net/20.500.12749/10727>. Accessed: Apr. 15, 2022. doi: 10.29375/01240781.3567.

DIARIO OFICIAL DE LA FEDERACIÓN-DOF. **Decreto por el que se formula la declaratoria de las Zonas de Atención Prioritaria para el año 2018**. Available from: <http://www.dof.gob.mx//avisos/2604/SEDESOL_291117_02/SEDESOL_291117_02.htm>. Accessed: May. 29, 2022.

ESCOBAR, G; BERDEGUÉ, J. **Conceptos y metodología para la tipificación de sistemas de finca**: la experiencia de RIMISP. En:

Escobar Germán y Berdegué Julio (Eds). Tipificación de sistemas de producción agrícola. RIMISP/ GIA, Santiago de Chile. 284 p. 1990.

FAO. Organización de Naciones Unidas para la Alimentación y la Agricultura. **Producción y productos avícolas**. 2018. Available from: <http://www.fao.org/poultry-production-products/products-processing/es>. Accessed: May. 29, 2021.

INAFED, Instituto Nacional para el Federalismo y el Desarrollo Municipal, Enciclopedia de Los Municipios y Delegaciones de México. **Sistema Nacional de Información Municipal**. México. 2021. Available from: <http://www.inafed.gob.mx/work/enciclopedia/EMM07chiapas/municipios/07020a.html>. Accessed: Nov. 27, 2021.

GALLEGO, C. F. **Cálculo del tamaño de la muestra**. Matronas profesión. v.5, n.18, p.5-13. 2004. Available from: <https://www.federacion-matronas.org/wp-content/uploads/2018/01/vol5n18pag5-13.pdf>. Accessed: Feb. 26, 2022.

GONZÁLEZ, O, et al. Contributions of backyard production to home peasant groups. **Estudios sociales**, v.22, n.44, p.146-170, 2014. Available from: <https://www.redalyc.org/articulo.oa?id=41731685006>. Accessed: Nov. 29, 2021.

GUARNEROS, Z. et al. Economía familiar e índice de biodiversidad de especies en los traspatios comunitario de Santa María Nepopualco, Puebla. **Revista mexicana de ciencias agrícolas,** v.5, n.spe9, p.1701-1712. 2014. Available from: <http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S2007-09342014001301701&lng=es&nrm=iso>. Accessed: Feb. 15, 2022. doi: 10.29312/remexca.v0i9.1058.

GUZMÁN, C. et al. Ruta alimentaria en circuitos y producción de traspatio en Donato Guerra, México. Estudios sociales. **Revista de alimentación contemporánea y desarrollo regional**, Hermosillo, v.29, n.53, e19696. Jun. 2019. Available from: <http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S2395-91692019000100101&lng=es&nrm=iso>. Accessed: Feb. 24, 2022. doi: 10.24836/es.v29i53.696.

LÓPEZ, J. et al. El traspatio de los productores de maíz: en san Nicolás de los ranchos, Puebla-México. **Ra Ximhai**, v.9, n. 2, p.181-198. 2013. Available from: <https://www.redalyc.org/articulo.oa?id=46128964013>. Accessed: Mar. 10, 2022.

MARIACA, M; GONZÁLEZ, L. **El huerto familiar en México**: Avances y propuestas. En: López Olguín JF, Aragón GA, Tapia RAM (Eds.) Avances en agroecología y ambiente Publicación especial de la Benemérita Universidad Autónoma de Puebla, v.l, p.119-138. 2007.

MARTÍNEZ, R. et al. Inseguridad alimentaria y vulnerabilidad social en Chiapas: el rostro de la pobreza. **Nutrición Hospitalaria**, Madrid, v.31, n.1, p.475-481, Jan. 2015. Available from: <http://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S0212-16112015000100054&lng=es&nrm=iso>. Accessed: Sept. 16, 2021. doi: https://dx.doi.org/10.3305/nh.2015.31.1.7944.

MANZANERO, G; VILLEGAS, Y. Producción femenina de cerdos criollos en dos localidades indígenas del Noroeste de Oaxaca, México. **Actas Iberoamericanas en Conservación Animal -AICA**, v.10, n.11, p.282-286, 2017. Available from: <https://aicarevista.jimdo.com/n%C3%BAmeros/vol%C3%BAmen-10-2017>. Accessed: Aug. 13, 2021.

MÉNDEZ, C. et al. Tipología de productores de ganado bovino en la zona norte de Veracruz. **Tropical and Subtropical Agroecosystems**, n.22, p.305-314. 2019. Available from: <https://www.revista.ccba.uady.mx/ojs/index.php/TSA/article/view/2723/1253>. Accessed: Jun. 22, 2021.

MIRANDA, R. et al. La producción porcina familiar: experiencias en la capacitación desde el Centro Universitario Municipal. **Coodes**, Pinar del Río, v.8, n.2, p.329-348, Aug. 2020. Available from: <http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S2310-340X2020000200329&lng=es&nrm=iso>. Accessed: Sept. 17, 2021. Epub 20-Ago-2020.

MORALES, W. et al. Parámetros productivos y económicos de gallinas ponedoras ISA Brown en segundo ciclo de producción suplementadas con aminoácidos no esenciales. **Revista Investigaciones Veterinarias**. Perú, Lima, v.29, n.2, p.533-543. Apr. 2018. Available from: <http://www.scielo.org.pe/scielo.php?script=sci_arttext&pid=S1609-91172018000200016&lng=es&nrm=iso>. Accessed: Sept. 17, 2021. doi: 10.15381/rivep.v29i2.14481.

MUÑOZ, T. et al. Proceso de producción y mecanismos de comercialización de chía (Salvia hispánica L.) por familias campesinas de los municipios de Atzitzihuacán y Tochimilco, Puebla, México. **Nova Scientia**, León, v.9, n.19, p.788-818, 2017. Available from: <http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S2007-07052017000200788&lng=es&nrm=iso>. Accessed: Sept. 18, 2022. doi: 10.21640/ns.v9i19.1104.

OLVERA, J. I. et al. Perspectivas del traspatio y su importancia en la seguridad alimentaria. **Agro Productividad**, v.10, n.7, p.1-15. 2017a. Available from: <https://revista-agroproductividad.org/index.php/agroproductividad/article/view/1055/902>. Accessed: Dec. 19, 2021.

OLVERA, J. I. et al. Importancia de especies vegetales en el traspatio de familias campesinas del noreste de Puebla, México. **Agroproductividad**, v.10, n.7, p.21-26. 2017b. Available from: <https://revista-agroproductividad.org/index.php/agroproductividad/article/view/1051>. Accessed: Dec. 19, 2021.

PORTILLO, R. Género y seguridad alimentaria: Rol e importancia de la mujer en la avicultura de traspatio en Tetela de Ocampo, Puebla, México. **REPOSITORIO NACIONAL CONACYT**, v.23, n.68, p.33–40. 2019. Available from: <http://repositorio.utm.mx:8080/jspui/handle/123456789/273>. Accessed: Feb. 18, 2022.

RODRÍGUEZ, G. et al. La Gallina De Rancho Y El Caldo De Gallina Como Elementos De Identidad Campesina Frailescana. **Actas Iberoamericanas de Conservación Animal–AICA** n.2, p.25-34. 2012. Available from: <http://www.uco.es/conbiand/aica/templatemo_110_lin_photo/articulos/2012/Trabajo011_AICA2012.pdf>. Accessed: Mar. 29, 2022.

ROCHA, R. et al. Tipología de sistemas de producción en la zona rural del municipio de Ibagué, Colombia. **Agronomía Mesoamericana**, v.27, n.2, p.253-264. 2016. Available from: <https://www.redalyc.org/articulo.oa?id=43745945004>. Accessed: Mar. 30, 2022.

SALAZAR, B. L.; MAGAÑA, M. M. A. Aportación de la milpa y traspatio a la autosuficiencia alimentaria en comunidades mayas de Yucatán. **Estudios Sociales,** Hermosillo, v.24-25, n.47, p.182-203, Jun. 2016. Available from: <http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0188-45572016000100182&lng=es&nrm=iso>. Accessed: Sept. 18, 2021.

SALDAÑA, M. L. Relaciones de género y arreglos domésticos: Masculinidades cambiantes en Concepción, Chile, Polis. **Revista Latinoamericana**. v.50, 2018. Available from: <http://journals.openedition.org/polis/15742>. Accessed: Sept. 06, 2022.

SÁNCHEZ, S. M.; TORRES, R. J. Diagnóstico y tipificación de unidades familiares con y sin gallinas de traspatio en una comunidad de Huatusco, Veracruz (México). **Avances en Investigación Agropecuaria**, v.18, n.2, p.63-75. 2014. Available from: <https://www.redalyc.org/articulo.oa?id=83731110005>. Accessed: Jul. 06, 2021.

TRIGUEROS, P. **Unidades domésticas y función de la mujer en un poblado rural en el que se practica la emigración a estados unidos**. In Salles V. y Mc Phail E. pp.87-114. (Eds.), Nuevos textos y renovados pretextos, 1ra. edición. México, D.F.: El Colegio de México. 1994.

VARGAS, L. et al. Diversidad y prácticas de crianza de animales domésticos en traspatios de comunidades indígenas en Guerrero, México. **Agro Productividad**, v.10, n.7, p.1-15. 2018. Available from: <https://revista-agroproductividad.org/index.php/agroproductividad/article/view/1050>. Accessed: Jul. 11, 2021.

VIEYRA, J. et al. La participación de la mujer en la producción traspatio y sus beneficios tangibles. **Cuadernos de Desarrollo Rural**, n.53, p.9-23. 2004. Available from: <https://www.redalyc.org/articulo.oa?id=11705302>. Accessed: Mar. 23, 2021.