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Peri-urban home gardens in San Cristóbal de Las Casas, Mexico are fundamental spaces of resistance

Vázquez-García, Amparo[1]; **Elizondo, Cecilia**[1*]

[1] El Colegio de La Frontera Sur, Grupo Académico de Agroecología, San Cristóbal de Las Casas, San Cristóbal de Las Casas, Chiapas, México, C. P 29290.

* Correspondence: celizond@ecosur.mx

ABSTRACT

Objective: To determine the effects of neoliberal policies (including the Green Revolution), the urban sprawl (as a consequence of population growth), and the reduction of agricultural areas on peri-urban agriculture; however, the main focus is the forms of resistance against these pressures from the dominant system.

Design/Methodology/Approach: Through participant observation, surveys, collection, and botanization we identified plant species, their diversity, uses, and richness. Home gardens in San Felipe Ecatepec, Chiapas, Mexico are a system, which consists of subsystems, functions, composition, and management, as well as a high number of species, high to moderate richness, and a surface that oscillates between 600 m^2 and 2500 m^2. Growing products next to the house provides healthy and fresh food, creates a useful and productive space, and preserves agrobiodiversity. It is an agroecosystem where each family and sitio or home garden interact with other families and other home gardens, integrating local knowledge and offering a space for families to live together. They can be considered spaces of resistance based on traditional knowledge, which also help to control their resources and to bolster individual and collective food sovereignty.

Results: Home gardens in San Felipe Ecatepec, Chiapas, Mexico are a system, which consists of subsystems, functions, composition, and management, as well as a high number of species, high to moderate richness, and established on surfaces that oscillates between 600 m^2 and 2,500 m^2.

Study Limitations/Implications: The research was carried out during the two years of the COVID-19 pandemic, which posed an extra challenge to the field work.

Findings/Conclusions: Growing products next to the house provides healthy and fresh food, creates a useful and productive space, and preserves agrobiodiversity. It is an agroecosystem where each family and sitio or home garden interact with other families and other home gardens, integrating local knowledge and offering a space for families to live together. They can be considered spaces of resistance based on traditional knowledge, which also help families to control their resources and to bolster individual and collective food sovereignty.

Keywords: Urban agriculture, food sovereignty, agrobiodiversity, agroecology.

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INTRODUCTION

Current food systems (*i.e.*, the agro-industrial model) are not sustainable. The said model (also known as the Green Revolution) has prevailed in the Latin American region for decades, promoted and defended by neoliberal governments. The agri-food companies are the sole beneficiaries of the agro-industrial model and its crisis. The advance of this

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model has been supported by many local, regional, state, or international governments and administrations or public institutions, which prioritize the commodification of agriculture and food. Policies are market driven and profits are based on speculation and the maximization of business profits (Escobar Moreno, 2006; FAO, 2014; Gómez Martínez, 2015; Barzola, 2019; GANESAN, 2020; MSCPI, 2021).

This model is also responsible for around 1/3 of greenhouse gases and 80% of biodiversity and agrobiodiversity losses. According to the Food and Agriculture Organization of the United Nations (FAO), approximately 75% of plant varieties and animal breeds have been lost since 1900, narrowing the genetic diversity on which human diet is based (Goome, 2008). In addition to the use of toxic inputs in production, this model encouraged the loss of traditional knowledge and promoted the ultra-processing of food. These policies have sustained social inequality and the loss of cultural values (Ceccon, 2008; Gómez Martinez, 2015, Barquera *et al.* 2020; Benítez *et al.*, 2020).

Therefore, the right of peoples to define and have control of their food and food production systems must be restored and strengthened, in both the local and the national spheres (ALAI, 2016). Home gardens provide such an opportunity, as a starting point whose keepers continue to produce and maintain ancestral practices and folk wisdom. They are the reflection of this traditional agriculture model, which has resisted all the policies that have tried to end it, considering it obsolete. This model is based on family workforce and organization, as well as on the use of resources, traditional knowledge, and manual instruments, surviving the attack of the agro-industrial model. This type of agriculture has been marginalized, has received little support, and has been discredited. Nevertheless, it still sustains food worldwide (Suárez Carrera, 2016).

This agriculture is mainly supported by the population that owns less than 5 hectares and depends on agriculture, day labor, and other salaried work. Their land is mainly use for rainfed agriculture and its production is destined for self-sufficiency and the surpluses for the domestic or export market.

Traditional agriculture originally maintained food sovereignty; this phenomenon is still ongoing in some regions —for example, in the home gardens studied. This culture still resists in these spaces. Other interesting stories can be found in the research carried out by the Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO 2022) about how peasants in 7 different regions of Chiapas have preserved their milpas. They provide another example of how this ancestral production system provides a space of resistance that preserves lore and traditions and protects native seeds which future generations will be able to sow.

Food should be once more produced according to the specific socio-environmental conditions of each place, respecting the natural systems and the social, cultural, and technological activities that peasants have practiced throughout history (Nuñes, 2000).

The impact of the aforementioned models has not left the municipality of San Cristóbal de Las Casas, in Chiapas, Mexico, unscathed: the urban sprawl and real estate development have spread through the valley of the municipality —where the community of San Felipe Ecatepec is located. These phenomena have increased the demand for public services; likewise, they have led to great environmental and social challenges.

In many places, the home gardens, plots, or *sitios* (as they are called in San Felipe Ecatepec) remain the primary source of food supplies that satisfy family needs and favor food sovereignty, as the handiest resource to survive the environmental risk and the market contingencies or fluctuations (Mariaca, 2012). The home gardens of San Felipe Ecatepec are no exception: they still put in practice local knowledge and preserve agrobiodiversity through diversified production and self-production of food. These sitios resist public policies that have favored both the development of agriculture with highly toxic inputs and urban development policies, which ultimately allocate lands to housing development, to the detriment of their agricultural potential.

Therefore, research was carried out to identify peri-urban home gardens and to determine their characteristics and how they carry out their activities. The home garden was studied as a system with subsystems that have certain functions, composition, and management. Our objective was to determine the diversity and use of the species that they manage. The field work was likewise focused on the social function that the home garden has in the community and fresh food consumption (Barbosa y Fonseca, 2019).

From the social aspect, considering the vision of Craviotti and Pardías (2012), the growth of urban areas and the pressure they put on rural systems, as well as the capacity for action of the subjects, are generating collective forms of resistance, rooted in shared traditional lore and dense social networks. This phenomenon is particularly based on the communal nature of the land, which cannot be sold to people outside the community. This resistance can be seen in the ongoing tradition of growing crops next to the house. Peasants continue with this activity, despite the pressure of urban sprawl and population growth, which influences both agriculture and home gardens, as well as increasingly smaller food production areas. Consequently, agricultural products decrease. This has also forced families to join urban activities in order to meet their needs; however, the ancestral culture of maintaining the home garden still provides them with fresh and healthy food.

The results are a relevant contribution to the study of peri-urban home gardens, which may serve as a basis for further research on the subject. It can also serve as an instrument for decision-making at different government levels, such as the whole state of Chiapas or the Desarrollo Rural and Desarrollo Urbano offices of the municipality; it can also support the decision-making of the social sector, including peasants or organizations that are working with home gardens and urban street markets.

MATERIALS AND METHODS

The study area is in the physiographic region of Altos de Chiapas, in the Altos Tsotsil Tseltal fifth socioeconomic region. It is located about five kilometers to the west of San Cristóbal de las Casas, Chiapas, Mexico (Camacho *et al.*, 2007), at a latitude of 16° 43' 31.61" N, a longitude of 92° 40' 28.99" W, and an average elevation of 2,223 m.a.s.l. The relief ranges from 1,000 m to 2,800 m above sea level and consists of a high mountain chain with stretched slopes (76.77%), a stepped plateau with low hills (19.61%), an intermontane valley (3.62%). The climates that have been recorded in the municipality are: temperate subhumid with dry winter (82.05%), semi-warm subhumid with dry winter (12.47%),

temperate humid with no dry season (5.47%), (INEGI, 2020). The vegetation cover in the municipality consists of pine-oak forest and secondary vegetation. The types of soils recorded in the municipality are: Luvisol (67.42%), Alisol (17.23%), and Gleysol (2.05%).

The original name of San Felipe Ecatepec was "Muk Ti Nam", which means "on the shore of the large lagoon". When the Spanish conquistadors arrived in the 16th century, the place was inhabited by people from the Maya Tsotsil group.

The participant observation technique (Amezcua, 2016) was used for this research. In the first stage, the study area was the subject to a reconnaissance visit and we established contact with the community authorities. The objectives of the research were explained to an Assembly and authorization was requested from the community commissioner to carry out the field work. Subsequently, visits were made to determine the existence and location of home gardens, and to identify the families that were interested in collaborating in the study. As a result, 10 home gardens were chosen.

In the second stage, we worked with representative people; we listened to them and verified their input by asking another member of the family or community producer, in order to obtain and complement different visions. The reports obtained were compared with our observations, recording our observations, perceptions, and scenarios in the field notebook. Questionnaires with closed and open questions were applied to the owners of the home gardens.

To calculate the home gardens' species richness, the individuals were counted, using the Margalef index (MI) proposed by Funes (2009), which includes crop, tree, and domestic animal species. The common names and uses of all the species of plants present in the home gardens were recorded with the participation of the home gardens' owners. The uses heading included the following categories: edible, medicinal, fodder, construction, ceremonial, fuel, fence, ornamental, and other. Plants were photographed, collected, and botanized for future identification. The plants that could not be recognized in the field, were photographed, and specialized bibliographic material, information available on the Internet —such as the International Plant Names Index (IPNI, 2022), Tropicos (ORG 2021), and Enciclovida (CONABIO, 2016)— were used for comparative and identification purposes.

Finally, the information obtained was analyzed, the qualitative information was systematized, and the texts of the interviews were examined.

RESULTS AND DISCUSSION

The family subsystem in San Felipe Ecatepec is made up of the nuclear and single parent types. Nuclear families are the traditional type of family; they include two generations (parents plus children); they are extensive or complex (three or more generations: parents, children, grandparents, and great-grandparents). Meanwhile, single parent families are made up of a mother plus children (Roman *et al.*, 2009). Seven women and three men are in charge of coordinating activities in these spaces. Their ages range from 44 to 70 years. Most of them attended primary and secondary school and the children of some producers have already studied an undergraduate degree. They speak only Spanish, no one has migrated to another country, and they are Catholic.

The families own the homes in which they live. Their houses are built with concrete blocks, cement slab, and stone; two of them are built with mudbrick and reed. They are connected to the power grid. Nine have access to well water and one person buys water from a pipe. None of the ten home gardens receives drinking water supply from the municipal system (SAPAM). Eight households cook with different fuel sources (butane gas, electricity, firewood, coal) and two use butane gas and electricity. Eight houses have access to the sewerage system, one uses a septic tank, and only one family uses a latrine to deposit excrement.

The ten families separate the organic and inorganic waste. The organic waste is sent to the *sitio* or home gardens and the inorganic waste is picked by the collection truck that circulates through the main streets. Secondary streets are dirt roads, while the main streets are paved.

Only two people mentioned that they receive support from government programs. Seven obtain their economic income from salaried work and three from local commerce.

The heads of the family (both women and men) carry out the following activities: domestic worker, mechanic, employee in the hotel sector (as temporary employees in the laundry area), construction work, carpentry work, sale of prepared products, confectionery, dressmaking, and elaboration of decorated paraffin candles. These jobs are carried out either in the community or in the municipality.

The domestic units have different spaces, with different land-uses and production systems (*e.g.*, milpas, vegetable gardens, *acahuales*, or forests), most of which are located in the back of the house or, in some cases, around it.

All these elements make up the home garden, which families call sitio and describe it as the place where they have their fruit trees, animals, milpas, ornamental and medicinal plants, among others. The house is integrated and interacts with the home garden or sitio, as well as with other gardens, milpas, ecosystems (such as the temperate pine-oak forest), and institutions, such as the municipal agency, the office of the commissioner, and the market (Figure 1).

These agroecosystems includes short-cycle plants —corn (*Zea mays*), broad beans (*Vicia faba*), and beans (*Phaseolus vulgares*)—, evergreen and deciduous fruit trees —Mexican hawthorn root (*Crataegus mexicana*), common quince (*Cydonia oblonga*), black cherry (*Prunus serotina*), or avocado (*Persea* spp)—, multipurpose plants —Mexican elder (*Sambucus mexicana*), Mexican pepperleaf (*Piper auritum*), and spineless yucca (*Yucca elephantipes*)—, medicinal plants —citrus scented marigold (*Tagetes nelsonii*), sweet fennel (*Foeniculum vulgare*), and dandelion (*Taraxacum official*), and ornamental flowers —calla lily (*Zantedeschia aethiopica*), bigleaf hydrangea (*Hydrangea macrophylla*), and belladonna lilies (*Amaryllis* spp). Only a few of the species recorded in the home gardens are mentioned here.

The land is communal. People practice rainfed agriculture and cultivate using hand tools. The land destined for cultivation is flat and only two home gardens have a slight slope. The smallest property has an area of 600 m^2 and the largest measures 2,500 m^2. Regarding their richness, eight of the ten home gardens or sitios have a high biodiversity, while in the other two it is moderate (Figure 2).

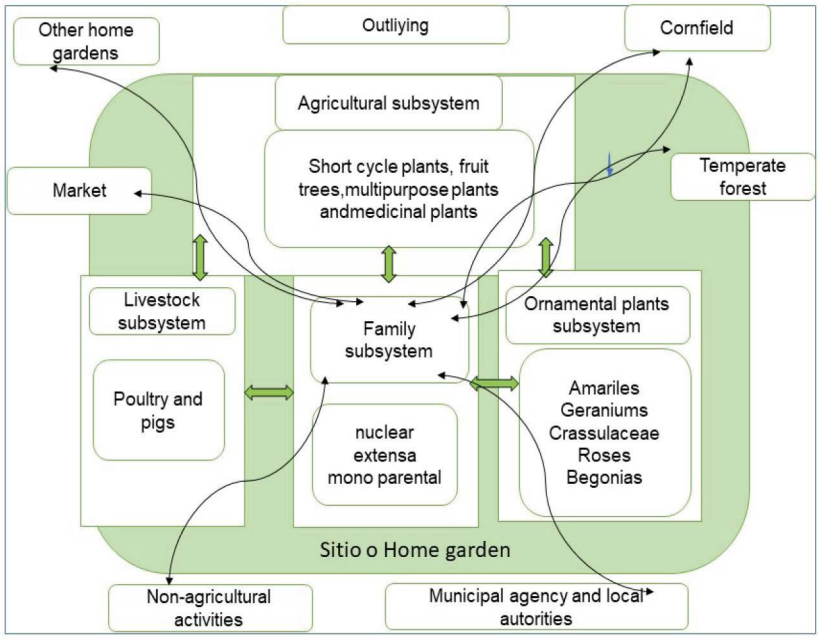

Figure 1. Home gardens, subsystems, and their relationships. Developed by the authors (2022).

Family garden	Species	Number of individuals
GF1	87	926
GF2	21	737
GF3	69	416
GF4	76	421
GF5	39	2295
GF6	65	1591
GF7	53	619
GF8	56	242
GF9	152	2149
GF10	64	250

Figure 2. Wealth of small backyard plants and animals from the ten home gardens or sites.

Plants provide food, medicine, fuel and oxygen; they regulate humidity and contribute to the stability of the climate. Figures 3 and 4 show the number of species and the uses in the ten home gardens.

A remarkable aspect of this research is that was carried out during the two years that the COVID-19 pandemic lasted. The interviewees identified several of the plants in the home garden as ingredients for home remedies that helped them cope with the effects of the disease. Additionally, the families and the research team maintained sanitary measures at all times to avoid contagion; likewise, the research team respected the times that they were asked not to visit their homes, because family members had been infected. It is worth emphasizing that nobody among the families that were part of the study died

Garden	1. Edible plants	2. Medicinal plants	3. Forage	4. Building	5. Ceremoniales	6. Firewood	7. Siege	8. Ornamental	9. Others
1	39	23	3	0	0	0	1	46	8
2	12	2	1	2	0	7	2	2	0
3	27	12	0	1	0	6	6	33	9
4	32	27	2	2	0	5	6	37	9
5	25	10	1	1	0	3	5	12	2
6	28	14	3	4	1	5	7	24	2
7	24	5	1	4	0	5	10	23	2
8	26	9	1	1	0	4	2	28	1
9	48	9	1	1	0	3	2	102	2
10	22	16	2	0	0	4	2	34	0
Totales	283	127	15	16	1	42	43	341	35

Figure 3. Knowledge and use of plants in ten Family Gardens.

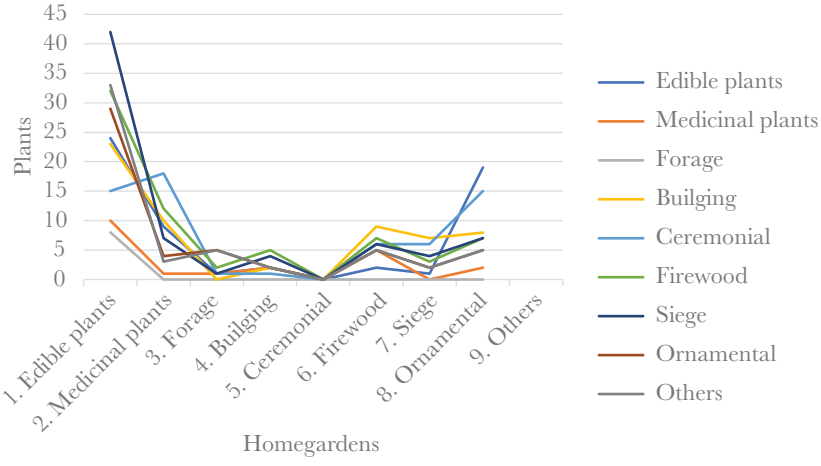

Figure 4. Graph of knowledge and uses about plants.

as a consequence of the disease. Although these families are linked with urban areas for several reasons (jobs, sale of products, among others), we could infer that their lifestyle and relationship with plants, as well as the possibility of being outdoors, lessened the impact of the pandemic with regard to urban areas.

Population growth and the expansion of the urban sprawl have an impact on agriculture and home gardens, as a result of the reduction of the areas destined for food production. Families are forced to participated in urban dynamics, in order to diversify their monetary income. Changes in land-use and housing land market have a major impact on agricultural land (Calderón-Cisneros and Soto-Pinto 2014).

The home gardens of San Felipe Ecatepec have an ongoing interaction with other agroecosystems. We infer that, to a certain point, the communal nature of the land influences their persistence.

The home garden (hf9) manages 152 species and has an area of 600 m^2, while the largest home garden measures 2,500 m^2 and has 39 species. In other words, the number of species does not depend on the land area. Eight sitios have a high biodiversity and two have a moderate diversity; this phenomenon is directly related to the jobs that the families do, the time they have available, and how they are organized.

The home gardens or sitios are considered as spaces of social resistance, because they hold back the growth of urban areas and the pressure they exercise on rural systems. The capacity for action of the subjects is generating collective resistance forms, rooted in a shared traditional lore and in dense social networks (Craviotti and Pardías, 2012). Meanwhile, Hernández and Sánchez (2010) also identified urban vegetable gardens in different parts of Spain as a collective process of resistance and articulation of alternative food proposals. Nevertheless, it refers to the resistance and recovery of the urban agriculture space (landscape, territory, mode of production, way of life, etc.). This phenomenon is linked to a counter-hegemonic neighborhood movement, based on questioning the control of the subsistence means by the globalized agri-food system and the recovery of the satisfiers, in order to satisfy human needs. Obtaining and producing food become an act of daily resistance. Therefore, as part of the elements of resistance aimed at sustainability, agroecology is the theoretical approach that sets down the guidelines for the ecological management of natural resources, the environmental issue, political ecology, and the technical, economic, social, and cultural aspects of social change towards a more sustainable society (Hernández and Sánchez, 2010; Sarandon and Flores 2014).

Likewise, although on a larger scale and in the context of the commodification of agriculture and the resistance against soybean agrarian extractivism, Barzola (2019) identifies how the resistance of the "Malvinas Lucha por la Vida" collective in Argentina confronted the multinational Monsanto and managed to expel it from its territory. This experience of struggle and resistance highlighted the crisis of the civilizing and productive model; consequently, the community did not only revalue their territory, but they also discussed the need for an alternative agricultural model that respects the food sovereignty of the peoples.

Consequently, on a small or medium scale, the resistance to the agro-industrial model or the neoliberal policies that have been implemented for more than half a century can lead to the maintenance or rescue of healthy food production systems that respect the cycles of nature and ecosystem relationships.

CONCLUSIONS

The home gardens of San Felipe Ecatepec are the primary source of healthy food. They are not isolated; on the contrary, they interact with other subsystems. These peri-urban agroecosystems are productive and highly diverse, they contribute to the conservation of agrobiodiversity, and they influence the food sovereignty of families living in peri-urban

areas. The land is communal, which in a certain way has favored the permanence of these production systems.

In this process of urban sprawl and its pressure on rural systems, the subjects' capacity for action is generating collective resistance, rooted in shared traditional kowledge and supported by dense social networks. This phenomenon is enhanced because the land is communal and cannot be sold to outsiders. This resistance can be perceived in the way that this tradition (cultivating next to the house) is maintained, as a mechanism that helps them confront the hegemonic development model.

They continue to do this despite the pressure of urban sprawl and population growth, which influences both agriculture and home gardens, as well as increasingly smaller food production areas, which causes a decrease in agricultural products. This has also led families to participate in urban activities to meet their needs. However, the ancestral culture of having a home garden that provides them with fresh and healthy food persists.

Several agroecological practices that are implemented to different crops contribute to the production and consumption of healthy food, likewise helping to reverse the causes of low yield and reducing high input costs.

This productive system can be considered as a space of resistance. It is supported by traditional culture or lore, allowing families to increase their control over their resources, both individual and collective. The home garden space also serves as a family meeting place, where they share hours of conversation, joint work, food consumption, and leisure. However, one traditional factor puts this agroecological system at risk: the distribution of land in inheritance. This threat has been reported since the beginning of the 20th century by the Food and Agriculture Organization of the United Nations (FAO) (2002). However, this should provide the basis for further studies that can follow-up these processes.

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