

Use and Exploitation of Backyard Fruits in Mochicahui, El Fuerte, Sinaloa, Mexico

Carlos Martínez Domínguez¹, Israel Osuna Flores², Loreto Coronado Moreno³,
Héctor Javier López López⁴, Aramis Olivos Ortiz⁵

¹Programa de Ingeniería Forestal, Unidad Mochicahui, Universidad Autónoma Intercultural de Sinaloa

²Empresa Acuícola Gilberto SC de RL de CV,

³Programa de Turismo empresarial. Unidad Mochicahui, Universidad Autónoma Intercultural de Sinaloa

⁴Programa de Ingeniería en Sistemas Computacionales, Unidad Mochicahui, Universidad Autónoma Intercultural de Sinaloa

⁵Centro Universitario de Investigaciones Ocenológicas. Universidad de Colima, Manzanillo, Colima, México

Abstract: *The present project was carried out in the Mochicahui Sindicatura, El Fuerte, Sinaloa, contemplating the main localities such as El Poblado, La Primavera and El Teroque and is considered as an alternative for the use and transformation of fruit products as added value in backyard and contribution to its value chain in rural communities (indigenous and peasant). Surveys were applied to adults 21 in the spring, 45 in El Poblado and 145 in the Teroque. Quantitative and qualitative methodological tools were applied, such as interviews, direct observation, participant observation, documentary review and simple random sampling. The most abundant species in the three communities is the mango (*Mangifera indica* L), followed by plum (*Spondias purpurea*) and avocado (*Persea americana*, the highest percentage being seasonal fruit.) Average production per tree is from 0 to 30 In most places, the highest percentage of people answered that they did not apply any type of agrochemical (91.11% in town, 68% in spring and 74.47% in El Teroque.) Regarding the transformation and use of backyard fruits, they consume natural fruit all week the highest percentage of people surveyed was 68.66%, in El Poblado 3 times a week 38.64% and in La Primavera the highest percentage are people who consume 5 times a week in a response of 25%. to the consumption of transformed fruit we have that while in La Primavera and El Poblado the highest percentage of people do not consume processed fruit except for the Teroque where people responded to consume three It is per week. The backyard fruits are cultivated preferably without the application of agrochemicals and although most people surveyed in the communities prefer to consume natural fruit, however there is the transformation of the fruit that is used in family consumption and a lower percentage is sold in presentations regional as ice cream and mangonadas (sweet mango with spicy).*

Keywords: Backyard fruits, use, exploitation

1. Introduction

The backyards (family gardens or solar), historically have represented a space where food satisfactions are reproduced, solving an immediate problem. Currently, in many communities in Mexico, this space persists due to the fact that it continues to contribute a great deal to the feeding of families. They bring with them traditional roots where the processes of selection, domestication, diversification and conservation oriented to the production and reproduction of flora and fauna maintain a close relation of the preservation, the enrichment of cultural values, generation and appropriation of technologies.

The solar or family garden is a system where peasant families produce various animal and fruit species throughout the year. Its use and sale in times of crisis helps to cover eventual expenses, functioning as a savings system. (Arias, 2012) so the economic function of the orchards is important for peasant families. (Juan-Pérez, 2013).

The orchard is a universal agroecosystem, it is found everywhere in the world and it is a basically agroforestry system, destined to the use of fruits, wood, firewood and serves in an important way, to shade the places (Mariaca et al., 2010).

The orchards are diversified agro-ecosystems, as has been pointed out by several authors (Ortiz 1978 and Budowski 1985). The orchards have been developed since pre-Hispanic times in Mexico and have adapted to a great diversity of climates and environmental changes, adapting the set of species to regional conditions (Gliessman, 1990).

Regarding fruits, it is considered that around 138 native species of the Mesoamerican region were consumed, which are grouped into 33 botanical families, the most important (due to the number of species they present) are: Myrtaceae 19, Sapotaceae 14, Cactaceae 11, Annonaceae 10 and Fabaceae 10, (Colunga et al: 2003; Longar, 2004).

In Mexico, family gardens are distributed over the entire territory. The most studied have been the orchards in the Yucatan Peninsula (Ruenes and Jiménez, 1997, Jiménez et al 1999). The authors highlight the great biological diversity of the orchards.

The composition and use of crops vary according to the circumstances of life and the needs of rural communities (indigenous and peasant).

It is important to know the advantages of the permanence of family gardens; One of the advantages and possibly one of the most important in critical times, due to global warming and climate change, is that it represents a small system

Volume 7 Issue 8, August 2018

www.ijsr.net

Licensed Under Creative Commons Attribution CC BY

within which diversity of plants, both edible, ornamental, medicinal, is preserved. among others, just as natural resources are conserved.

Currently in some regions of Europe is occurring a phenomenon that is to return to backyard feeding, this practice not only helps the family economy, but their products are free of agrochemicals. This is being generated little by little all over the world, given the need to consume organic foods.

Information on the economic role of family gardens, production volumes and marketing practices is of interest to evaluate how they can be integrated into a policy of use and conservation of biodiversity and development.

It is necessary to search for mechanisms to maintain and strengthen the regional food culture. There are many ways to prepare food from plants in family gardens, part of a culture of healthy and rich food.

The present project was carried out in the Mochicahui Sindicatura, El Fuerte, Sinaloa, contemplating the main localities such as Mochicahui, El Poblado, La Primavera and El Teroque and is considered as an alternative for the use and transformation of fruit products as an added value in backyard and contribution to its value chain in rural communities (indigenous and peasant).

2. Materials and Methods

Study areas

Three communities were studied in the period between February and May 2015: The town, La primavera and El Teroque in the Mochicahui Sindicatura, in the municipality of El Fuerte Sinaloa, Mexico, distributed over the physiographic region of the continental central plain of the Gulf of California.

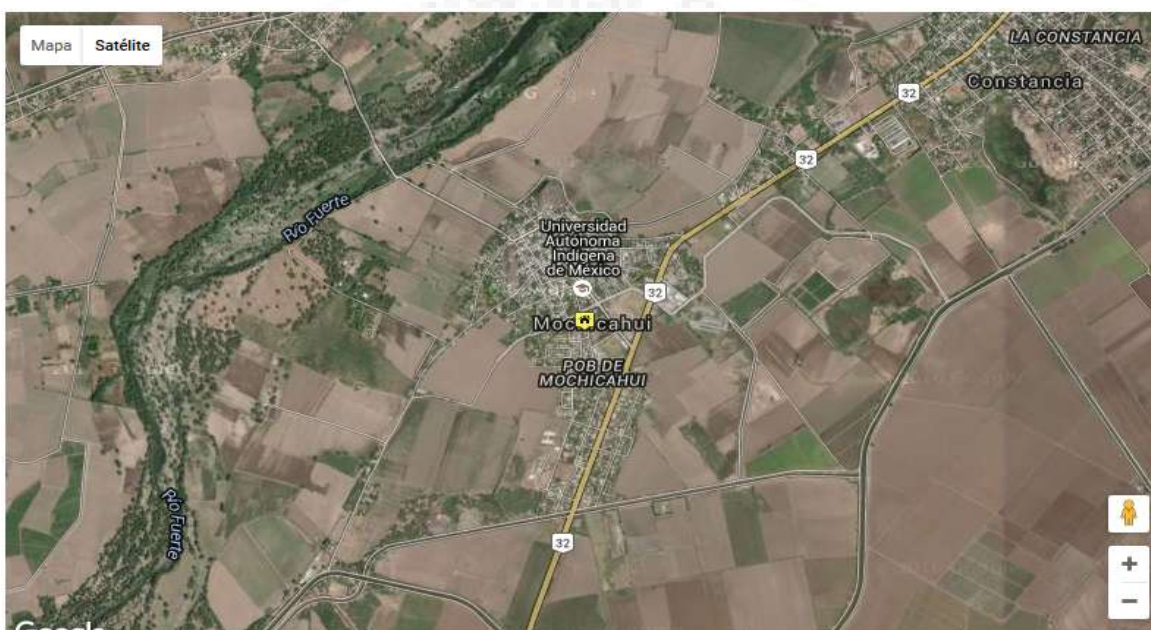


Figure 1: Map depicting the La Primavera and El Poblado samplingsites at the Mochicahui Sindicatura, El Fuerte, Sinaloa, Mexico

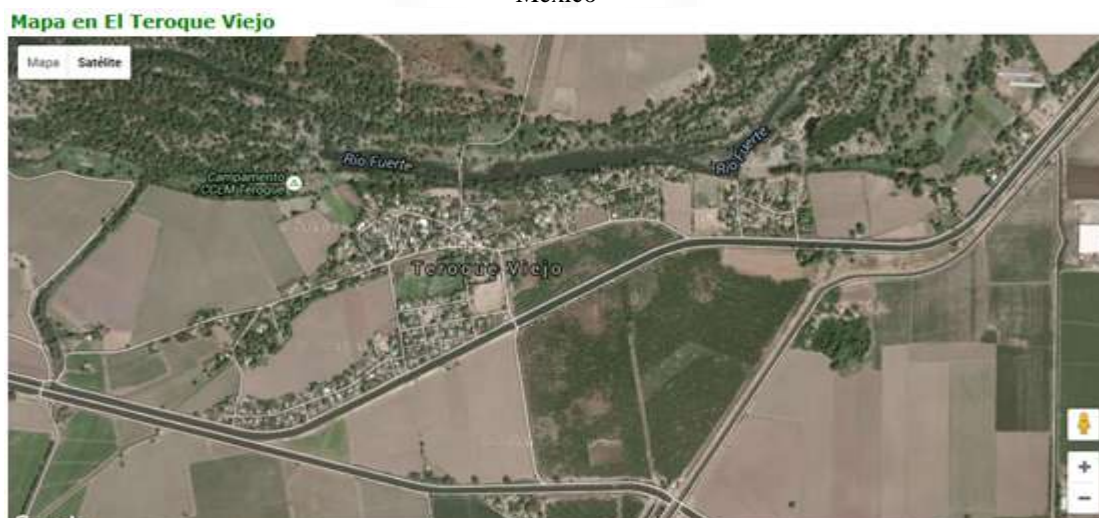


Figure 2: Location of the samplingsites El Teroque, Mochicahui, El Fuerte, Sinaloa, Mexico.

Surveys were applied to adults 21 in La Primavera, 45 in El Poblado and 145 in El Teroque, and species and tree varieties were identified through the shape of the leaf, the color, size and texture of the bark.

Quantitative and qualitative methodological tools were applied such as interviews, direct observation, participant observation, documentary review and simple random sampling with the purpose of making a diagnosis through the application of open type surveys contemplating biological, socio-economic, cultural aspects, main agricultural activities and backyard; aspects, situations and problems that affect the production and the biodiversity of the plots were identified.

The questions were grouped into three following categories

1. Questions related to the biological part of fruit trees

- a) Type of trees
- b) Temporary or perennial
- c) Average production per fruit tree
- d) Variation in production per tree fruit
- e) Age of fruit trees

2. Questions related to the protection of fruit trees

- a) Application of agrochemicals
- b) Type of agrochemical
- c) Application of manure, compost and leaves
- d) Pests

3. Questions regarding the use and transformation of backyard fruit

- a) Consumption of natural fruit
- b) Consumption of transformed fruit
- c) Use of unused fruit
- d) Percentage of use of backyard fruits
- e) Sale or self-consumption
- f) Processed product
- g) Sale of fruits or processed products
- h) Sale price
- i) Use some preserves

For the production of graphs and statistical applications, the program was used through the SPSS program, version 15.

3. Results

We identified 59 tree species present in the communities studied, 32 in the community of El Teroque, 11 in La Primavera and 16 in El Poblado. It was found that in the three populations the presence of 9 species is repeated. Of the 59 arboreal species, 32 correspond to fruit trees, of which six were common citrus: orange (*Citrus sinensis*) or (*Citrus aurantium*) orange trees (*Citrofortunellamitis*), grapefruit (*Citrus grandis* (L.) Osbeck), mandarin; (*Citrus nobilis*), lime (*Citrus aurantifolia* (christm.)Swingle) and citron (*Citrus medica*). These species were introduced by the Spaniards in this geographical region during the colonization process between 1521-1810, and were adopted and included in the cultural, food and medicinal heritage of rural populations. In addition, the fruit trees shown in (López-Ortiz et al, 2017) were found. The most abundant species in the three communities is mango (*Mangifera indica* L), which was also introduced by

Spaniards from India in the same period and is the most represented with a presence in the three communities. Plum (*Spondias purpurea*) and avocado (*Persea americana*) follow in abundance, both come from tropical areas of America and Mesoamerica. The other most representative species are the lemon (*Citrus × lemon*), of Southeast Asian origin and the orange (*Citrus sinensis* or *Citrus aurantium*) native of India, Pakistan and, Vietnam, the latter introduced by the Spaniards (López-Ortiz et al; 2017).

1. Questions related to the biological part of fruit trees

The highest percentage of seasonal fruit. The average production per tree is presented from 0 to 30 kilos in almost all places, except in El Teroque which also occurs in 50 to 60 kg; The highest fruit production occurs in trees that are 0 to 30 years old, with the highest percentages in trees that are 0 to 10 years old and the highest age production from 0 to 30. The greater number of people surveyed responded in a slightly higher percentage than 50% that there is variation in the production in the sites El Pueblo and La Primavera and in El Teroque a slightly higher percentage than 81% answered that there is variation in the production of its fruit trees. (Figs. 3-8 and Tables 1-4).

Table 1: Type of fruit trees in El Poblado, Mochicahui, El Fuerte, Sinaloa

Type of tree	Scientific name	Porcentaje
Mango	<i>Mangifera indica</i> L (Linneo, 1876)	28.79%
Plum	<i>Spondias purpurea</i> (Linneo, 1762)	9.09%
Orange	<i>Citrus sinensis</i> o <i>Citrus aurantium</i> (Osbeck, 1765)	12.12%
Naranjitas	<i>Citrofortunellamitis</i> (Linneo, 1753)	8.33%
Grapefruit	<i>Citrus paradisi</i> (Merril, 1917)	0.06%
Lemon	<i>Citrus limon</i> (Osbeck, 1765)	9.09%
Lime	<i>Citrus aurantifolia</i> (christm.) Swingle (Swingle, 1913)	1.52%
Guava	<i>Psidium guajava</i> (Linneo, 1753)	9.85%
Tangerine	<i>Citrus tangerina</i> (Blanco, 1837)	3.79%
Myrtle	<i>Myrtus communis</i> (Linneo, 1753)	1.52%
Avocado	<i>Persea americana</i> (Miller, 1768)	1.52%
Coconut	<i>Cocos nucifera</i> (Linneo, 1753)	3.03%
Papaya	<i>Carica papaya</i> (Linneo, 1753)	3.03%
Banana	<i>Musa paradisiaca</i> (Linneo, 1753)	0.76%
Cannon	<i>Averrhoa carambola</i> (Linneo, 1753)	0.76%
Almond	<i>Prunus dulcis</i> (Linneo, 1753)	0.76%

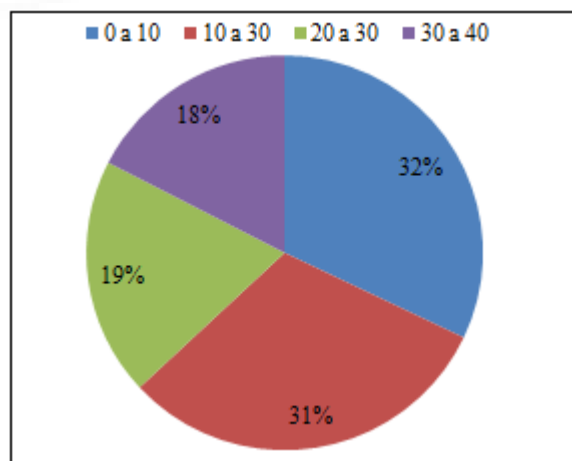


Figure 3: Percentage of age in fruit trees in El Poblado, Mochicahui, El Fuerte, Sinaloa, Mexico.

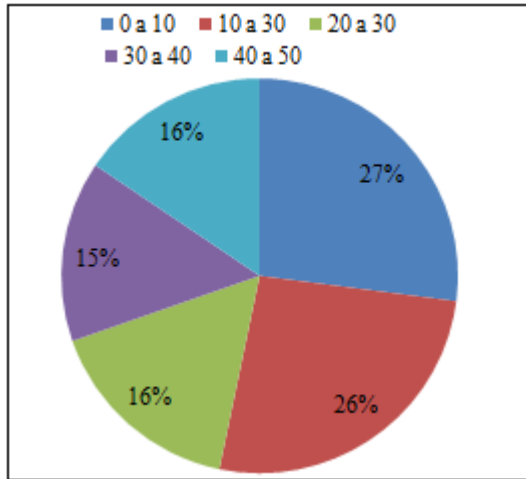


Figure 4: Percentage of average production and age of fruit tree in Kg in El Poblado, El Fuerte, Sinaloa, Mexico.

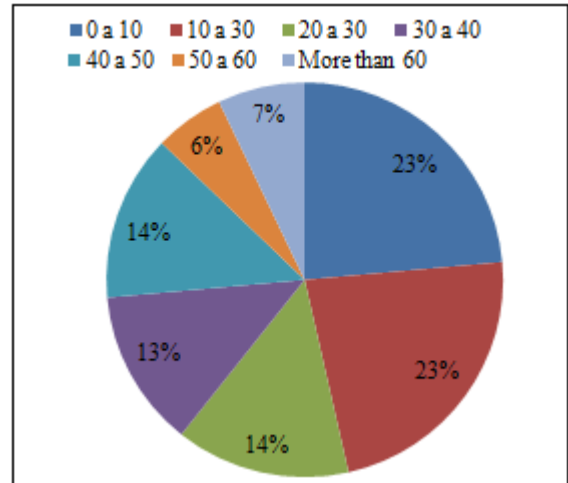


Figure 6: Average production per fruit tree in La Primavera, El Fuerte, Sinaloa.

Table 2: Types of fruit trees in La Primavera, El Fuerte, Sinaloa

Type of tree	Scientificname	Porcentaje
Mango	<i>Mangifera indica L (Linneo, 1876)</i>	19.28%
Plum	<i>Spondias purpurea (Linneo, 1762)</i>	13.25%
Orange	<i>Citrus sinensis o Citrus aurantium (Osbeck, 1765)</i>	10.84%
Naranjitas	<i>Citrofortunellamitis (Linneo, 1753)</i>	12.05%
Grapefruit	<i>Citrus paradisi (Merril, 1917)</i>	3.61%
Peach	<i>Prunuspersica (Linneo, 1753)</i>	3.61%
Lemon	<i>Citrus limon (Osbeck, 1765)</i>	4.82%
Lime	<i>Citrus aurantifolia (chrism.) swingle (Swingle, 1913)</i>	1.20%
Guava	<i>Psidiumguajava (Linneo, 1753)</i>	10.84%
Tangerine	<i>Citrus tangerina (Blanco, 1837)</i>	6.02%
Lichis	<i>Litchi Chinensis SONN.</i>	1.20%
Myrtle	<i>Myrtuscommunis (Linneo, 1753)</i>	3.61%
Coconut	<i>Cocos nucifera (Linneo, 1753)</i>	2.41%
Papaya	<i>Carica papaya (Linneo, 1753)</i>	2.41%
Banana	<i>Musa paradisiaca (Linneo, 1753)</i>	2.41%
Tamarind	<i>Tamarindus indica (Linneo, 1753)</i>	1.20%
Yucca.	<i>YuccaSpp.</i>	1.20%

Table 3: Type of tree in El Teroque, El Fuerte, Sinaloa.

Type of tree	Scientificname	Porcentaje
Naranjitas	<i>Citrofortunellamitis (Linneo, 1753)</i>	3.949%
Grapefruit	<i>Citrus paradisi (Merril, 1917)</i>	7.616%
Peach	<i>Prunuspersica (Linneo, 1753)</i>	2.821%
Lemon	<i>Citrus limon (Osbeck, 1765)</i>	9.450%
Lime	<i>Citrus aurantifolia (chrism.) swingle (Swingle, 1913)</i>	2.680%
Guava	<i>Psidiumguajava (Linneo, 1753)</i>	9.450%
Tangerine	<i>Citrus tangerina (Blanco, 1837)</i>	5.642%
Lichis	<i>Litchichinensis SONN</i>	0.141%
Myrtle	<i>Myrtuscommunis (Linneo, 1753)</i>	1.846%
Pistacho	<i>Pistacia vera L., Anacardiaceae (Linneo, 1753)</i>	0.423%
Avocado	<i>Persea americana (Miller, 1768)</i>	6.911%
Nogal	<i>Juglans regia (Linneo, 1753)</i>	0.423%
Coconut	<i>Cocos nucifera (Linneo, 1753)</i>	0.846%
Papaya	<i>Carica papaya (Linneo, 1753)</i>	2.000%
Banana	<i>Musa paradisiaca (Linneo, 1753)</i>	1.128%
Grape	<i>Vitisvinifera (Linneo, 1753)</i>	0.282%
Datil	<i>Phoenix dactylifera (Linneo, 1753)</i>	0.282%
Higo	<i>Ficus carica (Linneo, 1753)</i>	0.705%
Lemon real		0.705%
Granada	<i>Punicagranatum (Linneo, 1753)</i>	0.705%
Anona	<i>Annonareticulata (Linneo, 1753)</i>	0.141%
Guanábana	<i>Annonamuricata (Linneo, 1753)</i>	0.141%
Nispero	<i>Manilkarahuberi (Standley, 1933)</i>	0.282%
Mamey		0.282%
Maracuya	<i>Passifloraedulis (Sims, 1928)</i>	0.282%
Almond	<i>Prunusdulcis (Linneo, 1753)</i>	0.282%
Sidra	<i>Citrus medica (Linneo, 1753)</i>	0.423%
Apple	<i>Malus domestica (Borkhausen, 1803)</i>	0.423%
Tamarind	<i>Tamarindus indica (Linneo, 1753)</i>	1.128%
Pitahaya	<i>HylocereusSpp.</i>	0.423%
Blackberry	<i>Morusnigra</i>	0.423%
Noni	<i>Morindacitrifolia L.</i>	0.423%
Chico mamey	<i>Manilkarazapota (Royen, 1953)</i>	0.141%

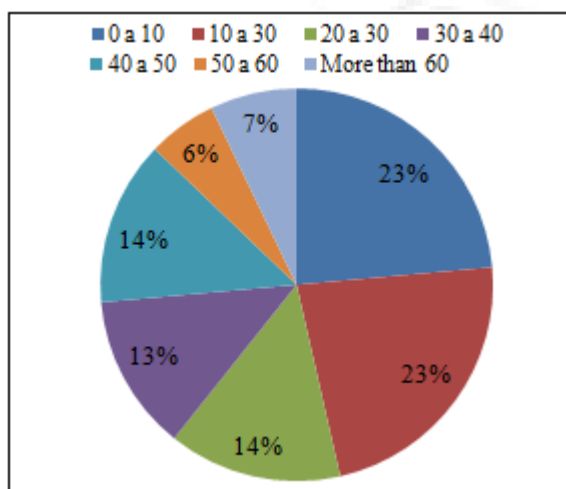


Figure 5: Percentage of production and age of fruit tree in Kg in La Primavera, El Fuerte, Sinaloa.

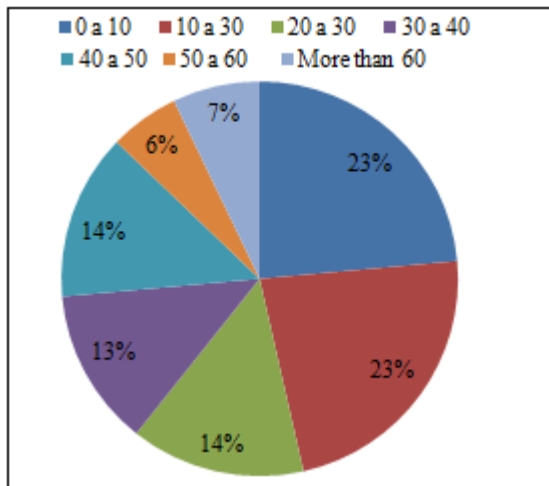


Figure 7: Percentage of production and age in fruit trees in Kg in El Teroque, El Fuerte, Sinaloa.

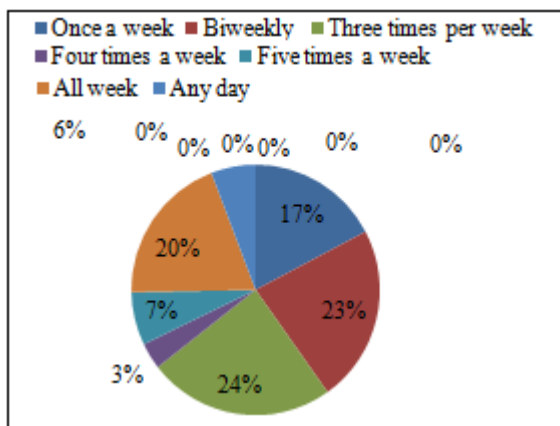


Figure 8: Average production per tree in El Teroque, El Fuerte, Sinaloa

Table 4: Type of fruit tree and use of unused fruit

Population	Type of tree	Use
El Poblado	Temporary 100 %	They shoot 33.33%, They lose 66.67%
La Primavera	Temporary 100 %	They give 33.33%. They shoot 33.33% and They lose 33.33%
El Teroque	Temporary 84 % Perennial 16 %	They give 17.09%. They Sell 1.12%. They shoot 42.7% and They lose 38.20%.

Questions related to the protection of fruit trees.

The highest percentage of people answered that they do not apply any type of agrochemical (91.11% in El Poblado, 68% in La Primavera and 74.47% in El Teroque.) With respect to those who use agrochemicals, urea is the highest percentage used (66.7% in El Poblado, 75% in Spring and 94.74% in El Teroque.) Regarding the application of organic fertilizers (compost, manure and leaves) the highest percentage of people answered that they do not use (82.22% in El Poblado, 84% in La Primavera and 74.47% in El Teroque.) Regarding the presence of pests, the largest number of people surveyed answered that there is no presence of pests (62.22% in the town, 52% in La Primavera and 46.26% in the Teroque) in terms of the presence of pests the most frequent is the whitefly (Tables 5- 8).

Table 5: Type of pests present in fruit trees in El Poblado, El Fuerte, Sinaloa

Plague	Percentage
Wormburner	4.44%
White worm	2.22%
White mosquito	22.22%
Black spots onleaves	4.44%
Worm	2,22%
Ant	2.22%
Any	62.22%

Table 6: Type of pests present in fruit trees in La Primavera, El Fuerte, Sinaloa.

Plague	Percentage
White worm	4.00%
White mosquito	16.00%
Black spots onleaves	4.00%
Grasshoppers	4.00%
Worm	12.00%
White spots	4.00%
Trips	4.00%
Any	52.00%

Table 7: Type of pests in fruit trees in El Teroque, El Fuerte, Sinaloa.

Plague	Percentage
White worm	4.35%
White mosquito	26.09%
Black spots onleaves	0.87%
Worm	16.52%
White spots	1.74%
Climbing plant	0.87%
Ant	1.74%
Green Campamocho	0.87%
Any	46.96%

Table 8: Protection of backyard fruittrees in El Poblado, La Primavera and ElTeroque, El Fuerte, Sinaloa, Mexico

Population	Agrochemicals	Fertilizers
El Poblado	Yes 8.89%. No 11.1%	Yes 17.78%. No 82.22%
La primavera	Yes 32%. No. 68%	Yes 16%. No. 64%
El Teroque	Yes 25.53% No. 74.47%	Yes 25.53%. No. 74.47%

3. Questions related to the use, transformation and use of backyard fruits.

First, we have that except for El Teroque where they mentioned that they consume natural fruit all week the highest percentage of people surveyed was 68.66%, in El Poblado 3 times a week 38.64% and in La Primavera the highest percentage is the People who consume 5 times a week in a response of 25%.

Regarding the consumption of processed fruit, we have that in La Primavera we obtained the highest percentage of people who mentioned that they do not consume processed fruit or once a week with 68%. In El Poblado, the highest percentage is for people who do not consume this fruit. type of fruit transformed with 37.78% except for El Teroque where people responded to consume three times a week with a percentage of 24.14%. Followed by those who consume twice a week with 22.99% and 19.4% all week.

The percentage of use of backyard fruit was greater in the Village with 90 to 100 with 42.22% of the responses and in the spring from 70 to 80 with 28% of the responses followed by the 60 to 70 with a 15.56 and 16% respectively, for El Teroque this type of results are not provided.

Regarding the use of fruit that is not used we have that in the town 66.77% is lost and in La Primavera it is given, thrown and lost with 33.33% respectively, while in El Poblado 42.7% is thrown away and 38.20% is lost, and in smaller percentages it is given away at 17.98% and sold at 1.12%.

The most frequently produced products in the town are ice cream and mangoes (sweet mango ice cream), in the spring, on the contrary, stews and ice cream, and in El Teroque, first they produce fresh water, ice cream and stews in second and third place of frequency.

Regarding the question whether they sell or consume the backyard fruits in the town answered 94.4% that is self-consumption and in other places such as La Primavera and El Teroque mentioned that it is for self-consumption.

Regarding the question if they sell their fruits or processed products, most people in the three sites replied that they did not have 93.33% in El Poblado, 88% in La Primavera and 77.30% in El Teroque.

Regarding the retail prices, the most uniform ones are in El Poblado with 5 pesos in response, and in La Primavera the highest percentage responded that 7 pesos in 66.67 pesos and 50 pesos 33.33%% and the most varied prices were obtained like answer in the Teroque of 30 pesos the 29.03%, 5 pesos the 19.35% and 20 pesos the 12.90% between other prices with a smaller percentage in response.

When asked if they use any type of preserved in El Poblado 100% answered no, in La Primavera 96% answered no and in El Teroque 98.58% answered no and replied that they only use dyes. (Figures 10-16 and Table 9-14).

Table 9: Use of fruits in the backyard in El Poblado, El Fuerte, Sinaloa, Mexico.

Use	Porcentaje
Ice creams	55.00%
Mangoneadas	37.50%
Jams	5.00%
Animal feed	2.50%

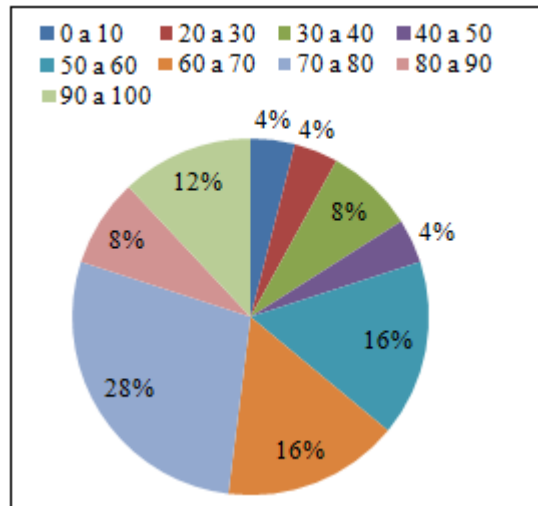


Figure 10: Percentage of use of backyard fruits in El Poblado, El Fuerte, Sinaloa.

Table 10: Percentage of natural fruit consumption in El Poblado, El Fuerte, Sinaloa.

Natural fruit consumption	Porcentaje
No once a week	9.09%
Once a week	4.55%
Biweekly	4.55%
Three times per week	38.64%
Four times a week	2.27%
Five times a week	11.36%
All week	29.55%

Table 11: Frequency Percentage of fura consumption transformed in El Poblado, El Fuerte, Sinaloa.

Consumption of transformed fruit	Porcentaje
No once a week	37.38%
Once a week	17.78%
Biweekly	6.67%
Three times per week	15.56%
Five times a week	4.44%
All week	13.33%
Any day	4.44%

Table 12: Use of backyard fruits in La Primavera, El Fuerte, Sinaloa.

Use of fruit by the family	Porcentaje
Ice creams	25.81%
Mangoneadas	32.26%
Jams	3.23%
Animal feed	3.23%
Fresh waters	29.03%
Smoothies	3.23%
Sweet	3.23%

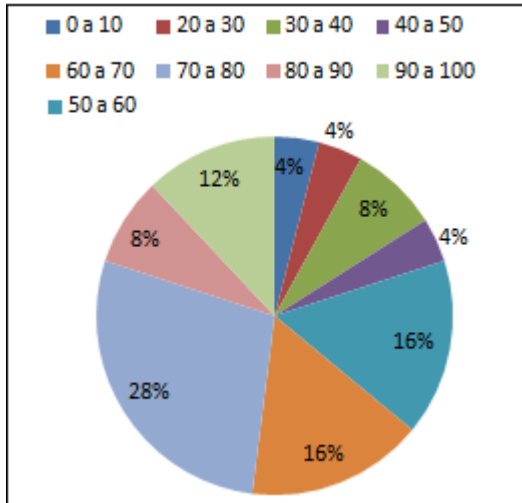


Figure 11: Percentage of fruit utilization in La Primavera, El Fuerte, Sinaloa.

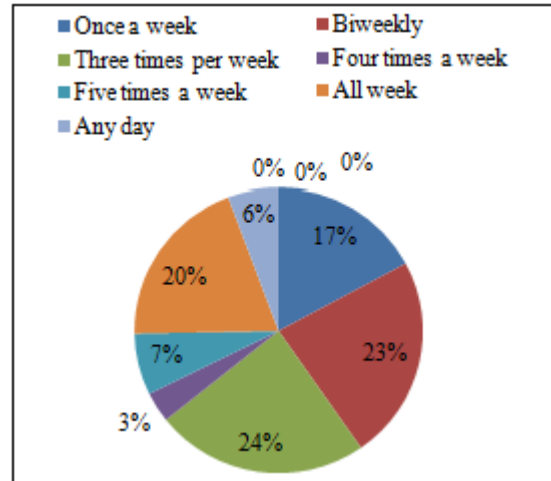


Figure 13: Percentage of use of backyard fruits in El Teroque, El Fuerte, Sinaloa.

Table 13: Frequency Percentage of consumption of natural fruit in La Primavera, El Fuerte, Sinaloa

Natural fruit consumption	Porcentaje
Once a week	8.33%
Biweekly	20.83%
Three times per week	20.83%
Four times a week	8.33%
Five times a week	25.00%
All week	16.67%

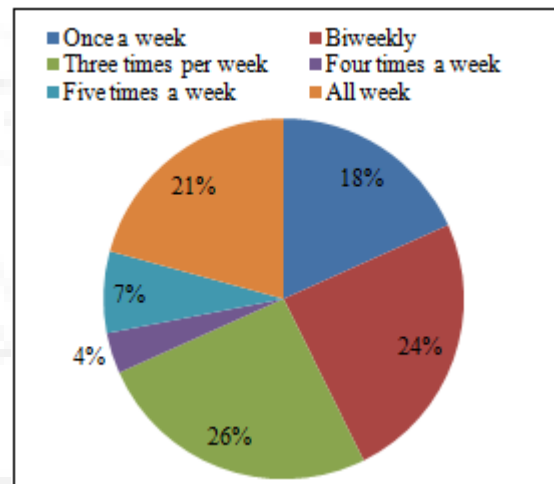


Figure 14: Percentage frequency of consumption of natural fruit in El Teroque, El Fuerte, Sinaloa.

Table 14: Percentage frequency in fruit consumption transformed in La Primavera, El Fuerte, Sinaloa.

Consumption of transformed fruit	Porcentaje
Once a week	4.00%
Biweekly	16.00%
Four times a week	8.00%
All week	4.00%
Any day	68.00%

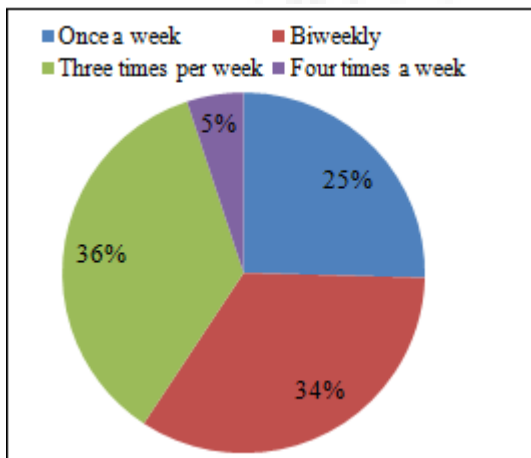


Figure 12: Use of backyard fruits in El Teroque, El Fuerte, Sinaloa

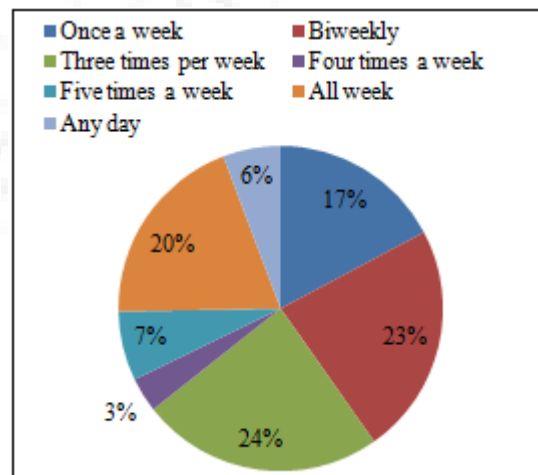


Figure 15: Percentage frequency of fruit consumption transformed in Teroque, El Fuerte, Sinaloa

Table 15: Prices of fruit sales in El Teroque, El Fuerte, Sinaloa.

Sale price(Mexican pesos)	Porcentaje
\$3.00	9.69%
\$4.00	3.23%
\$5.00	19.35%
\$10.00	3.23%

\$20.00	12.90%
\$30.00	29.03%
\$40.00	3.23%
\$50.00	12.90%
\$70.00	6.45%

Table 16: Percentages of sale, consumption of fruit trees and use of preservatives in El Poblado, La Primavera and El Teroque, El Fuerte, Sinaloa, Mexico.

Population	Utilization	Sale and consumption	Preservatives
El Poblado	Yes 6.67%. No 93.33%	Sale 5.56%. Self consumption 94.44%	No 100%
La Primavera	Yes 12%. No 88%	Self consumption 100%	Yes 4%. No. 96%
El Teroque	Yes 22.71%. No. 77.30%	Self consumption 100%	Yes 1.42%. No. 98.58%

4. Discussion

An extensive literature on orchards in tropical countries and indigenous communities highlights the contribution of orchards to the conservation of agricultural biodiversity (Caballero, 1992, Das and Das 2005) as well as the socio-economic and cultural importance of these (Lamont et al; 1999, Heckler 2004, Calvet-Mir et al, 2014).

Although the family garden occupies small areas, it is of great value for the rural and urban families that pose and know and manage it. In rural areas, the family garden is part of a complex production system that integrates agricultural activities, hunting, gathering, basket-making and mining. It is easy to see that the garden itself does not meet all the needs, since it is included in an integral system, capable of responding to needs, insofar as it is not deteriorated. In this way, indigenous and Afro-American and mestizo families and communities develop greater levels of prosperity autonomy, when they satisfy their food and other material goods themselves (Ospina, 2002).

Currently, fruits are recognized for numerous healing favors and are recommended to carry good habits in the diet. Morales (1998) mentions the therapeutic uses and properties of 105 fruits, most of them domesticated, of which 50 are native to the American continent, mainly from its varied tropical region.

The diversification in terms of the use of many of these traditional crops is not only achieved in their use as food, but also allows them to take advantage of their medicinal and ornamental value and their exploitation in a non-traditional way and in animal feed.

López-Ortiz et al (2017) determine the degree of biodiversity present in the rural communities studied, highlighting the dominant presence of certain species such as mango (*Mangifera indica* L), plum (*Spondias purpurea*), orange (*Citrus sinensis* or *Citrus aurantium*) and avocado (*Persea americana*) and in which they present the determination of diversity indices that demonstrate an average diversity of fruit trees in a general way in these communities of the northwest part of Mexico; however, there are few works in this region that speak to us about

aspects of their production, protection and use of these fruits, as shown in the results; the use and the transformation that is given to the backyard fruits is very low in all the studied communities, compared with the production that these fruit trees present, this can be explained in part because they are located within zones where an intensive agriculture since it is one of the areas of Mexico with the highest agricultural practice of this nature; however, it is known that the food or seasoning products obtained from family gardens, satisfy in many parts of the world the basic needs of the family, providing mainly a food supplement throughout the year (Wezel and Bender, 2003) and on the other hand it is known that family gardens due to a great diversity of plants satisfies a large part of the caloric and nutritional requirements of the family diet, on a smaller scale, the commercialization of surpluses (Mejía, 1995).

In all the communities the low use of agrochemicals such as fertilizers and pesticides is observed for the protection of fruit trees and the application although scarce of organic fertilizers, demonstrating with this a traditional conservation and resistance to the intensive use of agrochemicals in contrast to those used in modern agriculture in the areas surrounding family gardens; this reinforces the idea that similar gardens contribute to food security (FAO, 2014).

In a study conducted in the Southern Region of the State of Mexico by Juan-Pérez (2013) it has been shown that when plant diversity is extensive in the orchards, the use of the products obtained from them is also very diverse. The use of the products can be located in relation to environmental, ecological, economic, cultural and social conditions. It is observed that when the diversity of plants in the orchards of the rural environment is greater, then the feeding of peasant families is also variable. In this sense, the inhabitants of the rural communities are important social actors that promote agrobiodiversity in this portion of the Mexican territory.

Although in this study in the localities surveyed the results are not very favorable to the use of backyard fruits, in other regions of the country and in other countries, the use of backyard products is important, such is the case of Viet Nam for example, where family gardens have a long tradition. The International Plant Genetic Resources Institute (IPGRI) investigated approximately 100 of them in collaboration with national institutions. In this way, it was possible to discover the great productivity of these orchards. Some households obtain 50-60% of their income from the sale of their products. In this regard, in the framework of a research project funded by the Federal Ministry of Economic Cooperation and Development of Germany (BMZ), the International Plant Genetic Resources Institute (IPGRI) has investigated the contribution of home gardens to conservation in five countries. of phylogenetic resources. The study also aimed to analyze if the promotion of the diversity of the orchards has a positive effect on sustainable development. The results were unequivocal: the greater the diversity in the family garden, the better the food and the household income situation (GTZ, s / a).

In the Southern Region of the State of Mexico it is common that after satisfying the nutritional needs of the families, the farmers who want to sell directly the products of the garden

in the local markets, place plastic sacks, cloth or sisal on the floor, and use various measures for the sale of the products, for example, the jícamas are sold in sets of four or five pieces, each set has a price of \$ 10.00 (ten pesos); chilies are sold in quarts (wooden cubes of approximately 1500 grams), the price of each quart is \$20.00 (twenty pesos); a container of sheet with 500 grams of tomatillos, has a cost of \$10.00 (ten pesos); each sugarcane is sold at \$10.00 (ten pesos); a sheet container of approximately 750 grams of plums, sold at \$15.00 (fifteen pesos); seven bananas are priced at \$5.00 (five pesos) (Juan-Pérez, 2013).

It is important to note that the organization for the production of family gardens offers job opportunities to people with different abilities (De Paz, Andrea L, 2004), which allows them to exercise at home to develop their own work tools for use in gardens relatives (Berges Marisa, 2004). As a result, greater family integration is allowed (Mitchell Robert, 2004).

According to Mariaca, 2010 and Mariaca, 2012), Mexican families show interest in maintaining the species that provide benefits. Experimentation on the part of the families who own the orchards is done through the establishment of new plants within and within the limits of family agroecosystems. Frequently, families plant new vegetables and try to always have the same species as the neighbors of their communities or the region. The orchards have been developed and nurtured over generations because farmers experience and innovate constantly, allowing them to adjust to their needs.

Regarding the use and transformation of the backyard fruits, it is observed as a result of this work that most prefer natural consumption, followed by the transformation of fruits into common uses of the region, such as ice cream and mangoneadas among the most important, as well as it is observed in other regions of Mexico in the use and transformation of backyard fruits.

Family gardens represent a strategy to maintain the sociocultural features that characterize the inhabitants of Mesoamerica. By conserving agrobiodiversity, the sociocultural components of the human groups that live in rural communities are protected, and food security and sovereignty is also promoted (Juan-Pérez 2013).

It is important to recognize the advantages of the permanence of family gardens; One of them and possibly one of the most important in critical times, due to global warming and climate change, is that it represents a small system within which diversity of plants, both edible, ornamental, medicinal, is preserved. among others, just as natural resources are conserved. The preservation of biodiversity in traditional agricultural systems is important for the conservation of not only biological but also cultural diversity and for the multifunctionality of agroecosystems (Calvet-Miret al, 2014).

The social role is strengthened in the sense that it is related to the production of food and its diversification. The conception of sustainable development and protection of the environment is implicit in the evolution and development of

rural home gardens, guaranteeing for themselves the basic needs of the population, without endangering future generations (Gómez-Gómez, 2010).

5. Conclusion

It was possible to identify that the predominant cultures in the backyards of the informants are in order of highest to lowest Mango, Plum, Orange and Avocado in the localities under study, which are preferably cultivated without the application of agrochemicals and although most of the the communities prefer to consume natural fruit, however there is the transformation of the fruit that is used in family consumption and a smaller percentage commercializes it in regional presentations such as ice cream and mangonedas (sweet mango with spicy). Although the diversity of fruit trees is acceptable in medium terms, a greater part of this is not being used naturally and the transformation of these is low, as well as its commercialization compared with other backyards existing in Mexico as they are in the southeast and in other countries where consumption and marketing is important.

6. Acknowledgment

We appreciate the financial support granted by the General Coordination of Research and Postgraduate Studies of the Universidad Autónoma Intercultural de Sinaloa, for the development of the project "Value added to fruit products in the Sindicatura de Mochicahui, El Fuerte, Sinaloa".

References

- [1] Arias, R. L. (2012). El huerto familiar o solar maya – yucateco actual. En Mariaca, M.R. Mariaca, M. R. El huerto familiar del Sureste de México.
- [2] Budowski, G. 1985. Homegardens in tropical America: a review. Present the Frist International Workshop on Tropical Homegardens, Bandung Indonesia.
- [3] Caballero J., 1992. Maya homegardens: Past, present and future. *Etnoecológica*, 1: 35-54.
- [4] Calvet-Mir1, L., Garnatje, T., Parada, M., Vallés J. y Reyes García V. (2014) Más allá de la producción de alimentos: los huertos familiares como reservorios de diversidad biocultural. *Ambienta* Número 107., 15P.
- [5] Colunga, P., M. del R. Ruenes y D. Zizumbo. 2003. "domesticación de plantas en las tierras bajas mayas y recursos fitogenéticos disponibles en la actualidad", en P. Colunga y A. Larque (eds.). *Naturaleza y sociedad en el área maya. Pasado, presente y futuro*. Mérida, centro de investigaciones científicas de Yucatán.7
- [6] Das T., Das A.K., 2005. Inventorying plant biodiversity in homegardens: A case study in Barak Valley, Assam, NorthEast India. *Current Science*, 89:155-163.
- [7] FAO. (Organización de la Naciones Unidas para la Agricultura y la Alimentación). Post (2014). Post 2015 y objetivos de desarrollo sustentable (14).
- [8] Gliessman, SR. 1990 C understanding the basis of sustainability for agriculture in the tropic: experiences in Latin America *In* Ed Ward, s CA; Lal, R; Madden P. Ed. Sustainable agriculture system. Ankeny, IO, Soil, & Water Conservation Society. P. 378-389.

- [9] Gomèz-Gomèz, B. (2010). Potencial agroecológico de los huertos familiares en el municipio de H. Cárdenas, Tabasco: permanencia y perspectivas de desarrollo. Tesis de Maestría. Colegio de Posgraduados (Campus Montecillo). 71p.
- [10] GTZ. (s/a). *Huertos familiares: Tesoros de diversidad*. Proyecto Sectorial "People and Biodiversity in Rural Areas" <http://gtz.de> Heckler S.L., 2004. Cultivating sociality: aesthetic factors in the composition and function of Piara Homegardens. *Journal of Ethnobiology*, 24:203-232.
- [11] Juan-Pérez J.I. 2013. Los huertos familiares en una provincia del subtrópico mexicano. Análisis espacial, económico y sociocultural. Eumed. México. 136 p.
- [12] Lamont S., Eshbaugh W., Greenberg A., 1999. Species composition, diversity, and use of homegardens among three Amazonian villages. *Economic Botany*, 53:312-326.
- [13] Longar, B. m. del P. 2004. Frutos prohibidos. Pérdida de biodiversidad de especies frutales en México. México, centro de investigaciones económicas, administrativas y
- [14] Sociales del instituto Politécnico nacional.
- [15] Mariaca, M. R., A. González., L. Arias (2010). *El huerto maya yucateco en el Siglo XVI*. ECOSUR. CINVESTAV Unidad Mérida. FOMIX. UIMQROO. CONCYTEY. 180pp.
- [16] Mariaca, M. R. (2012). *El huerto familiar del Sureste de México*. Secretaría de Recursos Naturales y Protección Ambiental del Estado de Tabasco. El Colegio de la Frontera Sur. México. 544pp.
- [17] Mejía, G.M. (1995). Agriculturas para la vida: movimientos alternativos frente a la agricultura química: un enfoque desde sistemas populares colombianos. Cali, Colombia: LED, ACD, CEPROID, y cooperación para la educación especial "Mi nuevo mundo". 252 p.
- [18] Morales, A. R. (1998). *Frutoterapia: os frutos que dan vida* segunda edición Santa Fe de Bogota, Colombia: ECOE 212 P
- [19] Ortiz, G. G. 1978. Los huertos familiares en la Chontalpa: Un primer acercamiento. Reporte del problema especial. Departamento de Ecología. C.S.A. 46 p.
- [20] Ospina A. 2002. Agroforesteria: Un saber popular. Cali: Fundación Ecovivero (Acceso 7 de junio de 2016). URL disponible en: <https://es.scribd.com/doc/310565461/Agroforesteria-Un-Saber-Popular>.
- [21] Ruenes M., M.R. y J.J. Jiménez O. 1997. "importancia agroecológica de los huertos familiares yucatecos: solares". *Boletín de la Red de Gestión de Recursos Naturales*, 2a. época, núm. 6: 4-12.
- [22] Wezel, A. y S. Bender. (2003). Plant species diversity of homegardens of Cuba and its significance for household food supply. *Agroforestry Systems* 57 39-49pp.