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ABSTRACT

The aim of the paper is to present an application of a theoretical and methodological model for the systematization of peasant knowledge about a traditional agriculture practice of family orchards. It is a proposal that involves social participation, community organization and environmental education at three rural localities in the State of Mexico. The methodology applied includes participatory workshops, for obtaining ecological knowledge from farmers related to family orchards and agroecosystems management. The collected information was analyzed to identify aspects related to origin, application, transformation and transmission of traditional knowledge. The last step for knowledge systematization consisted of an important reflection that includes confrontation of the empirical experience with current theoretical approaches. The importance of this research, related to knowledge associated with family orchards, is due to their function of providing products for family subsistence. Because they allow "in situ" germplasm conservation, they favor family integration, foster community relationships, and bring environmental goods and services. Their management is based on vernacular and rational experience of using available natural resources, and represents an alternative for sustainable local development. However, these systems are subject to a disappearance process caused by urban growth, social migration, loss of traditional knowledge about orchard management, and lack of maintenance activities, among other problems that lead to abandonment. The study is based on the theoretical framework of agroecology, environmental education and knowledge systematization.

Keywords: agroecosystems, Peasant knowledge, rural localities, systematization, theoretical and methodological model.

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Introduction

Nature appropriation is an expression of implementation of multiple use strategy, and it is a response of an ecological and economic rationality. This nature appropriation is based on owners' local ecological knowledge that favours permanent adjustments and their ability to face social, economic and ecologic changes, developing natural resources management strategies (Toledo, 2005). Some of those management strategies constitute a tradition and are shared from generation to generation. Nevertheless, some of those management strategies are recent and are being improved through the years (Van der Wal et al., 2011).

In accordance with Toledo (2005) and Calvet-Mir et al. (2104), traditional knowledge is the result of millenarian practices that have been developed into peasant and indigenous communities. This traditional knowledge is constructed through beliefs (*cosmology*); it indicates a mental system of knowledge that persons have about the utility of natural resources and elements. The established relationship between beliefs and their uses describe potential (*corpus*); these lead to a production practices set, so people use and combine their beliefs and practices within their environment, and start to make decisions about the use of natural resources, which they will apply to their daily life (*praxis*).

Tradition is closely related with cosmogony and subsistence of communities. The objective of this relationship is to strengthen the value and management of plants, seeds, animals and diverse communitarian organization forms, as well as rain seasons and moon cycles. These aspects serve as a guide to peasants for sowing and harvesting throughout the year. Therefore, traditional knowledge plays a fundamental role in sustaining and preserving important environmental functions for subsistence agriculture, and it promotes diversity.

The aim of this research is to systematize traditional knowledge about family orchards that inhabitants of rural localities have at Colonia Juarez in Malinalco, El Carmen in Tenancingo and Progreso Hidalgo in Villa Guerrero, all municipalities of the State of Mexico, Mexico.

Knowledge Systematization

In accordance with Jara (2012), knowledge systematization is a conceptual elaboration at the first level, whose objective is the immediate experience of the persons who practice it for generating new knowledge. The systematization must incorporate critical analysis about experiences, starting with opinions, judgments or questions about what has been experienced. Knowledge systematization is about a reconstruction and an analytic reflection process, the importance of which lies in improving the experience. According to Jara (2012), it is equivalent to understanding the meaning and the logic of the complex process of the experience, taking out all the learning. Selener et al. (1996) argue knowledge systematization must include all possible opinions to reflect the diversity of the experiences and points of view involved, achieved through a collaborative process.

In a systematization process, the context where the experience was or is taking place, including both time and place, must be considered (Chávez, 2006). It is essential to observe and consider all the social, economic, cultural and also political aspects that could have an influence on the activities, and consequently on the results (Jara, 2012). Besides these considerations, it is necessary to take into account the participation and the availability of the involved persons (Selener et al., 1996; Chávez, 2006).

Implementation of Traditional Knowledge into Family Orchards

In family orchards, the families take part in natural resource management (Van der Wal et al., 2011) and people apply their knowledge for obtaining self-consumption products (Altieri, 2009; Garnatje et al., 2011; Montañez et al., 2014). The maintenance, use and care of these agroecosystems are based on knowledge of local characteristics, which is related with community cosmology and subsistence forms. The importance of the agroecosystems is the strengthening of values about plants, seeds, animal management and ways of organization (Massieu and Chapela, 2007; Toledo et al., 2008; Calvet-Mir et al., 2014). The agroecosystems have a fundamental role as a production system that promotes biological diversity and accumulates knowledge about the interaction of plants and other organisms as part of the ecosystem. Some examples of these agroecosystems are family orchards, milpa systems and shade-grow coffee, among other agricultural practices (Colín et al., 2012; Cahuich et al., 2014; Montañez et al., 2014; Santana et al., 2015).

Family orchards have been developed through generations; in Mexico they are known as *traspatio*, *solar* or *huerto casero* (Colín et al., 2012; Cahuich et al., 2014). They are agricultural systems where social, cultural, ecologic, agronomic and physical processes occur (Rivas, 2014; García et al., 2016a). Family orchards incorporate some components to the family: orchard, house, yard, animal barnyard and composting areas. All these components are working in an interrelated whole (García et al., 2016b). The family grows a wide variety of tree species, and it is considered of ecological importance because it conserves germplasm *in situ* (Rebollar et al., 2008). At the same time, it works as a shelter of wild animals, avian species, reptiles and small mammals. Due to this fact, the family orchards are important areas for agrobiodiversity and conservation (Calvet-Mir et al., 2014; Chablé et al., 2015). The species richness provides multiple benefits for families, such as plants for medicinal, condiment, food and ceremonial purposes, as well as construction materials (Juan, 2013).

The associated benefits with family orchards (Juan, 2013; García et al., 2016a) are related to social conditions, because all the family is integrated at the time they are working in the orchards. Collaborative work leads to a relationship with other families through the exchange of products or knowledge. These benefits are even economic as a result of selling, bartering and consumption. These benefits may also be environmental and linked to the orchards' vegetation; examples of environmental services obtained from these agroecosystems are

microclimatic regulation, nutrient recycling and soil protection, in order to reduce erosion and improve soil fertility.

In three rural communities of Malinalco, Tenancingo and Villa Guerrero where we studied Agroecosystems with Family Orchards (AEFO), these systems are encountering problems that may lead them to disappear because of development projects, family growth, or abandonment of land by migration, mainly because of the lack of knowledge about management and maintenance of family orchards (Guerrero, 2007; Chablé et al., 2015; García et al., 2016b).

Family Orchard Researches in Mexico

Agroecosystems are a modality of natural resource management (Chablé et al., 2015), where production and conservation strategies are implemented (Colín et al., 2012). For this reason, Colín et al. (2012), Mariaca (2012), and Santana et al. (2015) affirm that agroecosystems are complex systems.

Van der Wal et al. (2011) and Mariaca (2012) argue that the main objective of an agroecosystem is to meet nutritional requirements. The variety of products that families consume includes fruits, medicinal plants, tree leaves, eggs, milk and vegetables that provide to families part of their nutritional requirements. García et al. (2016a) consider that family orchards also bring social, cultural, economic and environmental benefits.

Colín et al. (2012) consider family orchards as family production units, where the management is based on environmental traditional knowledge, to satisfy market requirements and cultivate experience. White et al. (2013) affirm that family orchards are agrobiodiversity conservation areas, which at the same time satisfy and complement the family's daily food need. Family orchards and milpa systems are important strategies to provide ingredients used to cook daily meals (Toledo, 2005).

Families associate trees, shrubs and herbaceous plants to produce food (Rebollar et al., 2008; Chablé et al., 2015), based on ecologic, agronomic, cultural, social and physical processes of knowledge (Mariaca, 2012). Besides the intentional management, family orchards have an important role in biodiversity conservation, concerning species that arrive instinctively (Altieri, 2009; Van der Wal et al., 2011).

In accordance with Santana et al. (2015), these systems are a special form of agricultural production system, where the management is organized and carried out for the family. García et al. (2016a) emphasize the biodiversity of the orchards as an *in situ* gene bank, in order to produce food, medicine and fuels. Juan (2013) proposes five anthropocentric uses for the products of the orchards: ornamental, medicinal, alimentary, ritual and religious.

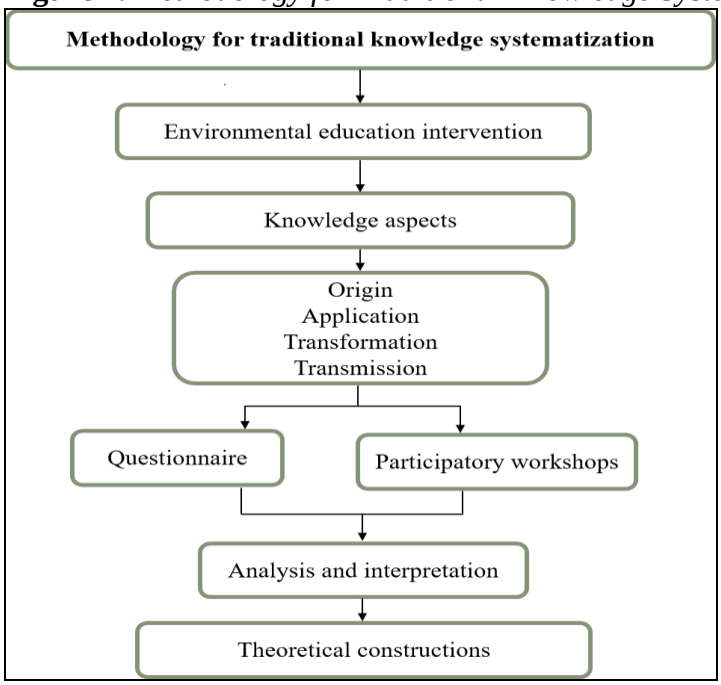
Family orchards are a practice in which families can ensure natural resources conservation and a food security strategy, because families produce their own food and establish their own cultivation according to their food needs and preferences. Families have achieved natural resource conservation and environmental management based on traditional knowledge in order to create a productive, multifunctional and multi-layered agroecosystem.

Methodology

The research was conducted in the districts of Malinalco, Tenancingo and Villa Guerrero, State of Mexico, Mexico. The communities chosen were Colonia Juarez, El Carmen and Progreso Hidalgo, respectively one for each municipality. Qualitative and quantitative methods were applied at different stages, including descriptions of the localities' characteristics, activities realized at the family orchards, and socioeconomic analysis of community and family conditions. The methodology is based on Integral Geographic Planning (Gutiérrez, 2013), which allows us to explain research stages in a methodological frame. Area characterization was realized systematically through environmental, social, economic and cultural aspects of localities, as well as agroecosystem management.

For traditional knowledge systematization (Figure 1), information about local knowledge was compiled, taking into account these knowledge aspects: origin, application, transformation and transmission. The approach of the study consisted of participation-action-research, developed in three stages: 1) participatory workshops for sharing traditional knowledge; 2) information analysis and interpretation that was compiled from persons who assisted in the workshops; 3) theoretical construction, considering a critical reflection that includes: a) knowledge acquired, b) logic interpretation, and c) in-depth reflection about the main findings confronted from an empirical and theoretical approach.

Figure 1. *Methodology for Traditional Knowledge Systematization*



Environmental education intervention was designed to obtain qualitative information about the knowledge that inhabitants have. It includes: a) initial and final questionnaire application, focused on identifying participants' knowledge level, and b) workshops to know how and from whom they acquire knowledge

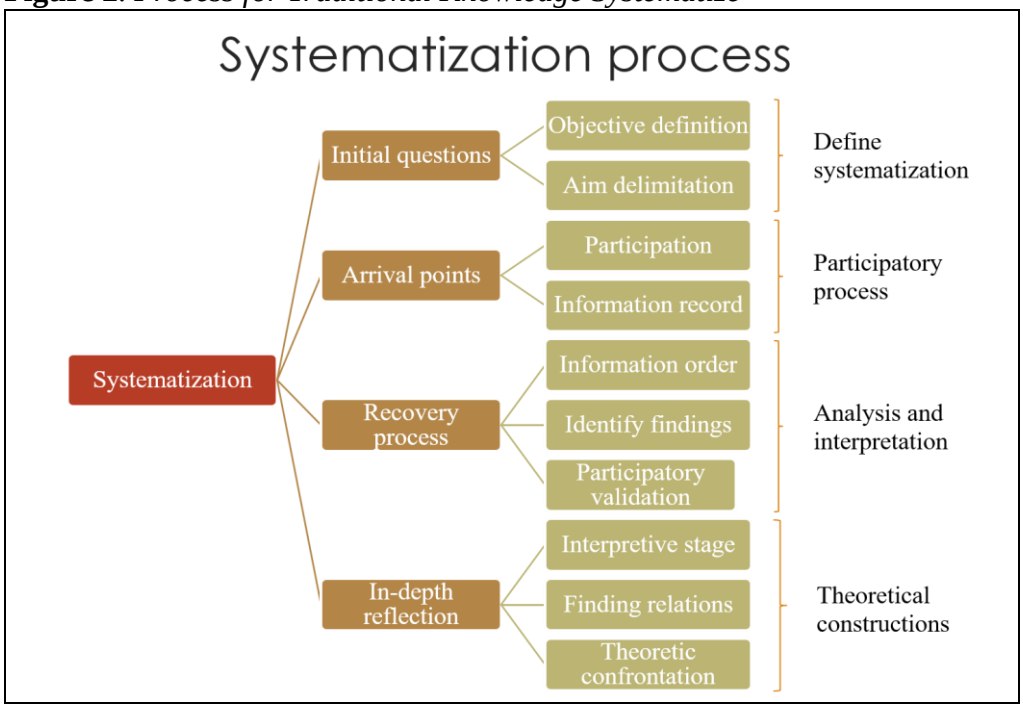
(three collective experiences). Topics included: family orchard owners' interests and necessities, with the objective to share learning activities for conservation, rehabilitation and installation of their family orchards.

From January to March 2017, workshops and questionnaires were conducted, as a means to socialize information about family orchards for analysing agrobiodiversity maintenance, use and management activities practiced in the AEFO; this analysis was complemented with non-participative observation.

The methodological systematization process considers the following phases (Figure 2):

- Initial questions: this stage is for defining the systematization objectives, while the researcher has clearly in mind the utility of what will be systematized. Delimitate the systematization objective, taking into the account the place where the experience has been carried out, as well as the period that will be chosen for systematization.
- Arrival points: participants must be the principal protagonists of systematization, because they share their practice, what has been done and how it has been realized over time. It is essential to register and save the obtained information during systematization experiences. Besides searching in books, data sheets, journals and documents, this could also include photos, videos or drawings. Confrontation with document investigation allows us to discover points of new learning or findings.
- Recovery process: this stage requires organizing an orderly reconstruction about what happened during the sharing process, normally in a chronological order and according to the designated period of time. In this phase, it is possible to establish significant moments, to identify knowledge changes occurred, to characterize stages of the process and the main findings collected. Description of the recovery process should be done as it occurs in the empirical process, avoiding anticipating conclusions or interpretations, even though it could be registered in order to go deeper at the interpretative stage. To close this step, we must share the results with all persons involved.
- In-depth reflection stage: this initiates the interpretative stage about all that has been identified, described and reconstructed previously from the systematization experience. It is necessary to analyse each component separately, and then to establish a match between these findings. In-depth reflection leads to understanding the key elements in order to confront these reflections of empiric experience with theoretical approaches.

Figure 2. *Process for Traditional Knowledge Systematize*



Study Area Characterization

The research area is located at an ecological transition zone (ecotone), between Nearctic and Neotropical biogeographical realms. It is integrated by 24 municipalities of the State of Mexico. Accentuated by latitudinal and altitudinal gradients, it represents a region with geographic, ecologic and socioeconomic importance, because in this region coexist flora and fauna species of template and warm climates. Family orchards have environmental, social and agroecological importance, as a result of the species that families cultivate and due to the management of traditional knowledge about plants and animals.

Localities analysed are situated on Malinalco, Tenancingo and Villa Guerrero municipalities, in the State of Mexico, Mexico, at 18º 48’ 58” and 19º 57’ 07” north latitude and 99º 38' 37" and 98º 35' 45" west longitude, respectively. These communities are part of the ecotone of the State of Mexico. Their predominant climate is (A) Ca (w1) (w) (i') semi-warm, sub-humid with summer rains, and average annual temperature of 18.5°C, and annual rainfall of 1,305 mm (García, 1982). The three localities are considered rural, with a total population of 2,799 inhabitants (INEGI, 2010). The principal economic activity is agriculture.

Results

Characterization of Agroecosystems with Family Orchards

Regarding the family orchard size, including the diverse components of the AEFO, in Villa Guerrero the surface is 642m^2, in Malinalco 626m^2 and in Tenancingo 454m^2. Based on field observations, we determined the components that integrate agroecosystems with family orchards, which are: house, orchard, yard, water tank, fence, animal barnyard and composting zone. In the centre region of Mexico, Colín et al. (2012), Santana et al. (2015) and García (2016c) report the same components, while in the south of Mexico Mariaca (2012), Cahuich et al. (2014) and Chablé et al. (2015) registered bigger surfaces including other components, such as a trash burning area and galley.

Families often organize the space according to their interests, in an average area of 500m^2. In accordance with Juan (2013) and White et al. (2013), orchard average area in the State of Mexico is 450m^2, while Van der Wal et al. (2011 observed family orchards) in Tabasco State to be 1000m^2. The organization of components gives them the possibility of using the space and designing their own distribution of each component. In so doing, they decide the best place for some components and reflect on why that place is best. For this organization, they analyse which components require grater care and supervision; or those trees, shrubs and herbaceous plants that they use and consume frequently. Other factors that determine components' location are: odour emissions that can be generated by animal presences or composting, water availability, and visual impact over the house.

In these agroecosystems, trees' leaves are utilised for three purposes: covering the ground in order to maintain humidity, feeding small animals and elaborating compost. Branches are used along property boundaries as provisional fence. Aromatic plants are used to repel pests, as well as season food. For Toledo (2005), Guerrero (2007) and Rebollar et al. (2008) the utilization of available resources has positive impacts for families and for the care and preservation of agroecosystems.

Use of Agroecosystems with Family Orchards

Food products from vegetable and animal origin that families consume from the AEFO are: fruits, leaves, stems, vegetables, eggs and milk. Families have the knowledge that consuming them is good because they grow them in natural way free from chemicals. They consider that family orchards contribute to their health because they know where products come from, the incomes they use for their production, and the water quality with which they are irrigated. According to Colín et al. (2012), Santana et al. (2015) and Chablé et al. (2015), the main function of the AEFO is to meet food requirements; products from agroecosystems that families consume are varied and provide quantity and variety to their family diet.

Families get income when they have surplus production from their family orchards, which they can then sell or barter with. Self-consumption provides savings because the family does not have the need to buy products obtained from their agroecosystem. Vegetation provides them a pleasant climate, because the temperature is more uniform during the day and gives off more humidity that contributes to a comfortable home. García et al. (2016a) categorize these benefits in environmental services and life quality contributions. Other benefits mentioned by these authors are those ethic-aesthetic, scientific-educative and recreational, which include: nature care, improving home appearance, opportunities for learning to use resources, having a space for familiar connivance, and disposing a place for children's games. Juan (2013) classifies these benefits in environmental, social, cultural and economic categories.

Family labour distribution for taking care of agroecosystems promotes family interaction and relationships with neighbours. At the time of exchanging products or knowledge, they enhance family union. This encourages social cohesion in a community. These systems are used for recreational activities, social events and knowledge sharing (Juan, 2013; Rivas and Rodríguez, 2013; García et al., 2016b).

Analysis of Peasant Knowledge accordance to Knowledge Origin, Application, Depth level and Transmission

Through participative workshops, we identified the knowledge that people have in these communities. It is important to emphasize that their main activity is agriculture, and for that reason, knowledge acquired is in an empirical way, meaning through the help that children give to their parents with seeding, cultivation and harvesting agricultural activities.

The average age at which children learn field work is 4 years old. During childhood, they observe and practice; parents explain to them orally how to plant and cultivate. During adolescence, they have acquired knowledge that is reinforced through daily field work. Thus, in adulthood they are able to develop agricultural tasks. This process contributes to their interest in having family orchards.

During experience exchanges at the workshop, the concept and definition of a family orchard was discussed; participants identified that they have a limited idea of agroecosystem characteristics. It should be noted that when referring to a family orchard, they relate mainly to the horticultural area, and do not perceive that trees, shrubs, the water tank, composting area and yard are also part of this integrated system. One possible explanation for this conception is related to some courses they have taken, in which a family orchard is equated to a horticultural area.

In-depth reflection at this stage yields knowledge about the agroecological techniques analyzed in this research; specifically, there is full awareness of the benefits obtained from natural resources, water and soil care. In general, participants are convinced about the importance of the AEFO for family

subsistence and for their health, because by these means, they consume foods that do not contain agrochemicals and cultivate their food in natural forms.

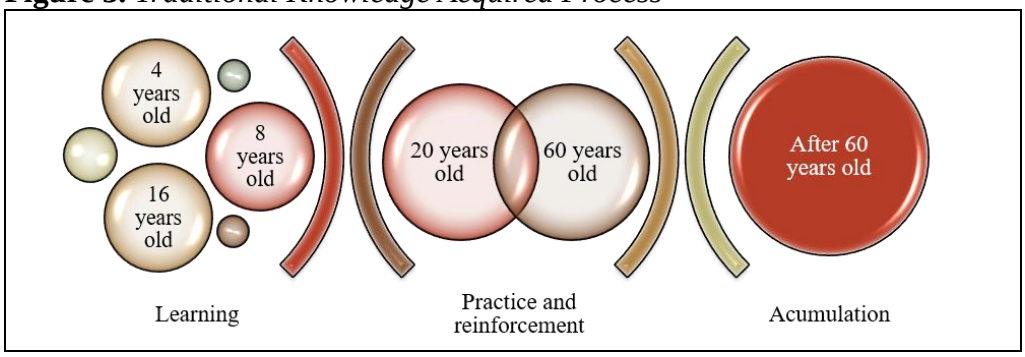
Regarding knowledge transmission, they do not transmit their diverse agroecological techniques, especially the use of plow with *yunta* and cattle manure as fertilizer. They do not teach their children to work in the fields, because they consider that formal studies in schools will be of major benefit to them. Likewise, they generally consider specialists' advice to be more valuable. This situation is worrying for the state of ecological knowledge, which is decreasing; it is being replaced by what they receive in trainings. In this sense, there is a greater specialization, but *cosmovision* and *praxis* are losing importance within peasant knowledge.

There are very few participants who consider that traditional agroecological knowledge has increased, and they still practice agricultural techniques adapted to their environment. In a contradictory way, they think their children will no longer transmit this knowledge to their descendants; and although most of them consider it important to teach ancestral techniques, only a few do so.

Peasant Traditional Knowledge Systematization about Family Orchards

The obtained information revealed important aspects of the knowledge acquisition process for the management of family orchards. Figure 3 illustrates how this is obtained. Among these phases we consider origin, application, transformation and transmission of traditional peasant knowledge.

Figure 3. *Traditional Knowledge Acquired Process*



Learning: Knowledge Acquired

Since children are starting to learn, they observe how their parents work; in this way, their interest in learning from and collaborating with their parents begins. At this age, they perform activities as games. For example, they irrigate plants with small buckets that their parents have given to them, tear off herbs in crops or orchards, cut flowers and fruits from trees or plants, and pick up trash that has been thrown on the ground. While doing these actions, they develop their first ideas of what to do to take care of plants, shrubs or trees. In this learning process, they may make mistakes and cut immature fruits or tear off

plants that have been sown; however, this helps them to discover the right way to do things.

Around 8 years old, the stage of game-learning ceases, and children begin to consciously learn about agricultural work. At this age, they already have the reflection capacity concerning what they are doing, and so they analyze why they are doing it. Thus, they gain the ability to relate activities with their customs, traditions and beliefs. In the case of Progreso Hidalgo community, parents pay children to carry out their work; with the received money, they can decide what to buy. In other communities, parents do not pay the children directly; however, they may buy them the candies or clothes they want.

At 16 years old, children become young adults and decide to study or work. At this moment, they feel themselves prepared to be hired to work on their own, unlike the two previous phases. Starting from this age, they may be subject to a full-time working day and receive payment. Until they are 20 years old, they will acquire more knowledge that will allow them to reinforce what they have already learned. At this age they associate crop cycles with rain season, moon cycles, terrain characteristics, and climatic conditions, among other factors that allow them to develop their agricultural activities.

Practice and Reinforcement: Application and Transformation of Knowledge

From 20 to 60 years old, they develop their agricultural labors, applying their knowledge and practicing what they have learned regarding agriculture. It is also during this period that they take into account strategies to increase their knowledge; this may occur through training, technical advice or receiving information from courses, workshops and talks between friends who share their own experiences that have given them good or bad results.

Knowledge Accumulation: Transmission

After the age of 60, they are hardly interested in learning, attending courses or changing their activities. They believe learning is no longer necessary, and consider that what they know already is enough. This is common because they have used their methods all their life and these have functioned for them. Their energy and ability to move also begin to diminish. Despite this situation, they have an integrative vision of the agricultural cycle, and their knowledge allows them to infer the proper time to prepare land, predict frosts or intense rains, associate crops and forecast if it is a good year to sow.

Discussion

Van der Wal et al. (2011), Colín et al. (2012), Juan (2013), Chablé et al. (2015) García et al. (2016 consider the agroecosystems of family orchards to include the same components that were identified in this research: house, yard or corridor, composting zone, water tank, orchard, horticultural area and animal

barnyard. However, zoning, composition, distribution and ordering of subunits depends on terrain configuration, as well as on climatic, topographical and soil factors.

Families carry out the care and maintenance of the AEFO in traditional ways, using tools such as a *machete*, hoe and *coa*, designed according to environmental and cultural characteristics. For Méndez and Gliessman (2002) and Altieri (2009), a feature of agroecosystems is that they involve labor, use traditional techniques, and do not use chemical inputs.

Knowledge of agroecosystem management provides families an important source of food. According to Toledo et al. (2008), Juan (2013), and Rivas (2014), family orchards provide multiple benefits and products, the main use of which is family consumption. Guerrero (2007), Palacios and Barrientos (2011) and Jiménez et al. (2011) consider that these systems contribute to household food security. In the same sense, White et al. (2013) consider that families obtain medicinal plants that help them to treat minor illnesses and cultural filiation symptoms.

The continuous and systematic observation of agroecosystem functioning allows people to transmit the knowledge they possess for the improvement and formation of family orchards to new generations. Calvet-Mir et al. (2014) consider family orchards to be reservoirs of vegetable species, as well as cultural and genetic diversity. It is an agroecological practice transmitted from generation to generation, from parents to children, and therefore it becomes traditional knowledge. For Toledo et al. (2008), adaptation, as well as biological conservation, is favorable based on uses and applications of the species. Knowledge that is maintained and reproduced by families in the AEFO has led them to generate cultural management, acquired through empirical activities, which is then shared with children, grandchildren and neighbors.

Conclusions

The family orchard is a peasant strategy developed by several generations and based on traditional knowledge that has led families to maintain, adapt and conserve agrobiodiversity. In the management of agroecosystems, culture is involved because families implement community customs, traditions and beliefs. These reflect on the use, application and practice of knowledge linked with local conditions in social, economic, environmental, cultural and political contexts.

Uses of the AEFO are decided by families and defined by interests in obtaining food, based on species richness and presence of family orchard components. However, there are problems due to limited space, reduced water availability, lack of interest for this practice, and limited knowledge transmission. Acquisition of knowledge arises with empirical practice; application and transformation of knowledge is achieved by continuous working and maintaining of the agroecosystem, and increases along people's lives; the transmission of knowledge is passed from parents to children, through oral form.

References

Altieri, M. (2009). *Vertientes del pensamiento agroecológico: fundamentos y aplicaciones* [Aspects of agroecological thought: fundamentals and applications]. Medellín, Colombia. SOCLA.

Cahuich, D. L. Huicochea and R. Mariaca. 2014. *El huerto familiar, la milpa y el monte Maya en las prácticas rituales y ceremoniales de las familias de X-Mejía, Hopelchén, Campeche* [Family gardens, cornfields and forests among the Maya: the ritual and ceremonial practices of families in X-Mejía, Hopelchén, Campeche]. Relaciones, 35 (140): 157-184.

Calvet-Mir, L. T. Garnatje, M. Parada, J. Vallés and V. Reyes. (2014). *Más allá de la producción de alimentos: los huertos familiares como reservorios de diversidad biocultural* [Beyond food production: home gardens as safeguards biocultural diversity]. Ambiente, 107: 1-15.

Chablé, R., Palma, D., Vázquez, C., Ruiz, O., Mariaca, R., and Ascensio, J. (2015). *Estructura, diversidad y uso de las especies en huertos familiares de la Chontalpa, Tabasco, México* [Structure, diversity and use of species on home gardens of la Chontalpa, Tabasco, Mexico]. Ecosistemas y recursos agropecuarios, 2 (4), 23-39.

Chávez, J. (2006). Learn from experience. A methodology for systematization *Aprender de la experiencia. Una metodología para la sistematización.* LEISA, Lima, Perú.

Colín, H., Hernández, A., and Monroy, R. (2012). *El manejo tradicional y agroecológico en un huerto familiar de México, como ejemplo de sostenibilidad* [Traditional and agroecological management for home garden at Mexico, as an example of sustainability]. Etnobiología, 10 (2), 12-28.

Garnatje, T. L. Calvet-Mir, M. Parada, M. Rigat, J. Vallés and V. Reyes. (2011). *Los huertos familiares del pirineo. Aproximaciones Etnobotánicas y Etnoecológicas del Pirineo Catalán* [Home gardens of Pyrenees. Ethnobotanical and Ethnoecological Approaches of the Catalan Pyrenees]. Métode, 72: 73-76.

García, E. (1982). *Modificaciones al sistema de clasificación climática de Köppen* [Modifications to the Köppen climate classification system]. Instituto de Geografía, UNAM, 252 pp.

García, J. C., Gutiérrez, J., Balderas, M., and Araújo, M. (2016a). Sociocultural and environmental benefits from family orchards in the Central Highlands of México. Bois et forets des tropiques, 329 (3): 29-42.

García, J. C., Gutiérrez, J., Balderas, M., and Araújo, M. (2016b). Livelihood strategy in the rural area of the Mexican Central Highlands: The family vegetable garden. Agricultura, Sociedad y desarrollo, 13 (4): 141-161.

García, J. C., Gutiérrez, J., Balderas, M., and Araújo, M. (2016c). *Aprovechamiento de huertos familiares en el altiplano central mexicano* [Use of family orchards in Mexican Central Highlands]. Revista Mexicana de Agroecosistemas, 3 (2): 149-162.

Guerrero, A. (2007). *El impacto de la migración en el manejo de solares campesinos, caso de estudio La Purísima Concepción Mayorazgo, San Felipe del Progreso, Estado de México* [The impact of migration on House gardens management in La Purísima Concepción Mayorazgo, San Felipe del Progreso, State of Mexico]. Investigaciones Geográficas, 63: 105-124.

Gutiérrez, J. (2013). *La Investigación Geográfica. Fundamentos, Métodos e Instrumentos* [Geographical Research. Fundamentals, methods and instruments]. Dunken. Buenos Aires, 149pp.

INEGI (Instituto Nacional de Estadística, Geografía e Informática) (2010). *XIII Censo Nacional de Población y Vivienda* [XIII National Population and Housing Census]. Instituto Nacional de Estadística, Geografía e Informática. México, D. F.

Jara, O. (2012). *Sistematización de experiencias, investigación y evaluación: aproximaciones desde tres ángulos* [Systematization of experiences, research and evaluation: approximations from three angles]. Educación global. 1: 56-70.

Juan, J. (2013). *Los huertos familiares en una provincia del subtrópico mexicano. Análisis espacial, económico y sociocultural* [Home gardens in a province of the Mexican subtropics. Spatial, economic and sociocultural analysis]. Eumed. 136.

Mariaca, R. (2012). *El huerto familiar del sureste de México* [The home garden of southeastern Mexico]. Tabasco, México: ECOSUR.

Massieu, Y. and Chapela, F. (2007). *Valoración de la biodiversidad y el conocimiento tradicional: ¿un recurso público o privado? En: Biodiversidad y conocimiento tradicional en la sociedad rural: entre el bien común y la propiedad privada* [Valuing biodiversity and traditional knowledge: a public or private resource? In: Biodiversity and traditional knowledge in rural society: between the common good and private property]. CEDRSSA, México. 117-134.

Méndez, E. and Gliessman, S. (2002). *Un enfoque interdisciplinario para la investigación en agroecología y desarrollo rural en el trópico latinoamericano* [An interdisciplinary approach for research in agroecology and rural development in the Latin American tropics]. Manejo integrado de plagas y agroecología, 64: 5-16.

Montañez, P., Ruenes, M., Ferrer M. and H. Estrada. (2014). *Los huertos familiares Maya-Yucatecos: situación actual y perspectivas en México* [Home gardens Maya-Yucatecan: current situation and prospects in Mexico]. Ambienta, 107: 100-109.

Palacios, V. and Barrientos J. (2011). Importance of the home garden for food security. Case of the Camëntsá indigenous community from Sibundoy Valley, Colombia. *Importancia del huerto casero en la seguridad alimentaria. Caso de la comunidad indígena de Camëntsá del valle de Sibundoy, Colombia*. CienciAgro, 2(2): 313-318.

Rebollar S., Santos V., Tapia A., Pérez C. (2008). Home gardens, a Chancah Veracruz, Quintana Roo experience. *Huertos Familiares. Una experiencia en Chancah Veracruz, Quintana Roo*. Polibotánica, 25: 135-154.

Rivas, G. (2014). *Huertos familiares para la conservación de la agrobiodiversidad, la promoción de la seguridad alimentaria y la adaptación al cambio climático* [Home gardens for the conservation of agrobiodiversity, the promotion of food security and adaptation to climate change]. Ambientico, 243: 4-9.

Rivas, G. and Rodríguez, A. (2013). *El huerto familiar: algunas consideraciones para su establecimiento y manejo. Una forma de contribuir a la seguridad alimentaria* [Home garden: some considerations for its establishment and management. A way to contribute to food security]. Turrialba, Costa Rica. CATIE, 38.

Santana, M., Navarrete, D., and Mateo, J. (2015). *Riqueza de especies en huertos caseros de tres municipios de la región Otomí Tepehua, Hidalgo, México* [Species richness in home gardens of three municipalities of the Otomi Tepehua region, Hidalgo, Mexico]. En: F. Montagnini, E. Somarriba, E. Murgueitio, H. Fassola y B. Eibl (Coord.), Sistemas agroforestales. Funciones productivas, socioeconómicas y ambientales. Turrialba, Costa Rica. CATIE. pp. 405-422

Selener, D., Zapata, G.. and Purdy, C. (1996). Documenting, evaluating and learning from our development projects: a participatory systematization workbook.

International Institute for Rural Reconstruction (IIRR), Y. C. James Yen Centre, Silang, Filipinas.

Toledo, V. (2005). *La memoria tradicional: la importancia agroecológica de los saberes locales* [Traditional memory: the agroecological importance of local knowledge]. Leisa, 20 (4): 16-19.

Toledo, V., Barrera, N., García, E., and Alarcón, P. (2008). *Uso múltiple y biodiversidad entre los mayas yucatecos (México)* [Multiple use and biodiversity within the Mayan communities of Yucatan, Mexico]. Interciencia, 33 (5): 345-352.

Van der Wal, H., Huerta, E., and Torres, A. (2011). *Huertos familiares en Tabasco: Elementos para una política integral en materia de ambiente, biodiversidad, alimentación, salud, producción y economía* [Home gardens in Tabasco: Elements for an integral policy on the environment, biodiversity, food, health, production and economy]. ECOSUR, México.

White, L., Juan, J. I., Chávez, C., and Gutiérrez, J. (2013). *Flora medicinal en San Nicolás, municipio de Malinalco, Estado de México* [Medicinal plants in San Nicolas, Malinalco County, State of Mexico]. Polibótanica, 35: 173-206.