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ARTIGO

HOME GARDENS IN LATIN AMERICA: WILD FOODS IN THE MESOAMERICAN EKUARO OF P'URÉPECHAS, MEXICO AND THE ANDEAN CHAKRA OF KICHWAS, ECUADOR

HUERTOS DOMÉSTICOS EN AMÉRICA LATINA: ALIMENTOS SILVESTRES EN EL EKUARO MESOAMERICANO DE P'URÉPECHAS, MÉXICO Y LA CHAKRA ANDINO DE KICHWAS, ECUADOR

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Abstract:

Agroforestry systems comprise important spaces for biodiversity involving traditional ecological knowledge in their management. In Latin America, within Mesoamerican region as well as Andean exists a prominent kind of agroforestry system called home gardens, distinguished by the presence of domesticated plants and animals, coexisting with wild foods. In this paper, we addressed a comparative view on home gardens between p'urhépecha *ekuaro* and kichwa *chakra* to document qualitatively the relationship between diversity of wild food and food sovereignty in Mesoamerica and Andean regions, within a context of cultural change, and to contribute to the discussion of wild-domesticated continuum related to plants in different home gardens. The ethnographic research shows three main elements: 1) that the diversity of forms of lives domesticated and wild that coexist in the home gardens form part of a food sovereignty system; 2) cultural change does not just affect home gardens in negative ways; 3) wild foods are in a very complex process of domestication in which it is difficult to define the lines between wild and domesticated. Wild food studies have to consider a broad approach to how wild food relates to human cultures.

Keywords: wild food; ekuaro; chakra; agroforestry system.

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Resumen:

Los sistemas agroforestales constituyen importantes espacios para la diversidad e involucran conocimientos ecológicos tradicionales en su manejo. En América Latina, por ejemplo en Mesoamérica y Andes existen diversos tipos de sistemas agroforestales representativos de cada región. Estos espacios son huertos familiares y se caracterizan por la presencia de plantas y animales domésticos que coexisten con especies silvestres y que son considerados alimentos. En este artículo mostramos un estudio de los huertos familiares de la región p'urhépecha denominados *ekuaros* y la zona andina, como es la *chakra,* documentamos cualitativamente la relación entre la diversidad de alimentos silvestres y la soberanía alimentaria en Mesomaérica y Andes, particularmente entre pueblos p'urhépechas y cayambis. Documentos aspectos de cambio culturaly contribuímos a la discusión sobre los alimentos que se encuentran en un continuo entre lo silvestre y lo domesticado. El trabajo etnográfico realizado mostró tres elementos principales: 1) la diversidad de formas domésticas y silvestres que coexisten en los huertos familiares y forman parte de los sistemas de soberanía alimentaria. 2) el cambio cultural no solo afecta a los huertos familiares demaneras perjudiciales, en algunos contextos ha promovido su diversificación. 3) los alimentos silvestres se encuentran en procesos complejos de domesticación, en estos escenarios es dificil definir las lineas entre lo doméstico y lo silvestre. Concluímos que los estudios sobre alimentos silvestres deben considerar enfoques más amplios para comprender cómo se relacionan con los cambios culturales que se experimentan a escala local.

Palablas-clave: alimento silvestre; ekuaro; chakra; sistema agroforestal.

1. Introduction

Traditional agroforestry systems are considered important strategies to maintain genetic diversity, soil conservation, water harvest, and also to conserve the knowledge associated with nature in traditional and local communities (ALTIERI *et al.*, 2013, MORENO-CALLES *et al.*, 2016). There are many different traditional agroforestry systems characterized by the management of domestic species, as well as wild species of plants and animals that are relevant for food sovereignty in local contexts. There are several agroforestry systems identified at a regional level in Mexico and the Andean highlands, from agroforests and backyards to terraces and wetlands. These systems varied in terms of location, size, as well as the kind of human management involved (Table 1) (CALVET-MIR *et al.,* 2014). One interesting traditional agroforestry systems is the so-called home garden (CALVET-MIR *et al.,* 2014).

Home gardens are a kind of traditional agroforestry systems. They are more compact than large productive fields, they are located close or even directly adjacent to dwellings, they are an extension of the domestic sphere usually managed by women, and produce is usually for home consumption. Home gardens are especially important because they are intensively intercropped, irrigated, composted, and vigorously tended year-round. In these small spaces families preserve traditional domesticated and wild species of plants and animals, and also test agricultural innovation and new cultivation techniques (CALVET-MIR *et al.* 2014, FINERMAN *et al.* 2003; MEHMOOD ABBASI *et al.*, 2013).

Wild foods are components of home gardens in Indigenous and local contexts (FINERMAN *et al.,* 2013; MEHMOOD ABBASI *et al.,* 2013; FREEDMAN 2015). Some of these plants are brought from the forest to the home garden by people and by natural mechanisms of dispersal (FREEDMAN, 2015; LADIO *et al.,* 2015). It is important to note that many wild plants and animals are in different levels of domestication processes (CASAS and PARRA 2016). The presence of and caring for wild plants in home gardens is due to their importance within Indigenous and local diets (FREEDMAN, 2015). Rapaport and Ladio (1999) estimated that 25% of the world's flora corresponds to edible plants, of which 92% is wild, hence, the importance of these plants for food sovereignty and culinary culture is enormous (RAPAPORT and LADIO 1999).

Table 1. Definitions of main traditional agroforestry system

Name	Definition
Home garden	Small-scale traditional agroforestry system containing several edible species of plants (domesticated and semi-domesticated) as well as animals. Also known as dooryard garden or roof garden.
Milpa	Mesoamerican term referring to extensive cultivate crops of commercial and subsistence value which can be away from the main settlement.
Ekuaro	Complex traditional agroforestry system of Michoacán, Mexico developed by P´urhépecha culture, which could be part of humans settlements related to agriculture, agroforestry and cattle rearing.
Chakra	The notion of the chakra is spreading throughout the Andean world. The word is used as a general term to refer to extensive fields as well as home gardens.

In Mexico and Ecuador (Mesoamerican and Andean cultural regions respectively), whilst the uses of wild foods have been documented in quantitative and qualitative studies (FINERMAN *et al.,* 2013; ORDOÑEZ, 2018; GORTAIRE, 2016), comparative efforts have been absent in ethnobiological and anthropological literature. Although the farming systems of the Kichwas of Pesillo and P'urhépechas of Cherán are not the only home gardens systems present in Mesoamerica and the Andes, they are representative of the biocultural diversity of regions. Also, the home gardens constitute an example of the microscale productivity present in these areas. In addition, they are part of a tradition of research on the two regions where the particular case studies are contributions that compare the two regions (LÓPEZ AUSTIN, 1995; LÓPES AUSTIN and MILLONES 2008, 2012; RAMOS, 2018; SALOMON, 1986).

Comparison between agroforestry systems is relevant insofar as it is situated in wider discussions about domestication process and also about food sovereignty and culinary culture. Ethnographic comparison could enrich our understanding about the link between the diversity of wild foods and cultural change.

The aims of the current work are: To document qualitatively the relation between diversity of wild food and food sovereignty in Mesoamerica and Andean regions; To analyze the position of wild food within a context of cultural change; To contribute to the discussion of wild-domesticated continuum related to plants in different home gardens.

2. Material and Methods

The ethnographical fieldwork at Cherán K'eri and Pesillo focused on understanding the content of traditional ecological knowledge that underlies wild food living in traditional agroforestry system. Both results are part of a master degree thesis in the case of Cherán K'eri and a PhD thesis in the case of Pesillo. In each community the authors made stances of several periods of time to accomplish a year: 2015 in Cherán and 2015-2016 in Pesillo. Both ethnographies were conducted with participant observation, and with snowball method, we participated in several agricultural situations, also we participated with women of the community and we helped them with the home-gardens care. We use qualitative methods that include non-positivists ways to interview people, but interact with them in their daily lives (GUBER, 2001).

We will describe the size and structure of home gardens, the distribution of space, the diversity of wild species, their phenology and ecology, as well as the integration of human activities into the landscape. To achieve this, we spent long periods of time with people going about their daily lives, employing different ethnographic techniques including corresidence, informal interviews and participatory trails through the home gardens to identify cultural values and sociocultural constraints around agriculture and livestock. All the species referred to by the people were registered and listed in table 2 and 3.

We chose 3 categories to identify wild plants and animals, these categories are: "Wild" (W) to what people and literature termed as wild related to plants and animals; "Domesticated" (D), to plants and animals identified as domesticated in literature and also by people; and "Wild-Domesticated" (W,D) to plants and animals in different phases of domestication, including wild varieties of plants and another managed in different intensity.

Both communities are examples of Latin American towns in which tradition and modernity coexist, maintaining by social or political processes, a latent cultural identity reflected in home gardens.

2.1 Chéran K'eri

Cherán K'eri is located in the middle of P'urhépechas Plateau, in the state of Michoacán, Mexico. The region is characterized by a temperate semihumid climate, with an annual average of 1200 mm of rain. The community harbors large coniferous forest composed mostly of pines and oaks (*Pinus patula, P. montezumae, P. pseudostrobus, P. oocarpa, P. leiophylla, P. michoacana, Quercus crassipes* and *Q. laurina)* (Fig. 1a, 1b) (INEGI 2012; PEDRAZA *et al.,* 1996).

Cherán K'eri has experienced significant environmental transformations over the last century. During the first half of the twentieth century, the forest was the principal resource for firewood, construction materials, timber, *tejamanil* (roofing), charcoal, and poles. During 1960s a boom in the extraction of pine resin was followed by the emergence of a new technique for preparing turpentine. While these activities are still practiced, they are no longer the principal economic drivers (BEALS, 2014; CALVEIRO,2014).

Initially, fieldwork was developed using the ethnographic snowball method starting with a single family and later living with other families. We employed participant observation and participatory mapping to record structural forms of traditional home

gardens (*ekuaro* in the P'urhépecha language), useful species of plants, trees and fungi, as well as the animals they kept in *ekuaro*. Plants, trees, and animal species referred by people were identified consulting the Digital Library of Mexican Traditional Medicine (2009) and by consulting specialists on corresponding taxa. Finally, we studied specific examples of *ekuaro*'s owners and analyze semi-structured interviews to understand how traditional ecological knowledge is embedded in the reproduction of home gardens.

2.2. Pesillo

The second case study was undertaken in the state of Cayambe in the north-Andean region of Ecuador, which is home to the Kichwa Indigenous community of Pesillo. Pesillo is located near Cayambe-Coca National Park, which encompasses a wide diversity of ecosystems, from upper highlands to Amazonian rainforest. Pesillo is situated at 3,000 m above sea level, among extensive plantations and terraced mountains. The seasonal fluctuation in Pesillo is between 15 and 16ºC, and there are several springs and two principal lakes: San Marcos and Puruhantag (Fig. 1c, 1d) (BECKER, 2009).

In general, Pesillo has a humid climate and an abundance of water, as it is located close to the Cayambe volcano. The volcano's slopes harbor several species of orchids, mosses, ferns, and giant bromeliads, locally known as *achupallas* (*Puya* spp.), as well as wild fauna such as the Andean white-tailed deer (*Odocoeilus virginianus*), the Andean bear (*Tremarctos ornatus*), and the Andean condor (*Vultur gryphus*). Primary forest has disappeared except for some native trees such as *Quishuar* (*Budleja coriacea*), *Yagual* (*Polylepis reticulata, microphylla*) and *Pumamaquis* (*Oreopanax ecuadorensis*) (SALOMON, 1986).

During the last half of 2016 and the first half of 2017, we employed different ethnographic techniques such as corresidence with elderly women, the only ones in Pesillo maintaining home gardens, or *chakras*. Most of the water consumed is used for irrigating fields for the rearing of dairy cows, which is now the main economic activity. Our ethnographic strategy involved the use of the snowball method to identify the people keeping and cultivating home gardens, which were seven elderly women. In addition, we undertook participant observation and indirect interviews to record the ways home gardens was maintained.

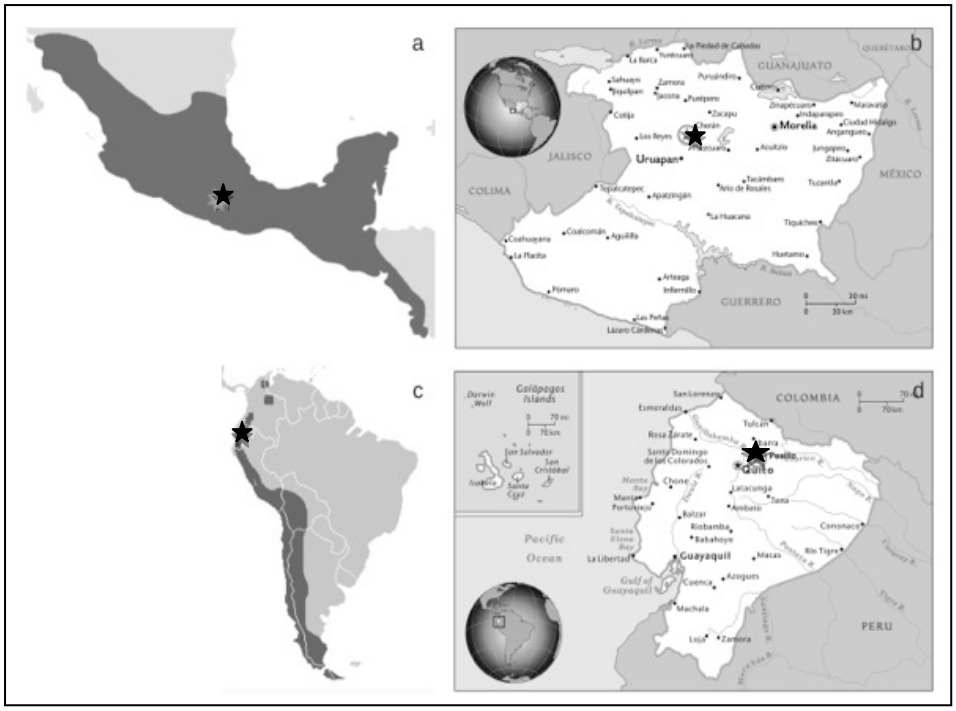

Figure 1: Locations of study in Mesomerica an Andean regions. a) Michoacan State in México and Mesoamerica; b) Cherán location in Michoacan State; c) Location of Ecuador in Andean region; d) Location of Pesillo, Ecuador. This figure was elaborated by the authors using Qgis.

We paid special attention to aspects of life stories to find out how people coped with socio-ecological factors such as migration and market forces. Additionally, we organized a workshop with younger people interested in the importance of native agriculture with 15 women, which enabled us to identify what species were preferred and considered important, and also which wild species had special cultural utility. The recognition of species mentioned during interviews and in the workshop was completed by a review of Encyclopedia of Useful Plants of Ecuador (DE LA TORRE *et al.,* 2008, RÍOS, 2008).

3. Results and Discussion

We are interested to shed light on similarities and differences about two representative Indigenous agroforestry systems, that potentially afford insights to understand cultural dynamics in Mexico and the Andean region in terms of relations between human, plants, trees and animals.

Unlike the *milpa*, the *ekuaro* are mainly dedicated to production for family consumption and include a variety of plants and trees growing together and sharing soil, water, and nutrients (Table 2 and 3) (FRANCI-GAONA et al., 2016). Our interviews indicate that *ekuaros* in Cherán K'eri have a variety of characteristics. Locally, in addition to using the term *ekuaro*, the people of Cherán K'eri also use the term *solar* as synonym. Some gardens are extensive (900 m^2) and others are small (25 m^2). Some houses simply have plants and trees in pots and other containers. Species density in gardens with potted plants is determined by the people who care for them and by the availability of containers in which plants can grow. For example, it is possible to find

maize (*Zea mays*), *nopal* (*Opuntia* spp.), and fruit trees planted in small spaces, in drums, pots, buckets, baskets, or jars.

On the other hand, in the Kichwa language, the term *chakra* refers to traditional seeds and crops from the Andean region. Although this term often refers to extensive fields of crops, it is also used to name the backyards within the houses. In the center of the village, home garden lots may measure 800 m^2, while on the edge of town, home gardens are found on lots of 1,200 m^2 surrounded by adobe walls. *Chakras* are usually divided into two sections: one by the front entrance to the main house, which contains wild species of medicinal plants, and one at the back, next to where pigs and other animals coexist, which contains trees, vegetables, grains, and tubers. The difference between the size of *ekuaros* and *chakras* derives from the fact that Cherán K'eri is more urbanized than Pesillo, which lead to a wide space in this last one.

One important feature in common between *ekuaros* and *chakras* is that women are the main keepers of these agriculture systems, although in Cherán K'eri these women are younger than in Pesillo, where elderly women are the only ones who nurture this kind of *chakra*. Nevertheless, one striking contrast concerns the kind of agriculture being developed in Cherán K'eri, which is intensive and vital for the economy of the people, and the scarce crops that remain in Pesillo as a result of the increase in cattle rearing.

The vitality of agriculture within *ekuaros* is reflected in the diversity of activities of women, who use containers to cultivate useful plants, a practice which has some important consequences. First, it is a way of recycling otherwise unwanted refuse. Second, it expands the area available for cultivating domesticated and wild plants.

Our results show that in Andean *chakra* there are 18 different species of wild plants and animals, whilst in Mesoamerican *ekuaro* there are 13 wild plants and animals, the number of species existing in both home gardens is very limited, sharing eight species, most of them domesticated ones (Table 2 and 3). Comparing with domesticated plants, the amount of wild or wild-domesticated plants and animals is very similar, for Pesillo (Andean *chakra*) is 42% and for Cherán (Mesoamerican *ekuaro*) 39% of the total plants and animals in each home garden. Most of the wild plants present in both *ekuaro* and *chakra* are medicinal or food and, in some cases, they support in different ways the food system, for example as wood for fire (Table 2 and 3, figure 2).

Ekuaros contain species of trees that have been used traditionally by P'urhépechas, such as apricot (*Prunus armeniaca*), *tejocote* (*Crataegus mexicana*), *capulín* (*Prunus serotina*), *zapote* (*Casimiroa edulis*), *higo* (*Ficus carica*) and *colorín* (*Erythrina americana*), among others, some of them are considering wild (Figure 3). The plants and living forms in the e*kuaro* are an integral part of people's livelihoods in Cherán K'eri. This importance has grown since 2011, when the local government became autonomous and the community reinforced their traditional way of living at a jurisdictional level in accordance with their own worldview.

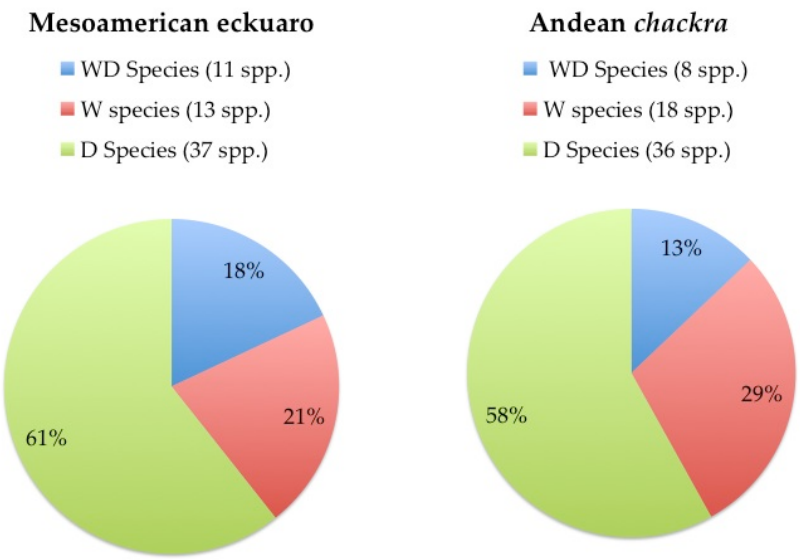

Figure 2: Wild, domesticated and wild-domesticated pants and animals in Mesoamerican *ekuaro* and Andean c*hakra*. This figure was elaborated with data obtained during this research.

Imelda Campos told us that throughout P'urhépecha history, the maintenance of *ekuaros* is invaluable. When a couple is married, the man is responsible for the *milpa*, whereas the woman takes care of activities within the home. She guarantees food security and the diversity of the vegetables produced during the year, especially the diversity of their daily food intake. It means that the *ekuaro,* its structure and importance, is tied to traditional kinship structures and the history of what it means to be a P'urhépecha.

Figure 3. *Ekuaro from Cherán, the owner is Imelda Campos. Picture by Tania González-Rivadeneira*

In contrast, some of the trees in Pesillo are native non-domesticated species such as *polylepis* (*Polylepis spp.)* and *pumamaque* (*Oreopanax ecuadorensis*) used to building fences, and for medicinal purposes such as *aliso* (*Alnus glutinosa*) and *lechero* (*Euphorbia laurifolia*) (Figure 4). Other trees like the eucalyptus (*Eucalyptus spp.)* provides firewood to cook in the traditional stove named *tulpa*. Some of the Pesillo home gardens are large enough to provide an annual harvest. Likewise, the peasants explained why they cultivate certain crops such as maize and quinoa in a particular season of the year, completing the annual cycle by alternating with root crops. All these decisions stem from a cosmological and geographical understanding of the Cayambe region; Graciela Alba explained that all agricultural practices at Pesillo are subject to a sacred calendar, depicted in the *chakana*, or Andean cross.

Now, in terms of wild food provided by *ekuaros*, throughout the year, the plants in the Cherán K'eri home garden provide a varied diet, for example *nopales* (*Opuntia spp.*), *quelites* (*Amaranthus spp.)* and *verdolagas* (*Portulaca oleracea*), which serves to prepare soup and a traditional dish called *atapakua*. Another example is the domesticated fruits collected from the trees of peach (*Prunus persica*), guava (*Psidium guajava*), pear (*Pyrus communis*) and *capulín* (*Prunus serotina*), as well as schrubs like the blackberry (*Rubus spp.)* are used to prepare sweets, desserts, and preserves, and to feed children (Figure 3). These species in *ekuaros* can be found with a different gradient of domestication,whilst the wild varieties can coexist in the same home gardens (VIBRANS, 2016).

The management of fruit trees, wilds and domesticates, is based on traditional ecological knowledge, with significant consequences for the domestication process. For example, hybridization is performed mostly by Ángeles Rojas, with her peach and plum trees. Years ago, she grafted a cutting from a neighbor's tree that has red flowers. The resulting blooms were pink and the fruits sweeter than she had previously.

There were several women who told stories about grafting cuttings to obtain sweeter fruits. Knowing the taste of the fruits from the color of the flowers derives from direct observation, but also from learning processes between the members of the community. Ángeles Rojas mentioned that she learned how to carry out the grafting procedure and to share cuttings for species improvement from a neighbor.

In contrast, the peasants of Pesillo are encouraged to grow and harvest a single crop of maize, quinoa, and peas per year, while most root crops and barley can be harvested twice. The main crops that provide food are maize (*Zea mays*), which serves to prepare *morocho*, a beverage that could be sweet or salt, whereas the quinoa (*Chenopodium quinoa*) could be prepared fried or as a soup. Another kind of herbs are the representative tubers of Andean region such as potatoes (*Solanum tuberosum*), *mashua* (*Tropaeolum tuberosum*) and *oca* (*Oxalis tuberosa*), which are eaten usually cooked. Especially *chochos* (*Lupinus mutabilis*) are a very valuable source of protein, which usually are consumed with a kind of corn named *chullpi*.

Besides agriculture, the rearing of animals has undergone particular changes in Cherán K'eri, determined by political, cultural, and ecological circumstances. Previous studies recorded the consumption of wild animals such as deer (*Dama virginiana*), armadillo (*Dasypus novemcinctus*), rabbits (*Sylvilagus* spp.), among others (BEALS, 1992; ALCALÁ, 2000). Currently in Cherán K'eri, most adults claim to have consumed these types of animals at least once; however, that is not true for younger people.

Since 2011, public policies have been developed for the preservation of natural resources, protecting forest land, including wild animals, even those that occasionally feed on the *ekuaros*. The Community Property Council of Cherán K'eri Autonomous Governement, reports that there have been poaching events. If someone is caught, they must pay a fine, and the animal is given to the community deer rescue center. Magdalena Durán mentions that she has not eaten mountain animals for more than 25 years, but that she has eaten deer, wild cat (*Lynx rufus*), armadillo (*Dasypus novemcinctus*), squirrel (*Spermophilus* spp.) and rabbit (*Sylvilagus* spp.) meat. She mentioned the scarcity of animals, the death of her husband, who was the hunter, and community policies as the reasons why the traditional ecological knowledge linked to consumption of wild meat has changed.

Figure 4. *Chakra from Pesillo. The owner is Isolina Ayala.Picture by Radamés Villagómez- Resendiz*

However, during the traditional feast of *Corpus Christi,* people do still go hunting for various animals, and *panaleros* collect honeycombs, which are placed on wooden structures for a traditional dance. Some people relocate several honeycombs in their *ekuaros* before celebration began and after the feast, the honeycombs are opened in the houses, where the honey and the worms or larvae of the bees and wasps are eaten; the most common genus of bees is *Polybia* (ARGUETA and CASTILLEJA, 2011; CASTILLEJA and ARGUETA, 2011).

In a similar vein, in Pesillo the consumption of wild animal meat is absent due to the presence of domestic animals such as Andean guinea pigs (*Cavia porcellus*) and chickens (*Gallus gallus domesticus*), which are kept until they are needed for a wedding or a funeral, whereas sheep (*Ovis aries*) and pigs (*Sus scrofa*) are reserved for the festivities of *San Juan* or *Inti Raymi* every June. According to Isolina Ayala, she prefers to fertilize her home garden with the droppings of her guinea pigs, which are richer than those of cows and sheeps (Figure 4).

The role of the cattle in both societies is an interesting contrast between Cherán K'eri and Pesillo, and deserves special mention. In the former, many families have dairy cows as part of a diversified mainly agricultural economy, whose milk is sold at market

as fresh cheeses, while in Pesillo, the main economic activity today is cattle rearing and breeding cows to produce milk, which creates considerable pressure to transform agricultural landscapes into grazing land. While it is true that cows are only used to produce milk, in Pesillo peasants consumed annually five or six cows for meat. In contrast, in Cherán K'eri beef is sold to butchers, but besides the meat that is sent to market, many women raise their own animals, mainly pigs, goats, sheep, and chickens, for daily consumption.

Likewise, animal fodder is derived from corn grown at the *ekuaro*, domestic food waste, and even vegetables that are not sold in the stores, while in the *chakras* more often cattle are feeding with foreign grassland introduced to enhance milk production. Another important difference concerns the economic value of the cattle, whereas in Cherán K'eri cattle implies the exploitation of meat for human consumption, in Pesillo cattle is used exclusively for milk production. In the former, whether pigs or cows, the animals reared offer women a kind of economic insurance, because if something happens in the family, they can sell their animals to pay medical costs, for a funeral, a marriage, or even a party. Whereas in Pesillo, when cows do not produce milk anymore their value decreases and people sell them as a byproduct.

The women interviewed in both regions concur that wild meat is a tasty meal, but one that should not be consumed very often, because it is not necessary, and because there are many more varieties of fresh vegetables available each season. These vegetables, for most of women could be found in the *ekuaro* as well as in the *chakra*, which has been built based on traditional knowledge and food preferences.

Finally, another important group of plants species growing in home gardens in the Mexican plateau and Andean highlands are medicinal herbs, which frequently are employed to treat physical and spiritual ills. However, in Pesillo their use are more frequently than in Cherán K'eri and the kind of herbs employed are mostly native from the ecosystem of *páramo,* such as *quinoa ataco* (*Amaranthus quitensis*), *marco* (*Ambrosia arborescens*), *chinchin* (*Azara microphylla*), *ortiga* (*Perilla frutescens*), *llantén* (*Plantago major*), among others, whereas in the *ekuaros* some of the main medicinal plants are not native like the chamomille (*Chamaemelum nobile*), sagebrush (*Artemisa mexicana*), among others.

Other striking contrasts have to do with traditional ecological knowledge underlying therapeutic practices. While in Pesillo theses labours are accomplished by *yachaks* and *curanderas* from ancient times, in Cherán K'eri, some women refer that a decade ago, a priest organized workshops to teach about medicinal plants. Nevertheless, in almost all of Mexican plateau communities there are therapeutic practices linked to *temazcal:* a construction of stone and mortar in which steam baths were taken, especially for pregnant women. In Cherán K'eri, at least one ekuaro had a *temazcal*.

In contrast, in Pesillo there are several stories that indicated therapeutic practices linked to medicinal herbs. For example Guillermo Colcha told us that if people walked alone in some places, environmental forces, or *mal aire* could affect them, causing fear and sickness. To treat these illnesses, they used wild herbs and plants that are available in the highlands, or *páramo*.

From this knowledge, systematized within the Andean worldview, we argue that traditional ecological knowledge, manifested in daily life, underlies many contemporary practices and inter-ethnic relations between villages and between

mountain and rainforest communities. According to Micaela Granados, people from Quijos and other Amazonian villages practice various kinds of witchcraft, which is often dangerous for the highland people. It is therefore important to keep medicinal herb species, which have been brought down from the mountains in their home gardens, or *chakras*.

Another example is Lolita Granados, who has a *chakra* surrounding her home, in which she has a considerable number of medicinal plants, hardly any domesticated crops, and just a few fruit trees, such as *chimpalo* (*Solanum caripense*) and *capuli* (*Prunus serotina)*. Similarly, Dolores Alba has a *chakra* behind her house, whereas at the front she hangs a row of dried maize known as a *wayunga*. In the back part of the house there are a row of *pencos* (*Agave americana*), valerians (*Valeriana officinalis*), and *marcos* (*Ambrosia arborescens*), which encircle the crops (Table 2).

Finally, Isolina Ayala has a larger lot on the edge of the village with a large area where she grows crops mixed with grazing for her five cows. In another area she keeps a medicinal *chakra* on which she grows herbs such as *cedron* (*Aloysia citriodora*), borage (*Borago officinalis*), and others. She has also introduced some exotic species such as sunflowers (*Helyanthus annuus*) (Table 2). Other plants, such as *juyanguilla* (*Basella ovobata*) and several kinds of nettle, grow naturally as her land is located on a slope, where the wind is very strong and pollen and seeds are dispersed.

Ekuaro and chakra in context of cultural change

The social context and economic constraints underlying the current use of wild food within home gardens use to be viewed negatively by some authors, especially regarding cultural change. For example, migration, the abandonment of agroforestry systems, the risk for food security and loss of traditional ecological knowledge are some of the consequences that allegedly threaten the cultural value of wild food in agroforestry systems (MORENO-CALLES *et al.,* 2016). However, these socio-ecological factors do not necessarily harm the practice of home gardening and sometimes involves non-intentional beneficial consequences.

In the case of Cherán K'eri, the main cultural changes that affect home gardens are emigration, the monoculture of maize, and market forces, which constitute factors that have influenced the transmission and reproduction of traditional ecological knowledge. Almost every family in Cherán K'eri has some relatives living in the United States or travelling there frequently. In 2011, when Cherán K'eri was experiencing a conflict situation due to the presence of illegal loggers, the land could not be cultivated because of violence, and most families experienced very difficult circumstances. Migrants helped their families by sending money to Cherán K'eri and the people were encouraged to improve their home gardens. As a result, peasants continued to cultivate their *ekuaros*, but now saw them with a renewed perspective, that this traditional agroforestry system maintained their food security during that difficult time.

Cherán K'eri emigration has had an impact on P'urhépecha culture in different ways. While the introduction of foreign knowledge, material culture, language, and values, has shifted P'urhépecha culture, it has led to the recognition and appropriation of their own culture and knowledge. For example, some people believe that in order to learn English more easily, it is better to know P'urhépecha languages. A family we worked with has two members going to the United States for at least six or eight months per year. When

they come back, they place much importance on the community forest, working as volunteers, planting pine trees throughout the communal lands. There are other cases of people who prefer foreign customs, but even in these cases, during the community feast, they wear traditional clothes.

Migration has also had impact on the traditional agroforestry systems in two ways. In some cases, there have been negative consequences for the *ekuaros*, because some people prefer to build a large house instead of a small house with a home garden, and the traditional knowledge and uses of plants and animals have been lost. However, the dynamics of migration, as we said before, tend to connect people to their land and culture, so that in many cases, when even young people return from the United States, they prefer to return to a traditional way of living, rearing animals and cultivating plants on their *ekuaros* for their own consumption, and bringing with them new concepts such as organic food, vegetarian diets, and cultural empowerment (Figure 3).

Thus, in some cases, migration causes the exact opposite of what is assumed to occur by ethnoagroforestry. The influence of the global market affects the diversity of plants and the transmission of traditional ecological knowledge, but, at Cherán K'eri, the global market has in some cases had the opposite effect on monoculture, as in the case of Marcos Rojas and his extended family.

Marcos Rojas is a farmer who studied administration in Morelia, but when he came back to the community, he realized the value of his own culture and started to create an *ekuaro* based on natural products, respecting the cycles of water, soil, and air. He used traditional techniques for planting for family consumption and for feeding the wild animals on his home garden so as to avoid having to kill them. He also experimented with different kinds of natural fertilizers and insecticides.

On the other hand, although the inhabitants of Pesillo have not experienced mass migration out of Ecuador, at least a quarter of the total population now live in Quito, especially men who work as laborers and only occasionally return to visit their families. This means that more than half of those remaining are women, who are the heads of families and are burdened with domestic responsibilities as well as with agricultural activities. They have to take care of children and the elderly. In addition, many of these women do not own land for cultivation, which forces them to work as employees of other people, cultivating potatoes and barley or, if necessary, resorting to the practice of *chucchir*, picking up the leftovers after the harvest.

The lack of men in the community to undertake heavy work on the land and the demands on women to work in the cultivation of potatoes is a significant cultural change for Pesillo inhabitants. However, paradoxically, many of the elderly women who actually maintain the *chakras* mentioned that if their husband were still alive, they probably would not have sufficient time for attending home gardens, as they would be more occupied with cattle rearing. This means that sometimes migration has allowed to women maintain their chakras, otherwise maybe it was not possible. Hence, there is still a hope that disseminating the traditional ecological knowledge associated to *chakras* increase through the occasional contact between elderly and younger women.

4. Conclusions

Ekuaro and the *chakra* depend on traditional ecological knowledge related to food sovereignty. Food sovereignty from the perspective of wild foods refers to a set of edible species but also species that, although not eaten, are part of the subsistence system. For example wild species used to generate fire for cooking, as well as those used as spices and in the medicinal-food system, these aspect are usually absent within agroecological approaches (ALTIERI et al., 2013; MORENO-CALLES et al., 2016; GORTAIRE, 2016; ARGUETA, 2008), therefore there is important to ask how are nonfood plants and animals related to food systems?

The importance of wild plants associated with food have been vital to cope with moments of economic, political and social crisis in these contexts, as happened in the case of Cherán, during the political conflict. It was the employment of wild plants and fungi that supported the shortage of foods inside the town and therefore guaranteed food sovereignty (GONZÁLEZ-RIVADENEIRA and ARGUETA 2018).

Likewise, the presence of wild animals for food is an issue that has been addressed inside the communities; on the one hand the presence of non-domestic animals such as deer is increasingly scarce due to the reduction of ecosystems, on the other hand, these animals are a fundamental part of the worldview of the communities, although they are no longer integrated into the diet. In Cherán, the change in the political regime made it possible to become aware of the predation of wild animals, which are linked to the P'urhépecha worldview and can be consumed in the ritual context of *Corpus Christi* (ARGUETA, 2008).

For the social sciences, and for ethnobiological science the study of a cultural phenomenon such as food has been an inexhaustible source of proposals (KUHNLEIN *et al.* 2006; LÉVI-STRAUSS, 1996; PIERONI, *et al.,* 2016, KATZ, 1990; HARRIS, 1989), which show the complexity of the cultural framework. In particular, from the perspective of agroforestry systems, we offered an approach that gives equal importance to social practices and biological constraints, as well as to the configuration of ecosystems. In this sense, food sovereignty, from the perspective of wild foods, is the result of a nuanced encounter between culture and nature based on processes of innovation, reinvention and reconstruction of relationships between humans and ecosystems.

The complexity of the nature-culture relationships experienced in the home gardens of both cultural regions, allow us to observe different instances of the transmission of knowledge and learning as a processual phenomenon, in which the continuous transference carried out between generations throughout time, becomes either in the appropriation of traditional ecological knowledge in the daily life, or in a fragile imprint, which eventually is a loss.

It is interesting that in Andean *chakra* the percentage of wild plants is similar to that of domestic plants, including the percentage of those here called "wild-domesticated", while in the *ekuaro* there are fewer species of wild and wild domesticated plants. This difference may be mainly due to the fact that a large part of the wild plants and *quelites*, as well as wild fungi in Cherán are collectively managed in the community near to pine-oak forests. Whereas in Pesillo, being in a more rugged ecosystem as represented by the Andean *páramo*, it is possible that Andean *chakra* harbor these plants given the inclement weather (VIBRANS, 2016).

Plants with the category of "wild-domesticated" or "W, D" are those that presented difficulties at the time of being defined as domestic or wild, since in the literature there

is no consensus on their degree of domestication and on several occasions it can be also find the wild variants of these species. Domestication is not a finished process, and contemporary plant and animal management practices exercised by Indigenous communities give continuity to domestication processes of long duration and intensity, such as corn, and in other cases, of less intensity, as is the case of *quelites* in *ekuaros*, or turnip and other plants categorized as "WD" in this document. We suggest that the wild food category could be rethought in terms of management practices that generate phenotypic, even genotypic changes in plants founded in spaces such as agroforestry systems, where we witness practices in which women try to extract seeds, taking special care for a plant brought from less managed ecosystems to adapt them in home gardens (CASAS and PARRA, 2016; VIBRANS, 2016; PICKERSGILL, 2016).

Domestication as an ecological process does not just concern human forestry management, mainly because traditional agroforestry systems are largely composed of domesticates and wild species of animals, which are sometimes disregarded within traditional ecological knowledge. As we said before, at Cherán K'eri, wild rodents and other animals coexist in home gardens, this animals in some cases and can dispersing seeds and pollen that serves as food for other animals, as well as increasing the diversity of traditional agroforestry systems.

Another way to view the home gardens is to consider cattle-rearing practice in Pesillo, especially with regard to *chakras* located near mountains. Cows attract wild animals such as bears and wolves, which attack the cattle and diminish milk production significantly. Similar events take place in *chakras* located within the village, where large rats called *pericotes* sometimes find their way into the rooms where Andean guinea pigs are kept and kill them in masse, even when they only need a few to eat. We consider that traditional agroforestry systems such as the *ekuaro* and the *chakra* constituted over long historical periods involving complex interrelationships where wild foods exist, including other animals, plants, fungi and also where people is a part of a food system where different kinds of human and no human entities live.

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Appendix A

Table 2: Species of plants and animals present in Cherán *ekuaro*

	Species in Cherán (Mesoamerican *ekuaro)*				
	Scientific name	Common name Spanish	Habit	Use	Wild (W) or Domesticaded (D)
1	*Agave americano*	Maguey	herb	craft	W, D*
2	*Amaranthus*	Quelite	herb	food	W
3	*Artemisia absinthium*	Ajenjo	herb	medicinal	D
4	*Artemisia mexicana*	Artemisa	herb	medicinal	W, D
5	*Beta vulgaris*	Acelga	herb	food	D
6	*Borago officinalis*	Borraja	herb	medicinal	W, D
7	*Brassica spp.*	Quelite	herb	food	W
8	*Casimiroa edulis*	Zapote	tree	food	D
9	*Chamaemelum nobile*	Manzanilla	herb	food	D
10	*Coriatrum sativum*	Cilantro	herb	seasoning	D
11	*Crataegus mexicana*	Tejocote	tree	food	W, D
12	*Curcubita ficifolia*	Chilacayotes	climbing plant	food	D
13	*Eryngium foetidum*	Cilantro	herb	food	D
14	*Erythrina americana*	Colorín	tree	food and fence	W
15	*Ficus carica*	Higo	tree	food and medicinal	D
16	*Foeniculum vulgare*	Hinojo	herb	seasoning	D
17	*Hypericum sp.*	Flor de San Juan	shrub	fence	W, D
18	*Malus domestica*	Manzana	tree	food	D
19	*Medicago sativa*	Alfalfa	herb	animal food	W, D
20	*Melissa oficinalis*	Toronjil	herb	food and medicinal	W, D
21	*Mentha piperita*	Menta	herb	medicinal	D
22	*Mentha spicata*	Hierbabuena	herb	food and medicinal	D
23	*Oenothera rosea*	Hierba de Golpe	herb	medicinal	D
24	*Opuntia spp.*	Nopales	shrub	food	D
25	*Ordeum vulgare*	cebada	herb	food	D
26	*Persea americana*	Aguacate	tree	food	D
27	*Petroselinum crispum*	Perejil	herb	food	D
28	*Phaseolus lunatus*	Habas	herb	food	D

29	*Picea abis*	Pinabeto	tree	fence	W
30	*Plectanthus oloroso*	Vaporub	Herb	medicinal	D
31	*Portulaca oleracea*	Verdolaga	herb	food and medicinal	W
32	*Prunus armeniaca*	Chabacano	tree	food	D
33	*Prunus persica*	Durazno	tree	food	D
34	*Prunus serotina*	Ciriguelo, capulín	tree	food	D
35	*Psidium guajava*	Guayaba	tree	food and medicinal	D
36	*Pyrus communis*	Pera	tree	food	D
37	*Rosmarinus officinalis*	Romero	tree	food and medicinal	D
38	*Rubus sp.*	Zarzamora	herb	food	D
39	*Rumex sp.*	Lengua de Vaca	herb	food	W
40	*Ruta graveolens*	Ruda	herb	medicinal	W
41	*Satureja macrostema*	Repollo de col	herb	food	D
42	*Sechium edule*	Chayotes	climbing plant	food	D
43	*Solanum lycopersicum*	Jitomate	herb	food	D
44	*Tagetes filifolia*	Anís	herb	seasoning	D
45	*Tagetes lucida*	Santa María	herb	medicinal	D
46	*Tilia* sp.	Tilia	tree	medicinal	W, D
47	*Urtica* sp.	Ortiga	herb	medicinal	W, D
48	*Valeriana officinalis*	Valeriana	herb	medicinal	W
49	*Vitis* sp.	Uvas	climbing plant	food	D
50	*Zea mays*	Maíz	herb	food	D
51	--	Shaskua	herb	food	W
52	*Dama virginiana*	Venado	Animal	food and ritual	W
53	*Dasypus novemcinctu*	Armadillo	Animal	food	W
54	*Sylvilagus spp.*	Conejo	Animal	food	W, D
55	*Lynx rufus*	Gato silvestre	Animal	food and ritual	W
56	*Spermophilus* spp.	Ardilla	Animal	food	W
57	*Polybia* spp.	Abejas. Panales	Animal	food and ritual	W, D
58	*Gallus gallus*	Gallina	Animal	food	D
59	*Ovis aries*	Oveja	Animal	food	D
60	*Sus scrofa*	Cerdo	Animal	food	D
61	*Bos taurus*	Vaca	Animal	food	D

* "W, D" category: we use this category with animals or plants that have incipient domestication process or in the case that according to people in the communities the plant could be find in home gardens in both: domesticated and wild.

Appendix B

Table 3: Species of plants and animals present in Pesillo *chakra*

	Species in Pesillo (Andean *Chakra)*				
	Scientific name	Common names Spanish	Habit	Use	Wild (W) or Domesticaded (D)
1	*Agave americano*	Pencos	herb	craft	W, D*
2	*Alnus glutinosa*	Aliso	tree	medicinal	W
3	*Aloysia citriodora*	Cedrón	herb	medicinal	D
4	*Amaranthus quitensis*	Quinoa Ataco	herb	medicinal	D
5	*Ambrosia arborescens*	Marco	shrub	medicinal	W
6	*Azara microphylla*	Chinchin	herb	medicinal	W, D
7	*Basella Ovobata*	Juyanguilla	herb	medicinal	W
8	*Borago officinalis*	Borrajas	herb	medicinal	W, D
9	*Brassica rapa*	Nabo	herb	food	W
10	*Brassica rapa var.*	Nabo chino	herb	food	W
11	*Chamaemelum nobile*	Manzanilla	herb	food	D
12	*Chenopodium quinoa*	Quinua	herb	food	D
13	*Cucumis sativus*	Pepino	herb	food	D
14	*Curcubita ficifolia*	Zambo	climbing plant	food	D
15	*Daucus carota spp.*	Zanahoria	herb	food	D
16	*Dianthus caryophyllus*	Clavel	herb	medicinal	D
17	*Eryngium foetidum*	Culantro	herb	food	D
18	*Eucalyptus spp.*	Eucalipto	tree	firewood	W
19	*Euphorbia laurifolia*	Lechero	shrub	medicinal	W, D
20	*Geranium spp.*	Geranios	herb	medicinal	D
21	*Helianthus annuus*	Girasol	herb	medicinal	D
22	*Peperomia galioides*	Tigresillo	herb	medicinal	W
23	*Linum usitatissimum*	Linaza	herb	medicinal	D
24	*Lupinus Mutabilis*	Chocho	herb	food	D
25	*Medicago sativa*	Alfalfa	herb	animal food	W, D
26	*Melissa oficinalis*	Toronjil	herb	food and medicinal	W, D
27	*Mentha spicata*	Hierbabuena	herb	food and medicinal	D

28	*Ordeum vulgare*	Cebada	herb	food	D
29	*Oreopanax ecuadorensis*	Pumamaqui	Tree	fence	W
30	*Origanum vulgare*	Oregano	herb	food and medicinal	D
31	*Oxalis acetosella*	Aleluya	herb	medicinal	W
32	*Oxalis tuberosa*	Oca	herb	food	D
33	*Perilla frutescens*	Ortiga negra	herb	medicinal	W
34	*Petroselinum crispum*	Perejil	herb	food	D
35	*Phaseolus lunatus*	Habas	herb	food	D
36	*Physalis peruviana*	Uvilla	herb	food	D
37	*Pisum sativum*	Arveja	herb	food	D
38	*Plantago major*	Llantén	herb	medicinal	D
39	*Polylepis spp.*	Yahuar	tree	Fence	W
40	*Prunus serotina*	Capulí	tree	food	D
41	*Rosmarinus officinalis*	Romero	tree	food and medicinal	D
42	*Rubus sp.*	Mora	herb	food	D
43	*Ruta graveolens*	Ruda	herb	medicinal	W
44	*Solanum caripense*	Chimpalo	shrub	food	W
45	*Solanum nigrum*	Hierbamora	herb	medicinal	D
46	*Solanum tuberosum*	Papa	herb	food	D
47	*Sonchus oleraceus spp.*	Canayuyo	herb	medicinal	W
48	*Sphaeralcea bonariensis*	Malva blanca	herb	medicinal	W, D
49	*Tropaeolum tuberosum*	Mashua	herb	food	D
50	*Ullucus tuberosus*	Mellocos	herb	food	D
51	*Urtica dioica*	Ortiga de Sanc	herb	medicinal	D
52	*Valeriana officinalis*	Valeriana	herb	medicinal	W
53	*Zea mays*	Maíz	herb	food	D
54	*Cavia porcellus*	Cuy	Animal	food and medicinal	W, D
55	*Gallus gallus domesticus*	Gallina	Animal	food	D
56	*Ovis aries*	Oveja	Animal	food	D
57	*Sus scrofa*	Cerdo	Animal	food	D
58	*Bos taurus*	Vaca	Animal	food	D
59	*Odocoeilus virginianus*	Venado	Animal	food	D

60	*Tremarctos ornatus*	Oso andino	Animal	ritual	W
61	*Vultur gryphus*	Cóndor	Animal	ritual	W
62	*Rattus sp.*	Rata. Pericote	Animal	no use	W

* "W, D" category: we use this category with animals or plants that have incipient domestication process or in the case that according to people in the communities the plant could be find in home gardens in both: domesticated and wild.

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