PERCEPTIONS OF CHANGE IN HORTICULTURAL SUBSISTENCE STRATEGIES IN A RURAL MEXICAN COMMUNITY: SAN FRANCISCO PICHÁTARO, MICHOACÁN

By

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Abstract

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Horticultural subsistence strategies have been an important aspect of indigenous communities throughout the world for centuries. However, in today's world economy they are losing importance as more and more rural communities participate in the global market economy. The disappearance of subsistence strategies should not be ignored, as they are important to indigenous households, communities, and local environments for four reasons: (1) local ecological knowledge, (2) local crop biodiversity, (3) household food security, and (4) sustainable agriculture practices. Mexico is a country where many indigenous groups still reside and carry on practices of local environmental management. Many communities in Mexico still depend on subsistence strategies for survival, however this situation is changing. As Mexico has become more involved throughout the last three decades in the world market, local communities have been adversely affected. Two theories address how change is affecting local subsistence practices such as home gardens. The first theory states that as rural and indigenous communities increasingly participate in the market economy, they are more likely to dismiss home gardening as a subsistence practice. A second and contrasting theory assumes that home gardens are

adaptable to market-oriented conditions and, thus, will persist through the continued adaptation of new crops in relation to market participation. The purpose of this thesis is to explore to what degree and how horticultural subsistence strategies are changing in an indigenous rural Mexican community. A case study research design was utilized to explore change, and perceptions of change that is occurring in home garden practices of San Francisco Pichátaro, Michoacán. Research methods included in-depth interviews of nine home garden owners, a community-wide socioeconomic survey, participant observation, and secondary data collection. I found that change is occurring in Pichátaro regarding agricultural activities and that for the most part community members are conscious of that change. A hybrid of the two previously mentioned theories is occurring, with home gardens adapting to increasing market participation during the last four decades, however most recently a shift from household participation in diversified on-farm activities to specialized off-farm activities is occurring, leading to abandonment of many home gardens in the community.

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CHAPTER ONE

INTRODUCTION

Horticultural subsistence strategies have been an important aspect of indigenous and local communities throughout the world for centuries. However, in today's world economy they are losing importance as more and more peasant communities participate in the global market economy. The disappearance of subsistence strategies should not be ignored, as they are important to peasant households, communities, and local environments for four reasons: (1) local ecological knowledge, (2) maintenance of local crop biodiversity, (3) household food security, and (4) maintenance of local sustainable agriculture practices.

Horticultural subsistence strategies are most commonly referred to as home gardens, kitchen gardens, or subsistence gardens, in addition to a number of culturally significant names. For the purposes of this thesis I will refer to these strategies as home gardens. Home gardens have historically been areas where indigenous and local knowledge has been maintained, where both men and women participate in gender specific activities and thus pass on gender specific, cultural knowledge of local agroecological management (Posey 2000; Eyzaquirre and Linares 2004; Altieri and Merrick 1987). In this manner, home gardens are also important for the *in-situ* maintenance of local biodiversity, where local knowledge ensures that appropriate management techniques are in place to promote continuing adaptation of local cultivated and non-cultivated varieties. This maintenance of local biodiversity in food reserves is also important for households, whose aim is to seek diverse production that supplies

household nutrition requirements throughout the year. In addition, and due to the aforementioned aspects, home gardens are areas of sustainable production, for both the household and the local environment. The features that make home gardens sustainable areas of cultivation include: a lack of chemical control, encouragement of nutrient recycling, water and soil conservation, and use of manual labor that requires participation by multiple household members (Kumar and Nair 2004, Montagnini 2006, Soemarwoto 1987, Benjamin et al. 2001).

Mexico is a country where many indigenous groups still reside and carry on practices of local environmental management. Many communities in Mexico still depend on subsistence strategies for survival, however this situation is changing. As Mexico has become more involved throughout the last two decades in the world market, local communities have been adversely affected. Emigration from Mexico for economic purposes has been present since before the 1940s Bracero Program took affect in the United States when mass numbers of Mexicans began leaving even rural communities in search for work in the United States. This resulted in acculturation, with the introduction of Westernized lifestyles and products into the most remote peasant and indigenous communities (Heisler 2008). In the 1990s Mexico became part of the North American Free Trade Agreement, which meant an increase in foreign agricultural goods in the Mexican market, thus making agricultural, and even subsistence farming increasingly difficult due to a raise in production prices, while imported goods were ever more cheaper and easier to obtain (Perramond 2008; Wiggins et al. 2002; Barrera-Bassols 2008).

The Lake Pátzcuaro Basin, located in the central state of Michoacán, Mexico is no exception to what has been occurring in rural and indigenous communities in Mexico regarding loss of subsistence economies in relation to increasing global market participation. San Francisco Pichátaro is a historically indigenous Purhépecha community located in the Lake Pátzcuaro Basin. Their local economy has traditionally depended on the participation in a diversity of production strategies that has involved both on-farm and off-farm activities. Home gardening has traditionally been an important subsistence activity for all households in Pichátaro, however this situation has been changing over the last four decades as increasing Westernized values of production and acculturation has shifted the focus of younger generations from diversified on-farm activities to specialized off-farm ones. Thus, this community was chosen as an ideal setting in which to investigate the continued perpetuation of traditional and local horticultural subsistence strategies.

The purpose of this thesis is to explore to what degree and how horticultural subsistence strategies are changing in an indigenous Purhépecha community. Two theories exist in the literature that relate to the perpetuation of home gardens and indigenous knowledge in local communities. The first theory is the hypothesis of vanishing knowledge proposed by Soemarwoto (1987), which assumes that rural and indigenous communities are not consciously aware of the ecological and social benefits of home gardens and so the home garden is subject to change regarding the social and economic situation which the community is being exposed to. Thus as these communities participate more and more in the market economy they are more likely to dismiss home gardening as a subsistence practice important for the maintenance of

household reproduction, cultural values, and the local environment. The second and contrasting theory proposed by Michon and Mary (1990) assumes that home gardens are adaptable to market-oriented conditions. As rural and indigenous communities participate more in the market economy, home gardens, which the household consciously values, will persist through the continued adaptation of new crops and associations in relation to market outlets and participation.

To understand which of the aforementioned processes are occurring in Pichátaro, I asked four main questions (1) Is change occurring in horticultural subsistence strategies in Pichátaro? (2) Are community members conscious of that change? (3) What changes have occurred? And (4) What do community members perceive as causes of change? To answer these questions I utilized a case study research design that involved the use of qualitative in-depth interviews of home garden owners, participant observation, a quantitative community-wide socioeconomic survey, and secondary data collection.

Chapter overview

Chapter Two, explores the literature regarding the importance of local ecological knowledge concerning subsistence strategies and the importance of home gardens for the local environment, households, and community. Chapter Three, provides a historical background of the Purhépecha people and the natural environment, from their pre-Hispanic origins to the modern day Purhépecha with an emphasis on agriculture and subsistence, along with an exploration of what is known about their indigenous ecological knowledge system. Chapter Four, takes a close look at the study community, San Francisco Pichátaro, focusing on the local environment, history, economy, cultural practices, and agriculture and subsistence. Chapter Five, presents the research design and

methods used that was used in order to answer the research questions. Chapter Six, presents the results of the in-depth interviews of orchard owners, along with the community-wide survey results and the analysis of secondary data. Chapter Seven, looks at how home gardens have been changing over time in Pichátaro and the outlook for the future of the home gardens. It emphasizes the importance of home gardens to households in Pichátaro and offers recommendations for reversing the current situation so that these important subsistence strategies are not lost. Finally, Chapter Eight offers a personal reflection of how I, as the principal investigator of this project, changed as a growing professional in relation to the methods that were utilized in the research design and the resulting conclusions I came to. It also presents what limitations of the study were, how the research could have been improved, and a suggestion for future routes of research.

CHAPTER TWO

LITERATURE REVIEW

Subsistence strategies have been an important part of traditional communities for generations. Subsistence needs of indigenous peoples have historically driven the need to develop local resource management techniques that allowed for a sustained use of available resources, as subsistence represents an intimate relationship that has been created over time between a community and its natural environment and resource base (Hunn 1999). Thus, the need to develop successful resource management strategies has led to the need to pass the knowledge of the environment and management techniques to each successive generation, forming the base for local ecological knowledge. An important aspect of subsistence is that it is dynamic, it is "rooted in past practices but of necessity adapting to technological, demographic, economic, social, and political changes" (Hunn 1999, page 7). For this reason I have chosen to focus on the study of indigenous knowledge loss as I feel it pertains directly to the loss of subsistence practices.

Local Ecological Knowledge

In the literature, local ecological knowledge is most often referred to as indigenous ecological knowledge or traditional ecological knowledge. I have chosen to use the term 'local ecological knowledge' for its capacity to encompass the scope of this thesis. Local refers to the area, such as a watershed or lake basin that has been inhabited by a specific group of people, whether heterogeneous or homogeneous over a number of generations. Ecological knowledge, a much more broad term in itself, will be referred to

here in a multidisciplinary sense encompassing not only the local knowledge of biological species that people hold, but the ways in which local peoples carry out and manage agricultural and natural resources in addition to the beliefs and traditions associated with them, that are often inseparable between culture and environment (Berkes 1999; Toledo 2002). Local ecological knowledge is a worldwide phenomenon, because all members of local cultures possess it to some extent or another, and a number of definitions exist to describe it (Toledo 2002; Godoy et al. 2005). Local ecological knowledge, therefore, is the form of knowledge that has been tailored to the local environment of a certain society; it is holistic and dynamic, created through a number of generations of experiences and experimentations of practical use in daily life (Posey 2000; Hunn 1999; Toledo 2002; Reyes-Garcia et al. 2005; Grenier 1998).

Importance of local ecological knowledge

Much of the local knowledge which a cultural group holds has evolved though a number of generations. This knowledge is passed down to each new generation, where it is expanded upon, experimented with, and where new information is added to it by adoption and adaptation to the local conditions (Maffi 2001; Toledo 2002; Kalland 2000). Studies have shown that indigenous peoples who reside within a specific ecological environment will over time develop a detailed and accurate knowledge about the management of their natural resources. No other society outside of the local culture has such an intimate knowledge and understanding of their surrounding environment (*ibid.*).

Traditionally, the intimate connection that indigenous peoples had with their environments often meant that they were more active in the sound management of their

natural resources, in order to sustain the local community (Berkes 1999; Barrera-Bassols 2008; Toledo 2002). Although not all indigenous societies can be regarded as sustainable managers of their surrounding landscape, scientists have found that in areas where culturally rich communities still reside, there tends to be a greater amount of biological diversity, due to the intense and diverse management of their surrounding natural environment. In fact, the "Rule of Indigenous Environments" proposed by Nietschmann (1992) refers to this by stating that "Where there are indigenous peoples with a homeland there are still biologically rich environments" (as quoted in Maffi, 2001). For the indigenous person, the knowledge they hold about their surrounding environment is rooted within their cultural context and delimited by space and time. For them nature and culture are one, thus nature is seen as a sacred entity (Berkes 1999).

The study of indigenous knowledge has much to offer the scientific community. Local ecological knowledge can offer insights into biological information, local resource management, conservation strategies and livelihood development programs (Berkes 1999). Although modern science does not see local knowledge as scientific or the indigenous people who possess it as scientists, traditional peoples are capable of and often do carry out controlled experiments and apply quantitative thinking to their systems of management. The way Western science has traditionally approached indigenous knowledge systems is due in part to the differences in paradigms that occur between them. Western science looks at the surrounding environment as a detached observer, an "outsider" who often has little local or personal experience within that environment. Western science, which has been based mostly in reductionist theories until the last few decades, has traditionally taken pieces of the system at hand apart in order to understand

the whole. In contrast, the indigenous observer sees himself as part of an overall, interwoven system where the pieces cannot be separated from one another if one is to understand how the system operates. Science and local ecological knowledge use empirical observations as a basis of investigation, however the difference in how observations are used may offer advantages to science (*ibid.*). Local inhabitants can offer insights into the context of many elements within their surrounding landscapes, such as the location, harvest, and use of plants. Another important aspect of indigenous knowledge is that it contains a rich history of the local environment, a history that cannot be fully understood using only scientific tools of analysis. The addition of local experiences and knowledge is of utmost importance in understanding the current situation of the local environment (Kalland 2000).

Local ecological knowledge is not only embedded within its surrounding environment, but there also exists little separation from other aspects of the local culture. The natural environment is embedded within the local culture just as much as it is embedded within the daily life of the local inhabitants. Landscapes that have been traditionally thought of as 'pristine' by the Western viewer are actually cultural landscapes, molded and formed by the peoples who lived there for generations (Posey 2000; Berkes 1999). Rituals, celebrations and religious activities are interdependent with the ecological knowledge that a local culture holds, so there is no strict separation between religious beliefs, knowledge of the natural environment, and subsequent practices that are carried out, otherwise known as the Cosmos (belief), Corpus (knowledge), Praxis (practice) or the K-C-P complex (Toledo 2002). These activities are dependent on knowledge of events such as lunar cycles, seasonal changes, plant and

animal reproduction cycles, and so forth. Because local ecological knowledge is so embedded within the local culture, it plays an integral role in maintaining social cohesion, thus local knowledge and culture are important for preserving identity, a sense of place, and social ethics and morals within a community (Berkes 1999; Posey 2000; Kalland 2000). The annual repetition of livelihood activities, which are based in local ecological knowledge, is important for passing the cultural knowledge, values, and identity to the succeeding generation. For scientists whose interest is to prescribe sustainable systems of development for indigenous communities, it is of utmost importance that the local knowledge and cultural traditions of a community be taken into account with the active participation of the local actors (Begossi et al. 2008; Aswani & Vaccaro 2008).

Local environmental knowledge has benefited biological and ecological understanding in a variety of ways, offering new information in the way of species identification, regional natural histories, animal behaviors and life cycles (Berkes 1999). Benz et al. (2007) found that phenotypic diversity in maize raised by two groups of farmers in Chiapas, Mexico was a result of farmer management practices and the ethno-linguistic differences that occur among the groups. Begossi et al. (2008) looked at "folk" taxonomic classifications of fish between two groups of fishermen on Brazil's Atlantic coast and in the Amazon and found that these fishermen classified groups of fish into "relatives" or "cousins," which corresponded to actual scientific families and subfamilies. Their findings emphasize the importance of local knowledge in taxonomic studies, especially those that are needed in areas of biodiversity where access may be limited (Begossi et al. 2008). Berlin et al. (1973) proposed a generalized structure of folk

biological classification and nomenclature based on a number of studies conducted concerning ethnobiological taxonomy (Figure 2.1). They recognized that even though "individual societies may differ considerably in their conceptualization of plants and animals", there were general similarities that occurred across classification structures.

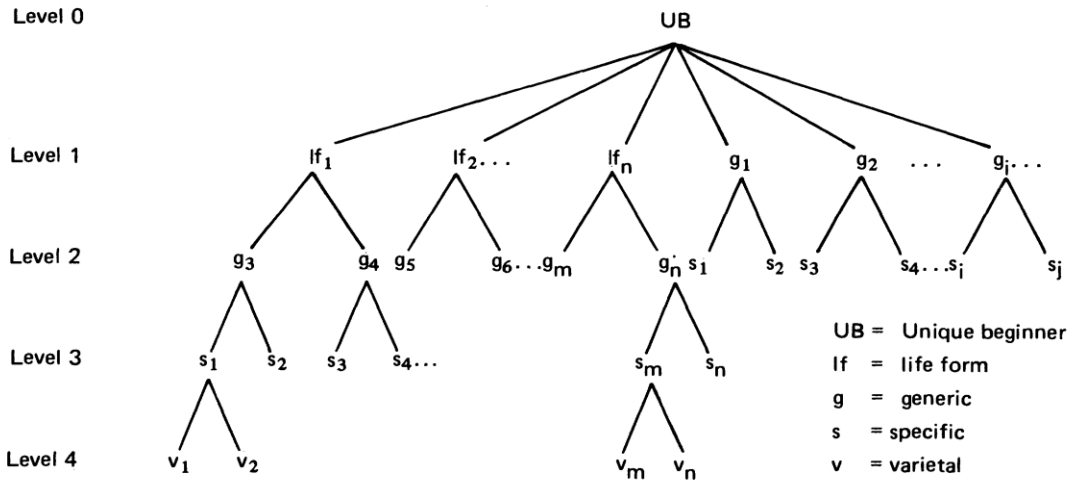

Figure 2.1: A schematic representation of the ideal classification scheme recognized in folk or indigenous biological taxonomy among varying ethnic groups. Source: Berlin et al. (1973).

Local ecological knowledge can be important for development programs that include resource management, biological conservation, agro-biodiversity conservation, environmental assessments and socioeconomic endogenous development (Berkes 1999; Posey 2000). Especially since many development programs are implemented by national and international authorities that are removed from the local environment in which local ecological knowledge is embedded, it is important to create a dialogue between the two in order to achieve the goal of sustainable management (Kalland 2000). Aswani and Vaccaro (2008) found that the Roviana people of the Western Solomon Islands have such an extensive knowledge of their local lagoon ecology that it allows them to take full advantage of the goods offered by that environment in a sustainable manner. This

represents intimate environmental knowledge that only comes from generations of interactions of local inhabitants with their local environment. These authors noted that the ability of scientists to recognize human-environment interactions and the importance of local knowledge is essential in developing appropriate management regimes for the local area (Aswani and Vaccaro 2008).

Loss of local ecological knowledge

Loss of local knowledge has been documented by many authors in the past few decades, especially loss occurring within indigenous communities. Loss of local knowledge equates to the loss of generations of "experience and adaptation" by local communities (Posey 1990). Integration into the global market has been recognized by many scholars as one of the main forces related to the loss of local ecological knowledge along with migration and acculturation (Godoy et al. 2005; Henrich 1997; Reyes-Garcia 2005; Brodt 2001; Gross et al. 1979). Migration affects networks of local knowledge by causing the breakdown of systems of exchange and reciprocity among community members when individuals regularly leave and when younger generations no longer return (Grenier 1998). Integration in the global market and migration often results in acculturation that leads to losses in local knowledge through naïve adaptations of new cultural ideals and ways of life. One example of negative acculturation leading to the loss of local knowledge comes from a phenomenon known as "language shifts", which occurs when there is an overall abandonment of the local or native language, shifting to a preference for the majority language (Maffi 2001).

For each society this loss tends to be specific, depending on the culture, the socioeconomical situation of the local area, and the extents to which market incorporation and assimilation occur (Godoy et al. 2005). A number of studies have been conducted in order to ascertain the manner and extent to which indigenous societies in varying parts of the world respond to market introduction, incorporation, and participation, and how this response relates to the loss of local ecological knowledge (Gross et al. 1979; Henrich 1997; Reyes-Garcia et al. 2005; Brodt 2001). What follows is a selection of literature that explores the loss of local ecological knowledge in different parts of the world.

Gross et al. (1979) compiled information from field studies of four indigenous villages in central Brazil in order to describe the environmental features that affect agricultural productivity in the area and then to relate those features to degree of market participation by the communities. The authors suggested that it is not so much the knowledge of Western goods that attracts indigenous groups to participate in market activities, rather it is the group's relationship to the surrounding environment that determines their extent of participation. They found that the degree of market participation was directly related to the degree of difficulty in surviving from slash-and-burn subsistence agriculture practiced in the region.

Henrich (1997) drew together empirical data from five Machiguenga communities located in the Peruvian Amazon that were studied over a period of 20 years, and applied this data to two common, but competing assumptions regarding indigenous peoples and incorporation into market economies. The first assumption is that imposed political and market structures are those which directly lead to a social and ecological breakdown of native populations, therefore forcing them to pursue short-term unsustainable economic

strategies. The second assumption is that because indigenous groups inherently manage their natural resources in a sustainable manner, when given control over adequate land and resources they will utilize this traditional knowledge in order to manage those resources sustainably. By contrasting communities with varying degrees of market incorporation, the author shows that market inclusion increasingly alters labor allocation, resource consumption, and land use patterns in the Machiguenga communities. Henrich (1997) found that the Machiguenga are actually active participants who seek to engage in the market in order to obtain Western goods. He also found that regardless of the vast traditional agroecological knowledge that the communities may possess, they pursue increasingly unsustainable methods of crop production and animal breeding in order to achieve greater income generating activities. Therefore, the concentration of income brought about by integration into market activities inclines these indigenous communities to breakdown and pursue production practices that are socially, economically, and ecologically unsustainable (Henrich 1997).

Reyes-Garcia et al. (2005) used a large number of observations and many covariates that served as proxies of varying dimensions of participation in the market economy in order to ascertain the degree of market integration as related to loss of "folk" knowledge in the Tsimane' territory of the Bolivian Amazon. The authors found overall weak correlations between market-related activities and "folk" knowledge in the villages of the study: however, three main findings resulted from the research. First, it was found that formal schooling was positively correlated with the amount of recognition in knowledge an individual possesses concerning plant uses. Second, a positive correlation was found between the distance of a village to a market center and the amount of "folk"

knowledge an individual possessed concerning plants. However, only up to about 50 km of distance, after which the amount of knowledge declined. Third, the authors found that when the distance from market center to village was controlled for, there was no correlation in knowledge of plant use to other indicators of market assimilation, such as cash earnings.

Brodt (2001) applied the concept of systems perspective to the analysis of local management systems in Central India. In order to demonstrate how a certain knowledge system may be affected by various socioeconomic pressures, the author applied concepts from systems' studies that included hierarchy, adaptability, connectedness, and scale to the local knowledge system. By applying these concepts the author was able to demonstrate that certain characteristics of knowledge tend to persist even when integrated within other knowledge systems, such as Westernized knowledge systems. Thus, while a particular skill related to a particular aspect of agriculture may be more susceptible to loss, a more broadly encompassing knowledge system (such as that represented by Ayruvedic medicine), which is applied to a many aspects of daily life, is more likely to be integrated into the new system of knowledge. In this manner, Brodt (2001) suggested that it is more likely that specific practices are susceptible to loss than are concepts, because practices tend to be tied more to the physical world and so when they cease to be utilized on a regular basis they erode more quickly. Concepts, on the other hand, tend to be somewhat removed from the physical world, and therefore, more resilient to change.

Historically local knowledge was based more on exchanges that the local community made with the local environment. However, today this has changed as local communities are becoming more ingrained in the global market system, so that the

traditional ecological networks of exchanges have grown to include those of the market (Toledo 2002). Therefore, local ecological knowledge is continually evolving and adapting, being transformed throughout generations of changes in the local natural environment, and in social and market structure. Although local ecological knowledge has proven highly susceptible to acculturation due to increased market participation and migration, there is a certain cultural memory that extends into and adapts to the new situations, allowing for the perpetuation of knowledge at a certain level, as proposed by Michon and Mary (1990) (this thesis Chapter One, page 3-4). This is mainly due to the continuing dependence of local communities on subsistence strategies for survival. In addition, many development programs exist today which aim at allowing more land rights and political independence of indigenous peoples, thus providing routes for the maintenance of local knowledge systems (Posey 1990). However, if local communities cease to depend on subsistence strategies for survival, and instead focus more on the marketplace to provide basic staples, then local ecological knowledge is at risk of disappearing due to lack of need and use, as proposed by Soemarwoto (1987) (this thesis Chapter One, pages 3-4). In this case, what will ultimately decide the fate of local ecological knowledge is the ability of the local culture to provide social cohesion in the face of acculturation and migration, so that the intergenerational link between learning and doing will not be ruptured (Godoy et al. 2005; Reyes-Garcia 2005; Brodt 2001; Gross et al. 1979; Barrera-Bassols 2008).

Home Gardens

Horticulture is utilized by many cultural communities throughout the world and has represented a system of household subsistence production for hundreds or even thousands of years, where much local knowledge is created, adopted, adapted and sustained (Christanty 1990). Horticultural subsistence strategies serve a variety of uses and come in various shapes and sizes, which are determined by specific cultural beliefs, socioeconomic status, and personal preferences (Schneieder 2004; Eyzaguirre and Linares 2004). Thus, a variety of names are associated with these strategies, such as kitchen gardens, subsistence gardens, home gardens, or orchards. For the purpose of this thesis I will refer to general horticultural subsistence strategies as home gardens. Home gardens are often located near to or as part of the household for ease of labor requirements. Their main function is often to provide year-around subsistence requirements for the household, including a source of secondary income for the home (Ninez 1984; Soemarwoto 1987; Eyzaguirre and Linares 2004; Wezel and Bender 2003). Home gardens most commonly form part of the local farming system and represent microenvironments that often contain levels of species diversity that are much higher than that of the surrounding farming system, including crop species and varieties that may no longer be cultivated on a larger scale. They also contain many species, such as woody trees and shrubs, that are not allowed to grow in agricultural plots in addition to animals that forage in the garden area, providing both a source of organic fertilizer and food for the household (Eyzaguirre and Linares 2004; Soemarwoto 1987). It has been noted in tropical regions that home gardens tend to mimic the surrounding forest structure (Soemarwoto 1987; Gleissman 1990).

Structure

Home gardens tend to be highly variable in size and layout: however, their overwhelming similarity lies in the presence of a high diversity of species (Soemarwoto 1987; Ángel-Pérez and Mendoza 2004; Eyzaguirre and Linares 2004). Other factors that determine a home garden's structure and level of use are: type of soils, drainage patterns, water availability, topographic aspect, and seed resources, along with family size and age patterns, and availability of labor. These factors reflect the variety of environmental and social components of a home garden (Gliessman 1990; Eyzaguirre and Linares 2004; Blanckaert et al. 2004; Benjamin et al. 2001).

Despite the diversity of factors which take place in the formation of a home garden, they tend to have an overall structure consisting of four general layers: (1) a root crop and herbaceous layer including herbs and medicinal plants, along with grain and forage species; (2) an annual, biannual, and perennial layer composed of mainly vegetable crops; (3) an intermediate layer of bushes, trees and vines, and (4) an upper layer of larger trees (Eyzaguirre and Linares 2004). Home gardens also often contain animals as part of their structure, which serve as a source of food for the household and as a source of organic fertilizer for the garden (Soemarwoto 1987; Kumar and Nair 2004; Blackenaert et al. 2004). Another similar aspect among home gardens is their nature of intercropping, where plant associations in smaller spaces are taken advantage of, such as nitrogen fixing legumes and maize plants with high nitrogen requirements, allowing for better yields. However, studies have also shown that as much as 60% of the vegetation in a home garden can be volunteer plants originating either from the garden itself or surrounding areas (Eyzaguirre and Linares 2004; Zaldivar et al. 2002).

An important aspect of home gardens has traditionally been diversity of production: however, studies have shown that as home gardens move closer to city centers subsistence production becomes less important, being replaced by more commercial production intended for sale (Soemarwoto 1987; Eyzaguirre and Linares 2004). Home gardens that are utilized more for commercial production or plantations have obvious changes in structure, such as a lower diversity of plant species, which are less culturally important and loss of the forest-like structural layers. In addition, commercial gardens often possess a greater number of introduced varieties and species leading to the potential genetic erosion of native species as they are displaced (Eyzaguirre and Linares 2004). Usually the first species to be abandoned are those that are highly nutritious or medicinal and which are mainly used within the household, but have little economic value (Soemarwoto 1987).

Availability of labor tends to be another key factor influencing the structure of home gardens: crop diversity tends to increase due to a greater number of labor hours available for the garden (Quiroz et al. 2004; Soemarwoto 1987). Consequently, when the amount of labor available to maintain a home garden decreases, so does the diversity; however, the number of perennials in the garden tends to increase (Soemarwoto 1987). Quiroz et al. (2004) conducted a study contrasting communities located in three regions of Venezuela and found that communities with moderate road access (i.e. improved dirt roads), had the greatest amount of diversity compared to communities that had either poor access (i.e. unimproved dirt roads) or access by paved road. In the same study, the authors also found that higher amounts of diversity was present in home gardens that were managed by people 60 years of age or more.

Environmental function

For the most part, home gardens tend to be both structurally and ecologically complex. Containing a variety of species both cultivated and tolerated of various shapes and sizes, thus home gardens tend to act as mini-reserves of species that are specifically adapted to local conditions and that may no longer be found on a larger scale (Eyzaguirre and Linares 2004; Ángel-Pérez and Mendoza 2004; Altieri and Merrick 1987). Quiroz et al. (2004) noted in their study that the Venezuelan *conucos* or home gardens are important areas where plant genetic resources are maintained. In a study conducted by Zaldivar et al. (2002), in the Chibchan Amerindian home gardens of two reserves in Costa Rica, 46 cultivated species were found in one reserve and 27 in the other. In addition to high interspecies diversity, the authors also found a high degree of diversity within species, specifically peppers and manioc. In a separate study conducted in a more recently established community in Veracruz, Mexico, a total of 338 species were found among home gardens with 117 of those having a secondary use, such as in the case of medicinal plants. Of the 338 species found, 38% were ornamental plants, representing the highest number of species; however, food species (representing 25%) were more abundant and more commonly found among gardens (Lazos and Alvarez-Buylla 1988).

Biodiversity of home gardens mainly depends on the culture of the community that maintains it, and their subsistence needs or needs for supplementary cash income. Bennett-Lartey et al. (2006) found that home garden germplasm within their study gardens of Ghana originated either directly or indirectly from four sources: exchanges with other home gardens, plants cultivated in their own field plots, market purchases, and research institutions.

The main reason for the increased complexity of home gardens is to buffer the household against crop failures, in addition to providing a variety of staples, and cooking and medicinal herbs throughout the year. The diversity of the garden allows for it to be highly adaptable to changes, either climatic or in the marketplace, if its products are sold (Soemarwoto 1987; Eyzaguirre and Linares 2004). Thus, home gardens are areas of continued adaptation and evolution of crops by societies who are constantly adapting to changing situations. In addition, gardens act as experimental centers for families, where introductions of new or wild species may take place and where a form of early domestication and management can occur (Lazos and Alvarez-Buylla 1988). This can be advantageous to scientists looking for insights into the evolution of the human-plant continuum as societies undergo change (Eyzaguirre and Linares 2004).

Home gardens have been recognized by many researchers to be systems of sustainable food production in addition to providing social and cultural sustenance (Blanckaert et al. 2004; Albuquerque et al. 2005; Benjamin et al. 2001; Kumar and Nair 2004; Soemarwoto 1987). Factors that make home gardens sustainable include: independence from high energy inputs, high inter- and intra-specific species diversity, nutrient recycling, soil and water conservation, application of local natural resource knowledge, and social interactions. With the widening influence of the market economy, however, more influence has been placed on commercial production of home gardens and so external inputs are being increasingly used (Figure 2.2) (Kumar and Nair 2004; Benjamin et al. 2001; Eyzaguirre and Linares 2004; Soemarwoto 1987).

Abdoellah et al. (2006) conducted a study concerning the commercialization of home gardens in Indonesia and found that the "ecological characteristics and social roles"

of home gardens within the study area had been negatively affected by commercialization. Plant diversity of the commercialized gardens had decreased while requirements for external inputs had increased. In addition, social cohesion within the community was lowered due to increased competition among gardeners and decreased use of the home garden for areas of social activity. Another negative aspect of the commercialized home gardens was that children were no longer allowed to play and participate in home garden activities, something that before had provided a means for children to learn cultural and social principles from their elders (Abdoellah et al. 2006).

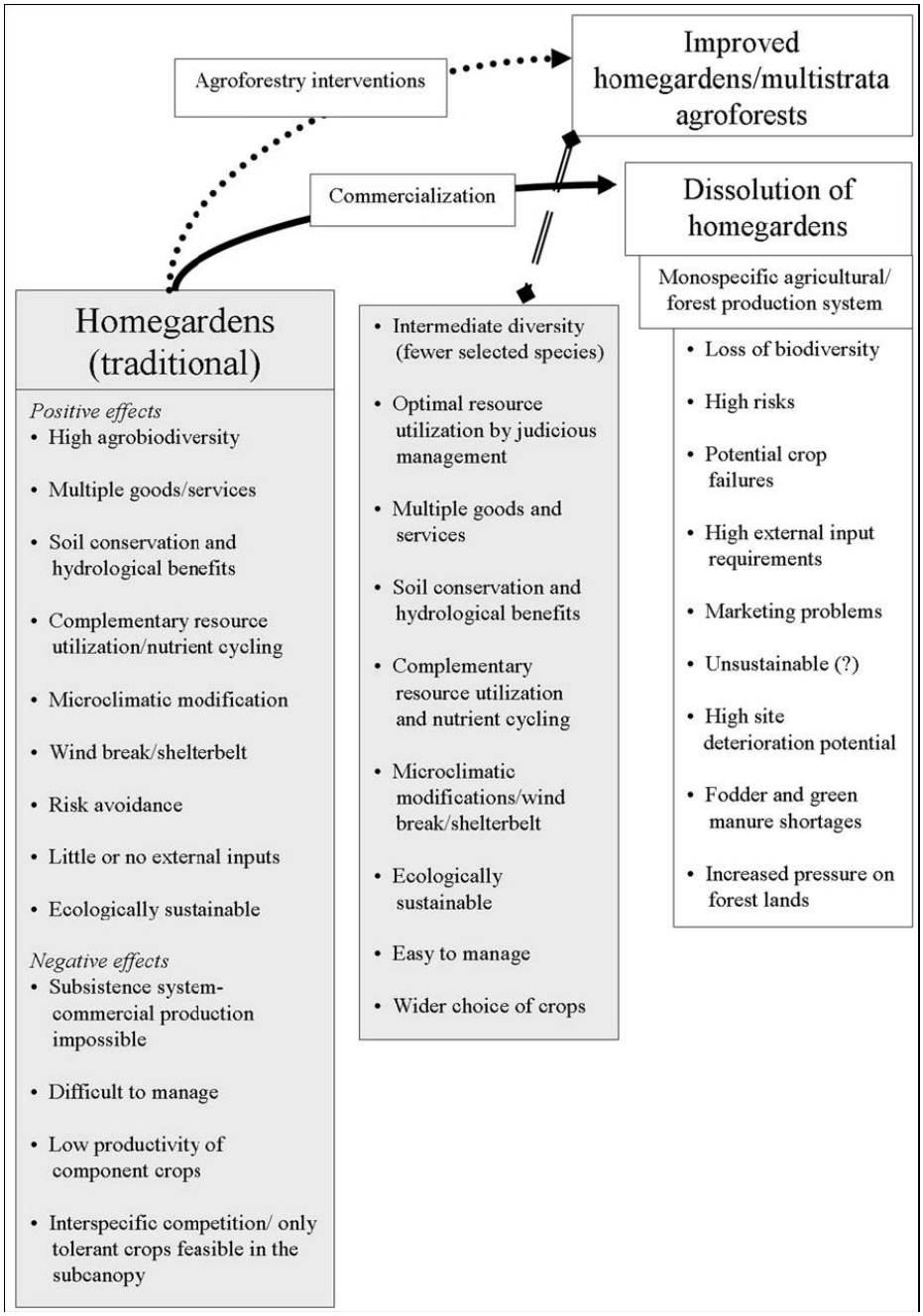

Figure 2.1: Changes that can occur in home garden structure as they move from subsistence oriented production to commercial production and improved home garden structure, which compensates for both practices. Source: Kumar and Nair (2004).

Socioeconomic function

Home gardens are important socioeconomically because they often provide a household with goods and services, such as food, medicine, fuel, construction material,

fibers, animal fodder, in addition to ornamental, religious, and ceremonial uses, which are all important to the reproduction of the household unit (Blanckaert et al. 2004; Ángel-Pérez and Mendoza 2004). Therefore, home gardens tend to fit well within local or indigenous farming systems due to the subsistence lifestyles that are often present (Kumar and Nair 2004). Ángel-Pérez and Mendoza (2004) concluded from their study conducted within the Mexican Totonac home gardens that the perpetuation of home gardens is linked to the subsistence necessities of the household, in addition to supporting the use of marginal lands for cultivation and the conservation of soil, water, and genetic resources. Lazos and Álvarez-Buylla (1988) noted in their study of home gardens in Balzapote, Veracruz, Mexico that the home garden is the "only dual purpose alternative that peasant families manage," where it serves as "an economical alternative" as well as a living space. Thus, the home garden provides a space in which the household can carry out various "domestic tasks" and where various social activities take place, especially in tropical zones (Álvarez et al. 1989). Mendez et al. (2001) conducted an interdisciplinary analysis of home gardens in Nicaragua and found that all families who participated in the study noted the home gardens' role in socialization, where members sought shade, relaxation, and recreation.

Home gardens also offer food security for the household in that they can provide year-around produce, medicine, and nutrition that may not be locally available or that the family cannot readily purchase (Bain 1993; Wezel and Bender 2003; Kumar and Nair 2004; Soemarwoto 1987; Montagnini 2006). Although home gardens do not always meet all nutritional requirements for a household, they can provide significant sources of vitamins and minerals for the family (Kumar and Nair 2004). Wezel and Bender (2003)

found that home gardens in Cuba provided households with fruits and vegetables that were not cultivated in their fields, in addition to meat and eggs produced from poultry allowed to forage in the gardens. Dewey (1981) conducted a study comparing groups of people who practice a range from subsistence to commercial agriculture in Tabasco, Mexico. They found that children of families who had greater crop diversity in their fields and gardens were less dependent on purchased foods, and therefore, were more self-sufficient and had better nutrition than those who did not cultivate a diversity of crops.

Gender

Gender also plays an important role in home gardens. Studies have found that intensive home gardening is linked to societies with matrilineal traits (Soemarwoto 1987). Women have been found to have vast resources of knowledge concerning multiple plant uses because they tend to be the ones who choose which foods, herbs, and medicinal plants the family consumes, and therefore, which plant varieties are grown. Women are also important in the saving and planting of seeds in the garden. For this reason they are increasingly recognized as the principal managers of agro-biodiversity in the home garden (Eyzguirre and Linares 2004; Bain 1993; Vázquez-García 2008). Mapes et al. (1990) explained that it is the women and children who are the principal cultivators of the home gardens or *solares* in the Purhépecha region of Michoacán, Mexico. In the *solares* the women have been the ones responsible in maintaining ancient varieties, as in the case of the *kokoc* bean (*Phaseolus coccineus*) and the black chia (*Amaranthus cruentus*), whereas men have been the ones responsible for the introduced

European fruit trees. Bain (1993) found that rural women in Mexico often participate in exchanges of information concerning home garden species and management with their extended families and neighbors. This author also noted that even though some women knew very little concerning the local ecology of their surrounding environment, they were able to provide long lists of plants they had or were growing in their garden along with how they were managed and used. However, current trends involving off-farm employment are drawing women out of the home, leaving less time for work associated with the household, including the management and tending of home gardens (Bain 1993).

Local ecological knowledge and home gardens

Home gardens not only serve as reservoirs of genetic resources, but of plant and animal knowledge as well. They have been part of subsistence economies for hundreds of years and so have become "ingrained in the tradition and culture of the people" who cultivate them (Soemarwoto 1987). They can act as areas where the preservation of cultural knowledge is perpetuated due to the intensive management of home garden species over extended periods of time (Blanckaert et al. 2004). Kumar and Nair (2004) noted that home gardening may be one of the oldest land-use practices around. Quiroz et al. (2004) offer an example of the plant knowledge that occurs in home garden management. They conducted detailed analyses of diversity on the species that were most commonly found in the Venezuelan *conucos* and found that farmers where able to recognize seven distinct varieties of chilies (*Capsicum* spp.), five varieties of papaya and four varieties of avocado (Quiroz et al. 2004)

Lazos and Álvarez-Buylla (1988) noted that knowledge of crop species is dynamic, it changes and adapts according to the household needs and each of its members assumes a different role in undertaking this knowledge. They also noted that children are introduced at an early stage into the management practices of the garden, and it is through their own experimentation that knowledge is passed to them by their parents (Lazos and Álvarez-Buylla 1988).

Because home gardens tend to be highly diverse in structure and composition, knowledge of a wide range of species and their specific management is assumed by the households that manage them, "within this mosaic peasants utilize knowledge of specific biological processes in their management practices" (Álvarez-Buylla et al. 1989). In a recently established mestizo community containing a variety of cultural backgrounds, Lazos and Álvarez-Buylla (1988) noted that household members are beginning to exchange plants and the knowledge associated with them and thus encouraging a hybrid, yet homogenized version of home gardens throughout the community.

Loss of local ecological knowledge has also been noted in home gardens. Several authors have documented a loss in diversity and disappearance of native species due to the loss of local knowledge and cultural attributes (Ángel-Pérez and Mendoza 2004). In countries such as Thailand, Malaysia, and Mexico, traditional home gardening is seen as antiquated and outdated. In the past 20-30 years, introduction of imported and/or improved varieties by extension authorities has undermined the traditional knowledge and management of traditional varieties that once dominated home gardens (Eyzaguirre and Linares 2004).

Migration has been connected to a loss of home garden agro-biodiversity by various authors. In a study conducted in northeastern Brazil, Alburquerque et al. (2005) observed that migration of families out of the region has resulted in the decline of local land-use practices and thus has produced a decline in traditional cultural practices. Quiroz et al. (2004) concluded that the necessity of families to engage in migration for wage labor has reduced the capacity of households to maintain diversity in their *conucos*. Bain (1993) noted in a study conducted between four rainforest communities of Veracruz and Oaxaca, Mexico that young people of the community were no longer interested in learning home garden strategies, that they saw no future in it mainly due their leaving the community for educational purposes. In addition, young people were noted to prefer purchased, westernized foods to those grown for home garden consumption (Bain 1993).

Conclusion

Home gardens can be found across cultures throughout the world; they have existed for centuries and have been an important component of household subsistence strategy for generations. Studies have shown that home gardens are not only important reserves of crop genetic material, but of local ecological knowledge as well, where families work together in close proximity to meet the needs of the household. However, in today's market economy home gardens as local ecological knowledge are suffering. Home garden composition is altered and at risk of loosing diversity in species composition when there is a greater availability of imported (from outside the immediate local area) foods and when introduced varieties offer greater yields. Also, the hope of greater economic gain alters garden structure and use. In addition, migration and

acculturation in local communities presents a risk to home garden diversity and structure. Therefore, home gardens should not be overlooked in the scale of both biological and sociological research for their importance in preserving crop varieties, some ancient, which are specially adapted to specific environments, and for their ability to perpetuate local ecological knowledge.

CHAPTER THREE

THE PURHÉPECHA

Lake Pátzcuaro Basin

The Lake Pátzcuaro Basin comprises one of three regions that form the geographic area that is occupied by the Purhépecha people, the other two being the mountainous volcanic *Meseta* region, which lies to the west of the Basin, and the *Cañada*, which lies to the northwest of the *Meseta* (Works and Hadley 2004). The Lake Pátzcuaro Basin is located in the state of Michoacán, in an area situated in the Trans-Mexican Volcanic Belt, a high volcanic plateau dominated by Cenozoic volcanic mountains and small lake basins above 2,000 meters above sea level (m.a.s.l.) (Figure 3.1). The area of the Basin comprises five geographic zones: (1) lake islands, (2) shoreline, (3) hillsides, (4) intermountain valleys, and (5) mountains. High mountain ranges border the basin to the west, north and south (Pollard 1993, Caballero and Mapes 1985). The Lake Pátzcuaro Basin is actually a tectonic depression that has an area of about 1,000 km^2, of which Lake Pátzcuaro makes up some 107 km^2 (Mapes et al. 1990). Volcanism has been important historically and culturally in the Basin, which contains the greatest number of monogenetic-type volcanoes (small volcanic vents usually having only one eruptive event) in the Trans-Mexican Volcanic Belt, the most famous being Paricutin located in the nearby city of Uruapan, Michoacán (Barrera-Bassols 2008).

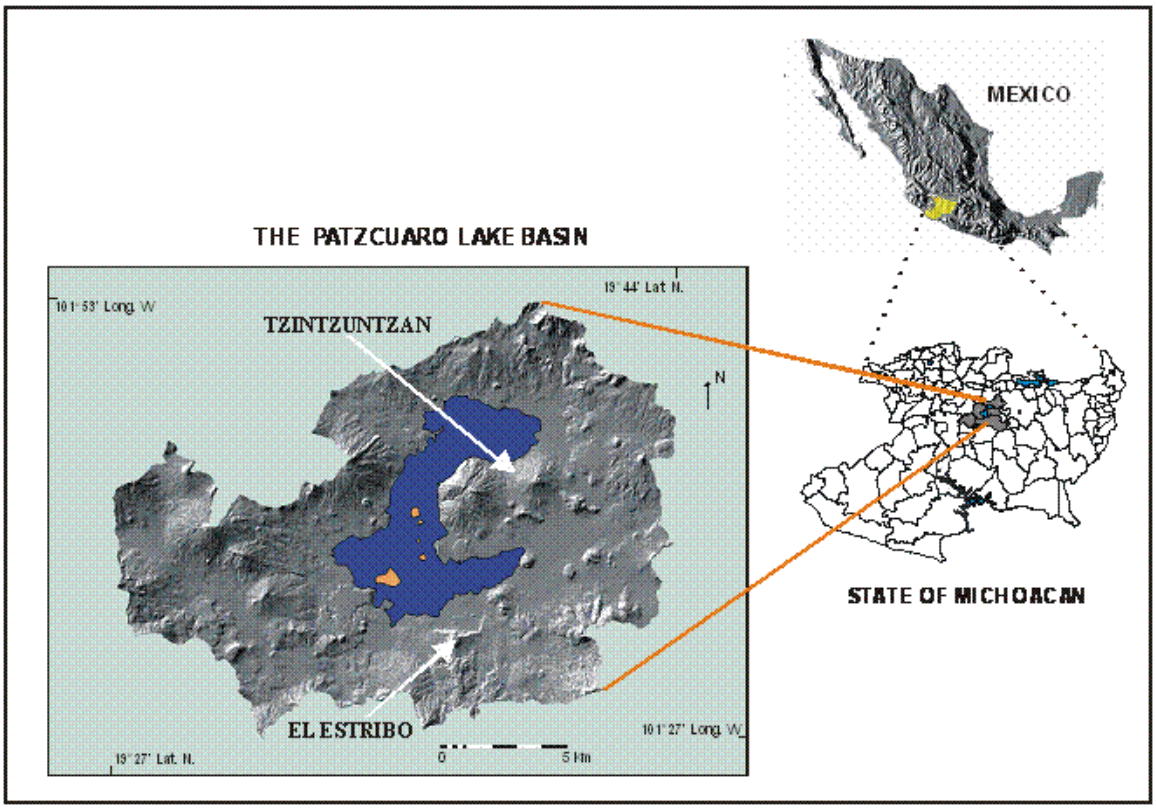

Figure 3.1: Location of Lake Pátzcuaro Basin in the state of Michoacán. Source: Barrera-Bassols (2008).

The Lake Pátzcuaro Basin has a temperate climate with a mean annual temperature of approximately 18ºC in the valleys and 12.5ºC in the mountains, where frosts are not uncommon in the months of December and January. The region experiences seasonal rainfall (900-1250 mm a year) generally occurring between the months of June and October, creating a sub-humid climate during this period (Pollard 1993, Fisher et al. 1999). Because there is much vertical heterogeneity in the Basin, six different bioclimatic zones can be identified: (1) very cold and humid (2,900 to 3,340 m.a.s.l); (2) cold and humid (2,400 to 2,900 m.a.s.l); (3) cold and sub-humid (2,600 to 2,900 m.a.s.l); (4) temperate and humid (2,040 to 2,400 m.a.s.l); (5) temperate and sub-humid (2,200 to 2,600 m.a.s.l), and (6) temperate and semi-dry (2,040 to 2,200 m.a.s.l.) (Figure 3.2) (Barrera-Bassols 2008).

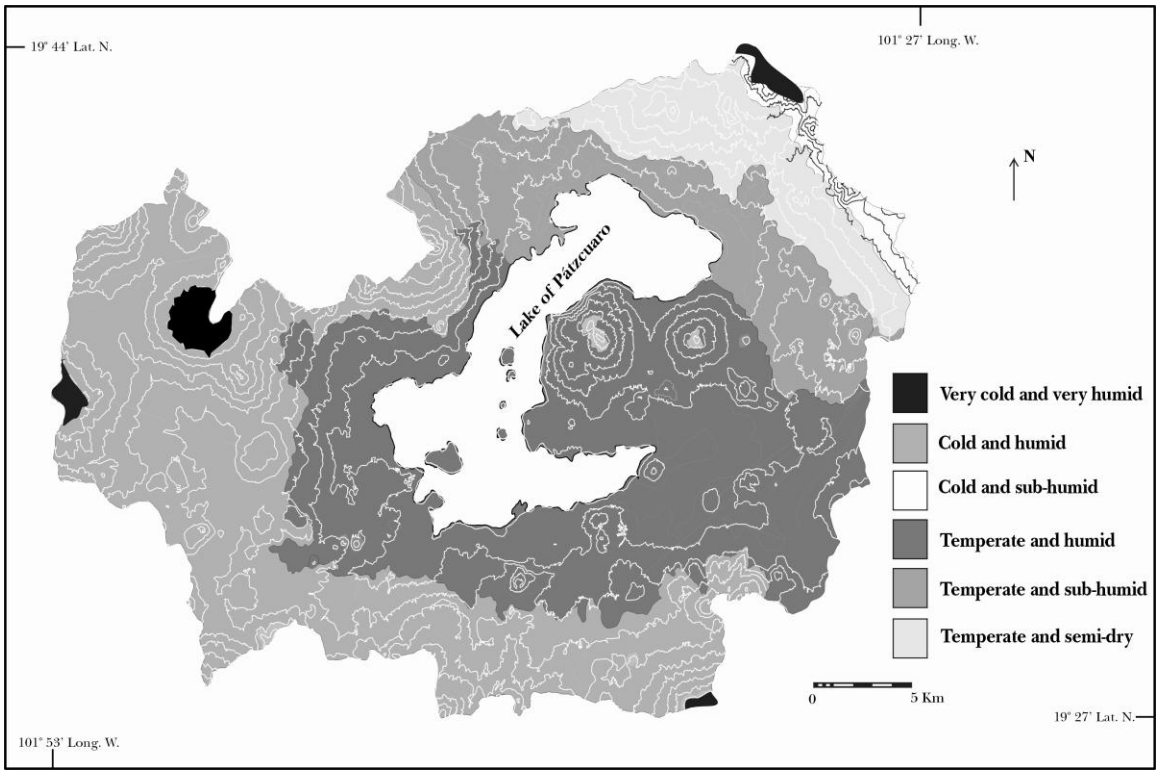

Figure 3.2: Vegetation patterns in the Lake Pátzcuaro Basin. Source: Barrera-Bassols (2008).

Due to the heterogeneity in landscape patterns and climatic zones of the Lake Pátzcuaro Basin, vegetation tends to be diverse with high endemism present. In addition, the Basin has experienced anthropogenic influences throughout the last 4,000 years, which has heavily influenced the vegetation patterns present today (Barrera-Bassols 2008; Caballero and Mapes 1985; Pollard 1993). There are seven main vegetation types occurring in the terrestrial regions of the basin: (1) alpine grasslands; (2) fir forests; (3) pine forests; (4) *baccharis* (groundsel relative) shrub communities; (5) oak forests; (6) sub-tropical shrub communities, and (7) anthropogenic grasslands (Figure 3.3) (Barrera-Bassols 2008).

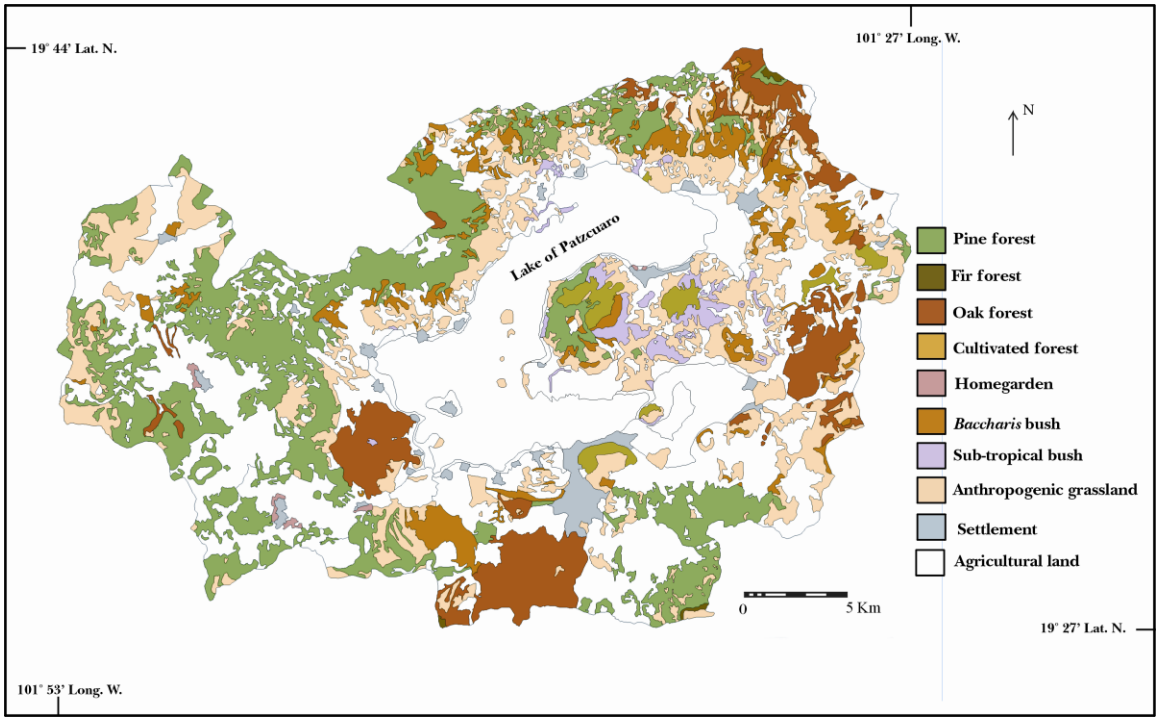

Figure 3.3: Ranges of where different types of vegetation occur in the Lake Pátzcuaro Basin. Source: Barrera-Bassols (2008).

Pre-Hispanic origins

Maize pollen found in sediment cores taken from Lake Pátzcuaro reveals that agriculture was present in the region from about 4,000 to 3,500 years ago, during which time data suggests there existed various human settlements over an extended area within the region. Small settlements around the lakeshores and on islands within the lake appeared between 100 B.C.E. (Before Common Era) and 500 C.E. (Common Era, same as AD), during which time raised fields and intermittent canals also appeared as evidence of the presence of wetland agriculture, where maize, possible root crops, and unknown fruitlike plant remnants occur (Fisher 2005; Fisher et al. 1999; Mapes et al. 1990; Caballero and Mapes 1985; Pollard 1993). The Purhépecha state emerged during the Middle Post-Classic period (900 C.E. to 1350 C.E.) in the Lake Pátzcuaro Basin of present-day Michoacán. It controlled an area of about 75,000 km^2, stretching throughout

the present-day states of Guanajuato, Guerrero, Mexico, Colima, Michoacán, and Jalisco. At its height, from about 1350 to 1525 C.E., the Purhépecha State controlled a major part of the pre-Hispanic Western Middle America (Pollard 1993; Barrera-Bassols 2008; Fisher 2005). During this time, the Purhépecha State ruled about 1,300,000 inhabitants, with its capital located in Tzintzutzan, Michoacán. There were about 90-95 settlements in the Purhépecha territory, of which some still exist today (Barrera-Bassols 2008; Toledo 1991). With a population density of 182-334 persons per square kilometer at the height of their reign, evidence of erosion levels within the lake suggests that inhabitants of the basin maintained a relatively stabilized landscape as compared to the earlier, much smaller settlements. This stabilized landscape suggests that intensively managed agriculture was taking place in the region at this time in the form of terraced landscapes dependent on abundant labor (Fisher 2005). Although geographically the Purhépecha Empire was located relatively near to the Aztecs, they were never conquered by them, maintaining a strong influence on the surrounding regions until the Spanish conquest (Barrera-Bassols 2008; Pollard 1993).

Land-use in the Lake Pátzcuaro Basin as well as in many parts of pre-Hispanic Mexico, strongly reflected the ingrained aspect of religion and the natural landscape controlled by the pre-Hispanic State. All aspects of the natural world were connected to aspects of religion, which resulted in a complex cosmology that strongly influenced agriculture and land-use. The ecosystem in which the Purhépecha lived was, as in other ancient civilizations largely an anthropogenic environment, delicately maintained by its inhabitants (Fisher 2005; Barrera-Bassols 2008).

In Middle American cultures, maize has been of considerable cultural importance since their beginnings. Origins of maize in central and northern Mexico date back around 5,000-4,000 B.C.E., with the appearance of *milpa*, the maize-beans-squash cropping system appearing around 2,000 B.C.E. Middle America religion centered on the belief that humans were created from maize, "maize anatomy and phenology where similar to the human cycle and both were…inextricably linked" (Barrera-Bassols 2008). The agricultural activities surrounding the planting and cultivating of maize reflected these beliefs in a mixture of masculine and feminine responsibilities during production. About 60 races of maize have evolved over the past 5,000 years due to its extensive cultivation throughout Mexico in varying climatic and geographical regions (*ibid.*).

Maize was and is just as important to the Purhépecha culture as it has been in other indigenous Mexican groups (Mapes 1987). Maize is so closely associated with Purhépecha cosmology that there are specific varieties that represent each of the 5 cardinal points in which the Purhépecha believed to be the edges of the world, with the 5^{th} cardinal point as the center, which lay in the Lake Pátzcuaro Basin (Barrera-Bassols 2008). Each cardinal point had a distinguishing color, and corresponding varieties of maize and other crops. The east was represented by the color red and its corresponding crops were maize *pinto* (*Zea mays* L.) and *chia roja* [*Cheopodium berlandieri* ssp. *Nuttalliae* (Stafford) Wilson and Heiser]. The west was represented by the color white and its associated crops were maize *blanco* (*Zea mays* L.) and *chia blanca* (*Amaranthus hypochondriacus* L.). The north was represented by the color yellow and its corresponding crops were maize *amarillo* (*Zea mays* L.) and *chia amarilla* (unknown species). The south was represented by the color black and its associated crops were

maize *colorado* (*Zea mays* L.) and *chia negra* (*Amaranthus cruentus* L.). The last cardinal point was located at the center and was represented by the color blue and maize *azul* (*Zea mays* L.). Almost all of the aforementioned crops can still be found today in traditional agricultural plots and home gardens. The moon was also an extremely important symbol in Purhépecha cosmology and crops were planted by its cycle. Because the moon was represented by a female god, women played a very important role in the planting, shelling, and processing of the maize. Even today, women are important in selecting the best ears of corn that will yield the seeds for the next year's crops (Mapes et al. 1990).

Post-Hispanic contact, the Colonial period

The Spanish conquest of the 1520s hit the Purhépecha territory quickly and had devastating consequences, both culturally and environmentally in the Lake Pátzcuaro Basin. In a period of less than a year, the Purhépecha State had collapsed, becoming subordinate to Spanish rulers and colonizers. During the 90 years following the Spanish invasion, high rates of mortality and forced emigration for purposes of slavery resulted in an 85% reduction in the Purhépecha population of the region. To escape the maladies of the Spanish conquest, many Purhépecha sought refuge in the mountainous landscapes surrounding the Basin; it was there that the indigenous culture and systems of land use were able to partially survive (Barrera-Bassols 2008).

During the Spanish conquest many changes in land-use occurred as land was increasingly appropriated into "*haciendas* and *ranchos*"[1] owned and operated by Spanish

[1] *Hacienda* refers to "large agricultural and livestock estates" and *rancho* to "small private livestock units" (Barrera-Bassols 2008).

colonials. In addition, the Spanish *encomienda* system was put into effect in much of the region (*ibid.*). The *encomienda* system consisted of a grant of control by the Spanish crown to an individual over a number of indigenous households, where the individual could implement forced tributes in the form of mined materials, agricultural products, and/or labor over the households. The *encomienda* system was not meant as a form of land granting, but in many cases became so when much of the indigenous population was decimated, and thus, the establishment of *haciendas* became more common (Encyclopedia Britannica 2009).

Much conflict occurred concerning land and resource rights between the colonialists and the Purhépecha communities. Indigenous people were forced off their land into planned settlements where they were given limited rights to the use of land and resources. However, most of the fertile land and available resources, which were once operated as communal territory among the Purhépecha communities, became the property of the colonialists. In addition, land degradation and continued exploitation of the Purhépecha people resulted in heavy conflict until the end of the Spanish rule (early 19th century) (*ibid.*). Evidence suggests that during this period high rates of soil erosion occurred principally due to the abandonment of the intensely managed gardens and agricultural plots that existed in the form of terraced landscapes, in addition to the introduction of European methods of agriculture, which used an ox-plow system (Fisher 2005). The invasion of Spanish colonialists and resettlements of indigenous people resulted in the *Mestizo*[2] communities that endure today throughout Mexico (Barrera-Bassols 2008).

[2] *Mestizo* refers to a person of both indigenous and Spanish or European decent.

The biggest change that occurred and which forever altered the indigenous form of land management was the introduction of European-style agriculture. Crops such as wheat, barley, oats, and fava beans were introduced and soon integrated into the traditional milpa system. In addition, fruit trees, poultry, pigs, and other livestock animals were introduced, diversifying the diet and extending the seasonal rainfed system into a year-around cropping system. These introductions were rapidly and effectively integrated into the Purhépecha traditional farming systems and still persist to this day, however, dependence on the traditional rainfed system of maize production is still widespread and acts as part of the subsistence strategy of Purhépecha communities (*ibid.*).

Christianity was introduced into the Purhépecha culture during Spanish colonization as a form of domination and social regulation. The Franciscan monks were the first to learn the Purhépecha language and extensively study and document their manners, customs, and religion. The result was a blending of Christian patron saints and pagan gods with related ceremonies for each, which exists to this day. Each community in the Purhépecha region has their own patron saint or group of saints that are venerated at specified times of the year. Especially in the agricultural producing communities, these "saints" are heavily tied to celebrations during planting and harvesting (*ibid.*).

Mexican Independence

In the period following the independence of Mexico from Spain (from 1821), a number of reforms took place that were focused on the restructuring of the economy and the modernization of the Mexican territory. Reforms that focused on agriculture and

rural modernization had considerable effects in the Lake Pátzcuaro Basin concerning land-holdings, land-use regimes, and the natural environment. Legal rights that the indigenous communities had to land became defunct, increasing the competition for land and natural resources that already existed. The Lerado Law of 1857 (originally aimed at decreasing the power of the Catholic Church through the removal of land ownership) resulted in a rechanneling of communally owned lands (the traditional land management strategy of indigenous groups) into the hands of small private landowners. In the Lake Pátzcuaro Basin this resulted in an increase of livestock estates owned by *Mestizo* individuals and the acquisition of large swaths of forestland, previously managed by the Purhépecha, by private entities; an event which severely affected their traditional subsistence economy and resulted in extreme forest exploitation in the Basin (*ibid.*).

The result of the era of land reforms during Mexican independence was dissent within the indigenous groups, which in the basin, resulted in violent opposition by the Purhépecha against the governing powers. An outcome of these events was a stronger organization among the Purhépecha in protest against the policies and reforms that negatively affected their communities, a sentiment that persists to this day. Because of their organization and opposition to the so-called reforms of that time, the Purhépecha were able to avoid complete land disenfranchisement (*ibid.*).

The Mexican Revolution

The period surrounding and following the Mexican Revolution (1910-1921), brought about another round of changes in the Lake Pátzcuaro Basin regarding land-use regimes, economy, and the Purhépecha culture. Revolution politics were aimed at the

restoration of lands to indigenous communities through the establishment of *ejidos*, which was meant to resolve the problems brought about by the inequities of land distribution that occurred since the Spanish conquest. However, this ended up not to be the case, as most land restitution policies resulted in "new socioeconomic imbalances, economic disparities, and environmental degradation in the basin" (Barrera-Bassols 2008). The *ejido* system of land restitution took place from 1930s to the late 1970s, with reforms taking place in the 1990s (Perramond 2008). They functioned by restituting privately owned land to communities in the form of communally managed lands. The communal lands were divided up into parcels that were managed by individual farmers, mainly *Mestizo* farmers. However *ejido* members did not actually own the land, nor did they have any title to it (the title remained in the hands of the original land owner or became state property), rather they had a legal right to farm and use the land for an indefinite amount of time and were even able to pass those limited land rights to family members. By the 1940s, *ejidos* and indigenous lands which represented varying forms of communal land managements made up about half of México's agricultural lands (Perramond 2008; Wiggins et al. 2002).

Although the land reform was seemingly beneficial, it resulted in regional disparity, ethnic inequality, and an assortment of conflicting land holdings, especially in the Lake Pátzcuaro Basin. This disproportion (that occurs to this day) was caused by confusing boundary mapping of the *ejido* lands and the granting of, in many cases, only marginal lands to the *ejido*, while prime tracts of fertile land remained in the hands of private owners (Perramond 2008; Barrera-Bassols 2008). The creation of *ejidos* "was

much more…about political patronage than about rectifying past landholding imbalances in the Mexican countryside" (Perramond 2008).

Many communities in the Purhépecha region retained strong cultural ties. In the 1940s almost half of Purhépecha individuals remained monolingual, while the majority of lands in their territory were already managed communally. This was beneficial in many Purhépecha communities for maintaining social cohesion and autonomous control in the face of change. However in a national effort to integrate indigenous communities into the "*Mestizo* ideology" bilingual (Spanish-Purhépecha) schools were established in almost every indigenous community, resulting in language-shifting and a reluctance of younger generations (especially today) in some regions to learn their native tongue (Barrera-Bassols 2008).

During the period from 1940 to 1965, the agricultural sector grew rapidly at a rate of 4.7% a year, making Mexico a net exporter of agricultural products by the 1960s (Wiggins et al. 2002). Green revolution technologies were introduced in the Lake Pátzcuaro Basin, modernizing irrigation systems while mechanizing and introducing chemical use on both *ejido* and private lands, in addition to the introduction of improved seeds. These technologies principally favored commercial agriculture at the expense of the subsistence sector (Barrera-Bassols 2008, Wiggins et al. 2002). During the 1960s and 1970s the Mexican government began to subsidize *ejido* agriculture. Subsidies came in the form of financing farm inputs such as fertilizers and other chemicals, offering guaranteed prices for crops, establishment of extension agents in rural areas in order to encourage the use of green revolution packages (such as those for maize that included improved seeds, and fertilizers, pesticides, and herbicides needed for use with those

seeds), and by making credit available to *ejidatarios* (individuals who used and managed *ejido* lands) at low interest rates. When the debt crisis of 1982 struck Mexico, the federal government responded by cutting the programs which offered subsidies to farmers, however many state governments continued supporting farmers through subsidies on farm inputs and guaranteed crop prices (Wiggins et al. 2002).

The modernization of agriculture in the Basin had significant effects on the indigenous manner of subsistence agriculture. What resulted was a shift from rainfed systems of maize cultivation that relied on the *milpa* (multi-cropping of maize, squash and beans) system and the use of organic fertilizers and manual labor, to a system of export bound, monoculture crops requiring increased monetary and chemical inputs. Because these technologies often resulted in increased yields, farmers quickly became dependent on them; however this also increased farmers' economic instability. Nonetheless, government policies of agricultural globalization did not take strong hold in the Basin, due to its unsuitable nature for supporting globally demanded products. Therefore, many farmers did not benefit from government subsidies in the region. However, in the areas immediately surrounding the Basin (the *Meseta*), forests have been decimated for avocado production, in addition to coffee and walnuts, systems that greatly benefited from the government's focus on globalizing the Mexican agricultural industry (Barrera-Bassols 2008).

The policies following the Mexican Revolution resulted in three types of land management schemes in the basin: (a) an indigenous system of multipurpose land management based on rainfed maize systems, forest exploitation and fishing, (b) *ejido*

lands producing maize that rely on both irrigation and rainfed water, and (c) private lands relying on irrigated systems and livestock raising (*ibid.*).

Modern day Purhépecha

Conflicts over land use increased and reached a peak toward the end of the 20th century due to the continued struggle between indigenous communities, private entities, and public-rural sectors over land granting procedures (Barrera-Bassols 2008). During Carlos Salinas' presidency from 1988-1994, agricultural subsidies and guaranteed prices for produce were heavily cut or removed altogether from both Federal and State agencies, in addition to the downsizing and removal in some cases of extension field agents, and the elimination of affordable credit for farmers (Wiggins et al. 2002). Reform in the agricultural sector also led to land reform in the rural sector. The most important land reform that occurred included the ability of *ejidatarios* to pursue titled rights to *ejido* lands (Perramond 2008).

Mexico entered into the North American Free Trade Agreement in the 1990s, opening up its markets to cheap food imports from the US, while being forced to eliminate the "protective tariffs and taxes on agrarian goods" that were originally established by the government to defend its farmers against price fluctuations brought about by food imports (Perramond 2008; Wiggins et al. 2002). In the Lake Pátzcuaro Basin, this resulted in a decrease of agricultural activities within indigenous communities. Maize prices began to descend rapidly, decreasing earned wages and making subsistence agriculture more expensive. Changes in livestock raising also occurred with the replacement of open range management with wire fenced parcels required by new crop

technologies to eliminate animals from the agricultural ecosystem. As for forest resources, which were owned in large part as indigenous communal territory, they came under the control of State management, which led to overexploitation in many cases on Purhépecha land by *Mestizo* elites and foreign enterprises. Today, both large and small scale logging has been banned in the region; however this has not stopped small woodcutter enterprises from operating, resulting in an inability of indigenous communities to effectively manage their surrounding forest resources while illegal logging continues to benefit only private companies. The decline in economic incentives for agricultural activities has resulted in many indigenous households specializing in various forms of artisanry (principally pottery and furniture making). Especially in the last two decades, the lack of economic activities in many communities has also led to massive out-migrations, many to the US, while exploitation of natural resources in the regions has resulted in increased land degradation (Barrera-Bassols 2008).

Since the turn of the 20th century, the globalization of agriculture and the end of agricultural subsidies have dominated land use patterns in the Lake Pátzcuaro Basin (*ibid.*). The privatization of *ejido* lands have allowed farmers to sell their land or parcel it off. This resulted, in many cases, in greater encroachment of urbanization in what once was farmland, and contract farming, a practice which allows agroindustrial companies to lease land for production purposes. Both of these promise greater returns on *ejido* land than traditional farming. However, the amount of privately owned parcels within *ejido* lands has remained low throughout Mexico, with only about 1% of *ejidatarios* seeking private ownership. In fact, associations of co-ownerships and cooperatives are emerging in the *ejido* territories and continue as a form of viable land management for many

communities. While individuals pursued ownership rights to their farm plots, the *ejidos* generally retained communal control of forest and grazing lands (Perramond 2008). As for the Lake Pátzcuaro Basin, the indigenous system of communal land tenure still dominates (Toledo 1991).

The opposing perceptions of the natural environment between indigenous communities and *Mestizo* entities have resulted in a combination of conflicting land holdings and land-use regimes in the Lake Pátzcuaro Basin. While autonomous indigenous communities have retained a traditional form of multi-purpose land management, *Mestizo* and government entities have pursued resource exploitation through "extraction and land-use specialization" (Barrera-Bassols 2003). The agricultural schemes that exist today in the Lake Pátzcuaro Basin are a direct result of these conflicting paradigms (*ibid.*).

Purhépecha environmental knowledge and land management today

It is evident from the preceding passages that the Purhépecha culture, as in many parts of the world, has been molded by a series of events beginning since the pre-Hispanic era, but even more so since the Spanish conquest. Especially today, with pressures of globalization exerting an ever increasing weight on indigenous societies, the Purhépecha cannot be thought of as a "pure" or "homogenous" indigenous entity, but rather as an ever transforming and adapting culture. So it is through this recognition that the environmental knowledge of the Purhépecha people is analyzed and considered (Mapes et al. 1990).

Even though the Lake Pátzcuaro Basin has a history of land degradation issues relating to pre-Hispanic land management and the consequences of changing land use since the Spanish conquest, the Basin remains relatively preserved compared to other lake basins in the Trans-Mexican Volcanic Belt (TMVB). The preservation of the Lake Pátzcuaro Basin has been attributed to four main reason; (1) the presence of a strong indigenous population that has been able to maintain ties to traditional land management systems that are important in maintaining subsistence strategies; (2) the ability of local farmers to integrate varying forms of agricultural strategies into their traditional farming system; (3) "the ability of Purhépecha households to overcome economic and environmental uncertainties"; and (4) a strong cohesion among the Purhépecha people (Barrera-Bassols 2008). A multi-disciplinary study of Purhépecha ethnoecology was begun in the 1980s focusing on communities in the Lake Pátzcuaro Basin (Toledo et al. 1980; Toledo and Barrera-Bassols 1984; Caballero and Mapes 1985; Barrera-Bassols 1988; Mapes 1987, Mapes et al. 1987; Toledo 1991; Barrera-Bassols 2008; Barrera-Bassols and Zinck 2004). This continuing study found that inhabitants of the Lake Pátzcuaro Basin have been able to maintain an "ecological knowledge system" that has been molded and adapted since the Conquest and has remained strong despite the "socio-cultural, economic, and environmental changes since the 1940s" (Barrera-Bassols 2008, page 454). The ethnoecological knowledge held by the Purhépecha communities in the Basin holds a variety of characteristics that have been essential in the preservation of the Lake Pátzcuaro Basin. Barrera-Bassols (2008) provides a list of these characteristics pulled from a number of publications, which resulted from the ethnoecological survey in the 1980s:

> (a) A multi-purpose land management strategy for both subsistence and commercial purposes;
> (b) A hybrid environmental knowledge system that integrates pre-Hispanic, Colonial and Modern technologies and know-how;
> (c) Local adaptations of a regionally shared environmental knowledge system that is constantly adjusted to economic and climatic circumstances;
> (d) Local institutions that control and sanction collective access to resources on communal lands;
> (e) Local institutions still based on prestige values rather than on capital accumulation;
> (f) A network of symbiotic relations between households and localities, aimed to exchange material and symbolic goods within the regions and throughout the year;
> (g) A network of markets where goods and services coming from the basin and from the outside are exchanged to fulfill dietary demands and basic needs of 100 localities; and
> (h) A syncretic religion embedded in both the Middles American and Catholic worldviews. (ibid.: 454)

There are eight main production activities that take place in the region, reflecting multi-use and diversification practices common to indigenous societies. These are agriculture (including silviculture), horticulture, fishing, hunting and gathering, aquatic and forest extraction, and artisanry (Mapes et al. 1990; Toledo 1991).

The Purhépecha ethnoecological system is a complex matrix of classification systems, management practices, and symbolic meanings. Their classification system is holistic, encompassing all aspects of their surrounding environment, which allows them to identify and recognize interrelationships between biotic and abiotic factors, including plants and fungi, animals, soils, seasonal variability, and climatic patterns. Almost all ethnoecological knowledge is connected in one way or another to everyday activities. The Purhépecha are able to recognize and label about 400 species of plants and fungi, of which include both wild and cultivated varieties. They are also able to accurately separate and identify 55 mushroom species, which accounts of about 40% of those that occur in the Basin. Many of the recognized species are incorporated in a variety of everyday uses, such as foods, medicines, tools, fuel, and religious purposes (Barrera-Bassols 2008; Caballero and Mapes 1985; Toledo 1991). Concerning animal species, the Purhépecha taxonomic system is able to classify about 60% of the species that exist in the

Basin, including reptiles, amphibians, birds, invertebrates, and fishes. Both the botanical and zoological classification systems are hierarchical, with 5 levels (Figure 3.4). As for soil, their system recognizes "21 soil types and sub-types in three hierarchical levels" (Figure 3.5). The Purhépecha ethnoecological system can also recognize relations occurring "between altitude, slope, soil type, and climatic factors" that permits the labeling of a number of bioclimatic zones (or landscapes) with their associated vegetation throughout the Basin (Figure 3.6) (Barrera-Bassols 2008).

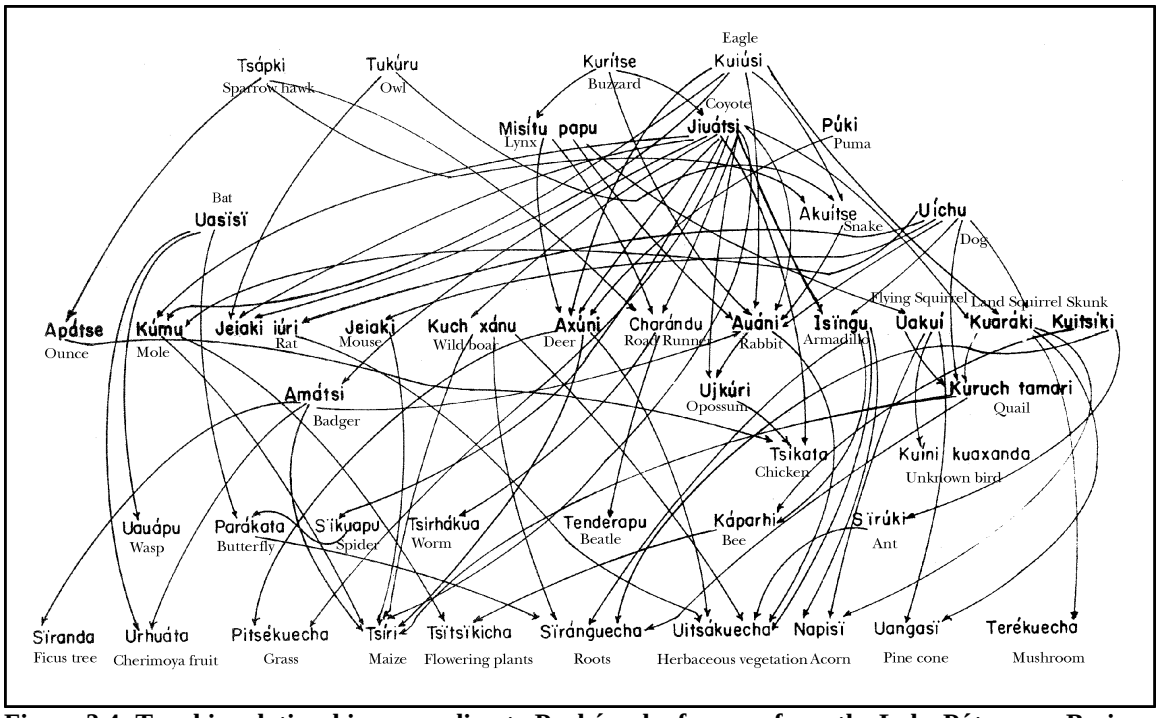

Figure 3.4: Trophic relationships according to Purhépecha farmers from the Lake Pátzcuaro Basin. Source: Arguetta (1988).

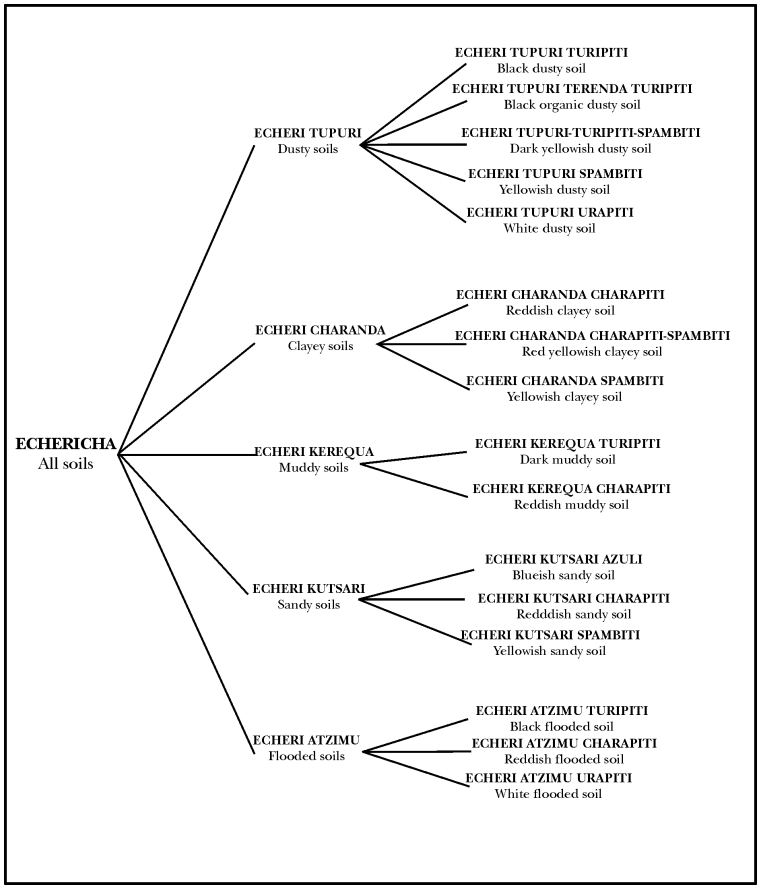

Figure 3.5: Soil taxonomy according to the Purhépecha local ecological knowledge system. Source: Barrera-Bassols (1988).

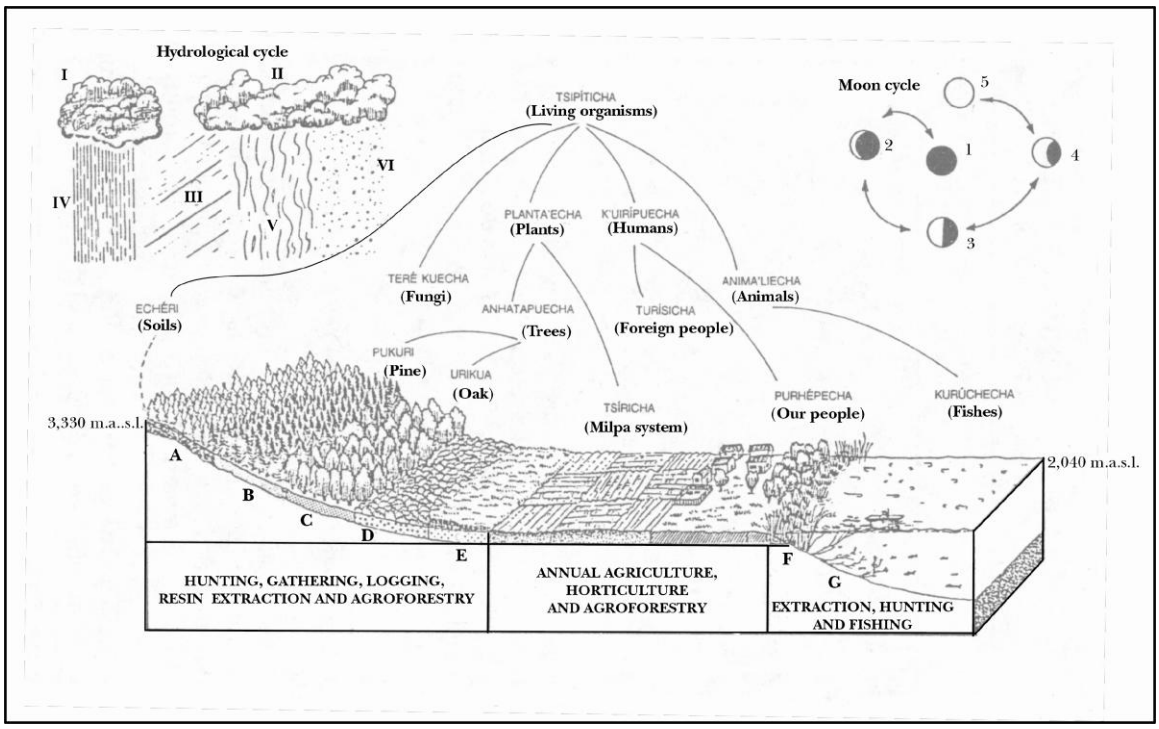

Figure 3.6: Model of the Purhépecha ecological knowledge system. Sources: Arguetta (1988); Barrera-Bassols (1988); Mapes et al. (1981); Toledo et al. (1980). Moon cycle: (1) Kutsi k'amarastia (new moon); (2) Kutsi uentania spichu (crescent moon); (3) Kutsi k'epekhuristi (half moon); (4) Kutsi k'epekumisatia (crescent moon); (5) Kutsi uirpiti (full moon). Meteorology: (I) Xumu turipiti (black cloud); (II) Xumu urapiti (white cloud); (III) Tariat (wind); (IV) Janikua (rain); (V) Shanoata (hail); (VI) Xuanda (fog). Vegetation types: (A) Kumchkaricharu (fir forest); (B) Pukuricharu (pine forest); (C) Urikuacharu (oak forest); (D) Anatapuicharu (shrub); (E) Ambakuri (grassland); (F) Tupatarhu ka patzimutu (tulle reed marsh), and (G) Uitsakuicha (floating hydrophytes).

Indigenous production in the basin has traditionally focused on diversification of activities within communities, including agriculture, fishing, forest exploitation, hunting and gathering, and artisanal activities. The traditional indigenous view of production is more in the form of reproduction of the family and community units rather than specialization for the sake of monetary gain, though this has changed in the last two decades due to globalization and out-migration. Diversification of activities also buffers the household against fluctuations in the environment as well as the market economy. Agriculture has been the main activity, principally focused on subsistence. Three different types of agricultural systems can be found in the basin: (1) annual; (2) perennial;

and (3) mixed cropping systems. Although all natural resources are currently considered as communal indigenous property in the region, actual agricultural parcels are managed and reckoned as private property (Barrera-Bassols 2008 and Toledo 1991).

Fishing has been important for those communities surrounding the lake edges. Both lake and forest resources are distributed among communities and managed communally among the members, although much dissent has occurred during the last century due to divisions and subsequent exploitation of forest resources by private entities. Traditionally hunting and gathering in surrounding forests occurred as part of the Purhépecha subsistence strategy (*ibid.*).

Artisanal activities are important for communities in the Lake Pátzcuaro Basin, each one specializing in a certain craft depending on its access to resources, these resources mainly encompassing woods, clays, and straw material such as grass reeds and wheat. The last three decades have seen a transition from artisanal activities being mainly seasonal (to offset decreases in agricultural returns during the dry season) to a year-around full time practice (Barrera-Bassols 2008).

Religious practices are also deeply rooted in the Purhépecha ethnoecological system. As in other regions throughout Middle America, pre-Hispanic cosmology has been successfully integrated into many aspects of Catholicism. The most noticeable of this integration are the ceremonies and associated *fiestas* throughout the year often commemorating various community patron saints, which are a melding of pre-Hispanic deities and tend to be associated with the agricultural calendar, often occurring during important periods of planting and harvest. Families within the communities are the ones which usually sponsor the festivities, with each "saint" passed to a new *mayordomo* or

sponsor each year. Hence these activities are mainly based in a system of prestige, rather than material wealth. This system regulates the amount of wealth a household may accumulate due to the amount of time and resources (including large sums of money) spent on festivities, thereby balancing capital distinctions among community members (Barrera-Bassols 2008; Toledo 1991).

The Purhépecha ethnoecological system is being increasingly threatened today due to a variety of external and internal pressures. The past two decades has seen widespread abandonment of agriculture and increasing specialization in artisanal activities. Traditional subsistence activities are disappearing. Younger generations no longer see the benefits of participating in traditional agriculture activities. Much of this is due to México's increasing participation in the global market and to out-migrations, especially to the United States. These processes have been detrimental in the Lake Pátzcuaro Basin, causing an increase in land abandonment and changes in land management from the traditional multi-use system to mono-cropped, high-input systems, which are leading to greater land degradation (Barrera-Bassols 2008). Language shifting has also threatened the Purhépecha ethnoecological system. In 1970, it was reported that some 20% of the population spoke an indigenous language in the Lake Pátzcuaro region, in 2005 that number had dropped to 8% (municipalities taken into account: Pátzcuaro, Erongaricuaro, Quiroga, Tzintzutan and Tingambato) (Mapes et al. 1990; INEGI 2005).

Conclusion

Since the pre-Hispanic era, the Purhépecha culture has been an ever evolving entity, forever molded and shaped by the events that have occurred throughout its history.

It has been surprisingly resilient to extinction, even though it suffered an almost 90% drop in population after the Spanish conquest. This is perhaps due to its relative isolation location within the Lake Pátzcuaro Basin, but also to the strong cultural identity and autonomy to which many Purhépecha have associated themselves to this day.

The resultant cultural evolution that the Purhépecha have undergone since the Spanish conquest has resulted in a dynamic region located in the Lake Pátzcuaro Basin, where each community interacts with others in a variety of manners and has been subject to similar politics since the pre-Hispanic era. At the same time, each community is quite different from one another due to each community's varying access to natural resources and the changes that have occurred in land use since the Spanish conquest. Today, this can be seen in varying degrees of loss and preservation of traditional methods of land management and Purhépecha ethnoecology among its communities. Globalization is taking an ever expanding toll on the Purhépecha culture, with fewer speakers of the native language in each generation. For this reason, efforts have been undertaken by both community members and non-governmental organizations (NGOs) to reverse the globalization process by promoting and encouraging the preservation of Purhépecha cultural activities, which range from learning the native language to sustaining traditional farming practices. It is ultimately through these types of programs and through continuing ethnographic research that the Purhépecha culture can survive into the near future.

CHAPTER FOUR

SAN FRANCISCO PICHÁTARO: THE CASE STUDY COMMUNITY

Pichátaro has been either the focus of or featured in a number of studies or works throughout the last three decades (Stanislawski 1950; Young and Garro 1981; Mapes 1987; Toledo and Barrera-Bassols 1984; Barrera-Bassols 2008; Works and Hadley 2004, among others). The most recent and exhaustive study being that conducted by Barrera-Bassols (2008), which focused on local knowledge and management of soil and land resources in Pichátaro. It is from all of these studies that I draw the majority of the information presented in this chapter.

Natural History

San Francisco Pichátaro lies in an intermountain valley, named *Parizapio*, at the edge of the Lake Pátzcuaro Basin and has the most cold and humid climate of the settlements within the Basin. It borders the *Meseta* or *Sierra* Purhépecha, the largest of the two geographical regions that make up the Purhépecha territory. The *Parizapio* valley encompasses three eco-geographic zones; (1) cold and sub-humid; (2) temperate sub-humid; and (3) warm and humid. Elevation in the valley ranges from 2,300 to 3,200 meters above sea level (m.a.s.l.) and is surrounded on three sides by volcanic mountains. (Figures 4.1 and 4.2) Archeological evidence shows that the valley has been inhabited from around 1200 C.E., with agro-silviculture being the most important activity since pre-Hispanic occupation due to the abundance of surrounding forest and water resources. Almost 45% of the region is made up of forest cover, with oak, pine-oak, pine, and fir

being the dominate species as elevation increases. Another 45% of the valley is in agriculture land, while 10% lies in anthropogenic grass and shrubland. Forest resources in the area have recently come under attack from illegal logging, fire, plagues, and overgrazing that has increased over the last two decades (Barrera-Bassols 2008; Young and Garro 1981).

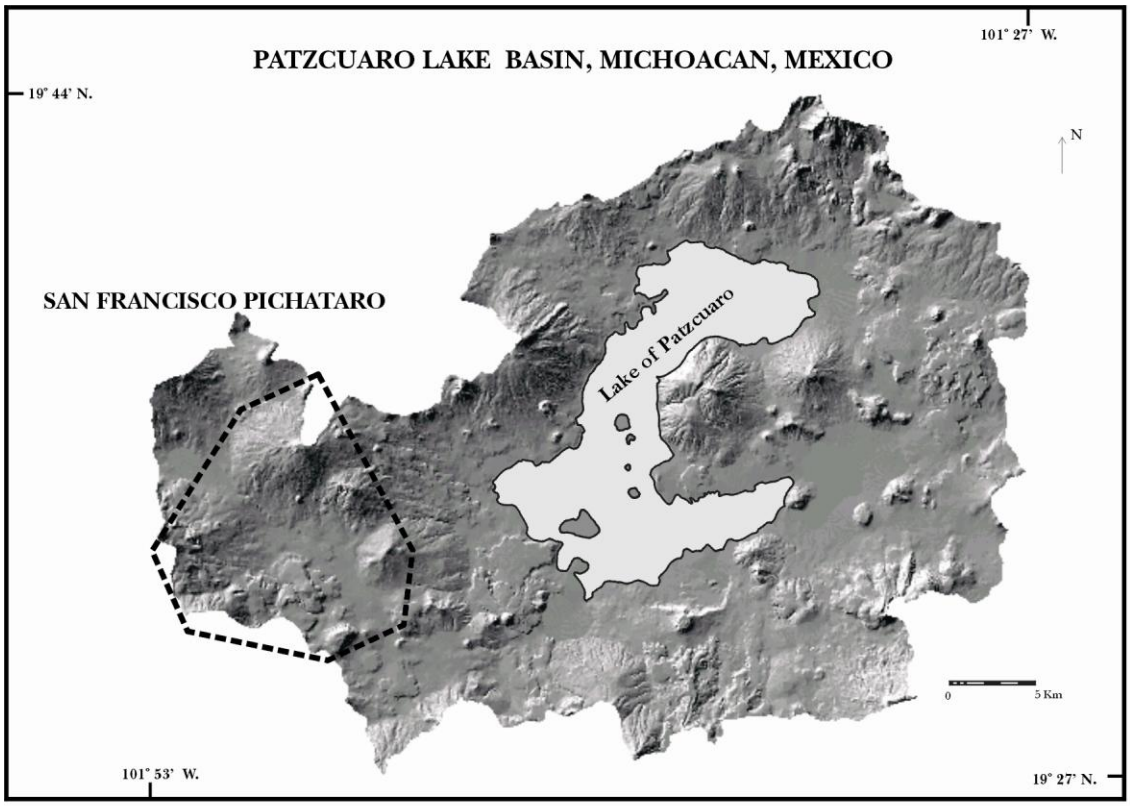

Figure 4.1: San Francisco Pichátaro within the Lake Pátzcuaro Basin. Source: Barrera-Bassols (2008).

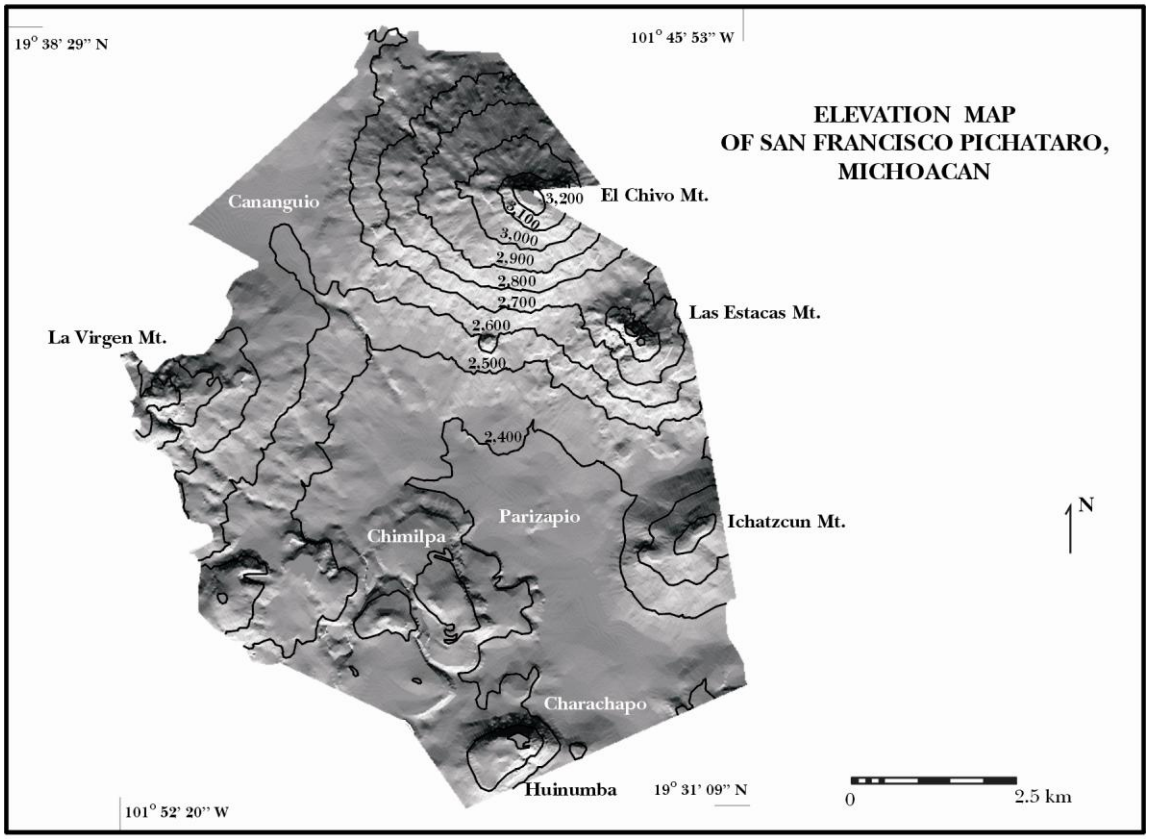

Figure 4.2: Elevation map of San Francisco Pichátaro, Michoacán. Source: Barrera-Bassols (2008).

Community of San Francisco Pichátaro

The name San Francisco Pichátaro is a reflection of both its pre-Hispanic origins and colonial influence. *San Francisco* became the patron saint associated with the community during Spanish colonial influence, as in many other communities both in the Lake Pátzcuaro Basin and in Mexico. The word *Pichátaro* in the Purhépecha language means "the place where wooden nails are crafted," reflecting both the proximity of forest resources to the community and the traditional wood cabin-like housing structure of the Purhépecha, the *troje* (Figure 4.3). *Trojes* were widely found throughout the Purhépecha region, including in Pichátaro up until the last few decades (Barrera-Bassols 2008). Young and Garro (1981) noted during their field research in Pichátaro during the mid-

1970s their impressions of the "handsome and solidly built wood plank houses (*trojes*) characteristic of the Tarascan Sierra," surrounded by stone fences and "entered through a heavy, shake-roofed gate." The traditional *troje* can still be seen in Pichátaro today; however the majority have been blocked in by cement brick walls or replaced by the more common *Mestizo* form of brick house construction. Housing units vary throughout Pichátaro in relation to the economic status of its members. For the most part households consist of one main building surrounded by two to three smaller buildings, and a garden area, that are fenced in some manner. The garden areas are often referred to as a *solar*. Plants that are found in the *solares* range from a few ornamental plants interspersed with herbs (the most common being mint, chamomile, cilantro, and epazote) to a few fruit trees intercropped with maize varieties (this thesis Chapter Six pages 88-89); Young and Garro 1981).

Figure 4.3: Traditional *troje* of Pichátaro. Source: Barrera-Bassols (2008).

Pichátaro is divided into seven *barrios* or wards that reflect seven pre-Hispanic settlements that existed at the edges of the valley prior to the Spanish conquest. These settlements where situated at different points in the valley until Spanish rule placed them together into one town, where one of the original seven settlements was located. It is thought that that original town was named *Chataru*. Despite existing as a single town for almost 500 years, the *barrios* of Pichátaro still retain separate identities and independently elect their own representatives for the local indigenous governing authority (*Asamblea*). Natural resources (forested land) are also divided between each *barrio* (Figures 4.4 and 4.5) (Young and Garro 1981; Barrera-Bassols 2008).

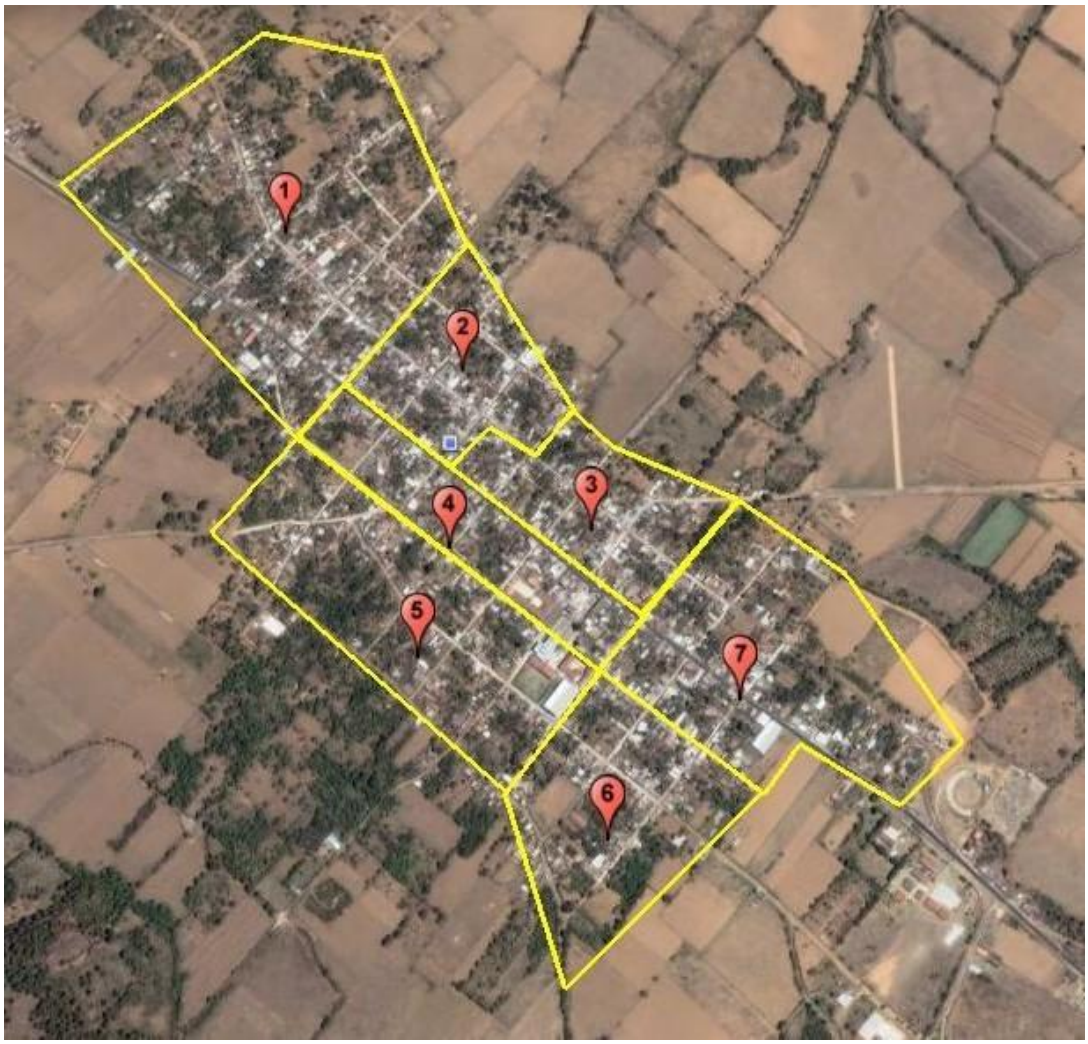

Figure 4.4: Divisions of barrios in Pichátaro. 1: San Miguel; 2: San Bartolo I; 3: San Bartolo II; 4: Santo Reyes; 5: San Francisco; 6: Santo Tomas I; 7: Santo Tomas II.

After the household, the *barrio* is the most important social unit in Pichátaro. Reflecting the Spanish colonial period, each *barrio* is named after a patron saint and has its own chapel to venerate it. Each *barrio* also celebrates a *fiesta* or ceremony that reflects the specific saint's day during the year. In addition, each *barrio* has a loudspeaker system that consists of megaphones attached to the tops of poles and which broadcast various announcements throughout the day specific to that *barrio.* The *barrio* thus becomes part of a person's identity; many will identify themselves with the *barrio* in which they grew up, although they may currently live in a different one. There is also

much rivalry that occurs among the *barrios*, causing many problems for community-wide unity, especially for internal community politics (*ibid.*).

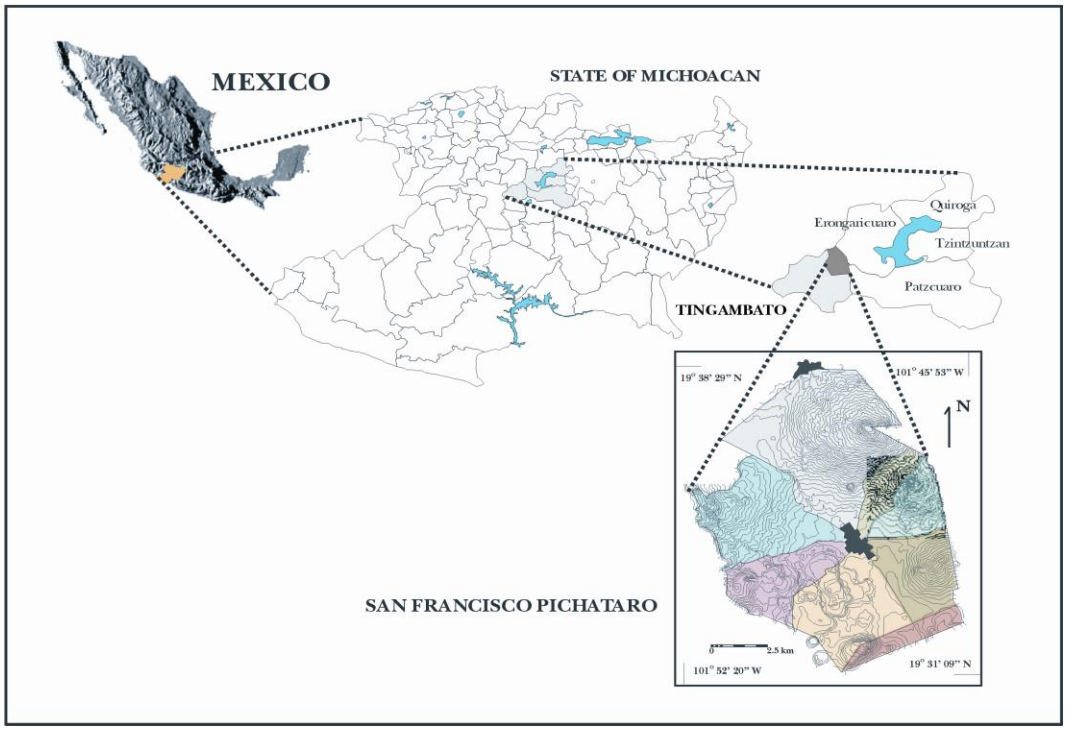

Figure 4.5: Map showing the geographic location of Pichátaro within the state of Michoacán and divisions of forest land among barrios, each color represents a separate barrio. Source: Barrera-Bassols (2008).

The town itself is organized in a densely populated uniform grid pattern, gradually letting out into the agricultural fields at its periphery. The majority of households have access to some running water and electricity, although a public sewage system is still lacking, and therefore, many households incorporate the use of an outdoor latrine. In addition there is no public waste disposal system, so that waste is often thrown into water ways or disposed of and burnt in housing compounds (*ibid.*).

Pichátaro has two official government structures and a corresponding set of governing officials for each (Figure 4.6). They are principally part of the federal system of *municipalities* or counties which are managed in a similar manner to the county system

in the United States. Pichátaro lies within the *municipio* of Tingambato (which is also the name of the county seat) and so is considered as a subordinate town to the county seat, although Pichátaro territory constitutes 40% of the *municipio*. However, Pichátaro also has federal status as a sovereign indigenous community, which allows them substantial independence from the county seat. The two forms of government work together in the management of the community, with officials representing Pichátaro as part of the *municipio* being largely responsible for communications between Pichátaro and Tingambato, and for requesting federal services, such as education and health services. The indigenous authority presides over the land managed by the community, administering forest and agricultural resources, and collecting the taxes on those resources that are imposed by the federal government (*ibid.*).

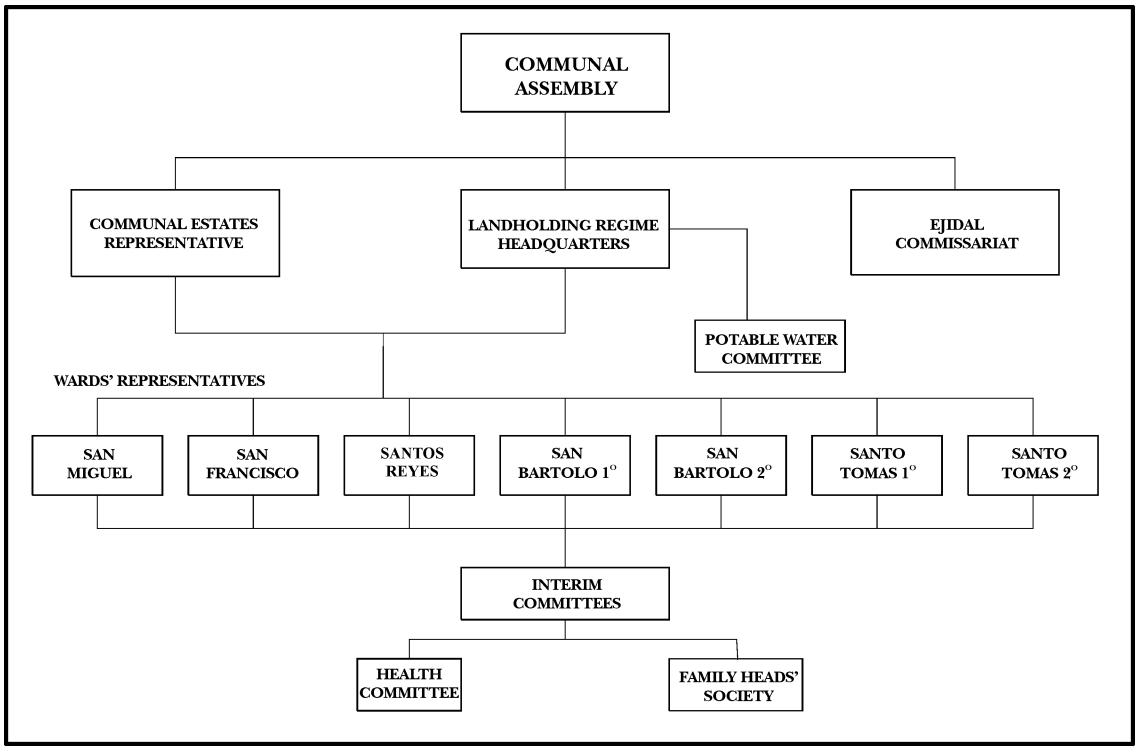

Figure 4.6: Organization of indigenous governing authority in San Francisco Pichátaro, Michoacán. Source: Barrera-Bassols (2008).

History and people of Pichátaro

During the pre-Hispanic period, Pichátaro represented one of the four corners of the Earth, as believed in Purhépecha cosmology. The yellow god of the north *Tiripeme Xungapeti* resided in the area and had control over rainfall. *Tiripeme Xungapeti* also ruled over the mountains, water springs, caves, and the holy areas belonging to the goddess *Cuerauaperi*, the Mother Earth (Barrera-Bassols 2003). In addition, Pichátaro was considered the holy place of yellow maize and amaranth. About 4,000 to 5,000 people were thought to inhabit the footslopes of the valley, where they partook in exchanges with the Pátzcuaro lakeshore settlements, bartering wood resources for fish, and temperate-climate products. Maize and amaranth were the most important crops in Pichátaro and common Purhépecha agricultural technologies were used in their production, such as the digging stick or *tarhekua*. Also, irrigation practices in the form of rainwater run-off control were apparent (Toledo and Barrera-Bassols 1984; Barrera-Bassols 2008).

During the Spanish conquest the population of Pichátaro was decimated as in other parts of the region, due to introduced diseases, forced migration, and wars. It is estimated that the population in Pichátaro underwent a reduction of about 85-88% during this time. This resulted in only about 50-60 remaining households (about 10% of the pre-Hispanic estimate), which remained a constant number throughout the next three centuries and which only began to grow at the end of the 19th century. Today there are about 800 households in the community of Pichátaro (Barrera-Bassols 2008, INEGI 2005).

As in the majority of Middle American indigenous societies, facets of the Purhépecha religion were integrated into those of Catholicism, which was forced upon the indigenous groups as a means of conquest and control. This largely resulted in a synchronism of religious deities and holidays, as is highly apparent in Pichátaro today as many of the *fiestas* held throughout the year, which represent Catholic patron saints, also coincide with important days of the year on the agricultural calendar. Religion is highly important for maintaining political, social, and cultural norms in Pichátaro. The sponsoring of religious-oriented *fiestas* throughout the year by different households is a means of controlling wealth among individual households. Therefore, those households with excesses (or presumed accesses) in wealth will spend lavish amounts of money to sponsor a festivity for the *barrio* or community, thereby leveling out distinctions in assets among community members. In fact, holding *fiestas* throughout the year is considered the second most important activity in town after making a living! There are two main types of *fiesta*, the Catholic-related, community-wide ones and the *fiestas* held for celebrating important life events, such as baptisms and weddings. About twelve community-wide *fiestas* are celebrated throughout the year, amounting to more than 30 days of celebration (not including those days used to celebrate important life events) (Figure 4.7) (Barrera-Bassols 2008; Toledo 1991; Young and Garro 1981).

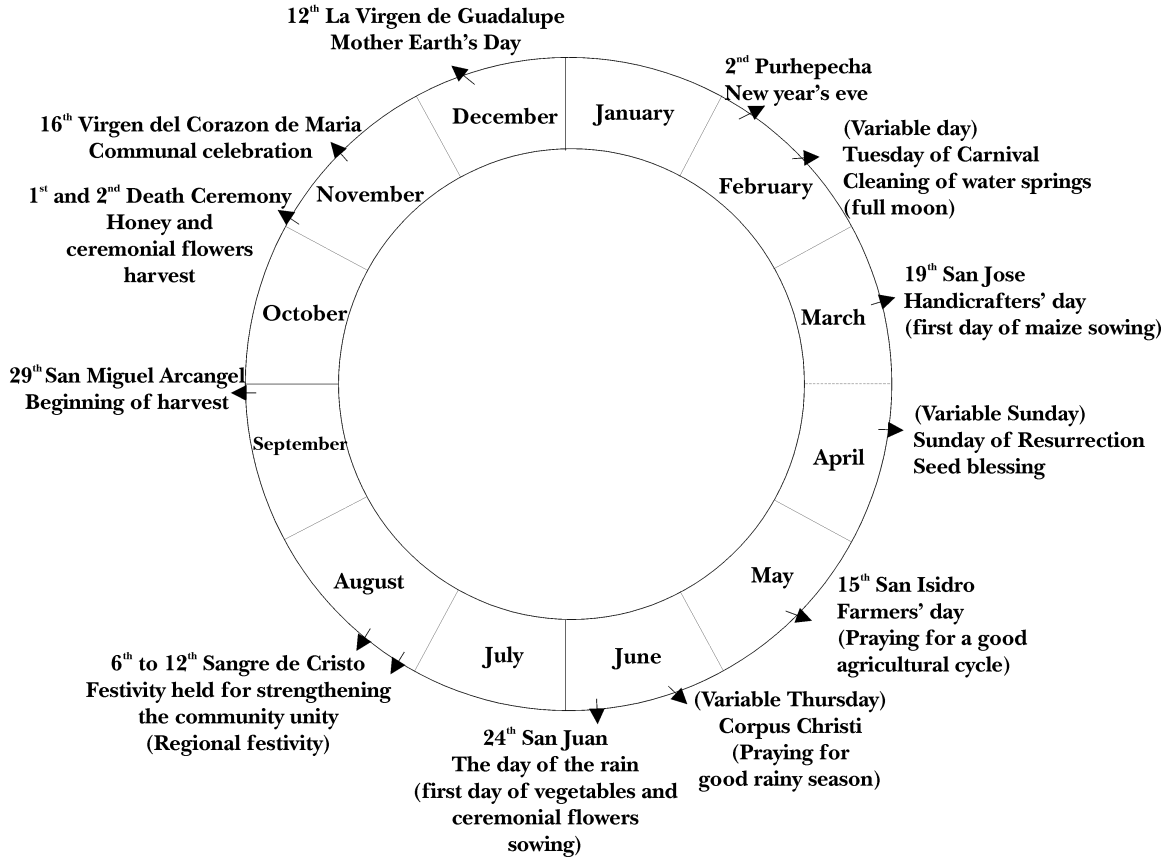

Figure 4.7: Religious and festivities calendar for San Francisco Pichátaro. Source: Barrera-Bassols (2008).

The household is the most important social unit in Pichátaro. The household is traditionally patrilocally organized and each member has specific duties which contribute to household maintenance in some way. Kinship ties are extremely important, especially in agriculture when parents and siblings unite for planting and harvesting activities. Thus, belonging to a household is of utmost importance in maintaining a livelihood, and for being a contributing member of the *barrio* and community (Barrera-Bassols 2008).

Since the pre-Hispanic era, Pichátaro has been situated along an important trade route that connects the Lake Pátzcuaro Basin with the neighboring *Meseta Purhépecha* region (the most extensive of Purhépecha territories consisting of a high volcanic plateau of intertwining mountains and valleys). This trade route was also used by the Spanish

after the Conquest. Therefore, Pichátaro has always been a community of much exchange, where foreigners often passed through and where many *mestizos* settled. Today, this route is reflected in an improved highway system that has regular bus transportation to surrounding communities and the main town of Pátzcuaro (Barrera-Bassols 2008; Young and Garro 1981). A dynamic has been created by this interchange with foreign individuals in Pichátaro, which, consequently, has sharply influenced the "co-evolution of eco- and socio-systems" of the area (Barrera-Bassols 2008). Tensions between local inhabitants and outside entities have occurred throughout the centuries, mainly due to demand for the abundant forest resources that exist in the region (Stanislawski 1950).

Beginning in the 1940s the Lake Pátzcuaro Basin became known as a "region of refuge," that is, a region in Mexico that was somewhat isolated from development and had a majority of indigenous communities. These regions became the focus of the government's rural development programs, which focused on the implementation of formal schooling, town infrastructure improvements, and agricultural development. As a result of these programs, the first bilingual school was built in Pichátaro in the 1940s, with agricultural assistance arriving in the form of donations of Holstein cattle in the 1950s, and the construction of a dirt road in the 1970s connecting Pichátaro more efficiently to the major Pátzcuaro-Uruapan highway (Young and Garro 1981).

Emigration has been present in the community since the 1940s, with many taking advantage of the Bracero Program implemented in a bi-lateral agreement between the United States and Mexico as a means to increase farm labor in the U.S. during World War II (Heisler 2008). Young and Garro (1981) found that about half of their survey

participants in 1976 had traveled outside of Pichátaro at least once in search of temporary employment, with about one-in-four heads of households having traveled to the United States for work. Most emigration is tied to the agricultural cycle, so that during important times of planting in the spring and then during harvest (November-December) males are present to participate (Young and Garro 1981; Barerra-Bassols 2008). Even with these strong ties to the agricultural activities of the community, Barrera-Bassols (2008) found that in the late 1990s about 38% of households had at least one member living and working in the US, with many more living outside of Pichátaro but within Mexico. Migration has significantly affected Pichátaro, to the extent that Barrera-Bassols (2008) refers to the community as a "transnational," in that traditional cultural values have and are being molded and transformed by the experiences of those who have migrated out of and back to the community. While a greater sense of individualization has resulted, and patterns of consumption have been altered to focus on external products, religion, kinship, and community solidarity have reinforced the importance of the community's cultural identity (*ibid.*). In fact, today many women still can be seen wearing modern traditional dress consisting of handmade skirts and blue shawls of varying blue- and white-stripped patterns.

Globalization has had a significant impact on Pichátaro throughout the past two decades. There has been increasing involvement by younger generations in off-farm activities, preferring instead to participate in the traditional furniture making activities of the community. The emphasis on furniture making has also increased forest resource exploitation both by locals and outside entities. Cultural changes, including language shifting, has taken place due to increasing global influences such as migration to the

United States and nearby city centers in search of better work opportunities, and in some cases for the purpose of higher education (Barrera-Bassols 2008).

A "hybridization" of the community has taken place, with traditional customs and standards being upheld by older generations, while younger generations have focused more on modern-day global influences. The following passage by Barrera-Bassols (2008) effectively sums up this contrast: "The overlapping of traditional dresses and religious ceremonials with black t-shirts, long hair and tattoos, *sombreros* [hats] and baseball caps, donkeys and US-bought four-by-four trucks, alcohol and marijuana, folk and [modern] music, and old wooden [*trojes*] with permanently under-construction modern residences, are common cultural objects, habits and rituals observed when walking though the town's streets." (page 500).

Economy

Today, wage earning activities can be divided into two realms, on-farm and off-farm activities. The most common on-farm activities consist of agriculture, agro-forestry, gathering (principally fungi), forest extraction (lumber and resin), and livestock raising. The most common off-farm activities are carpentry and furniture making, embroidery, and petty commerce. Traditionally, Pichátaro has had the most diverse production activities among communities in the Lake Pátzcuaro Basin, participating in about nine separate economic activities. However the increasing abandonment of agricultural activities has led to an economy based more and more on off-farm activities and forest extraction (*ibid.*).

Traditionally, men will participate in one main economic activity augmented by one or more side activities. For example, a man will primarily consider himself a farmer, but will also participate in other activities such as resin collection or temporary migration for wage labor. Women for the most part dedicate themselves to the household and supplement household income through the sale of embroidered cloths, managing small variety stores, or by selling traditional dishes such as *etole* and *pan dulce* in the streets (Barrera-Bassols 2008; Young and Garro 1981).

Various surveys concerning agriculture and economic activities have been conducted over the last four decades and show the shift that is occurring in the community. Young and Garro (1981) conducted a socio-economic survey in Pichátaro in 1976, which showed that 72% of males over the age of 15 considered agriculture as their primary occupation whereas only 4.3% considered carpentry or furniture making as theirs. Toledo and Barrera-Bassols (1984) conducted a second survey in 1982 and found that 56% of males considered agriculture as their primary activity. Another survey conducted by Barrera-Bassols (2008) in 1997 showed that 45% of males considered agriculture as their primary activity. Thus agriculture as a primary household activity declined about 30% during a period of only three decades.

The evolution of economic activities based in agriculture to those based in off-farm production has resulted in changes in the socioeconomic structure of the community. While changes in land use have occurred, so has access to natural resources. Because of limited access to natural resources people in Pichátaro have increasingly compensated by focusing in off-farm activities, mainly furniture production. Due to the immediate monetary returns that often result from furniture production as opposed to

agriculture, gaps in social stratification have occurred with those who rely on off-farm income becoming increasingly influential locally. Contributing to the socio-economic divide is the change in household structure that has taken place over the two decades. Traditionally, households consisted of extended families of six members or more who depended on subsistence activities for household consumption, whereas today households are mainly composed of nuclear families of 3-4 members who depend on external resources for maintaining household structure (Young and Garro 1981; Barrera-Bassols 2008). Barrera-Bassols (2008) found that 55% of households consisted of young nuclear families in 1997, and that these tended to be the poorest households, with neither access to agricultural land nor capacity to make furniture, thus relying on agricultural or off-farm wage labor, including that from temporary emigration.

Furniture production

Furniture making and wood carving have been an important activity in Pichátaro since pre-Hispanic times, as the community has abundant forest resources nearby. Traditionally wood-workers were held in high esteem in the community. Stanislawski (1950) mentioned in his observations of the community at the time that only a dozen or so wood artisans existed and these were referred to as *maestros* or teachers. High quality, intricately carved wooden posts, doors, and furniture were made for the traditional *troje* wood cabins (*ibid.*).

Woodworking increasingly became a form to both complement agricultural production and to offset market and environmental uncertainties. However, today woodworking has taken more precedence over agricultural activities (Barrera-Bassols

2008). The abundance of relatively cheap wood resources, which have been severely undervalued, has made it possible for many to participate in woodworking with the hopes of receiving greater monetary gain than agriculture would provide. This widespread participation in woodworking is resulting more and more in lower quality craftsmanship, as there is now an overabundance of artisans who constantly try to undersell one another. In addition, trucks from outside the region arrive in Pichátaro almost daily to haul away furniture, much of which is unfinished and therefore sold at incredibly low wholesale prices. The monetary return is obviously more immediate than that of agriculture, and seemingly less labor intensive. For this reason furniture making is currently viewed by younger generations as the most viable economic activity, although it has proven to be viable only in the short term. This is because the cost of production does not fully reflect the labor and skills required for high quality production, nor the environmental degradation resulting from over-harvesting undervalued forest resources and the lack of adequate lumber processing facilities (*ibid.*).

Agriculture and subsistence

Evidence shows that agricultural production in the valley where Pichátaro is located, has been present for about 3,000 years. Farmers have been able to develop multi-use strategies in the valley since its occupation for maize production, which consequentially has been adapted to the harsh climate of this mountainous region. Local livelihoods have been sustained through local production, complemented by exchanges with surrounding communities since the pre-Hispanic era (*ibid.*). There has always been abundant and fertile farmland in addition to abundant forest resources in the valley,

giving Pichátaro a material advantage over the average Mexican indigenous village. Up until the last two decades, Pichátaro has had enough access to land to provide for the production needs of its inhabitants. Today, however, there is increasing competition for land resources as population growth is rapidly expanding at a rate of 55% between 1976 and 1997, and as lands, previously held as communal *ejido* property, is being leased for use by outside agricultural companies (Barrera-Bassols 2008; Young and Garro 1981; Perramond 2008).

Spanish colonization affected agriculture in Pichátaro much as it did in the rest of the region and throughout Mexico. New crop and animal introductions were integrated effectively into the pre-Hispanic farming systems that exist until this day. Introduced crops of wheat and oat complemented the *milpa* system because they could be grown during the dry season when the rain-dependant *milpa* could not. The addition of this mono-cropping system thus provided a significant addition to the traditional *milpa* multi-cropping system that was already in place, because it diversified agricultural production and allowed for year round cropping. Fruit trees, such as apples, pears, and peaches among others, were introduced with great success into existing home gardens and became an important part of subsistence diets.

Livestock introduction also increased agricultural productivity. Cattle were introduced into fallow crop lands as part of the annual rotation, providing a source of fertilization for the coming year's crops. The introduction of bulls benefited agriculture in that the use of the Egyptian ox-plow was made possible. Sheep raising was also introduced in Pichátaro, where wool manufacturing became an important activity until recently (Barrera-Bassols 2008; Stanislawski 1950).

After the Mexican Revolution, much land in the region was restored to that of indigenous communal property or relegated as *ejido* parcels. Also during the later half of the 20th century, Pichátaro slowly regained its status as an indigenous community, finally being recognized as an official indigenous territory in the early 1990s allowing rights to its own local government and laws. Thereafter, conflicts arose due to differences between those who were entitled to the *ejido* parcels assigned by the national government and those who supported the communal property regime of the indigenous community. In fact, many indigenous members of Pichátaro do not recognize the *ejido* system as legal according to their local laws. This is also reflected in a conflict between older and younger generations, in which older generations support the indigenous communal property regime, while many younger individuals want their own legal right to private lands. This is seen by the local indigenous authorities as a way "to privatize the local territory, threatening the base of the indigenous community corporation and the grassroots of the Purhépecha traditions" (Barrera-Bassols 2008).

Home gardens

Since before the Spanish arrived, home gardening in Pichátaro has been an important horticultural subsistence activity. Pre-Hispanic home gardens in the area were estimated at containing more than 80 species of plants and animals, with the introduction of European fruit trees complimenting this system greatly (Barrera-Bassols 2008). European fruit trees were introduced by the Franciscans during the late 16th century, at which time they became an important part of the *solares* (Mapes et al. 1990). By the 1950s, home gardens were still abundant in the community (Stanislawski 1950). Young

and Garro (1981) noted in the mid 1970s: "To the south [of town] one walks first through the orchards, for which Pichátaro is regionally famous, and then reaches the fields." Today, the southern and southeastern areas of town is where the majority of home gardens can be found. Thus, the people of Pichátaro have maintained home gardens as an important part of their agricultural and subsistence systems for generations (Toledo et al. 1980, Toledo and Barrera-Bassols 1984).

Today different types of home gardens can be found according to their intended utilization. They range from small, home gardens grown solely for subsistence purposes to larger more intensely managed orchards for the sole purpose of production for sale (see this thesis chapter 6, page 108). Pichátaro is one of about 10 communities that produce fruit for both subsistence and local consumption in the region, where distinct differences occur between those communities that are located either at the lake shore or in the intermountain valleys. Pichátaro represents one of the communities situated in the intermountain valleys. The most common soils found in this area are Andisols, with annual rainfall around 1,000 mm and temperatures ranging from 14-16ºC at altitudes ranging from 2,400-2,900 m.a.s.l. Pichátaro is most regionally known for its apples and pears, but other varieties of fruit can also be found. The most typical fruits found in home gardens are: apples (seven varieties), pears (~10 varieties), peaches (seven varieties), plums (two varieties), quince, figs, walnut, and the Mexican native fruits *tejocote* and *chapulin* (see this thesis chapter 6, 88-89). Other plants that can be found include small berry bushes such as raspberry and blackberry, seven maize landraces, more than 25 vegetable, legume, and cereal crops, and as many as 25 different kitchen and medicinal herbs, along with a countless number of traditional and religious flowers. In addition,

chickens, pigs, sheep, and other small animals are kept in the gardens (Barrera-Bassols 2008; Mapes et al 1990).

While women tend to be the principal keepers of the herbs, medicinal plants, flowers and vegetables in the home gardens, men are most likely to take care of the fruit trees and maize. Traditionally, these areas have been intensively managed and have provided areas for experimentation with new cultivars. The home gardens tend to be smaller and can be found scattered throughout town in household *solares*. The home gardens require hand labor for cultivation, irrigation, fertilization, and harvest, and little, if any, mechanical equipment is used. The most common forms of fertilizer used in the gardens are organic amendments, such as dried leaves, household wastes, and animal manures mainly from poultry (*ibid.*).

Conclusion

Presently, Pichátaro is a community at the crossroads of indigenous values and acculturation from an ever encroaching globalized world. For this reason Pichátaro was chosen as my principal study community. Experiences from emigration outside the region and country, and overall changes in cultural values within Mexico itself, have resulted in a shift in the cultural values of younger generations of Pichátaro community members who see better opportunity in activities other than agriculture that promise greater monetary gain. This is the primary reason why agriculture and traditional subsistence activities are of increasingly less importance with each subsequent generation. In addition, households no longer have to depend on subsistence activities for consumption requirements due to greater access to imported food (regionally,

nationally, and internationally), and so have focused on off-farm wage earning activities. It is in this manner that local ecological knowledge begins to lose importance and is at risk of disappearing as theorized by Soemarwoto (1987).

CHAPTER FIVE

METHODS

In this chapter I present the methods that were used in order to understand the perceptions and processes taking place in Pichátaro, Michoacán regarding the perpetuation of traditional subsistence strategies in the community. I begin by discussing my research design, in which I used a case study analysis. I follow by discussing the methods: qualitative interviews, socioeconomic surveys, participant observation, and secondary data collection. I end by discussing the procedures I used to analyze the data.

Research Design

Home gardens have traditionally been important subsistence activities in Pichátaro, which in recent years, have been disappearing due to a variety of regional, national, and global influences exerted on the community, such as migration and decreasing profitability of agricultural practices (Barrera-Bassols 2008). To investigate the fate of home gardens in Pichátaro and possible causes of change, I conducted an in-depth case study of the horticultural subsistence practices in Pichátaro. To achieve this I combined the methods of qualitative interviews, socioeconomic surveys, participant observations, and secondary data collection (Figure 5.1).

A case study can be defined as "an intense study of a single unit for the purpose of understanding a larger class of (similar) units" (Gerring 2004: 342). There is no required number of cases that can be selected for a case study; rather, the number involved should reflect the objectives of the research at hand. Therefore, the case study should meet the three requirements of the qualitative method: describing, understanding, and explaining (Tellis 1997). For this reason, it is of utmost important that case studies take into account the perspectives of the actors (participants of the study), when gathering, analyzing, and reporting data.

Prior to carrying out the research project, permission was sought from the community's indigenous authority to conduct interviews and surveys in Pichátaro. As a condition of permission to conduct such research in the community, results and conclusions of this research will be formally presented in front of the Pichátaro indigenous authority.

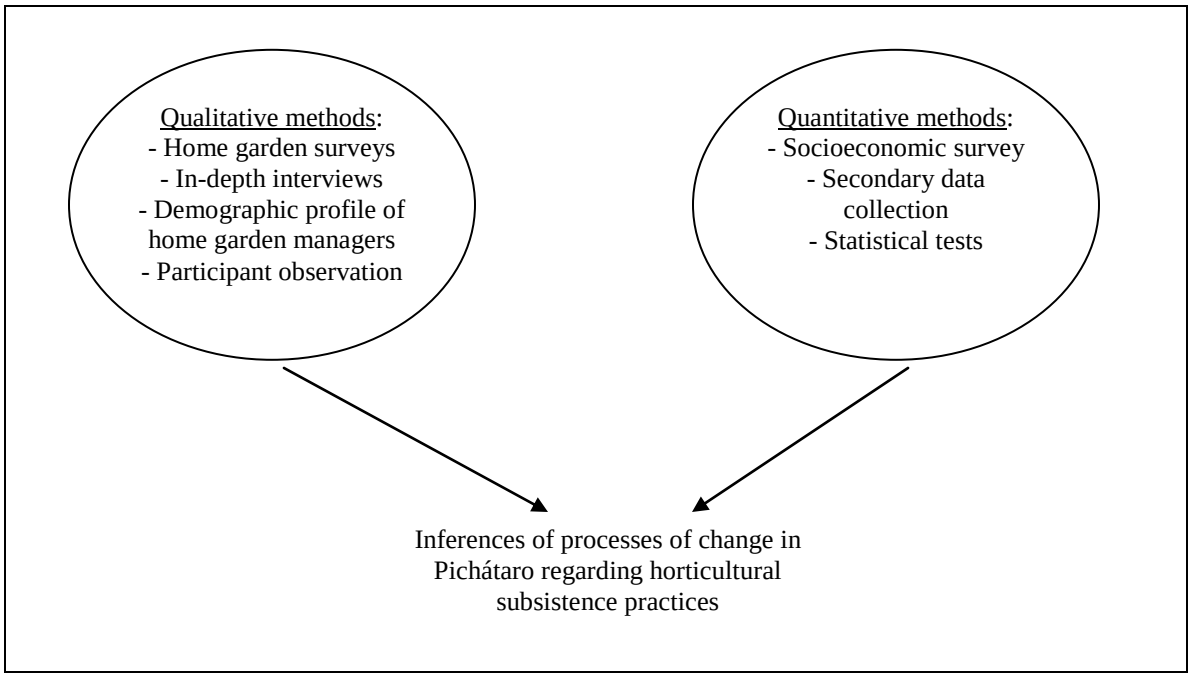

Figure 5.2: Schematic representation of research design.

Research Methods

Qualitative interviews

To assess farmers' perceptions of change within the community, a qualitative study of home garden owners was conducted by implementing in-depth, semi-structured interviews, surveys and participant observation. Interviews were conducted between July and November, 2008. For the interviews, nine individuals who owned and managed home gardens in Pichátaro were purposively chosen on the basis of agreement of participation. Purposive sampling is a form of non-probability sampling which attempts to select a heterogeneous range of participants that most accurately reflects the population being studied (Frankfort-Nachmias and Nachmias 2007; Weiss 1994). Purposive sampling is advantageous when the sample size (*N*) is small and when specific cases need to be chosen to accomplish a given research strategy (Seawright and Gerring 2008). Therefore, a range of participants in terms of gender, age, socio-economic status, and location was sought. However, since the majority of larger home gardens occur in the south and western portions of Pichátaro, most home gardens chosen to participate in the qualitative interviews occurred in these areas (Figure 5.2). A research assistant, native to Pichátaro, who assisted in identifying which households owned home gardens, accompanied me on all household visits, and assisted in any language barriers that occurred during the interviews. All interviews and surveys were conducted in Spanish.

Figure 5.2: Areal map of San Francisco Pichátaro showing the locations of the home gardens that were visited for qualitative interviews.

Indigenous communities in Mexico tend to be somewhat apprehensive to outsiders and Pichátaro is not an exception; however, inhabitants of Pichátaro have become familiar with frequent visits by NGO representatives, researchers, and students. Therefore, the assistance of a native *Pichatareño* at the interviews, my ability to speak fluent Spanish, and the local people's familiarity with researchers from outside of their community assisted in easing interviewees' apprehension in talking with me during the interview sessions. Always, in the beginning, interviewees were extremely cautious. However, once the interview process began, respondents felt more at ease and freely provided information. I was even invited back to a household or home garden on several occasions. I used a process of cross-verification across all interviews, that is, I cross checked interview responses against one another to constantly monitor my questioning approach to assure more accurate and sincere responses.

Each interview session consisted of four to five parts: (1) Initial visit, where consent to have an interview was given, (2) walk through the home garden, with a structured survey of basic home garden characteristics taken (although in some cases an orchard walk was not possible due to inclement weather conditions at the time), (3) an in-depth, semi-structured interview, (4) structured demographic survey of the home garden owner, (5) follow-up visit, if necessary, to collect further information.

The structured survey of home garden characteristics remained consistent for all cases and was made up of questions regarding general characteristics of the home garden, such as plants present, principal gardeners, and ages of gardeners (Appendix A). The in-depth, semi-structured interview was more flexible and was driven by the interviewee. I had a basic interview guide that I followed but when topics of interest emerged they were explored in-depth with further questioning. The interview guide was then modified to add new topics that emerged throughout the interviewing process. The overall interview guide consisted of six main themes: (1) importance of the home garden for the household, (2) management of garden genetic material, (3) how home garden practices were learned by the gardeners, (4) if children/grandchildren participate in home garden management and how interested are they in participating, (5) if home garden management is being taught in the same way to the younger generations as it was to the gardener being questioned, and (6) perceptions of gardeners regarding changes taking place in subsistence and agricultural activities in Pichátaro (Appendix B). The interview was followed by a structured demographic survey that remained constant for all interviews, and consisted of six themes regarding; (1) household composition, (2) schooling of household members, (3) household economic activities, (4) migration, (5) household

land-holdings, and (6) languages spoken in the household (Appendix C). I kept a field journal, to record personal reflections and impressions about the interviews, observations of interviewees, and observations of their home gardens.

Each household visit lasted from two to four hours, with the majority of time spent in the interviewee's orchard. All case study interviews were tape recorded when consent was given and when consent was not given, interview responses were directly written. I performed all transcriptions of case study interviews, first into Spanish and then later translated into English for ease of dissemination of results.

Socio-economic survey procedures and analysis

A community wide socioeconomic survey was conducted to assess socioeconomic changes and perceptions within the overall community of Pichátaro. The socioeconomic survey was conducted between the months of November 2008 and January 2009. There are approximately 800 households in Pichátaro, divided into seven *barrios* or wards. The survey was conducted in 10% of the households in the community, representing 83 total households that were surveyed. The number of households chosen to participate in the survey per *barrio* ranged between 11 and 13 households. Each *barrio* consisted of an average of seven street blocks. Random selection of participating households was sought by choosing every other household on each block, however this often did not ensure participation, but at least one household on every block was surveyed. A team of 4 to 6 female volunteers from the local *preparatoria* (high school) along with 2 principal investigators (an undergraduate student from the UNAM Morelia campus and myself) was utilized to conduct the surveys. All

volunteers were female because they were recruited by my interview research assistant, who was also a female attending the local *preparatoria.* The teams worked in pairs, with the principal investigators also participating while acting as overall monitors. All teams worked together by *barrio* so that everyone was in one general area at once, thus facilitating the monitoring of survey teams. As previously mentioned *Pichatareños* are familiar with outsiders who come to the community either seeking information through research or providing educational workshops. They are also accustomed to state census teams who regularly visit and some are more than happy to offer information to census or survey teams. For this reason, the survey teams often approached households with the description of the survey as a simple census concerning agriculture and household consumption in Pichátaro. This appeared to lower respondents' apprehension about the questions we were asking.

The survey was orally conducted in Spanish and consisted of eight main sections: (1) name, date, location of household, (2) household demographics, (3) economic activities of household, (4) migration of household members, (5) household agricultural property, (6) presence of home gardens and patio gardens, (7) household consumption, and (8) maize consumption.

The community-wide survey was pre-tested on six households in one *barrio,* and changes were made to ensure ease and understandability for respondents and surveyors. The majority of survey questions were arranged into yes/no dichotomous answers, however for some questions, lists were provided for ease of answer selection (for example when choosing which species of trees and herbs were present in a home garden) (Appendix D).

Secondary data collection

The format of the socio-economic survey was based on previous survey research conducted by Young and Garro (1981), Toledo and Barrera-Bassols (1984), and Barrera-Bassols (2008). Thus, a comparison of socioeconomic trends was able to be made over the past four decades. Comparisons were made in population size, language, economic activities, and migration. Comparisons made in language use also included West (1948). The most current census information from the Mexican National Institute of Statistics and Geography (INEGI 2005) of Pichátaro was also used for comparisons.

Data analysis

Case study interviews were analyzed in three parts, corresponding to the three sections of the interview process. Basic data about the home gardens (i.e. plant varieties present, age and sex of principal caretakers) and the demographic information taken was organized into an Excel spreadsheet. The in-depth, semi-structured interviews were analyzed for content in two manners. First, they were organized in conjunction to the question categories asked. Second, interviews were coded to find emerging themes that occurred among all interviews. The themes that were coded for included: (1) changes in home gardens in Pichátaro, (2) where home garden knowledge came from, (3) the home garden as a subsistence strategy, (4) family participation in home garden maintenance, (5) gender divisions in home garden management, and (6) language.

The socioeconomic survey data was first organized into an Excel spreadsheet where means, medians, and percentages were calculated for all categories of the survey.

Excel was also used to create data figures that visually represented the survey results. Data were analyzed using SPSS 13.0 statistics software. Categorical data were analyzed using the Pearson's chi-square test. The chi-square test is a statistical method used to measure the relationship between variables; in this case it was used to measure the relationships between all categorical variables (Field 2009). Variables were coded as follows: (1) no = 0 and yes = 1; (2) male = 1, female = 2. Age of households was coded into three categories: 1 = 20 to 40 years, 2 = 41 to 60 years, and 3 = 61 years. Ages of household members were grouped into four categories: 1 = 5 to 20 years, 2 = 21 to 40 years, 3 = 41 to 60 years, and 4 = 61 years and greater. Age of household was based on the ages of the household head(s). Continuous variables and categorical variables were analyzed using the bivariate and point-biserial correlations, respectively. Bivariate correlation is a statistical test used to measure the correlation between two continuous variables, whereas point-biserial correlation measures the correlation between continuous and categorical variables, where the category is a discrete dichotomy (Field 2009). Continuous variables included the number of household members and number of economic activities of each household.

Pearson's chi-square tests were used to measure the relationships between: (1) age and home garden presence, (2) sex and home garden maintenance, (3) sex and orchard garden maintenance, (4) home garden presence and parent home garden presence, (5) age group and ability to speak Purhépecha, (6) age group and ability to understand Purhépecha, and (7) gender and fluency in Purhépecha. Bivariate and point-biserial correlations were conducted on the following data: (1) number of household members and presence of home garden, (2) number of household members and number of

economic activities, (3) number of household members and occurrence of agricultural parcels, and (4) number of household members and home garden product use.

Conclusion

To answer the questions proposed in this thesis, I used an integrated approach that combined social, ethnographic, and statistical methods, which allowed me to make inferences as to what is occurring in Pichátaro regarding horticultural subsistence strategies. Results of the case study interviews and socioeconomic survey responses, followed by a brief explanation of the results are presented in Chapter Six. Also in chapter five I explore the socioeconomic trends that have occurred over the last four decades in Pichátaro. In Chapter Seven I discuss the changes that have occurred in horticultural subsistence strategies in Pichátaro, especially over the last four decades and the consequences of those changes.

CHAPTER SIX

RESULTS

This study was conducted to understand the perceptions and processes taking place in Pichátaro, Michoacán regarding the perpetuation of traditional subsistence strategies in the community and the role those strategies play in the households. This chapter presents the results of the case study research that I conducted in Pichátaro. The chapter begins with the results from the qualitative interviews that were conducted in the home gardens of Pichátaro. In this first section, I: (1) profile the home garden managers, (2) provide a description of the home gardens, (3) discuss home garden management and knowledge, and (4) explore perceptions of change. The second section of the chapter presents the results from the socioeconomic survey by discussing: (A) household demographics and language, (B) household economic activities, (C) migration, (D) agricultural activities, (E) horticultural subsistence activities, (F) garden types, and (G) fruit and vegetable consumption. The third and final section presents results from the analysis of socioeconomic trends over the past four decades, focusing on population size, language, economic activities, and migration.

Qualitative Interviews

Interviews conducted as part of the case study are divided into three main sections: (1) a demographic profile of respondents, (2) a description of the home gardens based on surveys that were conducted, and (3) an overview of home garden management,

knowledge, and perceptions of change in Pichátaro. A total of nine home garden owners were interviewed for the first part of the study.

Home garden managers

Table 6.1 provides a demographic overview of the respondents. The average age of respondents was 63 years old. The oldest respondent was 88 years old, and the youngest was 40 years old. Only two respondents were female; however, they mentioned their husbands as the primary garden caregivers. The average household composition consisted of the respondent and his/her spouse due to the fact that most respondents had grown children who had already left the household. However, one respondent had married children with their respective families living at home. Only two respondents said that their children had left for purposes of migration, primarily to the United States. Five respondents mentioned agriculture as their primary wage activity. However, subsistence activities in Pichátaro are entirely dependent on rain-fed agriculture, thus produce and supplementary income is available generally between June and October (the rainy season months), after which produce and income drops drastically, forcing the household to focus on alternative wage earning activities. These alternative wage earning activities were in the form of odd-jobs, mainly related to wood-working. Other odd jobs included embroidery by the women, mushroom collection, resin collection, clandestine logging, temporary reforestation jobs, a bike repair shop, and a small convenience store. Two respondents who stated other primary wage earning activities were a construction worker and an owner of a small variety store. All households spoke Spanish, with only one mentioning Purhépecha as their primary language. In the Purhépecha-speaking

households, it was only the older generations that spoke it; the younger generations could only partially understand it.

Table 6.1: Demographics of home garden owners.

	N	*Average*
Gender		
M	7	-
F	2	-
Age	-	63 years
Marital status		
Married	8	-
Widowed	1	-
Family members living in household		
Interviewee	9	-
Children	7	-
Grandchildren	2	-
Siblings of interviewee	2	-
Households that have members who migrate	2	-
Parcels owned per household	-	2.4
Primary wage earning activity		
woodworking	2	-
agriculture	5	-
other	2	-
Household primary language		
Spanish	8	-
Purhépecha	1	-
Households with members who speak Purhépecha	4	-

Description of home gardens in Pichátaro

General home garden characteristics are presented in Table 6.2. These include average size and age, structure, species grown, and the presence of animals. Six of the nine home gardens involved in the case study were diversely managed for fruit and *milpa* (traditional maize-beans-squash cropping system), and forage production. These six gardens were the most diverse in terms of overall plant species that the owners purposely grew, having not only a variety of fruit trees, but also incorporating maize production, some vegetable production, and flowers during the rainy summer months, and forage production such as oats (*Avena sativa*) and vetch (*Vicia sativa*) in the winter months. Three of the home gardens only incorporated fruit trees in their structure meaning they

did not use the garden floor for *milpa* or forage production. In these three home gardens, fruit production was principally for sale. Also, these home gardens were generally less diverse in overall species than the ones used for *milpa* and forage production. However, one orchard garden devoted solely to fruit had the greatest number of fruit varieties present (16 varieties) to provide continuous fruit production throughout the growing season and thus maximum profit.

Table 6.2: Home garden characteristics derived from nine case study respondents.

	N	*Average*
Size	-	0.5 hectares
Age	-	40 years
Structure		
Fruit trees only	3	-
Fruit trees/milpa	6	-
Number of fruit varieties	-	7.3
Number of maize landraces	-	2.3
Home gardens cultivating vegetables and herbs	5	-
Forage	2	-
Animals present	2	-

The differences in home garden characteristics that I found among the participants fell into two categories: production for household consumption or production for sale. While the home gardens that focused more on household consumption more closely resembled home gardens (Figures 6.1 and 6.2), the home gardens that focused on production for sale more closely resembled actual commercialized orchards (Figure 6.3). Characteristics of these two home garden types are presented in Table 6.3. Although some home gardens focused on production for sale, I still consider them as part of the household subsistence strategy, as they provided some produce for the immediate and extended family members households' during the season. However, they were not considered as primary income sources for the household, as some of the profit from the sale of produce goes back into the home garden itself and some into the household, as a form of secondary income.

Table 6.3: Characteristics of home gardens used for household consumption and home gardens used principally for sale of produce.

Characteristics	*Types*	
	Household consumption	Sale
Maize production	Yes	No
Forage production	Yes	No
Annual plant varieties	Yes	No
Species richness	Greater	Less
Structure	Multi-level plant stories	One plant story
Animals	Hens, horses or burros	Horses or burros
Amendments	Animal and green manure	Animal and green manure
Produce sold	Only surplus	All produce
Household consumption	All produce	Only surplus
Family participation	Husband/wife teams	Husband
Proximity to household	Close	Further away

Figure 6.1: *Milpa* patch growing in a home garden. Note that this photo was taken in the fall when the maize had already dried and the fruit trees had lost their leaves.

Figure 6.2: *Milpa* on the edge of a home garden growing among fruit tree saplings. Note the maize plants had already dried and the fruit trees had already lost their leaves for the winter, however the squash were still green.

Figure 6.3: A home garden focused on production for sale.

Plant varieties

No actual collection and analysis of particular varieties was undertaken in this study, therefore fruit, *milpa,* and forage varieties were described by the home garden owners themselves. The local common names that were described by the owners were cross-referenced with data from ethnobotanical studies conducted in the region (Mapes et al. 1990; Mapes 1987; Toledo et al. 1980) to connect taxonomic classifications with the common names (Table 6.4). The fruit tree varieties found in the home gardens included six varieties of pears, two of apple, eight of peach, two plum, quince, *tejocote*, walnut, and *capulin*. According to case study respondents, as many as six maize landraces were also cultivated in the home gardens (Figures 6.4 and 6.5).

Table 6.4: Varieties cited by respondents to be present in their home gardens.

Type	*Local common name*	*English translation*	*Scientific name*
Fruit trees	Pears		*Pryus spp.*
	Prieta or huergamonte	Dark skinned	
	Colorada	Colored	
	Cristalina	Cristal	
	Lecha	Milk	
	Chata		
	Blanca or cordalina	White	
	Apples		*Malus spp.*
	California		
	Camuesa		
	Peaches		*Prunus spp.*
	Diamante	Diamond	
	Donita	Donut	
	Melocata		
	Amarillo-hueso colorado	Yellow-colored stone	
	Amarillo	Yellow	
	Prisco blanco		
	Rojito chapeado	Shiny red	
	Prisco-hueso colorado		
	Plums		*Prunus spp.*
	Amarilla	Yellow	
	Amarilla-pavia, larga	Yellow-	
	Membrillo	Quince	*Cydonia oblonga*
	Tejocote	Mexican hawthorn	*Crataegus pubescens*
	Capulin/Cereza	Cherry	*Prunus serotina*
	Nogal	Walnut	*Juglans spp.*
Other fruits	Fresa	Strawberry	*Fragaria spp.*
	Zarzamora	Blackberry	*Rubus spp.*

Table 6.4 (continued)

Vegetables	Chile perón	Habanero chili	*Capsicum pubescens*
	Calabaza	Squash	
	Chilacayote		*Cucurbita ficifolia*
	Chayote		*Sechium edule*
	Papa	Potato	*Solanum spp.*
	Haba	Fava bean	*Vicia faba*
Multi-purpose herbs	Chía roja	Red amaranth	*Amaranthus cruentus*
	Amaranto	Amaranth	*Amaranthus spp.*
Herbs	Menta, hierba buena	Mint	*Mentha spp.*
	Ruda		*Ruta graveolens*
	Cilantro	Cilantro	*Coriandrum sativum*
	Romero	Rosemary	*Rosmarinus officinalis*
	Manzanilla	Chamomile	*Matricaria recutita*
	Epazote	Wormseed	*Chenopodium ambrosioides*
	Cedrón		*Simaba cedron*
Grains	Maize		*Zea mays*
	Blanco	White	
	Huarote		
	Morado	Purple	
	Amarillo	Yellow	
	Colorado	Colored	
	Azul	Blue	
Forage	Avena	Oats	*Avena sativa*
	Janamargo	Vetch	*Vicia sativa*

Figure 6.4: Some of the variety found in the home gardens: fruit trees, amaranth, maize, flowers, and some unknown volunteers.

Figure 6.5: A chayote squash using a fruit tree as a trellis. Note the fruit tree had already lost its leaves for the winter.

Home garden management and knowledge

The bulk of the home garden interviews consisted of an in-depth, semi-structured survey focusing on the following themes: (1) importance of home garden for household, (2) management of garden genetic material, (3) how home garden management practices were learned by the gardeners, (4) if children/grandchildren participate in home garden management and how interested they are in participating, (5) if home garden care is being taught in the same way to the younger generations as it was to the home gardener in question, and (6) perceptions changes in perception of subsistence and agricultural activities taking place Pichátaro (Appendix B). Table 6.5 shows the range of responses among the semi-structured interview questions given to home gardeners.

Table 6.5: Responses to semi-structured interview questions.

	N
Home garden role	
Household consumption	9
Supplementary income	8
Social function	2
Seed exchange	
Replants volunteer seedlings	8
Saves milpa/vegetables seeds	6
Gender of principal cultivator	
Male	7
Female	0
Both	2
Origin of home garden knowledge	
Learned from extension authorities or NGOs	4
Learned at home, growing up	5
Children's perceived interest in home garden activities	
None	5
Little	2
Somewhat	1
Very	1
Perceived changes in Pichátaro	
Yes	8
No	1

Home gardens provided an important form of subsistence for all interviewee households. The gardens provided supplementary income for eight of the nine

respondents' households, while produce was consumed from the home gardens in all households. In the home gardens where only excess or small amounts of produce were sold, the majority of the profit was returned to garden maintenance. In the home gardens where produce was grown principally for sale, a minimum amount of the profit was returned to the home garden itself, while the majority went into household discretionary cash.

As mentioned above, the gardens, and more so those focused on subsistence, are intensively managed throughout the year to provide a number of different produce requirements. This is important for the households in that they extend the season to its maximum, providing sources of both food and income. However, it was only the subsistence oriented gardens that produced throughout the entire year, growing dry season crops such as forage. The following quotes illustrate the importance of growing produce throughout the season:

> *…from July to September there are different varieties of pear that mature at different times, also there are other fruits, so more or less between these months is when there is fruit and the poverty doesn't feel so bad, because there is a little bit of extra income, and also there is stuff to eat. For example, the maize gives grain, there are* quelites, *squash, wild mushrooms from the forest, during the dry season it is much more difficult.* (Male age 69)

> *I never let the land rest, it gives me corn, it gives me oats [for forage] and it gives me fruit.* (Male age 63)

The importance of home gardens in maintaining local landraces and varieties was only briefly touched upon in order to provide a general assessment of the nature of the orchard as a place where the conservation and maintenance of local genetic material occurs. In eight of the nine home gardens, volunteer seedlings from the home garden itself were continuously used to replace dead or dying trees, or to expand the garden. Almost all respondents stated that they had primarily bought seedlings to plant the initial

orchard, or to try out new varieties, and that all seedlings planted thereafter were volunteers from the same home garden. Almost all garden managers used *tejocote* (*Crataegus pubescens*), a native Mexican fruit as a rootstock for pear and apple varieties (Figure 6.6).

Six of the respondents used their home garden to grow *milpa* and forage. The families that planted *milpa* and vegetable species (Table 6.4) saved enough seeds from each year's harvest for the following year's planting. Respondents who planted forage varieties bought the forage seed each year.

All principal cultivators of the home gardens were men; in only two cases did wives worked alongside husbands. In these two cases, wives cared for the garden products grown in the home garden, such as the vegetables, herbs, and medicinal plants, while husbands cared for the trees and the maize grown in the home garden. However, during harvest the wives helped cut fruit. In four households, one or more children participated in labor activities either with or without their mother. In two households, the children continuously helped. In one of these households, grown children helped during planting and harvest, and it was mentioned that they always participated in home garden activities when they lived at home.

When asked about the origin of garden knowledge, only three respondents said they learned home garden management and care at home by working in their family's home garden. Surprisingly six respondents mentioned that they "learned on their own," either by establishing their own home garden or through buying property that already had an established garden and learning from there. Of the respondents who said they learned on their own, many actually learned from *ingenieros* (a general term used for a variety of

technicians in Mexico) or more appropriately extension authorities and NGO specialists who often visit and work within the community. Mostly respondents learned fruit tree management techniques such as grafting and pruning from the specialists. Despite this, the majority of respondents mentioned they did in fact grow up in homes that had home gardens with fruit trees present, however, there was no intensive management of those trees, and they were allowed to grow naturally. One respondent directly commented that he indeed helped his father in their home garden when he was growing up, but it was when he was older that he actually learned of management techniques, such as pruning and grafting (Figure 6.6). The following quotes illustrate how different respondents learned about some home garden management techniques:

> *When I lived at home my parents had a garden with fruit trees, but all of them were large…I alone learned how to take care of my garden…I learned out of necessity, I planted the trees and I learned from there.* (Male age 63)

> *Various* ingenieros *have come, they have come [periodically] and they ask me questions and I ask them questions such as how to make different amendments, and that's how I learn.* (Male age 73)

Figure 6.6: Pears grafted onto *tejocote* (photo taken in the fall when trees had already lost their leaves).

Children's participation in garden activities was split, with four respondents stating that their children either were currently or had, when they lived at home, helped in the home garden and had extensive knowledge of garden management. In only two of those cases, respondents said that their children had much interest in continuing home garden maintenance when their parents no longer could. Interestingly, one case involved grown children with their own household (consequently next to their parents' household and orchard) and another case involved one household with small children still living at home who consistently helped their parents in the home garden. When asked about children's perceived interest in the garden activities, half of those who did help in the home gardens were little interested. One respondent mentioned he preferred that his children leave and study at the university in the capitol city of Morelia (where one child

was already studying). Another mentioned that his children preferred artisan work over agriculture as a wage earning activity.

Perceptions of change

Eight of the nine respondents said they do perceive changes in Pichátaro related to the presence of home gardens. They overwhelmingly said there were fewer home gardens than before and that people were no longer interested in maintaining the gardens, that they prefer artisan woodwork or to leave the community for better opportunities. The main reason for this being that home garden work is intensive requiring too time investment and the return received (for selling produce) is not as profitable as it was in the past. Almost all respondents stated that the gardens left in the community are mostly abandoned. Some of the abandoned home gardens are those left to family members who may no longer live in the community and who only visit them once a year and harvest what the home garden has produced. The following quotes illustrate the perceptions of respondents in regards to reasons behind change in subsistence gardening activities:

> *Before, everyone had their own little garden, but not anymore. The trees are left to get too big and old, they are no longer maintained, it is too dangerous to climb the tree to pick the fruit…they no longer have time to maintain [the orchards], they just let them die and they disappear.* (Male age 73)

> *…People no longer are interested [in maintaining home gardens], for example, in the garden over there, the owners left it to grow, sure their children enjoy the fruit, they come to harvest when it is ripe, but they no longer plant [new home gardens], the majority of the people just leave them because it is a lot of work the garden, a grand labor.* (Male age 58)

> *As the people pass away, so do the home gardens.* (Male age 88)

When asked what the respondents felt had influenced changes in home garden practices within the community, most explained that the younger generations no longer see enough profit in garden management for the amount of work and time that has to be

invested in maintaining the home gardens. Because of this many younger generations are leaving agricultural activities altogether, opting for work as artisans or leaving the community in search of better work opportunities, as expressed by the following quotes:

> *When I was a child there were lots of gardens, but they are all gone…like here [in Pichátaro] the majority of the people are artisans, they no longer like to work in the field or in the forest [like before]*. (Male age 58)

> *The younger people are no longer interested in working in the field, they focus on wood-work, they can make a better living that way.* (Male age 73)

> *Well, they [younger generations] no longer have time to maintain the home gardens, so they let them die and they disappear.* (Male age 73)

> *Now being an artisan is more important than agriculture; it is the principal way of making money in the community. The home garden is no longer so much of a business.* (Male age 44)

Three respondents noted that in the gardens that remained, changes had occurred in the varieties present, that the "creole" varieties which once existed no longer were present. All respondents considered the *camuesa* apple variety as the "creole" variety, one that "originated" in Pichátaro (Table 6.4). They are almost not found at all in the home gardens today. Many noted that they have "dried up" and will no longer grow, or that they are have been replaced by other varieties such as the *california*. Even though the *california* produces larger fruit and the tree renders more produce, the *camuesa* fetches a higher price because the people still prefer the *camuesa*.

> *…such as the* camuesa *apple, before there were a lot, but they no longer plant them in the home gardens, there just isn't any, they traded them for the* California *and there are a lot of those. People don't really like [the* California *apple] but they buy it, however they still always look for the* camuesa. (Female age 40)

Other changes in structure were also noted, such as the disappearance of beehives, which were once an integral part of the home gardens.

In addition many respondents noted that home garden products are getting harder to sell, which is important for maintaining the home garden.

> *The home garden was good when there were no paved roads in and out of the community, but fruit of better quality enters into the market and the 'creole' varieties no longer have value.* (Male age 44)

> *You can not earn a lot of money selling the fruit*. (Male age 58)

Another reason that many respondents referred to as contributing to home garden disappearance is conversion of garden parcels for other uses, which for the most part are parceled off among family members who sell them or build their own houses on the land. In this way garden land is much more profitable to the individual, as land in town has become increasingly hard to come by due to explosive population growth during the last four decades. The following quotes point out the reasons people are converting home gardens to other uses:

> *Well, the people, they have a lot of children and they don't have [enough land to give each one a piece], the children leave [the home] and they buy a small lot and they cut down all the trees there*. (Male age 73)

> *When the elders pass away, each [family member] does something else with their part [of the land their parents left] or they think differently, there is no more interest [in maintaining the home gardens] and the fruit sells very cheap. So one says 'to be selling [the fruit] so cheaply, better I cut [the orchard] down and I do something else with it. Before, over there (on the opposite street corner) was a garden, now it is all houses*. (Male age 58)

> *We used to plant* milpa *in the* solar, *but now my kids are grown and they all live in the* solar *with their families, there is no more room to plant anything.* (Male age 58)

Conclusions

Subsistence gardens in Pichátaro are hybrid environments, a mix of European introduced fruit in the upper stories, while Mesoamerican vegetables and herbs dominate the understory. This hybrid environment is continually being molded and shaped by its caregivers. Their management combines local traditional knowledge and knowledge of new techniques learned from outside sources, where men and women sometimes work together combining gender specific knowledge to optimize production. The garden has

served as a place of experimentation by those who cultivate it and continually try out new, non-native fruit varieties to see if they will be successful additions to the garden. Native varieties are used in conjunction with non-native ones in order to promote successful adaptation, as in the use of the native *tejocote* as a rootstock for non-native apple and pear varieties. Once a new species is known to grow well in the garden environment, farmers opt for replanting seedlings that emerge as a means to expand or replace trees, rather than buy new trees each time. In addition, all seeds from maize, vegetable, and herb species are saved from year to year, each time ensuring the continued adaptation and survival of local species and heirloom varieties.

Subsistence gardens in Pichátaro have been utilized since before the Spanish conquest, they have been intensively managed for over 500 years. The soil has been carefully managed from year to year so that it provides the substrate necessary to produce the food needed by the household. Thus, garden soils in Pichátaro are anthropogenic soils, managed for well over 500 years. In the gardens that remain, the soils are still cared for in quite the same manner as they have always been, recycling household and farm wastes, and dependent on rainfall for water. Subsistence gardens in Pichátaro have represented a form of sustainable production over time. They help reduce water runoff and soil erosion, while encouraging the sustainable use of water; they promote nutrient recycling, and conserve local genetic resources, in addition to offering an important source of nutrition for the household.

Socioeconomic survey

Results of the socioeconomic survey have been divided into six sections: (1) basic information regarding households in Pichátaro and language usage, (2) economic

activities, (3) migration, (4) agricultural activities, (5) home gardens, and (6) fruit and vegetable consumption.

Household demographics and language

Households were asked a series of questions regarding demographics and language utilized by household members. Questions included who lived in the household, their relationship to the interviewee, sex, age, languages understood and languages spoken. Fifty-one percent of the household members were female and 48% were men. The average number of family members per household in Pichátaro is 6.4 people, with a median of one family head per household. Household age was based on the age of the household heads, which was grouped among all households into three categories: 20 to 40 years old, 41 to 60 years old, and 61 years and older. Thus the median household age fell between 41 and 60 years old.

Ability to speak and understand the native language, Purhépecha, was also measured according to the similar age groups as above. Figure 6.7 shows the percentage of people able to understand and those who could speak Purhépecha across all age groups. Measurements were broken up in this manner because many people are able to understand a few words, mainly those that are most often spoken by their grandparents or parents, however they cannot speak it. This can be seen in Figure 6.7, where for the age groups of 41 to 60 years and younger there is a large gap between those who can actually speak Purhépecha and those who can only understand it.

A chi-square test revealed a significant difference between age groups in their ability to speak Purhépecha ($p < .001$) and their ability to understand the language ($p <$

.001). Therefore, the older the age group, the more likely they were to both speak and understand Purhépecha. For example, 89% of individuals 61 years and older were able to understand and 70% were able to speak Purhépecha, whereas only 11% of individuals between the ages of 5 to 20 were able to understand the language and 2% were able to speak it.

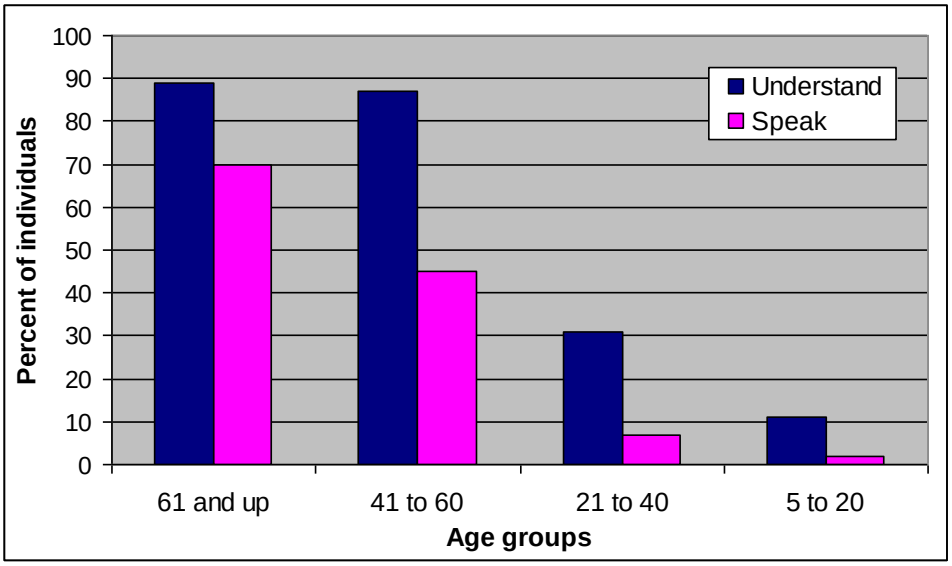

Figure 6.7: Percent of individuals in each age group who were able to understand and speak Purhépecha.

Across all age groups, only slightly fewer males were able to speak and understand the native language than females (Figure 6.8) (19% of females spoke it, while 11% of males did). This is perhaps due to the fact that historically it was mainly the males who migrated for purposes of work, and because the areas where they migrated to spoke only Spanish or English, they were discouraged from speaking their native language and were even criticized for it. Thus, as they returned to Pichátaro, many preferred to use Spanish as their primary language, even in their households, instead of Purhépecha.

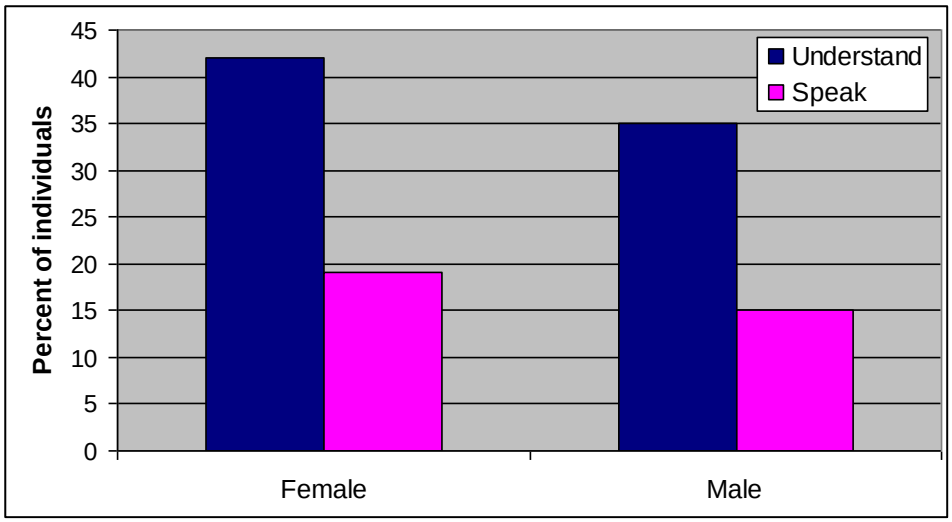

Figure 6.8: Percentage of males and females who could understand and/or speak Purhépecha.

Economic activities

Thirteen different economic activities in which individuals are known to participate in Pichátaro were listed in the first section of the survey (Figure 6.9). Individual households participated in an average of three economic activities. There was a positive correlation between number of households members and amount of economic activities in which they partook ($r = .473$, $p < .001$). Woodworking, which included carved furniture, traditional carved posts and doors, and general carpentry, accounted for the economic activity practiced by 55% of the households in Pichátaro. Agriculture was practiced by 48% of households. Embroidery is a traditional activity that is practiced exclusively by women and girls, and is practiced in 40% of the households. The category representing "other" economic activities included activities such as musicians, remittances from migrating household members, and the sale of traditional food items during the *cena* (supper) hour.

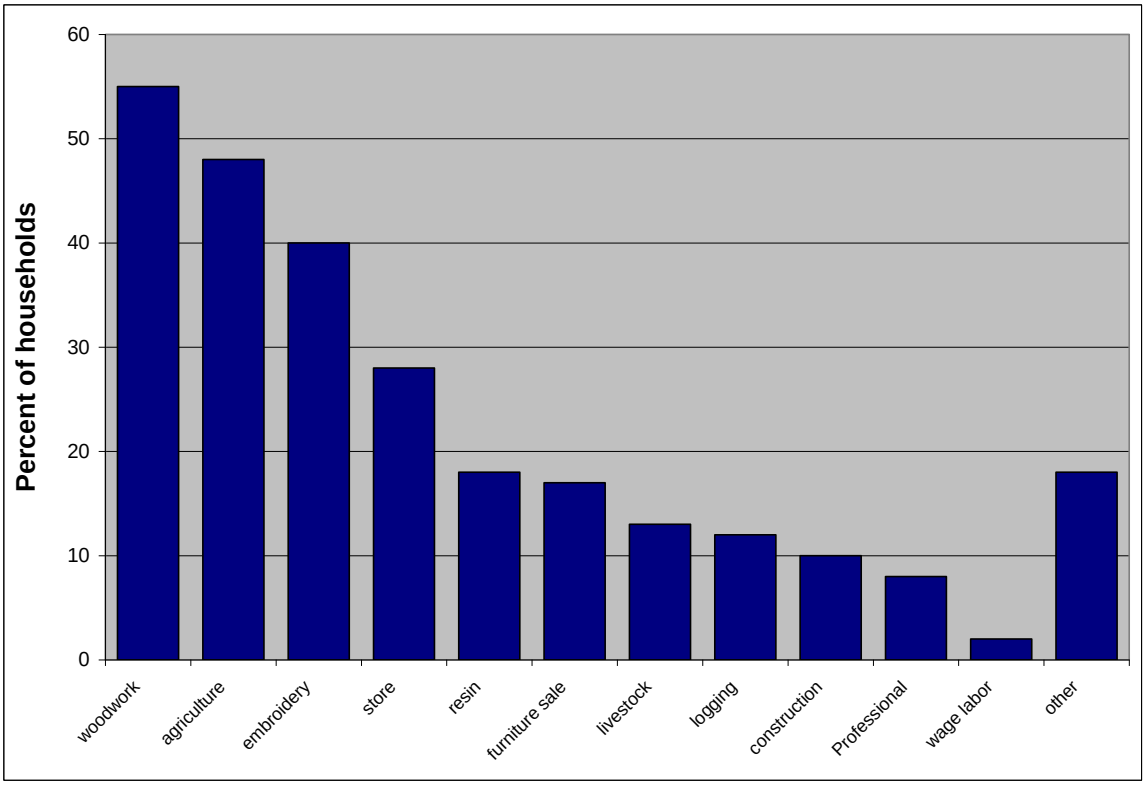

Figure 6.9: Percent of households participating in each economic activity listed.

Woodworking was also the most commonly cited primary economic activity for households, representing 38% of the households, where agriculture was the primary economic activity for 23% of households. When agriculture and woodworking activities were broken down by *barrio* it was found that San Miguel had the highest percentage of agriculture practicing households at 69%, whereas San Bartolo II was the *barrio* with the highest percentage of woodworking households at 75% (Figure 6.10). San Bartolo II runs along the main street in town, which is also part of the throughway that connects several small towns to the Pátzcuaro-Uruapan highway. Thus, many families take advantage of the exposure, often setting up woodworking shops or storefronts on this road.

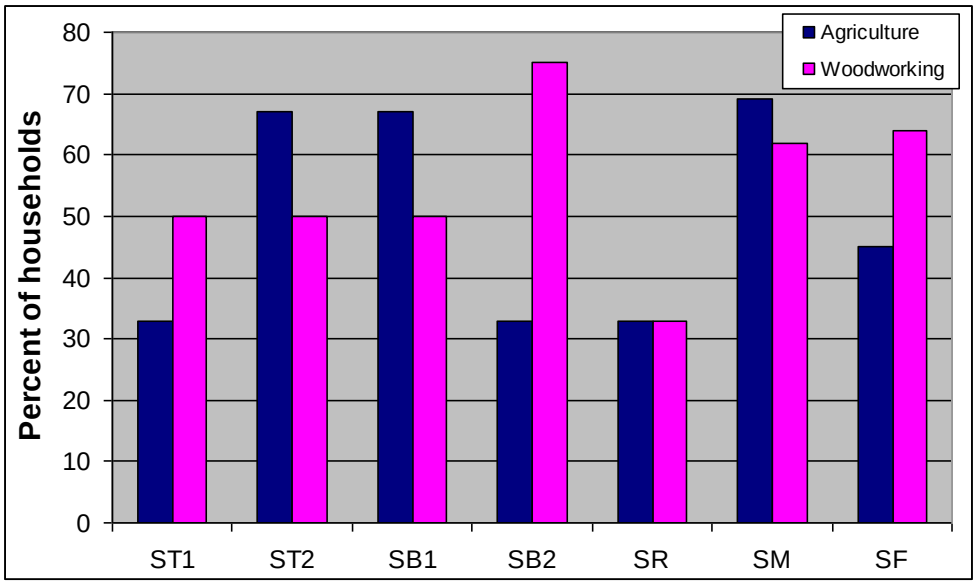

Figure 6.10: Percentage of households that participate in agriculture and in woodworking by *barrio*. ST1=Santo Tomás I, ST2=Santo Tomás II, SB1=San Bartolo I, SB2=San Bartolo II, SR= Santos Reyes, SM=San Miguel, and SF=San Francisco.

Migration

Households were asked if they had family members who had migrated, how many migrated, and where they migrated to. Thirty-six percent of households had at least one family member who migrated outside of town for economic purposes: of those, 43% migrated to the United States or Canada (Figure 6.11). There was an average of 1.7 migrants per household within those households that had migrating family members. About 30% of migrants stayed in Michoacán, the majority of those moving into the larger city centers (such as the capital city of Morelia) for purposes of going to school or other professional jobs. Still, 43% migrated to the US, participating in a wide range of wage earning activities.

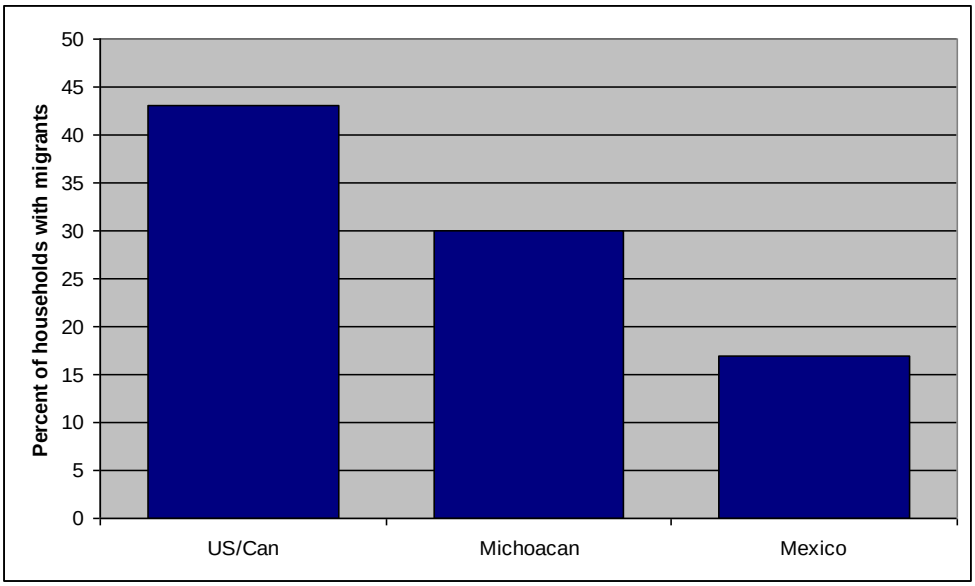

Figure 6.11: Percent of households with migrating members within the state of Michoacán, within Mexico and to the United States or Canada.

Agricultural activities

The third section of the survey focused on whether the household cultivated agricultural parcels, how many, and what the parcel was used for. Forty-two percent of households had at least one agricultural parcel that they either rented or owned, with an average of two parcels per household (Figure 6.12). There was no correlation between the number of household members and whether or not they cultivated agricultural land. There were an average of 1.4 crops grown on each parcel. Maize was grown in 97% of the parcels, within which 9% included the traditional milpa crops (maize intercropped with fava bean and squash). In 26% of the households with agricultural parcels, oats were grown for forage use. The *barrio* with the highest occurrence of households with agricultural parcels was San Bartolo I at 58%. It is interesting to note that while San Bartolo I had the highest percentage of households with agricultural parcels, it didn't have nearly as high a percentage of households participating in agriculture as did San

Miguel and Santo Tomás II (Fig. 6.10). However, I was not able to speculate the reasons behind this as the information I have regarding this specific issue is limited.

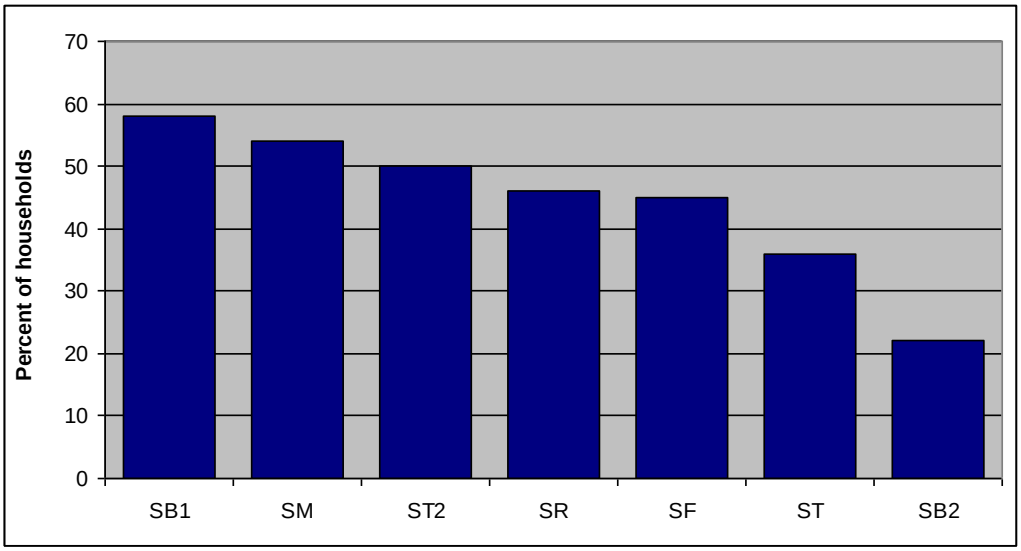

Figure 6.12: Percentage of households in each *barrio* that had agricultural land. SB1=San Bartolo I, SM=San Miguel, ST2=Santo Tomás II, SR= Santos Reyes, SF=San Francisco, ST=Santo Tomás I, and SB2=San Bartolo II.

Horticultural subsistence strategies

Because there is a variety of home garden shapes and sizes that occur in Pichátaro, questions regarding horticultural subsistence strategies were divided between two realms, the smaller patio based home garden and the larger home garden with many fruit tree components that will be referred to as an orchard garden. Questions regarding home garden or orchard gardens were similar. They included how produce was consumed, who participated in home garden maintenance, and which products were grown in the home or orchard garden. Also included was if the heads of household had grown up with home or orchard gardens in their parents' homes (Appendix D).

Sixty-three percent of the households had smaller home gardens; while just 11% had larger more extensive orchard gardens (Figure 6.13). Of the households that had home gardens, 98% were connected to the home and 75% consumed the products grown

in the home garden in the home, with only 3% of households selling products for extra income. In 56% of the larger orchard gardens, products were consumed in the household, and 22% were sold for supplementary income. Flowers were the most commonly found component of the patio home gardens at 81%, then fruit trees. Seventy-five percent of the smaller home gardens had at least one fruit tree, with the most common fruit tree in the patio garden being peach followed by pear. All orchard gardens had fruit trees, with 44% of them also growing maize. The most common fruit tree found in the orchard gardens was pear, which was found in all orchard gardens, followed by the apple (Figures 6.14 and 6.15). Animals were found in 27% of the home gardens, and the most common animals being chickens. Animals were found in 22% of the orchard gardens, with the cow being most common.

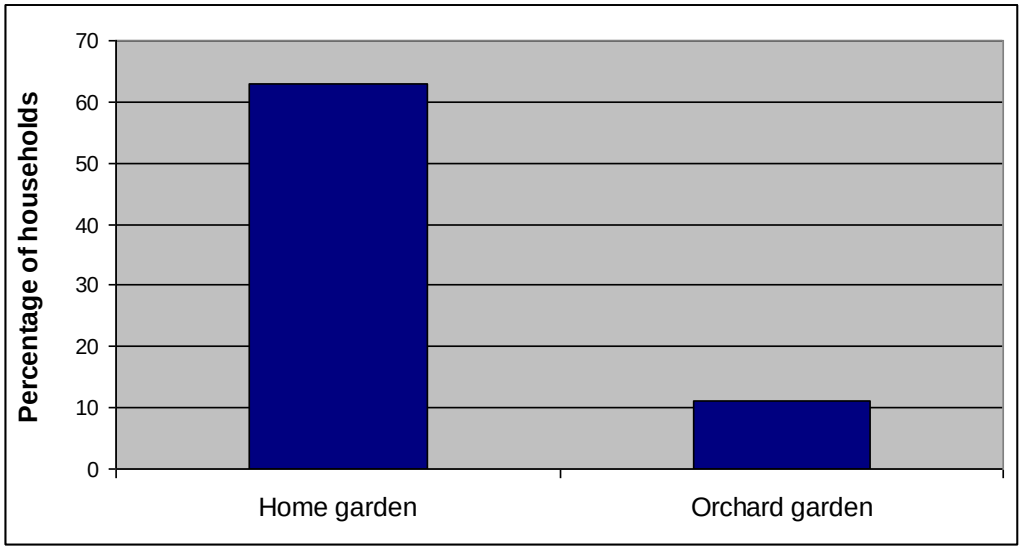

Figure 6.13: Percentage of households that had home gardens and percentage that had larger orchard gardens.

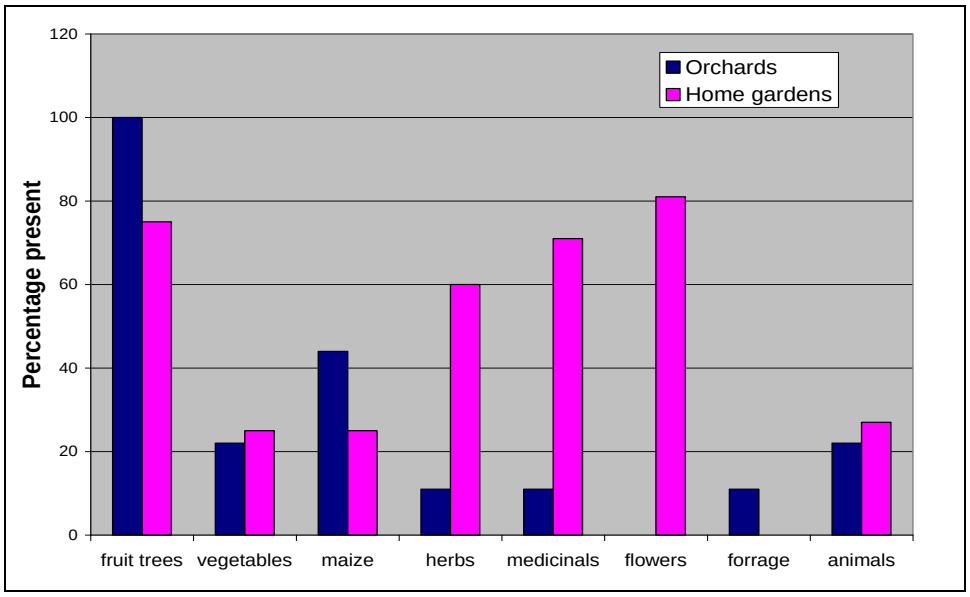

Figure 6.14: Presence of major components in orchard gardens and home gardens

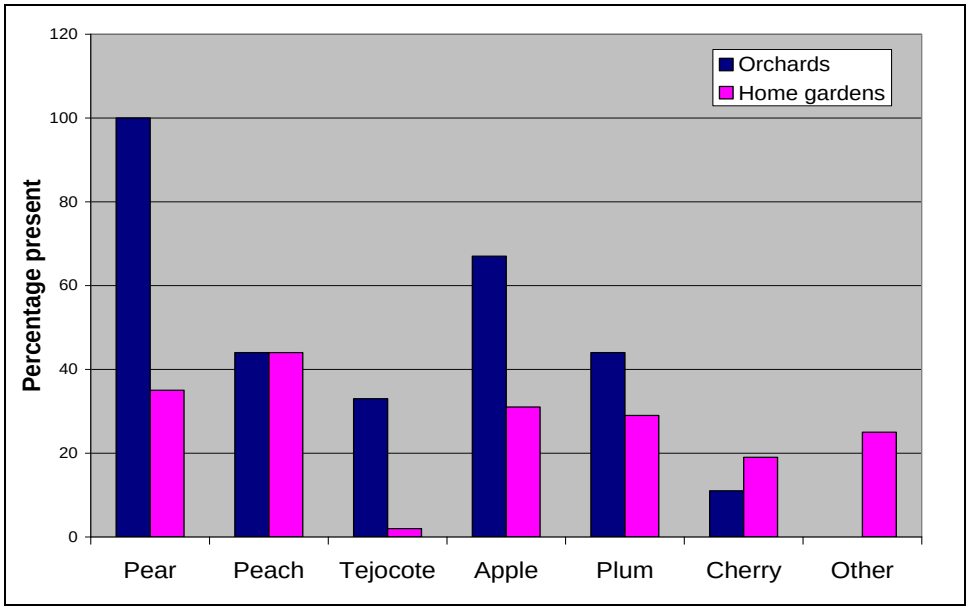

Figure 6.15: Percentage of different fruit tree varieties present in orchard gardens and home gardens.

Chi-square tests revealed no significant difference between *barrio* and presence of home gardens or orchards. There was also no correlation between number of household members and the presence of home gardens or orchard gardens.

Chi-square tests found that women were more likely to manage home gardens

(p = .003), whereas men were most likely to manage orchard gardens (p = .041). This is most likely due to the fact that the orchard gardens are often set apart from the household and are considered more as an agricultural parcel which requires more labor intensive management. In all cases, men were responsible for tree maintenance such as grafting, pruning, and harvesting the fruit, even in the home gardens. The women took care of the vegetables, herbs and medicinal plants in the home gardens and in some cases the orchard gardens also, since these are the products most used by the women in the home.

Chi-square tests also revealed that households with home gardens were more likely to have had home gardens while growing up (p = .001). However, there was no statistically significant difference between head-of-household age and presence of home garden or orchard garden for a household.

Garden types

Data from both the qualitative interviews and from the community-wide survey, along with observation of the different garden types among households in Pichátaro, led me to separate out three types of home gardens based on their proximity to the households, size, structure, varieties present, and gender divisions in plant care. These three subsistence garden types are: flower/herb gardens, *solar*[3] or home garden, and orchard gardens (Table 6.6).

[3] See Chapter Four, page 57 for an explanation of the *solar*.

Table 6.6: Characteristics of subsistence garden types in Pichátaro.

Characteristics	*Garden type*		
	Flower/herb	*Solar* or home garden	Orchard garden
Proximity to household	Connected, patio garden	Connected to household	Not connected to household
Size	Very small	≤ 1.0 hectare	≥ 0.5 hectare
Structure	Plants mostly in pots	3 to 4 plant stories	One plant story
Species present	Flowers, herbs, medicinal plants, fruit trees in some	Flowers, herbs, medicinal plants, annuals, fruit shrubs, fruit trees, animals	Fruit trees
Family participation	Women and girls	Men and women, children	Men

Fruit and vegetable consumption

Section four of the socioeconomic survey focused on fruit and vegetable consumption in Pichátaro. Questions in this section included if the household purchased fruits and vegetables, where the produce was purchased most often, and how often they were purchased. The survey also included which fruits and vegetables were purchased most often, however this question was not included in the analysis due to the seasonal variability in produce purchases. Households were allowed to choose all answers that applied for the question regarding where produce was purchased. All households buy fruits and vegetables. Nearly two-thirds (62%) of the households used the daily fresh market set up in the main plaza of town to buy their produce. Forty-two percent of community members also used the Tuesday flea market as a main supplier for household produce (Figure 6.16). Therefore the majority of community members rely on the central market for their produce. Thirty-nine percent of households purchased their produce once

a week, whereas everyday purchasers and households that purchased their produce three times and week were each 30% (Figure 6.17).

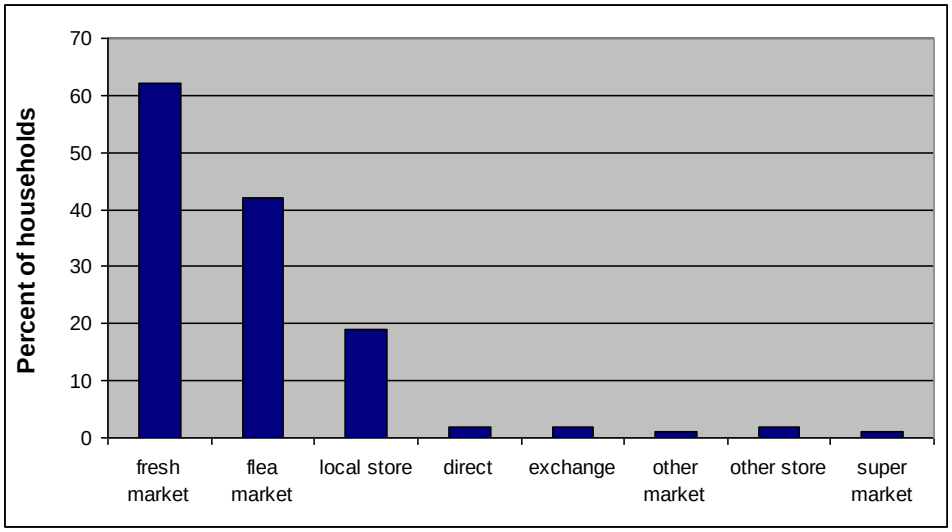

Figure 6.16: Places where households most often buy their fruits and vegetables.

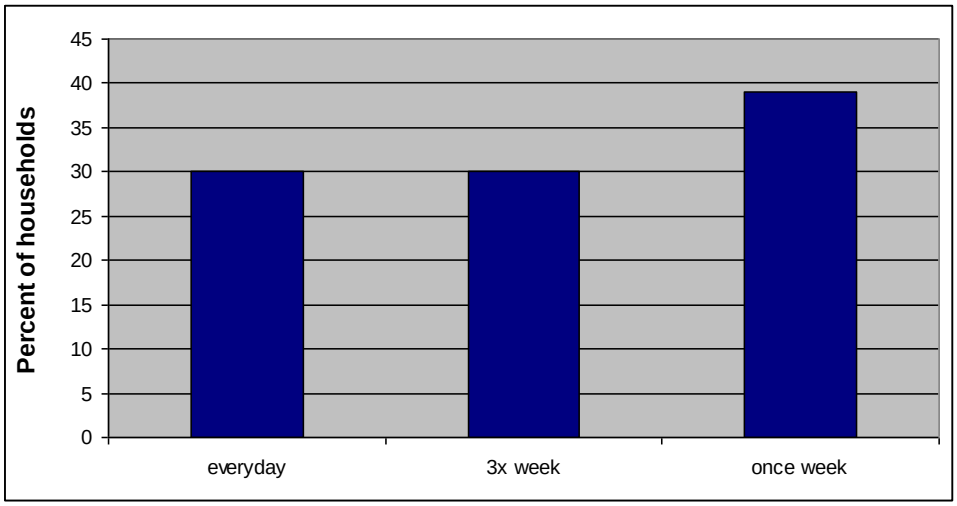

Figure 6.17: Frequency in which households buy fruits and vegetables.

Maize consumption

All households in Pichátaro consume maize in a variety of forms. Half of the households have to purchase maize due to lack in resources (such as land and cash) to grow it. However, the most common form of purchase is direct from the grower; 79% of those who purchased maize cited that they purchased it directly (Figure 6.18).

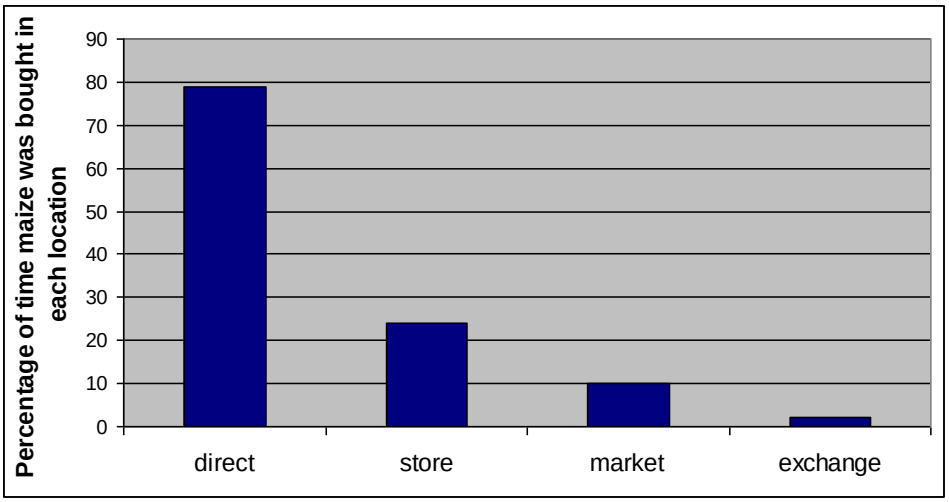

Figure 6.18: Most common sources of maize in Pichátaro.

Socioeconomic trends in Pichátaro

The preceding survey results were compared to results from surveys conducted in the community of Pichátaro in 1976 (Young and Garro 1981), 1982 (Toledo and Barrera-Bassols 1984), and 1997 (Barrera-Bassols 2008) in order to provide an analysis of socio-economic trends over the past four decades. Information from the most recent population and household census conducted by the Mexican National Institute of Statistics and Geography (INEGI 2005) in Pichátaro was also used.

Population

Changes in population size was analyzed for Pichátaro using results from the surveys conducted in 1976, 1982, and 1997, for the most current population size, IGENI census data from 2005 was used. Population had steadily risen since 1976, with only a slight drop in 1982. From the surveys that have been conducted in the community, population size has increased 37% over the last four decades in Pichátaro (Figure 6.19).

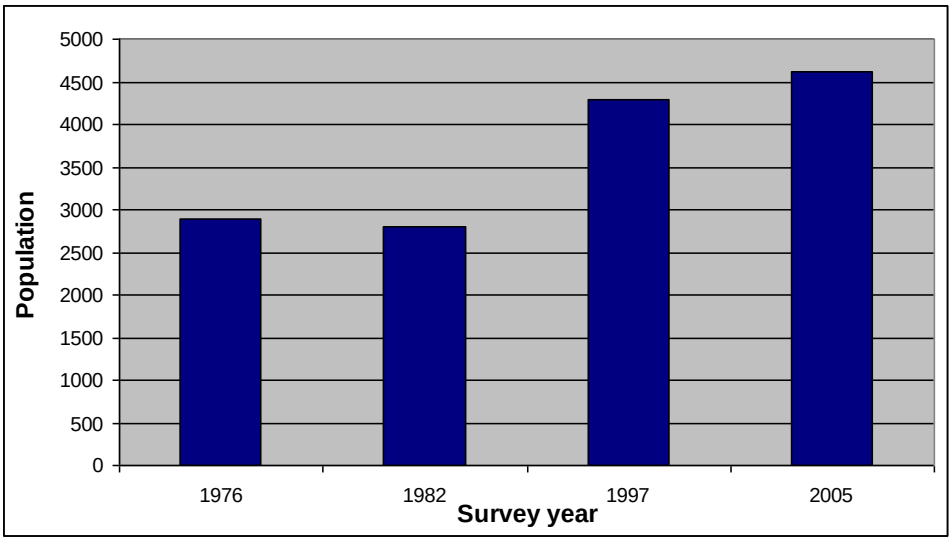

Figure 6.19: Population in Pichátaro over the last four decades as determined by survey and census results in the years 1976, 1982, 1997 and 2005.

Language

The Purhépecha language saw a dramatic decrease in speakers in Pichátaro between 1948 and 1976 (Figure 6.20), which is most likely due to the establishment of Spanish-bilingual schools in the community during the 1940s (Young and Garro 1981). However, during the 20-year period from 1976 to 1997, Purhépecha speaking individuals remained relatively steady at about a quarter of the population, with a slight increase in the early 1980s. The last ten years has seen a 7% drop in Purhépecha speakers in Pichátaro, as more of the younger generations no longer even understand it. However this may change in the coming years as increased importance has been placed on the Purhépecha language in the region, illustrated by the fact that it has been integrated into the public school system as part of the curriculum. Many survey respondents mentioned that although their older children did not know how to speak Purhépecha, their preschool to elementary age children were beginning to learn it in the local school.

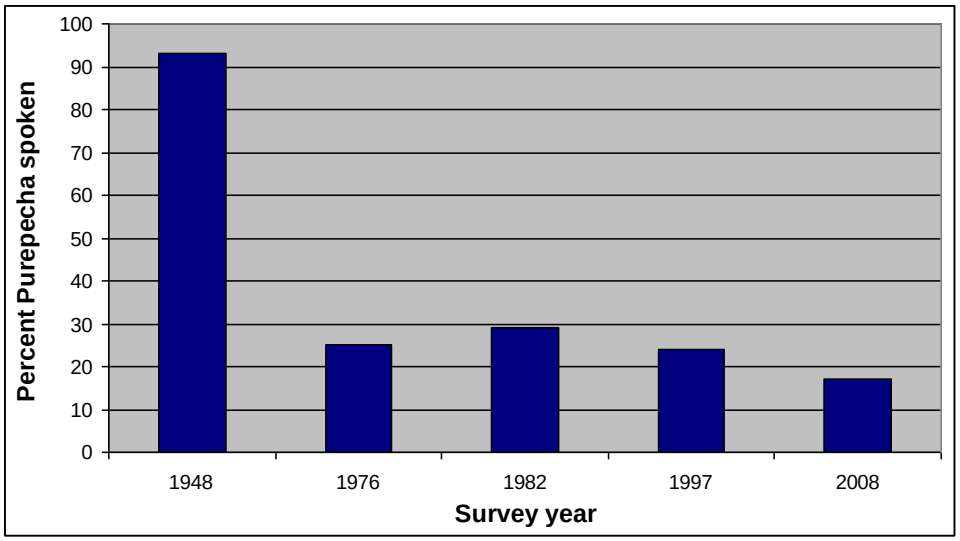

Figure 6.20: Percent of Purhépecha spoken during each survey event.

Economic activities

Figure 6.21 illustrates the changes that have taken place in two important primary economic activities in Pichátaro: agriculture and woodworking. The last three decades (since the 1982 survey) has resulted in a 50% increase of households that participate in woodworking, while agricultural activities have decreased about 24% since 1976.

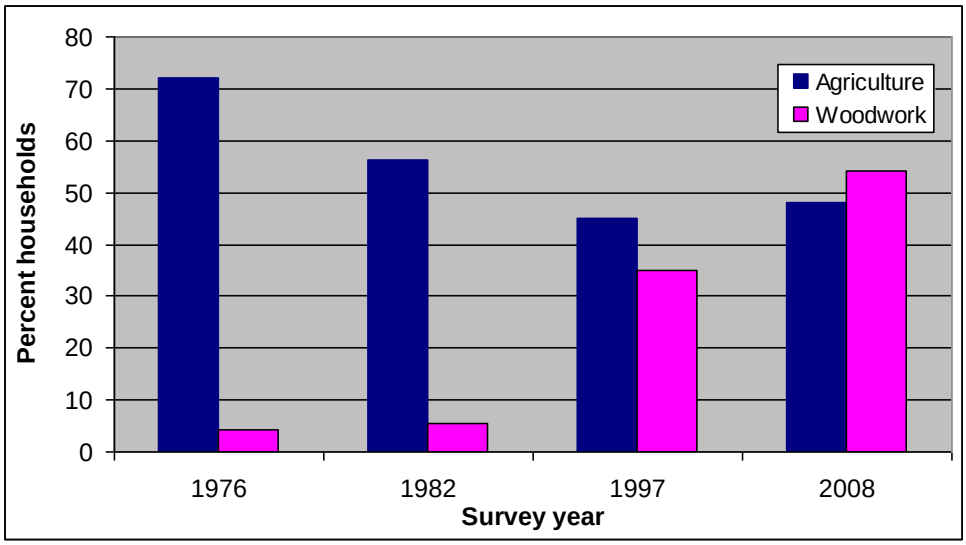

Figure 6.21: Changes in two economic activities over the past four decades of survey years.

Figure 6.22 shows the changes that have taken place during the last decade in stated primary economic activities. In 1997, agriculture was still a primary economic activity for 28% of the households in Pichátaro. However, by 2008 woodworking had replaced agriculture as a primary activity, increasing about 14%, while households with agriculture as a primary activity decreased about 5%.

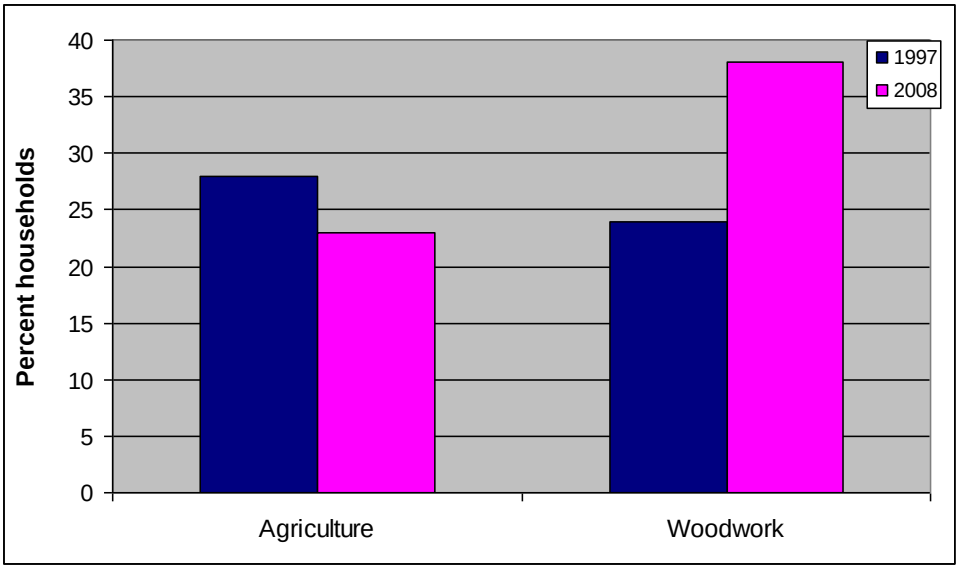

Figure 6.22: Changes in two primary economic activities during the last decade.

Migration

I was not able to make direct comparisons in migration rates between the surveys' years due to the differences in measurement methods in each survey. However an average of about a quarter of household heads in Pichátaro had worked in the US by the 1970s, most taking advantage of the Bracero Program (this thesis Chapter Four, page 63). In 1976, Young and Garro (1984) found that half of household heads had migrated outside of Pichátaro, namely to the US or Mexico City. By 1997, 38% of households had at least one member living outside of Pichátaro. In my survey, this percentage remained stable, resulting in about 36% of households with at least one member who had migrated

outside of Pichátaro, but only about 15% of households had one or more members immigrating to the US.

Conclusion

Results of the community-wide socioeconomic survey supports the findings from the in-depth interviews with home garden caregivers: younger generations are no longer interested in subsistence or farming activities, and income specialization focusing on off-farm activities is quickly replacing the traditional manner of on-farm income diversification. This shift in household income has also been accompanied by the decreasing use of the native language and cultural self ascription. Nevertheless, re-introduction of Purhépecha language and cultural training in the schools may help to reduce this trend in the future.

Even though the general trend concerning subsistence gardens in Pichátaro points to their increasing declining use, they still exist in a variety of forms, which means that they remain vitally important to some households. Many households still have herb and flower patio gardens, yet the traditional *solar* or home garden is declining in importance for many households. In addition, my results showed that the average age of home garden producers is 60 years and older, while the younger generations are not interested in maintaining traditional subsistence practices, as evidenced by the socioeconomic trends over the last four decades.

Chapter Seven discusses the changes that have occurred in Pichátaro subsistence garden strategies over time, while examining the trends that have occurred in the gardens, which today has resulted in three different garden types. In addition, Chapter Seven

looks at the consequences of the decrease in use and importance of home gardens in Pichátaro, while offering an outlook for the future with suggestions on how this situation can be turned around.

CHAPTER SEVEN

DISCUSSION AND CONCLUSIONS

The home gardens that exist today in Pichátaro have a variety of shapes and sizes. They are intensively managed, providing produce for the household in the summer and fall, and forage for animals during the winter months. They are entirely rainfall dependant. For the most part, home gardens are part of the local multiuse subsistence strategy, combining fruit and some vegetable production for secondary income and household consumption. Maize is a common and crucial component of home gardens and is mainly for household consumption and forage production (up to six local maize landraces were cropped during my fieldwork). All home gardens studied are and have been traditionally managed organically, meaning that they do not implement chemical treatments and use only organic fertilizers. In addition, all labor is manual and no mechanical equipment is used. Some owners had tried in the past to implement chemical pest control only to have it fail due to lack of knowledge and appropriate resource access. In fact, many home garden owners were proud of the fact that they managed their orchards without using chemical controls, or as they stated "organically," and are aware of the economic and environmental benefits of organic management due to exposure to local NGO (non-governmental organizations) and university representatives.

The purpose of this research was to find out if change is occurring in San Francisco Pichátaro regarding horticultural subsistence strategies, and if community members are conscious of that change. My objectives were related to two contrasting theories regarding subsistence practices, such as home gardens and indigenous

knowledge. The first theory proposed by Soemarwoto (1987) states that rural and indigenous communities are not consciously aware of the ecological and social benefits of home gardens and so traditional home gardening practices are subject to disappearance as indigenous communities increasingly participate in the market economy. The second theory proposed by Michon and Mary (1990) states that rural and indigenous communities are aware of the importance of home gardens to the household and community, and assumes that home gardens will be purposively adapted to changing market situations. Thus, the home garden will persist through the continued adaptation of new crops and associations in relation to market participation.

The objectives of my research were to find if change is occurring in home gardening practices in San Francisco Pichátaro, what changes are is occurring, and if community members are conscious of these changes. After analyzing my study results, I found that change has been occurring in Pichátaro home gardens and that a hybrid of the two aforementioned theories is occurring. Until the last decade, home gardens were being adapted to changing market participation over time, but in the last decade, there has been increasing abandonment of home garden practices as younger generations have become less interested in traditional agriculture and subsistence practices.

Historical trends and change in subsistence gardens

Horticultural subsistence practices have been present in Pichátaro since before the arrival of the Spanish. Pichátaro households have successfully adapted to new crop introductions, such as European fruit trees, after the Conquest and have continued to adapt throughout time to changing governing situations, market economies, and

environmental conditions. As evidenced by my interviews and survey results, it has been during the last four decades that home gardens have undergone dramatic changes in response to regional development, going from being mainly confined to the *solares,* then becoming larger and appearing more like actual orchards, and recently declining in abundance due to socioeconomic and cultural changes.

During the early 1970s, a dirt road was constructed to connect Pichátaro with the main Pátzcuaro-Uruapan highway (two relatively large commercial centers). Before the construction of the road, the community mostly relied on exchanges with the lakeside community of Erongaricuaro (about 9 kilometers to the east) and with the mountain community of Comachuén (about 10 kilometers to the west). Historically, Pichátaro partook in a variety of craft production activities, such as carved wooden posts and doors, cabinetry, palm-leaf hats, woven-reed items, wooden bowls, broom handles, shawls, and woolen items, such as blankets and belts (Marr and Sutton 2004). However, after the road was constructed and bus service arrived to the community, it was much easier for inhabitants to travel and transport products to the larger, more central commercial center of Pátzcuaro. Because of this, a drop in attendance was noted in *Pichatareños* at the Erongaricuaro market, since the larger markets in Pátzcuaro became the focus of their commerce (Young and Garro 1984). One respondent recalls:

> *Before, they [my grandparents and parents] did not sell the produce [from the orchard], they exchanged it. They would go to Erongaricuaro to barter the fruit for fish or* metates *[mortar and pestle]. But when the road was built is when they started to sell the produce.* (Female age 35)

With the shift from Erongaricuaro to the larger commercial center of Pátzcuaro, craft production activities became more specialized and wide-spread in the community. Gender related tasks were affected as more women began to produce breads and

embroidered textiles, while men became increasingly involved in woodworking and related activities. In addition, families were able to seek medical care from the clinics in Pátzcuaro, no longer relying on more traditional herbal remedies that were grown in the *solares* (Young and Garro 1984).

Interviewee responses have led me to conclude that it was during this same time that some home gardens began to outgrow the *solar* and take on the form of actual orchards, since it was now possible to sell produce in Pátzcuaro, which had a larger consumer base. Many home garden owners noted that they had established or bought their land about 30 to 40 years ago, and that they had learned new fruit tree management techniques from outsiders, even though they also mentioned that they grew up in households that had home gardens with fruit trees present. Therefore, as evidenced from interviewee responses, it was at this time that modern fruit tree management techniques were brought to the community by extension authorities and other specialists, perhaps because of the increase in home garden abundance and size.

During the 1990s, the dirt road was replaced by a paved road, with regular bus service to more towns within the region. Despite this seemingly increased access to the markets in Pátzcuaro, almost all respondents who participated in this study mentioned that they currently preferred to sell their produce in the closer communities of Cherán and Paracho, rather than in Pátzcuaro. This could be due to the greater influence the market economy is having in the region. Today there are more and more large, commercialized orchards present in the *Meseta Purhépecha*[4], while foreign produce is sometimes imported. Washington State labeled apples can easily be found in the daily fresh markets

[4] For a description of the *Meseta Purhépecha* see this thesis Chapter Three, page 29.

in regional towns, even in Pichátaro, which was once well known for their locally grown apples. Once respondent commented:

> *There is more commercialization, the market calls for more quality and flavor and in the market something is lost along the way because there are more orchards in other regions and there is more competition…the thing is that here we do not have monocultures, there is a lot of variety in the home gardens, but we offer no competition with the ones that have large orchards of only one cultivar, with improved varieties.* (Male age 69)

Interestingly, very few respondents noted that they actually sold their produce in Pichátaro, citing that *Pichatareños* do not pay much for the fruit, and that they can fetch higher prices elsewhere.

All respondents in the study perceived recent, more drastic changes in horticultural subsistence practices in Pichátaro. Many cited that there are fewer home gardens today and less emphasis is placed on subsistence practices all together. Overall, the last two decades have seen a drastic increase in artisan woodworking activities, while agriculture and subsistence activities are of much less importance. This is due to a number of factors related to socioeconomic changes in the community, such as, migration and acculturation, increasing market competition for agricultural products, changing agricultural policies, and a growing population. Today, there is much less profit that is earned from subsistence production, so an increasing number of the younger generations no longer see the value in agriculture as a means to supplement income. Agricultural activities themselves have shifted from maize/horticultural crop production to cattle production, due to its higher profitability.

Three principal reasons account for the increasing abandonment of traditional agriculture and subsistence production in Pichátaro. First, the rise in the use of Green Revolution technologies in the 1970s, followed by the end of agricultural subsidies and the influx of cheap maize imports from the U.S. during the early 1990s, which drastically

affected the profitability of the maize-based agriculture of the region (Barrera-Bassols 2008). The cost of production for small farmers had risen so much that it was now cheaper to import maize than to grow it for self-consumption. Second, an increase of more than 55% in the number of households in Pichátaro over the last four decades has lead to increased competition for agricultural land resources, and in the reduction of the historical home garden lands, due to the increase of house construction and urbanization. Third, traditional and subsistence agriculture has been increasingly viewed as antiquated and profitless by younger generations, who see no future in it and who perceive farming as an undignified activity (*ibid.*). This was evidenced by the average age of respondents, which was 63 years old; it was actually difficult to find younger garden managers to participate in the interviews (the youngest was 40 years old). I also found that the respondents with the most local knowledge concerning garden management were those over 60 years in age. Obviously, this is the case in any situation regarding local knowledge, the older generations are the most experienced in carrying out local practices, such as agriculture and subsistence gardening. However, I also noticed that there was almost a complete lack of local knowledge by the younger generations (less than 40 years old), mainly due to their lack of interest in and use of this knowledge.

Consequences of loss of horticultural subsistence strategies

Pichátaro is an indigenous community where the economy has traditionally functioned in the context of a prestige system, where the aims of production are the reproduction of the household, *barrio*, and community material and symbolic needs, such as items necessary for religious purposes. Thus, the household does not act independently

but as an integrated member of the community, participating in communal tasks for the benefit of the *barrio* and community. Through this system, household earnings are regulated by a number of mechanisms that do not allow for class differentiation among households within the community. Due to this, household heads will spend large amounts of time and money on communal activities such as holding *fiestas* and other religious celebrations (this thesis Chapter Four, pages 60-61). Even though migration and global influences have resulted in the individualization of households, and thus the decreasing use of the prestige system, it still persists in many communities throughout the Lake Pátzcuaro Basin, including Pichátaro (Toledo 1991). In this economy, home gardens have worked quite well, providing an extra source of income and a means of nutrition allocation for the household.

Although the prestige economy still exists in Pichátaro, an increasing number of households are participating in the national and even global market economy, importing goods for consumption and exporting artisan produced items, essentially making Pichátaro a transnational community. Thus, an imbalance has now been created among households who specialize in the production of items for export and sale, and those who continue to participate in a diverse range of activities as a means of household reproduction. The households that have chosen to specialize in commercial production activities are more likely to take on the standards of individualism that is promoted by the market economy. Thus, what is seen today in Pichátaro is an increase of younger generations who pursue Westernized lifestyles, no longer speak Purhépecha, and who no longer self identify as Purhépecha people, while the older generations still participate in

traditional economic activities, are more likely to understand and speak Purhépecha, and who self identify as Purhépecha indigenous people.

What are the consequences of this change for horticultural subsistence strategies? Home and orchard gardens have been and remain important to the household, community, and natural environment in Pichátaro for four reasons: (1) maintenance of local crop biodiversity, (2) household food security, (3) maintenance of local sustainable agriculture practices, and (4) local ecological knowledge. This importance is emphasized by the fact that some households still use gardens as an important subsistence strategy. However, as households cease to participate in these strategies, the community runs the risk of losing important local cultivated, semi-domesticated and tolerated varieties (volunteer plants), households become less food independent, knowledge of local environmental management is lost, along with sustainable manners of production and earnings.

Crop biodiversity

While the majority of maize crops are grown in the fields that surround the community, maize is also grown in the *solares* and orchard gardens, and there are distinct landraces that are grown in each of these areas. For example, colored varieties of maize are most often grown in the *solares* and orchard gardens. The reason for this, given by the farmers themselves, is due to their more intense irrigation and soil management requirements. West (1948) concluded that the colored landraces most likely evolved in the home garden environment where organic waste was often deposited, and thus these varieties adapted to higher nitrogen requirements. In fact, Pichátaro has been considered

by the Purhépecha as one of the places in the Pátzcuaro Basin that produces the best colored maize (Mapes 1987). Qualitative interviews from this study revealed six maize landraces that are grown in the different home gardens in Pichátaro. However, as subsistence strategies lose importance in Pichátaro, and home and orchard gardens begin to disappear, the local maize landraces that are specific to these environments also are at risk of disappearing, along with their associated religious and specific culinary uses.

All interviewees said that they save and replant seeds and tree seedlings from year to year, thus emphasizing the importance of the home and orchard gardens in maintaining varieties and landraces specifically adapted to the local environment. Home gardens in Pichátaro are a haven for a large number of important cultivated species that are specific to these agricultural systems, representing a reserve of diverse cultivars that are not grown on larger scales. Even though I did not conduct an actual collection of species present in the home gardens, I was able to determine from the owners that there are at least 22 varieties of fruit trees, six maize landraces, five to six important varieties of vegetables, and seven different herb species, in addition to poultry and beekeeping. Past studies in the area have found as many as 25 different vegetable, legume, and cereal crops, and 25 different kitchen and medicinal herbs, along with a countless number of flowers used for both traditional and religious purposes (Barrera-Bassols 2008; Mapes et al 1990).

Food security

Although maize has remained a staple subsistence crop due to the variety of environments (fields and gardens) in which it is grown, this is not the case with other

produce. Results of the socioeconomic survey showed that households in Pichátaro are relying more and more on purchased fruits and vegetables. All households that participated in the study bought fresh produce to some extent, purchasing a wide range of everyday staples at the daily fresh market in the central plaza. While 63% of households had home gardens, the majority had only a few fruit trees, with mostly herbs and flowers present. Only a quarter of the gardens used the space to grow the traditional *milpa* crops. As one respondent noted:

> *There are families that have to buy everything, they don't grow anything. There is no longer space for a garden, everyone lives in the cement, and so where are they going to put a garden?* (Male age 45)

Although all respondents of the garden interviews consumed products from their gardens and emphasized the contribution of garden products to household food security, overall they are losing their importance as a source of nutrients for the household, as market goods are replacing them. As peasant households move away from subsistence production towards cash production, they jeopardize household food security. Dewey (1981) found that children from more self-sufficient households in a community of Tabasco, Mexico had fewer nutrient deficiencies than those that relied on purchased produce. Home gardens supplement household food security because they allow direct access to nutritionally rich foods, increase available income for other food products, and offer alternative sources of food during times of scarcity (Montagnini 2006).

Sustainable land management

Horticultural subsistence activities in Pichátaro represent a form of sustainable land management, as many are intensively managed to provide year-round products for the household. Especially *solares* have the ability to provide fruit, *milpa* products and

forage, along with countless kitchen and medicinal herbs. Both *solar* and orchard garden managers emphasized their use of traditional management techniques, which included the use of natural amendments that include animal and green manure in addition to household organic waste, intercropping of both cultivated and volunteer plant species, utilization of seasonal variations in rainfall for water requirements, and the absence of chemical treatments. Thus, traditional *solares* and orchard gardens in Pichátaro often mimic forest structure, having more than one plant story or level, providing soil and water conservation, promoting nutrient recycling, and conserving genetic resources while allowing the continued adaptation of local plant varieties and creating beneficial microclimatic effects.

Knowledge transmission

Subsistence strategies are an important context for the perpetuation of local knowledge as older generations teach younger ones how to care for and manage the environment in which produce is cultivated, gathered, or hunted. However, in Pichátaro younger generations show little, if any, interest in agriculture and subsistence activities, thus creating a gap in the transmission of local environmental knowledge that is associated with these activities. Results from the qualitative interviews and surveys showed that gender related activities specific to home garden management was dependent on knowledge transmission from older generations, even though this knowledge has been complemented by outside influences on modern fruit tree management techniques. Nevertheless, only two respondents, representing only 22% of all respondents, cited that their children were interested in learning and carrying on garden management techniques.

Language is also an important factor in local knowledge transmission, as native language is a purveyor of cultural knowledge, where local worldviews and ways of life are expressed most accurately (Maffi 2001). However, the Purhépecha language has declined drastically in its use in Pichátaro, especially during the last half of the 20th century. West (1948) documented that over 90% of individuals in Pichátaro spoke Purhépecha 60 years ago, but today that percentage has declined to about 18% of individuals. Language began to decline in the 1940s, when the first bilingual school was built in Pichátaro. This shift in language use is also reflected in the different manner in which each generation in Pichátaro describes themselves. Until recently, the majority of Pichátaro inhabitants self identify as Purhépecha indigenous people, mainly due to the town's location in the Purhépecha region, a shared religion, and other cultural ties, although many actually are of *Mestizo* or mixed heritage. Today, a line can be generally drawn between those older and younger than 40 or 50 years old in the way they describe themselves. Many of those younger than 40 or 50 years old do not speak Purhépecha and do not see themselves as Purhépecha (even if they still claim Purhépecha heritage), while those older than 50 years old ascribe themselves as indigenous, even though they may speak very little or none of their indigenous language (Barrera-Bassols 2008). This is evidenced by my survey results, which showed a 56% gap between age groups older and younger than 40 years of age who can speak Purhépecha.

Conclusions and recommendations

Horticultural subsistence practices have been present in Pichátaro since the pre-Hispanic era. They have been shaped and molded throughout time in response to internal

and external influences, making them hybrid artifacts. Today, however, these practices are at severe risk of disappearing altogether, taking with them the local species and knowledge in which they are embedded, along with household food independence.

Pichátaro was once a community dependent on a diversity of activities focused on on-farm production (relying on cultivated produce for food and maize self-sufficiency). It has now shifted to being dependent on specialized activities focused on off-farm production and reliant on purchased produce for food. To promote the importance of diversification of economic activities, which includes on-farm activities such as subsistence gardening, a number of actions should to be taken, otherwise subsistence gardens are in danger of being lost. These actions include utilizing programs already in place that promote the exposure of locally produced, organic produce, adding value to garden produce by taking advantage of gender specific activities, utilizing local tourism, and encouraging the creation of land incentives that would promote the use of *solares* or communal gardens.

In the Lake Pátzcuaro Basin, programs already in place promote organically produced items by peasant farmers by aiding in the exposure and transport of those items to commercial centers, such as the capitol city of Morelia. These programs were put in place by local NGO representatives, and some producers in Pichátaro take part in them. However, most garden managers do not utilize this resource as a means of promoting the sale of their produce. Since garden produce is managed organically, subsistence gardeners are eligible to utilize this outlet as a means to promote their organic products. This outlet can also be used to promote the sale of value-added produce in the forms of chutneys, marmalades, jams, and other canned green goods. Since the *solar* is where

men and women can often be found working together in the cultivation and maintenance of garden species, it is reasonable that women could take on the activity of adding value to home garden produce that is for sale. Another advantage that the community has is their reputation for wood carved items, which brings a large number of tourists through town each year, especially during their main festival that occurs in August. Garden producers can take advantage of this by selling value-added items in the furniture stores that adorn the main road, and during the several *fiestas* (more than fourteen) taking place during the year.

Another option that would encourage the continued cultivation of subsistence gardens would be the implementation of land incentives. Ideally, these incentives would encourage the continued use of orchard gardens that exist in the community, but are now abandoned and which are currently being divided up and converted to home parcels. Instead of being divided and sold for building homes, they could be leased for the use of garden cultivation by households that would otherwise not have access to land that purpose. Of course certain regulations would have to be in place for these types of programs to work, such as rules governing the specific uses of the land.

For each of these recommendations, the most important element is education. It is essential to remind community members of the importance of the subsistence gardens, and why they should not be discarded as a source of household income and food. Education programs regarding maize, emphasizing the importance and maintenance of local landraces, while demonstrating the risks of non-native technologies (such as transgenic varieties and chemical control) have been successful in Pichátaro. Thus,

programs emphasizing the importance of horticultural subsistence practices should not be disregarding as a possible means of conserving this essential activity.

CHAPTER EIGHT

REFLECTIONS

This project was an interdisciplinary project, encompassing horticulture, sociology, and anthropology. More emphasis has been placed on multi-disciplinary research in the last few decades due to the profound interrelatedness of the natural world and human societies. Despite this, I was not trained as a multi-disciplinary scientist, my background lies in biology with an emphasis on plant biology. Needless to say, carrying out this research project was definitely a growing experience for me as a budding researcher and because of this I have entered into the world of multi-disciplinary research, never to return to strictly studying one discipline.

Since my academic background lies mainly within the realm of biology, there was obviously a learning curve involved as I took on sociological- and anthropological- based research methods to carry out this project. This resulted in some drawbacks in the manner in which I performed the research methods. Including more home gardens in the qualitative surveys would have given more breadth to the research, and supported more strongly my results and conclusions. I also think that my lack of experience in conducting qualitative interviews kept the responses from becoming as rich as they perhaps could have been, including some information that I failed to recognize as I was conducting the interviews. Even though I utilized participatory observation, I feel that if I had more experience in conducting participatory research, I could have also contributed to a richer understanding of what is occurring in Pichátaro. In addition, I spent a great amount of time modifying the socioeconomic survey, finding in the end that I could have modified it even further in order to ensure more accurate responses related to what I

wanted to learn. As I mentioned, however, this project involved a huge learning curve for me and I feel that, overall, the results reflected the purpose of the study and what I wanted to know about what is happening in Pichátaro regarding subsistence practices.

Despite the aforementioned drawbacks, I feel that this research has contributed to the understanding of what is occurring in terms of change in traditional activities, related to local development and influences from the market economy in San Francisco Pichátaro. This project is important also because it can be used as a basis for further research involving the shift from traditional subsistence practices to greater participation in the market economy in rural and indigenous communities. Further research, which involves a number of different disciplines (ecology, horticulture, geography, sociology, and anthropology, to name a few) working together in order to understand the effect of the market economy on people, communities, and the environment, especially in third-world countries where many indigenous communities still predominate, is needed. This research is extremely important as the world is noticing and acknowledging the severe impact that the market economy has had on not only the natural environment, but on people and communities themselves, and the importance of conserving and reviving local practices of production and sustainable development for the perpetuation of a healthy existence for the human population.

Further research specifically involving the community of Pichátaro and the Lake Pátzcuaro Basin involving shifts in traditional production needs to include an intensive survey and cataloging of the species present in the home gardens that are left, along with an ethnobotanical study of their uses. My research revealed that the average age of home gardeners in Pichátaro is over 60 years old, meaning that this information is likely to be

lost when this generation passes away. Therefore, there is urgency for projects that would involve surveys of home garden knowledge and biodiversity, since home gardens often harbor species and varieties that are no longer cultivated on larger scales. It is also important to further understand the mechanisms behind the shift found in traditional production strategies so that measures can be taken to ensure the viability of rural and indigenous communities that have historically depended on subsistence for their survival. For the most part, rural and indigenous communities are not customarily prepared to participate in a world economy, and so much of the time when they do, increased poverty is a result, while traditional subsistence practices are continually left behind.

Another important aspect of further research that would be specific to the community of San Francisco Pichátaro would be research into the reasons why there is overall disunity among community members. This lack of unity has been one reason why Pichátaro has had troubles in the past working together on proposed projects of community development that would ensure the survival of traditional practices (personal communication, Barrera-Bassols). I also noticed this underlying distrust among community members in my research, but did not delve into it further as it did not directly pertain to project. However, I feel it is important to understand the dynamics that are occurring in the community in order to implement programs that support and encourage the use of traditional subsistence practices.

Overall, this project met the research objectives I set out, showing that change is taking place in Pichátaro and community members are conscious of that change. Interviewees also showed a concern related to that change, as younger generations no longer want to learn the ways of their elders. Thus, I intend to continue this research in

Pichátaro, to specifically carry out a cataloguing of species and varieties that are found in the home gardens and the knowledge associated with them. However, equally important is to understand the dynamics of change that are taking place and how unity among community members can be achieved in order to successfully carry out local development projects that involve the perpetuation of traditional subsistence strategies.

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APPENDIX

APPENDIX A

Survey of home garden characteristics

1) What are the general characteristics of the home garden and what are the main uses for its products?
    a. Size
    b. structure
    c. Perennials
    d. Annuals
    e. Food plants
    f. Ornamentals
    g. Fuel plants
    h. Medicinal plants
    i. Animals present?
2) Who is the principal cultivator of the home garden?
3) Who participates in home garden activities and labor?
4) What is the age and gender of principal cultivator of the home garden?
5) How long has the home garden existed?

APPENDIX B

Semi-structured Interview

1) What role does the home garden play for the household?
    a. Subsistence
    b. Supplementary income
    c. Social functions
    d. Cultural functions
2) Is there active exchange of knowledge/seeds/produce of home garden products with neighbors in/outside village?
3) Where and how was the knowledge of home gardening learned by the parents/grandparents?
    a. Helping in the garden
    b. Cooking in the home
    c. Medicinal uses within the home
    d. Cultural uses
    e. Religious purposes
4) Do you perceive changes in the general practices of home gardening between older and younger generations? If so what types of changes?
5) What do you feel has influenced that change?
    a. Internal to community
    b. External to community
6) Do the children of the household regularly participate in household activities such as gardening?

7) Are the children interested in home gardening?
    a. If so, how interested do you perceive they are?
        i. None, they don't participate in home garden activities.
        ii. Little, only do it because it is required of them
        iii. Somewhat, they do it because it is required of them but seem interested in doing it correctly.
        iv. Very, they do it regardless of requirement and are interested in learning the correct management and care of the home garden plants.
8) Do you feel that the knowledge of home gardening is being taught in the same way as it was taught to the generation before? Why do you feel this way?
9) Do you feel that your children will continue maintaining the home garden?

APPENDIX C

Demographic survey

1. What is the household composition?
2. What are the ages and sex of household members?
3. What is the relative schooling of household members?
4. In what types of formal and informal work do the household members participate?
5. Are there household members that migrate outside of the community for economic purposes?
6. What types of land holdings does the household possess?
7. What languages are spoken in the household?

APPENDIX D

Socio-economic survey

Name of surveyor:

Date:

Survey number:

Name of surveyed:

Address (including barrio, street, house number)

Fill in the following table with the name of each person who lives in the household together with their corresponding data. Place a star by each head of household.

Number of people who live in the household: Number of heads of household:

Name	Relationship	Age	Sex	Level of education	Understood languages	Spoken languages

(followed by a table in actual survey)

Section 1: Household economic activities

1) In what economic activities does the household participate and what is the percentage of time devoted to each activity?
    a) Agriculture
    b) Livestock raising
    c) Wood extraction
    d) Resin extraction
    e) Hand-made furniture
    f) Artisanal wood carving
    g) Embroidery

h) Textile crafts

i) Petty commerce

j) Wage labor

k) Construction

l) Professional (which profession)

m) Other (specify)

Section 2: Migration

1) How many household members live temporarily or have moved permanently outside of Pichátaro?

a) Where do they live?

(1) Within Michoacán

(2) Within Mexico but in another state

(3) In the USA

b) How much time during the year do they spend there?

c) In what economic activities do they participate?

Section 3: Property and land use

1) Agriculture

a) Does the household rent or own any agricultural parcels?

b) How many agricultural parcels does the household possess?

c) For what activity is each parcel used and what is the approximate size of each one?

(1) Parcel size: activity:

(2) Parcel size: activity:

(3) Parcel size: activity:

(4) Parcel size: activity:

(5) Parcel size: activity:

Activity:

Maize

Milpa

avena/animal fodder

orchard

home garden

fallow land

cattle grazing

other animal

Section 4: Home gardens and orchard garden information

1) Do you maintain a home garden?

   a) If yes, is it attached or apart from the home?

      (1) Are the products from the home garden for household consumption only, for sale or for both?

      (2) Who participates in home garden maintenance?

      (3) What do you cultivate in your home garden?

         (a) Fruit varieties

         (b) Other fruits

         (c) Vegetables

(d) Maize

(e) Grains

(f) Herbs

(g) Medicinals

(h) Flowers

(4) Do you also have animals as a part of your home garden?

(5) Did your family maintain a home garden when you were growing up?

b) If no, did you previously have a home garden either in your own home or growing up in your parent's home?

(1) If so, why do you no longer maintain a home garden?

2) Do you maintain an orchard garden?

a) If yes, is it attached to or apart from the home?

(1) Are the products from the orchard garden for household consumption only, for sale or both?

(2) Who participates in orchard garden maintenance?

(3) What do you cultivate in your orchard garden?

(a) Fruit varieties

(b) Other fruits

(c) Vegetables

(d) Maize

(e) Grains

(f) Herbs

(g) Medicinals

(h) Forrage

(i) Flowers

(4) Do you also have animals as a part of your orchard garden?

(5) Did your family maintain an orchard garden when you were growing up?

b) If no, did you previously have an orchard garden either of your own or while growing up?

(1) If so, why do you no longer maintain an orchard garden?

Section 5: Household consumption

1) Do you purchase fruits and vegetables for household consumption?
2) What amount of the fruits and vegetables for household consumption is purchased?
3) Where do you purchase the fruits and vegetable consumed in the household? Can you estimate the amount you usually purchase at each place?
   a) Fresh market in town
   b) Family owned grocery store in town
   c) Direct from local farmers
   d) Market in another town (where?)
   e) Family owned grocery store in another town (where?)
   f) Supermarket chain store (where?)
4) Can you estimate the amount of household income that is used to purchase fruits and vegetables?

Section 6: Maize consumption

1) Do you buy maize?

2) What varieties do you buy?
3) When do you buy maize and how much do you buy?
    a) Everyday
    b) Three times a week
    c) Once a week
    d) Less than 4 times a month
4) Where do you buy maize?
    a) Fresh market in the town plaza
    b) Small grocery store in town
    c) Direct from the producer
    d) Through exchange
    e) Market in another town
    f) Small grocery store in another town
    g) Supermarket in another town