ETHNOGRAPHY OF CAMPESINOS

POLITICAL ECOLOGY AND CONSERVATION OF BIODIVERSITY IN A MAN AND BIOSPHERE RESERVE IN CHIAPAS, MEXICO

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Thesis submitted in the fulfilment of the requirements for the degree in Doctor of Philosophy

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2019

Declaration

I, María Gabriela González Cruz, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

ACKNOWLEDGEMENTS

Katherine Homewood. Thank you for your personal and professional advice. Your help and support encouraged me to improve every day.

To Marc Brightman. Thank you for introducing me into Anthropology. For your time, your patience and support.

To CAOS group and The Human Ecology Research Group at University College London (UCL), for introducing me into conversations on conservation and sustainability around the world.

To the Anthropology department at UCL. Thank you for accepting me and allowing me to develop my PhD.

To Consejo Nacional de Ciencia y Tecnología (CONACYT) and Secretaría de Educación Pública (SEP) for providing me with the funding for developing this PhD.

To institutions in Chiapas Mexico. ECOSUR, PRONATURA S.A., FRAYBA, CIDESI. Your commitment and contributions for the rights of campesinos and indigenous people has no borders.

To Comisión Nacional de Áreas Naturales Protegidas (CONANP). In particular, to the office at Tuxtla Gutierrez, Chiapas. Who received me along this journey, always with a smile and disposition to have a conversation with me.

To the staff and the Director of the Man and Biosphere Reserve, *La Sepultura*. Thanks for your commitment and collaboration during fieldwork.

To Universidad Nacional Autónoma de México. Always offered me a place to visit and colleagues to connect to.

To every person in *Josefa Ortiz de Domínguez*. You taught me about courage, life and the forest. I will treasure your friendship for the years to come.

To children at *Josefa Ortiz de Domínguez*, who taught me how to see the world with new eyes.

To my students, who became teachers along this journey and gave me confidence for the future.

A mis hermanos Marco, Pamela and Omar. Los respeto y los admiro, ¡un chingo!

To all my friends, whose passion for their life and their work is an everyday inspiration. Passports does not define who we are. It is us, that along our journey become family and inspiration to each other.

To Malcolm. Thank you for your friendship and our adventures together.

To Dean and Alex. You saw beyond my limitations and encouraged me to be a better person.

To Rosa María, Miguel Ángel and Liliana, I love you. You inspire me every day.

To Miguel González Silva. You are my angel and my strength.

To those who build alternatives for sustainability everyday.

To woman and men in *ejido Josefa Ortiz de Domínguez.*

To my family.

ABSTRACT

In 2015 countries in the United Nations committed to the Sustainable Development Goals (SDGs). Some of these goals refer to preserving biodiversity and ending poverty and hunger in rural areas. There is insufficient knowledge of how these goals might be accomplished in collaboration with local communities. In Mexico, one of the most biodiverse countries in the world, rural areas are inhabited by campesinos: small-scale farmers and landowners. The present dissertation focuses on the livelihood of these local actors and discusses their economic strategy in relation to conservation discourses and conservation practices. I adopted a political ecology perspective and combined anthropological methods with ecological observations to developed fieldwork in *ejido Josefa Ortiz de Domínguez,* a community inside the Man and Biosphere Reserve (MABR) *La Sepultura*, Mexico. Chapter 1 establishes the theoretical approach to this dissertation and describes the methods used. Chapter 2 explains who is the campesino and points out the central perspectives on conservation and political ecology in Mexico. Chapter 3 analyses the history of the *ejido Josefa Ortiz de Domínguez*, and the role of campesinos in managing a temperate forest and a successional dynamic. Chapter 4 analyses the livelihood strategy of campesinos and explains its interplay with conservation projects promoted by *La Sepultura*. Chapter 5 illustrates how birds move through the landscape using both the mature vegetation of the forest and the surrounding successional vegetation as habitat. Chapter 6 explores current environmental and social movements in Mexico, and the growing claims of campesinos at *La Sepultura*. Finally, in Chapter 7, I argue that conservation projects can be a tool for global and local interests to coincide. By recognising the human rights of campesinos and paying attention to their livelihood, conservation agencies move beyond ecological discourses and contribute to sustainability and the SDGs.

IMPACT ASSESSMENT

This investigation looks for alternatives to current conservation approaches and building sustainability in the context of Protected Areas and the Sustainable Development Goals. It pays attention to one social group that has been historically accused of deforesting and degrading tropical ecosystems in Mexico and Latin America: peasants, also called campesinos. The present study focuses on the livelihood of campesinos, the ecological heterogeneity associated with it, and the non-monetary values that define it. This research contributes to critical political ecology research in Mexico. It goes beyond dualisms such as conservation versus poverty, or local people as destroyers or conservationists of ecosystems.

This research focuses on people as an element of the environment. It is one of the few academic studies that analyse campesinos as environmental subjects in Latin America and Mexico. This provides a bridge for social and natural scientists to discuss biodiversity and rurality in the region. It pays attention to ecological and environmental interactions rather than to environmental or ecological units. It looks to answer political questions in conservation and sustainability, such as how to safeguard biodiversity, and for whom?

Locally, this research leads to discussion of conservation and sustainability together with local communities. Regionally, it presents a study case on protected areas and how conservation projects function in the state of Chiapas, one of the poorest states in Mexico. At the national scale, this dissertation promotes a political ecology perspective in Mexico. This is an emerging discipline that possesses a strong potential for advancing Latin American and global discussions about conservation and sustainability. Internationally, it gives importance to socio-environmental movements that shape environmental alternatives and local-global voices demanding environmental and social justice. It provides a “bottom-up” perspective on conservation to those hoping to

work jointly with local communities under democratic practices and equal participation principles.

For local people, this dissertation aims to evidence the voice of present and future generations of campesinos defending their forests and their right to a decent life. At a community level, this research is a testimony to local efforts to maintain biodiversity. It represents a tool for building dialogues with agencies and institutions negotiating economic and environmental projects. This research clarifies that campesinos develop alternative economies and a specific environmental knowledge which organisations such as biosphere reserves might recognise to enrich collaboration.

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GLOSSARY OF RELEVANT TERMS IN SPANISH

Asamblea ejidal

Official areas where collective decisions take place inside *ejido*s. Generally, *asambleas ejidales* are organised by the authorities within *ejido*s. Here, *ejidatarios* vote for the decisions concerning land-use management.

Cafetal

Agroecosystem, also called coffee garden. *Cafetales* are grown in the forests, and maintain its vegetation strata.

Comunidad agraria

Collective land regime. *Comunidad agraria* is mainly practised by indigenous people. Recognition of land titles in *comunidades agrarias* are older than the Mexican independence (1810).

Ejidatario

Population with communal land titles within *ejido*s. *Ejidatarios* have a vote in *asambleas ejidales* and are the main people responsible for the institutions governing land-use.

Ejido

Collective land regime. *Ejido*s constitute an Aztec system of collective property settlement re-introduced by the government to provide land to landless individuals after the Mexican revolution (1910).

Frutal

Agroecosystem, also called fruit garden. *Frutales* are generally grown in the successional forest and they contain fruit trees that enrich the family diet.

Huerto familiar

Agroecosystems also called home gardens. They are recognised for their role in safeguarding biodiversity as most of the species found in *huertos* are multi-purpose

Mestizo

Individuals who have a mixed Spanish, black and Indigenous ancestry. Mestizos are the product of racial mixing or mestizaje.

Milpa

Polycrop system which represents the main economic activity of most campesinos in Mexico. It allows the co-existence of different plant species, such as maize, beans, squash, chilli, and other semi-domesticated and non-domesticated plant species.

Poblador

Also called *avecindados*. They are individuals who live inside *ejido*s without the right to vote and without land titles. Generally, *pobladores* constitute the descendants and extended family of *ejidatarios*.

Pozol

Traditional beverage made with water, granulated maize and sugar.

ACRONYMS

BANRURAL: Banco de Desarrollo Rural.

CBD: Convention of Biological Diversity.

CEDICAM: Centro de Desarrollo del Campesino Mixteca. Centre for Integral Small Farmer development in the Mixteca.

CIDESI-Unitierra: Pro Neo-Zapatista school.

CITES: Convention of Threatened Species of Flora and Fauna.

CNC: Comisión Nacional Campesina.

CONABIO: Comisión Nacional de Biodiversidad.

CONAFOR: Comisión Nacional Forestal.

CONANP: Comisión Nacional de Áreas Naturales Protegidas.

CONASUPO: Compañía Nacional de Subsistencias Populares.

Cooperativa AMBIO. Environmental Organization.

ECOSUR: Colegio de la Frontera Sur.

EZLN: Ejercito Zapatista de Liberación Nacional.

ICDP: Integrated Conservation and Development Projects.

MABR: Man and Biosphere Reserve.

MEA: Millennium Ecosystem Assessment.

NAFTA: North American Free Trade Agreement.

NGO: Non-Governmental organization.

NOM: Norma Official Mexicana (Mexican Official norm).

PAS: Protected Areas.

PES: Payment for Environmental Services.

PESH: Payment for Enviromental Services-Hydrological.

PROCEDE: Programa de certificación y derechos ejidales Program for Certifitacion and Ejidal Rights.

PROCODES: Programa de Conservación para el Desarrollo Sostenible. Regional Sustainable Development Program.

PROGRESA: Government Social Assistance Program (1994-2000).

PRONATURA SUR A.C. Environmental NGO (1989-Present).

OPORTUNIDADES: Government Social Assistance Program (2000-2006).

SEMARNAT: Secretaria de Medio Ambiente y Recursos Naturales.

SDGs: Sustainable Development Goals.

UMA: Unidad de Manejo Ambiental. Environmental Management Unit.

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CHAPTER 1

An Ethnography of Campesinos. Chiapas and *Ejido Josefa Ortiz de Domínguez,* Mexico

INTRODUCTION

In 2015, countries at the United Nations committed to the Sustainable Development Goals (SDGs). Some of these commitments relate directly to eradicating poverty and hunger and preserving biodiversity. Accomplishing the SDGs is a colossal task. People settling in rural areas might be the most important actors in reaching the SDGs. Globally, there are approximately 1.2 billion men and women living in rural areas, 80% of them living in poverty (FAO, 2017). In developing countries, people living in rural areas depend directly on biodiversity to develop their living and contribute with up to 80% of the food that is locally consumed (Samberg *et al.,* 2016).

People from rural areas are commonly called peasants. In various parts of Latin America, including Mexico, they hold the name of campesinos. Besides being people facing difficult social and economic circumstances, the rights of campesinos are becoming more widely recognised (United Nations, 2018). The Food and Agriculture Organization of the United Nations (FAO) discusses their strategies for managing biodiversity as opportunities for matching conservation with food-sufficiency (FAO, 2018), and the United Nations General Assembly declared 2014 the International Year of Family Farming. Also, in November 2018, the Third Committee (Social, Humanitarian and Cultural) of the United Nations voted in favour of the UN Declaration of the Rights of Peasants and Other People Working in Rural Areas. This acknowledgment of the rights of peasants and their life strategies could play a fundamental role in accomplishing the SDGs, and in building an inclusive, sustainable society.

In Mexico, there are approximately 20 million campesinos (Comisión Económica para América Latina, 2017). They own 60% of the mature forest in

the country. Campesinos include indigenous and mestizo communities with a shared common past, present challenges and attitudes toward their future. In parallel, their landscapes and their forest are the arena of global conservation and sustainability efforts. These efforts also have a history and an agenda for present actions and coming events. Consequently, campesinos and conservation are bound together by interests concerning the forest, by values around biodiversity, and by perspectives concerning the present and the future. How do campesinos and conservation interact? Moreover, what do campesinos think about conservation? And, what could this interaction contribute to the discussions about sustainability in general? I address these questions with an ethnography led by two central ideas. First, that campesinos play an active role in the land-use change and the preservation of their forest. Second, that the remaining mature forest in Mexico exists as an ecological unit in relationship with other biotic and abiotic aspects of the environment. I examine these issues from a political ecology perspective.

To develop this ethnography, I focus on four themes: 1) the history of campesinos and the historical events that defined their landscape, 2) the material relationship of campesinos with the landscape, 3) the ecological interactions that define the landscape and 4) the events that might lead to conflicts between conservation agencies and campesinos. I discuss conservation and sustainability as processes directly related to the everyday life of households residing in the *ejido Josefa Ortiz de Domínguez.* This is a campesino community located inside a Man and Biosphere Reserve called *La Sepultura*, in the state of Chiapas, Mexico (throughout this text, community refers to an *ejido* and/or a *comunidad agraria*).

Chapter 2 describes the campesino and discusses the major events that moulded the campesino way of living. In this chapter, I also describe some contributions that campesinos give to the political ecology on conservation and sustainability. Chapter 3 elucidates the political history of *ejido Josefa Ortiz de Domínguez* and outlines the events that determine the life of individuals and families, and the transformation of the landscape. It also describes how socio-economic policies (including conservation policies) and values from the campesino way of living shape the local livelihoods, promoting the evolution of

family practices and communitarian institutions. In Chapter 4, I explain the reasons campesinos give for living in the remote *ejido Josefa Ortiz de Domínguez*. I define the main characteristics of their productive activities and interpret the role of biodiversity in the economic rationale of campesinos. In Chapter 5, I focus on the ecological elements that define and organise the everyday practices of campesinos in *ejido Josefa Ortiz de Domínguez*. I analyse the landscape as an ecosystem where birds move while seeking out habitats and resources during the different seasons of the year. In Chapter 6, I reflect on the way campesinos relate to political statements on conservation and sustainability today. Most of all, I exemplify the challenges that campesinos and conservation agencies might overcome to strengthen alliances in the long-term and commit to sustainability. Finally, in Chapter 7, I present the general discussion of this dissertation.

I discuss the way biodiversity plays a crucial position in the livelihood of campesinos, a position that moves beyond the preservation of the mature forest. I also argue that substantial contributions of conservation projects to rural communities are not restricted to monetary stimuli. Contributions include the acceptance of the non-monetary values that define the ties of rural people with their surroundings. I propose that the environmental, social and economic struggles of campesinos in Mexico connect with conservation efforts inside and outside the MABR. As part of these struggles, campesinos demand recognition from policies intended to modify their lifestyle and their landscape.

Contributions of campesinos in conservation and sustainability rely on different aspects of their history, on their strategies for apprehending diversity as a principle for their subsistence, and finally, on the alliances they make with others that share some of their values and viewpoints for their future.

METHODS

Almost every person who was born in Mexico during the late 1980s grew up witnessing the emergence of an indigenous movement in Chiapas called Neo-Zapatismo. Neo-Zapatismo transformed the political agenda concerning social inequality and indigenous rights. Besides, Chiapas is the region where

Mexican ecologists and conservationists have developed some of their most meaningful work. Both realities influenced me to decide I would travel there and seek out alternatives in conservation.

I was exceptionally interested in local realities and local voices of communities in the state, such as those from the Neo-Zapatista movement and the forestry communities. Here, I discovered a place full of complexities and opportunities to cultivate my experience as an ecologist and a doctoral student of anthropology. Chiapas is the state with the highest financial investment in conservation in Mexico. However, the rates of land-use change are among the highest in the country (ENAREDD+, 2014). Chiapas is also the state with the highest number of individuals living in poverty in Mexico (CONEVAL, 2018)

The history of Chiapas includes the presence of Mayan people since pre-Columbian days, distribution of land to rich private owners during *Porfiriato,* waves of immigrants looking for land after the *Reparto agrario* in the XXth century (for more information see Chapter 3) and the arrival of Mayan families running away from the genocide in Guatemala in the 1990s (De Vos, 2002). Land use in Chiapas relates to the demographic impact of these human settlements. In addition, land-use change and deforestation were incentivised by logging concessions given by the federal government during the 1960s and 1970s, and the green revolution promoted by economic policies during the 1990s (see Chapter 3). From a political viewpoint, the state was the major stage for the evolution of social movements demanding social justice, such as Neo-Zapatismo, and the appearance of environmental practices like agroecology (Chapter 6). Finally, but no less significant, Chiapas possesses the highest number of protected natural areas (PAs) in the country, including the first Man and Biosphere Reserve in Mexico (CONANP, 2018).

Closely associated with the complexity mentioned above, conservation in Chiapas works as a multi-layered, often contradictory and sometimes potentially underhand process. On the one hand, a large number of academic articles, technical reports, and pilot projects focused on conservation of biodiversity highlight the positive role of local strategies and culture in maintaining biodiversity and allowing sustainability (Bhagwat *et al.*, 2008). On the other

hand, social and environmental activists perceive conservation in the region as a set of practices and discourses that work in alliance with land grabbing processes and as partners in crime for an unjust economic system that ignores historical demands from people living in rural areas (Tscharntke *et al.,* 2012). These social and environmental activists see conservation projects as a silent witness to degradation of ecosystems promoted by national and international economic policies (Reddeldia, 2017a). To clarify, when I mention conservation throughout this dissertation, I mainly refer to the set of projects related to the Man and Biosphere Reserve Program (MAB) by UNESCO aiming to protect, maintain and/or restore natural resources in the long term (UNESCO, 2017).

Developing fieldwork in Chiapas required me to recognise all the elements mentioned above. With this in mind, I decided to live in a protected area. Here, I looked for in-depth conversations about the politics of conservation and sustainability. I present this dissertation as a result of this experience: an ethnography of campesinos. I focus on the relationship between the members of *ejido Josefa Ortiz de Domínguez* and the landscape inside the Man and Biosphere Reserve *La Sepultura*. This ethnography finds inspiration from the work of ecologists in Mexico, such as Victor Manuel Toledo and Ivette Perfecto, from humanists and social scientists working in Latin America such as Arturo Escobar, Boaventura de Sousa Santos and Dianne Rocheleau; and from the campesino and indigenous struggles of Neo-Zapatismo and autonomous communities in Mexico.

I have written an ethnography of campesinos because they might have their own definition of what conservation means and how it should operate inside and around Protected Areas in Mexico. I am certain that understanding their actions offers insights into different social, economic and environmental perspectives relevant for working on sustainability and achieving the SDGs. Specifically, when exploring the dynamics of conservation projects inside Protected Areas, I consider it is necessary to include detailed consideration of social aspects of how individuals and local institutions respond and modify local practices and perspectives towards the environment.

One element of the lives of campesinos that is particularly relevant for this dissertation is their livelihood. I use the term livelihood in this dissertation as explained in the *Oxford Dictionary of Environment and Conservation* (Allaby and Park, 2013) to describe the activities that households develop within an ecological, economic and social context to meet their objectives and satisfy their needs. Emotions, material goods and perspectives for the future associated with this livelihood are crucial aspects of the present ethnography. The analysis of the activities that shape the livelihood of campesinos, combined with a historical perspective of the events that defined the effect of the MABR *La Sepultura* within rural communities, and an ecological perspective for understanding the rural landscape, allowed me to reveal some of the interactions associated with the use and maintenance of biodiversity. This approach also allowed me to reveal some possible contributions of campesinos to conversations about sustainability worldwide.

THEORETICAL CONTRIBUTIONS

I conceptualise the contributions of this ethnography within a political ecology framework. For this, I combined three different but related approaches: historical narratives (Atran *et al.,* 1993; Alimonda, 2002; Boege, 2015), landscape management (Eakin *et al.,* 2014; Da Silva *et al*., 2017), and ecology of interactions (Armswhorth *et al.,* 2004; Erisman *et al.,* 2016). I use the history of *ejido Josefa Ortiz de Domínguez* for understanding the interplay between the social and economic policies directly related with land-use change and the lives of campesinos. I pay attention to the way projects related to conservation impact both the landscape and the livelihood of people living in the *ejido*. Using a historical perspective, I focus on how institutions, decisions and economic activities form and change through time (Merino and Martínez, 2014). I take as a reference previous work developed in the region focused on forestry and coping strategies of campesinos (Merino and Martínez, 2014; Speelman et al., 2014).

Additionally, I look at the landscape as the place where campesinos develop their economic strategy; productive and economic activities are key elements in this dissertation. I analyse them to understand the relation of campesinos with

the ecosystem and to capture the way they approach conservation of biodiversity. To achieve this, I take inspiration from previous work of ethnoecologists, agroecologists and anthropologists (Gudeman and Rivera, 1990; Esen, 1993; Toledo et al., 2003; Persha, Agrawal and Chhatre, 2011).

I use an ecological perspective for understanding specific plant-animal interactions that define the landscape. For this, terms such as plant communities, biotic and abiotic interactions or ecological strata became terms commonly used in my chapters. The ecological perspective in this dissertation is influenced by agroecology and agroforestry (Perfecto and Vandermeer, 2010; Gliessman, 2016; Altieri and Nicholls, 2017).

Finally, as part of the historical narrative of the livelihood of campesinos, I discuss the emergence of campesinos as environmental actors, with clear statements about what conservation should be and what a sustainable future implies.

In this dissertation, I aim to contribute to a healthy dialogue about conservation and sustainability from a bottom-up perspective. Even though I focus on the work and everyday life of campesinos in Mexico, I am confident I maintain a critical view of the role that different actors play in achieving conservation and building sustainability. I value this dissertation in terms of its applied work and its theoretical contributions. On an applied level, my research engages with the interests campesinos have for understanding the way environmental policies operate and for promoting the creation of productive activities that mesh with the interests of conservation projects. In theoretical terms, political ecology in Mexico has a unique opportunity to be enriched by and built on relations with indigenous and mestizo communities (Boaventura de Sousa, 2010; 2018).

The efforts that connect conservation of biodiversity, the emergence of environmental movements and the maintenance of local livelihoods seem subtle, but they are alive, dynamic and incredibly creative. Nowadays, theory and practice related to conservation and rural studies have a unique opportunity: recognising these linkages and taking action next to local realities

(Guha and Martinez Alier 1997; Martinez-Alier, 2002). I hope that this dissertation contributes to this change.

PERSONAL BACKGROUND

I consider myself an ecologist. In Mexico, doing fieldwork, collecting data and taking samples for ecological studies requires previous authorisation by the owners of the land where data and samples are collected. This experience often includes visiting local authorities and, sometimes, staying in their homes. It connects scientific research with local communities in potentially positive or negative ways. As I studied biology and natural resource management, I gained experience in doing ecological research while creating a friendship with my local hosts. With time I felt motivated by my conversations with local people during fieldwork. I used ethnoecology for understanding local institutions and local ecological knowledge. I often worked in South Mexico since it is a region rich in culture and biodiversity. With time, I gained experience in quantifying environmental services. I became aware of the role that economic approaches to conservation have in the functioning of Protected Areas (PAs).

Once I finished my undergraduate and master's studies, I documented opinions of directors and staff of PAs, environmental NGOs, and local community leaders about why economic values for ecosystems are important or not for decision making. After this work experience, I wanted to understand more about how international agendas for conservation and sustainability relate with the everyday life of the people that live, depend on and sometimes maintain ecosystems with healthy biotic and abiotic interactions. Then, I decided to do a PhD in Anthopology at University College London.

Writing about ecosystems from an anthropological perspective was a challenging task for me. Many ecologists working on conservation talk about the need for natural scientists to connect their research with critical discussions about power interactions and to get involved in political ecology and environmental anthropology (Sayre, 2012). Environmental research needs more integration of social and natural frameworks together with more interdisciplinary conversations (Armsworth, Kendall and Davis, 2004).

ANTHROPOLOGICAL TOOLS

Marc Brightman and Jerome Lewis (2017: 1-34) explain that anthropology provides a unique opportunity for understanding sustainability. It documents the values, practices, epistemologies and ontologies of different cultures. Thus, an anthropological perspective is an invitation to understand sustainability as a cultural process. The authors mention that anthropology might contribute to build and maintain social and ecological diversity by re-imagining societies, landscapes and elements of the environment.

Katherine Homewood (2017: 91-109) explains that as a global discourse, sustainability focuses on the interrelation between environmental conservation, economic development and social equity. But in practice, local visions of sustainability are often disregarded and good intentions are taken captive by actors promoting commodification of common resources. She considers that anthropology has the opportunity to integrate qualitative and quantitative data to evidence local processes that might contribute to positive change in this regard.

The two attitudes towards anthropology mentioned above constitute the foundation for this research. However, understanding sustainability and conservation from an anthropological perspective was a novel task for me. This dissertation represents the first stage of a learning process that will continue over time. The books *Research Methods in Anthropology*, by H. Russell Bernard (2017) and *Analyzing Qualitative Data*, by Graham R. Gibbs (2007) are the references for the anthropological tools I used while doing fieldwork. These tools are summarised as follows.

Archival research

I looked for documents about the use of natural resources in *ejido Josefa Ortiz de Domínguez*. These documents included the *Ordenamiento territorial*, a legal document that defines the rules for land-use and land-use change inside the *ejido*; the rules of procedure that regulate the access to natural resources; and the legal agreement that explains the commitments between *ejidatarios* and the Man and Biosphere Reserve *La Sepultura*. The authorities from *Josefa Ortiz de Domínguez* provided these documents.

In San Cristobal de las Casas, I visited the library of Colegio de la Frontera Sur (ECOSUR) to collect information from theses of former students working in the area and technical reports from the National Commission for Protected Areas (CONANP). In Tuxtla Gutierrez, I visited the Regional Offices of Natural Protected Areas where the Director of *La Sepultura* has an office. There, I had access to the *Plan de manejo* (land use and management program), the document that explains land use and management strategies allowed within the MABR.

Observation and analysis of content

Ejidatarios invited me to different forums about conservation and economic development. Together with *ejidatarios* I attended forums with local authorities from different *ejido*s where *La Sepultura* has influence. We also attended forums with governmental agencies (CONAFOR, CONANP). In San Cristobal de las Casas, I was a frequent visitor attending lectures organised by Neo-Zapatistas and ECOSUR.

Census

I carried out a census while introducing myself and my research aims to every house in *Josefa Ortiz de Domínguez*. This activity gave me the opportunity to make a map with the location of each house in the *ejido*. The census also provided me with a general picture of how families work. I registered the names of the head of family and her/his partner, their number of children, their legal status (as *ejidatarios* or *pobladores*), their age, their level of education, their main productive activities, and the conservation projects in which they participate. Once the census was completed, everybody knew who I was. This activity gave people and me the confidence to continue with the research. With the information I obtained from the census, I created a database which became the first stage of analysis of this dissertation.

Semi-structured and open interviews

During my first days at *Josefa Ortiz de Domínguez*, I kept a list of some questions I wanted to ask campesinos: How did *La Sepultura* influence their practices? How many projects did they develop? And, how did they relate with *La Sepultura*? Semi-structured and open interviews helped me to know a little

more about each head of family and allowed me to have a first glance at the life of campesinos and their opinions about *La Sepultura*. Interviews became less frequent with time as campesinos and I created friendships which facilitated informal conversations and my participation in their activities.

Participant observation

Once the census ended, I initiated conversations with members of the community. In this stage of fieldwork, I always gave people the leadership of the conversations. They talked about their plans, their struggles, *La Sepultura* and their daily activities. These conversations helped me to overcome my shyness and to show people my genuine interest about their life and their perspectives on the forest. Soon, the conversations guided me towards my own interests. Yet, I decided to modify some of the aims of my research proposal. This way, I could approach research issues of common interest for campesinos and myself. My supervisors, professors and PhD colleagues had told me that modifying research aims is a common process while doing fieldwork. So, I assumed this change as an eventual part of the research project.

I felt deeply engaged in conversations with *ejidatarios* and *pobladores* from *Josefa Ortiz de Domínguez*. Their voices are a fundamental component of this dissertation. Besides conversations, I took part in the everyday activities that families in the *ejido* and *La Sepultura* develop. With this experience, I developed a rich description of the livelihood of campesinos living in *Josefa Ortiz de Domínguez*. Every landscape unit relates to at least one productive activity. Then, campesinos explained their landscape while talking about their activities. They walked with me while telling me how they have transformed the forest.

I took photographs, recorded individual meetings between me and *ejidatarios,* and kept two diaries to document the life of campesinos and my personal experiences in *Josefa Ortiz de Domínguez*. In the diaries, I took notes of observations. I wrote about what I saw, what I felt, and what I experienced. I worked on my diaries and my notes every day. I made transcripts from conversations and interviews. I used to work on my notes before going to sleep, after the evening reunions with the families. In one diary, I described my day

and the activities in which I had taken part. During the mornings of the following days, I used a different diary to write about my impressions, my feelings and my interpretation of what I had seen, learned and experienced. I also had a small notebook with me, which I carried everywhere, so I could take fast notes when necessary. I used this notebook especially for writing numbers, names and dates.

Additionally, I kept an agenda with me. I used it to write the activities I would develop during the week and the name of the person I would meet. I used to plan one or two activities together with *ejidatarios* per day. This way, I had enough extra time for taking notes, keeping my diary updated and doing participant observation with the rest of the community. I always kept both handwritten and computer notes during fieldwork.

Focus groups

I conducted focus groups with teenagers and with women from the *ejido*. Focus groups with teenagers allowed me to understand how the young generation participates in the daily activities, together with their parents and grandparents. Focus groups also allowed me to document the perspectives that the younger generation has about their forest. Focus groups with women provided information about the governmental economic programs that operate within the *ejido* and the challenges people face to raise their children. Besides, talking with women gave me a rich understanding of the reasons people have for living in *Josefa Ortiz de Domínguez* despite its remoteness from the city.

Life histories

I documented the history of the *ejido* by compiling the life-histories of campesinos. Life histories allowed me to understand individual points of view about how and why the community and the landscape have changed over the years. I detailed the key events that defined the existence of the families and the evolution of their livelihood since the foundation of *Josefa Ortiz de Domínguez*, including the creation of *La Sepultura*. The analysis of these narratives was crucial for informing this ethnography.

Walks and transects

Two young *pobladores* taught me how to recognise birds by their singing. They were members of a team that receives training in monitoring birds from an NGO called *Pronatura Sur* A.C. The two *pobladores* and I went on several walks in the *ejido* during the mornings. We watched and documented the names and the behaviours of birds. We designed a transect for observations and we used the same transect systematically. While we looked for the birds in the diverse landscape units, I asked them about the behaviour of the animals. For each species of birds, we registered their name (both scientific and local names), their actions, the plants they use, and the period of the year in which they are present. We registered the information in lists.

Formal interviews and events

I interviewed policy makers, environmental practitioners, human rights defenders and local authorities working in Chiapas and *La Sepultura.* These different actors gave me a broad perspective on conservation in Chiapas. Information about these formal interviews is shown in Appendix 1 (Table 5). Additionally, I attended seminars and conferences about environmental movements, conservation and human rights in Chiapas and Southern Mexico. The main events I attended are listened in Appendix 1 (Table 6).

ETHICS

In September 2015, the Ethics Committee of the Anthropology Department at University College London (UCL) approved the Risk Assessment and Ethics Methods Procedure for my PhD project and allowed me to do fieldwork. I followed the ethical principle from the Association of Social Anthropologists Ethical Guidelines for Good Research Practice for the UK and Commonwealth (https://www.theasa.org/ethics/guidelines.shtml), American Anthropological Association Principles of Professional Responsibility (http://ethics.americananthro.org/category/statement/), the Code of Practice for Graduate Students at UCL (http://www.grad.ucl.ac.uk/codes/), and UCL's Off-site Working Code of Practice.

In Mexico, I received authorisation from the National Commission of Natural Protected Areas via the Director of *La Sepultura*. I also received authorisation

from the authorities of *ejido Josefa Ortiz de Domínguez*. I clarified the purpose, the goals, the sponsorship and the methods for the research. I detailed how I would process the information and publish the results of the research. I received informed oral authorization from participants during communal and private meetings. I kept continuous feedback with participants to prevent any possible risk or ethical conflict during the research.

In my ethnographic anecdotes, I use pseudonyms to give anonymity to the people I interviewed. The ethnographic material is taken from hand-recorded interviews as well as taped interviews, although most of the taped interviews were lost after the theft of my computer and personal documents in 2016. Field notes and personal diaries were particularly crucial for recording my cumulative months of fieldwork in Chiapas between October 2015 and March 2018.

I respected the researcher/informant relationship during fieldwork and the analysis of information. My relationship with the participants of this research was built on trust and mutual respect. As mentioned, informed consent implied that all participants received information about the aims and the development of the research. Besides, people could withdraw their participation at any time. I agreed with participants about the anonymity of the information and that some photographs, conversations and description of their everyday activities would become part of the thesis. I clarified that professors at the university, conservationists, and other specialised and non-specialised public would have access to the results of the research.

During fieldwork and the analysis of the information, I kept my diary and my transcripts safe from external readers. During transcription, my field notes and diaries were very important for ensuring the transcriptions were as faithful to the conversations as possible. During feedback, I offered partial results of my research to *ejidatarios* and *pobladores.* My intention was to share information and to be clear about the findings of the research while keeping the confidentiality of participants.

I interviewed different actors relevant for local conservation in the region. However, this thesis focuses on *campesinos* and prioritises my time living in

Josefa Ortiz de Domínguez. Giving back the results of my research to the *ejido* focuses on creating material for the families and the local school. For this, I made the commitment to share my research in a way that is easy to read and understand for the participants and their descendants. As interests differ among actors, I also plan to prepare a technical report for conservation agencies that participated in this research.

Money and gifts

One family received me and cooked for me during my stay in *Josefa Ortiz de Domínguez.* I paid USD 20.00 per week to the housewife of this family (in 2016, the minimum wage per week in Chiapas was approximately USD 25.00 per week). I also made a monetary compensation to two *pobladores* who walked with me during mornings to observe birds. We agreed I would pay them USD 12.00 per day. While living in the *ejido*, women invited me to buy all my groceries in the family shops they have instead of bringing them from the municipality, so I did.

In summertime, I invited a colleague who specialises in pedagogy and art to spend some days in the *ejido*. She organised and ran an art workshop for children and teenagers. The purpose of the art workshop was to build a traditional Mexican puppet inspired by elements from nature. We provided pencils, paint and materials for one week of activities.

A friend of mine visited me and took photographs of the families. I gave these photographs back to the families. I used to buy candy and coloured pencils for children and teenagers. I gave two gifts to the new-born babies I met. I gave a box of coloured pens to a young *pobladora* who enjoyed painting landscapes inspired by *Josefa Ortiz de Domínguez.* She drew some sketches of *Josefa Ortiz de Domínguez* for this thesis*.* Sadly, these sketches were stolen outside the *ejido* and they are not part of this dissertation. I also gave one gift to my closest friend at the end of my last visit.

Finally, I agreed I would go back for one last visit after finishing the research. I agreed to share with *ejidatarios* and *pobladores* the general lessons and results of the PhD. They asked me for two things: one copy of the thesis (it will become

part of the archive of the *ejido*) and a textbook with the history of the *ejido* (for the library in the elementary school). Therefore, I will give back all information in the form of books for children and their families, presentations for *ejidatarios,* technical reports and presentations for the staff and the director of *La Sepultura* and workshops for the three generations of *ejidatarios* and *pobladores* that live in *Josefa Ortiz de Domìnguez*.

STUDY SITE AND FIELDWORK

La Sepultura Man and Biosphere Reserve

La Sepultura Man and Biosphere Reserve is located in southwest Chiapas, Mexico (Figure 1). It is within the physiographic region of Sierra Madre de Chiapas (16º00'18'' and 16º29'01'' North, 93º24'34'' and 94º07'35'' West). Its area is 167,309 ha. *La Sepultura* is bounded to the north by the *Depresión Central de Chiapas* watershed, to the east by the summit of *Sierra Madre de Chiapas-Soconusco* region, to the south by the Pacific Coast, and to the west by the *Sierra Madre de Chiapas-Oaxaca* region (Instituto Nacional de Ecología, 1999).

La Sepultura includes different ecosystems and constitutes one of the most biodiverse regions of Mexico. Tropical Evergreen Forest, Cloud Forest, Short Tree Savannah, Evergreen Seasonal Forest, Tropical Semi-Deciduous and Deciduous Forest, Pine-Oak Forest, Pine-Oak Liquidambar Forest, and Successional Forest (Instituto Nacional de Ecología, 1999) are the ecosystems within *La Sepultura*.

Endemic animal species in the area include the bird *Passerina rositae*, reptiles such as *Porthidium dunni* and *Sinfimus leucostomus,* and amphibians such as *Dendrotriton magarhinus*. Plant endemic species include *Pinus chiapensis, Ceratozamia matudae* and *Dioon merolae*. *La Sepultura* is also habitat for endangered species such as jaguar (*Panthera onca*)*,* the howler monkey (*Ateles geoffroyi*)*,* the Central American tapir (*Tapirus bairdii*)*,* the eagle (*Harpyaliaetus solitaries*)*,* the highland guan (*Penelopina nigra*) and the quetzal (*Pharomachrus mocinno*) (CONANP, 2018).

Four rivers and sub-watersheds emerge in *La Sepultura*: *El Tablón, Tres picos, Catalina and Sierra Morena*. The core zone and the buffer zone of *La Sepultura* are located in the highest region of *El Tablón* (Speelman *et al.*, 2014).

Figure 1. *Ejido Josefa Ortiz de Domínguez*, Man and Biosphere Reserve *La Sepultura,* Chiapas. Mexico.

El Tablón sub-watershed

Almost 90% of the vegetation in *El Tablón* watershed is forest. *El Tablón* has 24,735 ha and is situated at an altitude between 675 and 1,537 meters above sea level within the municipalities of Villaflores and Jiquipilas, Chiapas (16º11'38" and 16º22'29" North, 93º31'57" and 93º44'31" West). The weather is sub-humid tropical, with an annual precipitation of 1,200-2,800 mm. The rainy season is from May to November (Instituto Nacional de Ecología, 1999).

Ejido Josefa Ortiz de Domínguez

The *ejido Josefa Ortiz de Domínguez* is located in the uppermost part of the sub-watershed *El Tablón*, next to the core area of *La Sepultura*. It has an area of 1,165 ha, a total population of 271 individuals and 26 *ejidatarios* (official

landowners). In the early 1970s, people arrived in the area and developed a forest-based livelihood (Instituto Nacional de Ecología, 1999).

Doing fieldwork at *ejido Josefa Ortiz de Domínguez*

Fieldwork started in November 2015 and extended until 2018. In total, I spent 18 months in Chiapas. During this time, I travelled from San Cristobal de las Casas to Tuxtla Gutierrez (the capital of the state), from Tuxtla Gutierrez to Villaflores, from Villaflores to the Man and Biosphere Reserve *La Sepultura* and to the campesino community named *ejido Josefa Ortiz de Domínguez*.

I arrived at San Cristobal de las Casas in November 2015. Once I arrived, I visited non-Governmental Organizations (NGO's) involved in conservation. I had conversations with staff from *Pronatura Sur A.C.*, AMBIO (environmental NGOs) and Casa Fray Bartolome de las Casas (a local organization in defence of human rights). I also became a guest student at Colegio de la Frontera Sur (ECOSUR), where scholars, professors and activists organise periodic debates about REDD+ and conservation projects operating in the state of Chiapas. Additionally, I attended lectures at CIDESI-Unitierra, a pro Neo-Zapatista school. At these lectures called *Semilleros* (meaning where seeds are saved), I had my initial direct approach with the resistance movements of indigenous and campesino communities against Protected Areas and Payment for Environmental Services. In December 2015, I went to Tuxtla Gutierrez where I visited the offices of the National Commission for Natural Protected Areas (CONANP) to meet with the directors of Biosphere Reserves.

Formal visits to *Josefa Ortiz de Domínguez* started in February 2016 after a meeting I had with the director of the Man and Biosphere Reserve *La Sepultura*. The Director talked to me about the *Cuenca el Tablón* (watershed *el tablón*), where *La Sepultura* develops most of its conservation projects. The director explained that *Josefa Ortiz de Domínguez* maintained a commitment of working with *La Sepultura* for developing sustainable practices for cattle and for protecting the mature forest in their territory as part of a Payment for Environmental Services program (PES). After his explanation and his invitation, I decided to visit *La Sepultura* Man and Biosphere Reserve.

I arrived at *La Sepultura* with the staff: three technicians that were responsible for the majority of the programs operating along the *Tablon* basin. Two of the technicians were born and raised in communities located within the area of influence of the biosphere reserve. Once I explained my research interests to the staff, we visited different communities. At the end of February 2016, during one week of short visits to different communities, I was introduced to campesino leaders willing to talk to me and explain their motives to collaborate in conservation projects together with the biosphere reserve.

The *ejido Josefa Ortiz de Domínguez* was the last community I visited (Figure 2). The road leading there goes alongside the river. Travelling to the *ejido* means passing through the successional vegetation and crossing through some of the last fragments of mature forest in the region. The *ejido* is located next to the core area of the MABR *La Sepultura*.

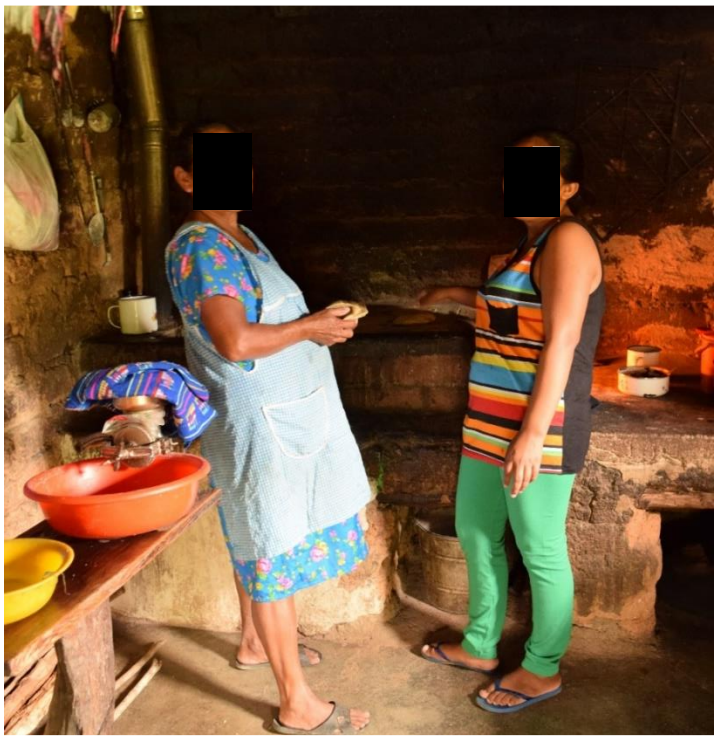

Figure 2. Women, grandmother and children in their kitchen. *Ejido Josefa Ortiz de Domínguez*.

In March 2016, I presented my research proposal and myself at a meeting with a small group of campesinos at *Josefa Ortiz de Domínguez*. They are the leaders of conservation projects in collaboration with *La Sepultura*. At the end of the meeting, they authorised me to take part in the *asamblea ejidal*; the official

meeting where collective decisions take place (For further explanation, see Chapter 2). During *asamblea ejidal*, I explained the aims of the project to the rest of the community and the local authorities. I asked for permission to develop fieldwork with the rest of the community. My presence in the community was accepted and I arranged the first meetings with people interested in having a casual chat with me. Group and individual conversations would become an everyday activity for me from that moment onward.

I first recorded information about the economic and demographic characteristics of the community. With a census I registered the activities campesinos developed and some main characteristics of the landscapes (for example, the abundance of plants and animals). With time, as I assumed a passive role in the conversations, people talked about the issues they considered relevant. I followed their interests during conversations and paid attention to the topics that could match with my research interests. At the beginning of fieldwork, I was interested in discussing how Payment for Environmental Services (PES) works in the area and about land-tenure conflicts between Protected Areas (PAs) and rural communities. However, under the influence of campesinos, my research interests acquired a more historical and social perspective.

During April 2016 and May 2016, I established strong friendship with the children in the community. During 12 of the 18 months I lived in Chiapas, Mexico there was the most extended strike of teachers in modern history. Teachers rejected a reform of education promoted by national political elites. Because of this strike, the children had much free time to spend with me. Children introduced me to their families and taught me about the activities their parents carried out.

After one month of living in the community, people in *Josefa Ortiz de Domínguez* knew who I was. They often referred to me as *maestra Gaby* (teacher Gaby). They called me a teacher because I helped children with the homework their parents assigned to them in the absence of the “formal teachers”. People also called me *biologa Gaby* (Biologist Gaby). They called me biologist because I told them I used to work in the forest, collecting plants like other students who had visited the region before. They did not have previous

experience with anthropologists, and they never referred to me that way. With time, some families invited me to their homes to take photographs of their everyday activities and to talk about them. With the passing of time, I developed friendships and closer relations with some families.

At the end of April 2016, my research priorities changed. People were interested in discussing the challenges of the campesino way of living. This included the constant negotiations with *La Sepultura*. Campesinos were also interested in telling me about what it means for them to live in the forest. As I became a known person for the community, campesinos allowed me to witness communal meetings with federal agencies such as CONAFOR. At the same time, topics for conversations evolved. For example, conversations focused on feelings and thoughts related to *La Sepultura* turned into explaining successes and failures associated with the conservation projects operating in the *ejido.*

Did the community present me an image that they wished me to have? Walking long hours together with *ejidatarios* and building a strong friendship with members from all generations of *ejidatarios* and *pobladores* let me be aware of the everyday conflicts associated with conservation. As conversations with informants evolved, I noticed how important it was for them to express their opinions. After some months of recording information, the communal leader of *Josefa Ortiz de Domingues* invited me to his house to share with me the concerns that some members of the community expressed about talking to me and inviting me to collect information about their productive activities. At the end of the conversation, he explained that I would be treated like a doctor: I would listen to all, I would listen about their pain and their joy; because, only by listening, I would be able to give something meaningful back to the community. This allowed me to feel confident about the thruthfulness of the information I documented.

During the first three months, I could not stay in the community for more than 15 days in a row. One positive effect of my constant travelling was that I shared the communal vehicle with the members of the *ejido*. As the journey to the municipality takes two hours and a half, families and I used this time to continue our conversations.

Two personal events became crucial for establishing a good relationship with people in the *ejido* during the first stages of fieldwork. Three weeks before I lived in *Josefa Ortiz de Domínguez*, I suffered a close personal bereavement. As personal relationships are important for campesinos, it was inevitable for me to talk about my situation. This experience created a sense of trust among families and me. Our relationship was soon challenged when I received an advice from a founder of the *ejido*. He suggested to me to share my partial results with campesinos as an exercise to give back something to the community. At the same time, the oldest *ejidatarios* asked me to share time and knowledge with the youngest members of the community. As a consequence, my participation as a teacher and a companion of children determined my relationship with the families of *Josefa Ortiz de Domínguez*. Thus, the emergence of a relationship of mutual intellectual respect and emotional understanding permeates this dissertation.

In addition, on the 8th of September of 2017, an earthquake affected Chiapas and *Josefa Ortiz de Domínguez.* The catastrophe damaged all houses and most of them had to be re-built. The roads were closed and access to the community was impossible. Families found refuge in the town's centre, next to the *casa ejidal.* Nobody was injured. Women, men and children stayed together until a helicopter from the military arrived with medicines, non-perishable food and clothes. The road was open some weeks after the earthquake. I arrived approximately one month after the catastrophe. Every family was re-building their houses and counting damages. My work during that period focused on listening to the families and helping in any way I could.

It is important to mention that the *ejido Josefa Ortiz de Domínguez* is a relatively young community. Three generations of people live in this *ejido* (Figure 2). The first generation refers to *ejidatarios*, the individual landowners who founded the *ejido* in the 1970s. The second generation refers mainly to *pobladores*, the sons and daughters of *ejidatarios*, who work the land their fathers lend them and which they will inherit. Children and teenagers, those who attend the school during the morning and help their parents and grandparents with the everyday

activities of the *ejido,* represent the third generation. These three generations of campesinos are the protagonists of the present dissertation.

CHAPTER 2

Campesinos, Political Ecology, Conservation of biodiversity and Sustainability

INTRODUCTION

People who depend directly on the forest for their livelihood are mainly small-scale farmers, peasants or campesinos (Sunderland, Ehringhaus, and Campbell, 2008). They are key actors in conserving biodiversity and achieving the SDGs. The close association between small-scale farmers and biodiversity implies that forests and ecosystems protected by conservation schemes – for example, Payment for Environmental Services (PES) and Protected Areas (PAs) - also contribute to the food systems of rural communities (Shrestha *et al.*, 2017). Therefore, paradigms of environmental science and conservation of biodiversity must consider ecosystems as a primary source for food and goods to local societies.

The term sustainability was defined in the Brundtland Commission (1987) as a development that meets the needs of the present without compromising the ability of future generations to meet their own needs. In this context, overcoming biodiversity loss and persistent poverty are two main challenges for building sustainability. This is clearly stated in the Millennium Ecosystem Assessment (2005), the Convention of Biological Diversity (CBD) and the Sustainable Development Goals (SDGs).

According to Roe *et al.* (2013), there is a shared notion among conservationists who acknowledge the positive link between conservation of biodiversity and poverty alleviation. Likewise, conservationists consider that extreme positions mentioned in some policies and scientific debates (such as conserving

biodiversity versus promoting economic development) obscures the advance towards integrated approaches on sustainability. However, one question that has not yet been well addressed is how to harmonize solutions.

Conservation of biodiversity, alleviation of poverty and sustainability

Laurance *et al.* (2012) argue that conservation of biodiversity requires PAs to succeed. They argue that PAs diminish the threats of biodiversity loss and the degradation that surrounds them. However, the authors found that landscapes surrounding protected areas demand urgent consideration as they are going through rapid declines in their forest cover. Authors suggest that promoting ecological connectivity is imperative to allow PAs to effectively contribute to conservation. Ecological connectivity refers to *beta* biodiversity. *Beta* biodiversity is an essential index for conservation because it indicates the heterogenization or the homogenisation of the landscape (Isbell *et al.,* 2017).

Research studies in Costa Rica and Brazil demonstrate the positive social and ecological effects of PAs (Andam *et al.,* 2010; Nolte *et al.,* 2013). However, Oldekop *et al.* (2016) suggest that taxonomic and functional biodiversity is vanishing inside PAs. This decline relates to the continuous conflicts that come up between local communities and conservation agencies. They conducted a meta-analysis to assess the effects PAs have on the wellbeing of local societies. The results of their research indicate that co-management of PAs by local people and conservation agencies leads to higher socio-economic benefits than strict regimes of conservation. Also, they showed that local capacity for building institutions are essential for the success of projects related to conservation. According to the authors, conservation and socio-economic improvements of local people should not be in conflict. Best-implemented conservation policies must consider the socio-economic and political situation of the ecosystems aiming to be safeguarded, and to recognise and support the livelihood of local individuals.

According to Sims and Alix-Garcia (2017), protected areas (PAs) and Payment for Environmental Services (PES) are the two most effective instruments to achieve conservation and reduction of deforestation in Mexico. Additionally,

these are the two basic conservation schemes proposed to achieve the SDGs in the country. One of many challenges for PES and PAs to achieve the SDGs in Mexico is their performance in the long term.

The authors conducted the first comparison at a national scale of the various conservation schemes that operate in Mexico. Concerning Protected Areas, they worked on: Natural monuments, Sanctuaries, National, State and Municipal parks, Areas for protection of Flora and Fauna, Areas for protection of Natural resources, Certified Areas and Biosphere Reserves. With respect to PES, they worked on hydrological services, biodiversity conservation and carbon sequestration. This study analysed the effects of PAs and PES on forest cover, poverty and demographic change in local communities over ten years; from 2000 to 2010. Results showed that PAs reduced deforestation by about 20-25%. PES contributed to poverty alleviation by some 10-12%. Biosphere reserves generated the major improvements in conservation, while strictly protected areas showed the least favourable results. What the authors conclude is that PES and biosphere reserves in a mixed strategy are the best mechanisms for reducing deforestation without negatively altering the livelihood of individuals and families. One of the positive aspects of these two conservation strategies (PES and biosphere reserves) is that both recognise the need to contribute to local livelihoods. As part of their conclusions, the authors propose that conservation is only sustainable if it is grounded in respect for the rights and needs of local people.

Berkes (2013) explains that research on the social effects of conservation schemes such as PAs and PES often focuses on their monetary benefits. However, poverty is a broad term associated with many more issues than monetary income. Multidimensional poverty also relates to deprivation of food security, education, dignity, decent work, among other aspects of people's lives. In this context, one of the challenges of matching conservation of biodiversity and poverty alleviation relies on paying attention to the benefits that local people consider essential for conserving resources. In the work of Sims and Alix-Garcia (2017), poverty data came from CONAPO (Consejo Nacional de Población). This information is based on indicators for literacy, primary schooling, availability of potable water, sanitation and electricity, and housing

characteristics. In the meta-analysis of Oldekop *et al*. (2016), effects on wellbeing referred to improvements in the social, economic, cultural or political life of communities, such as empowerment, displacement, financial impact and conflict.

Berkes (2013) goes further in his argument to consider that conservation can be accomplished only in partnership with local societies. The lack of concern about human rights and livelihoods is what usually leads to the conflicts documented between conservation schemes and communities, reinforcing the assumption that people do not have the will to conserve. Therefore, the author proposes that better approaches to the link between conservation and poverty alleviation should rely on improving livelihoods while working on conservation.

Berkes (2013) and his collaborators evaluated 10 projects of the United Nations Development Programme (UNDP) Equator Initiative. They tried to understand local priorities related to conservation in different parts of the world. The study found new employment opportunities and livelihood diversification, technical training, capacity building and technology transfer are positive non-monetary benefits of these projects. The evaluation also indicated that the political dimension of these projects is highly important. Political benefits of these projects include: having a voice in conservation, control of land, better relations with government agencies, and reduction of encroachment and poaching.

Social objectives have rarely been presented as aims in conservation projects. In all cases analysed, there is evidence of local issues associated with conservation: attachment to the land, the needs of future generations and land rights. This evidences that non-monetary objectives are as important as money for achieving conservation and the SDGs. Berkes concludes that solutions are not universal, that they are specific to each case.

For Adams (2013), projects aiming to combine conservation and poverty alleviation require a complex strategy to be successful. He considers that conservation must engage with a perspective on biodiversity that considers the aspirations and wellbeing of local people. Adams also points out that sustainability discourses and the debate about poverty alleviation and

conservation often exist within a neoliberal agenda, often understood as green growth. However, different environmental movements around the world also contribute to this debate as they connect to social and environmental justice.

According to Scoones (2016), one conversation that accompanies the definition of sustainability today is the possibility of creating processes based on social transformations led by citizens and communities. They express alternative forms of democracy, different epistemologies and diverse ecologies. Scoones considers that citizen-led transformations toward sustainability create networks, alliances, mobilisation and institutions in their everyday activities. One of the potentialities of this way of building sustainability is the diversity, innovation and creativity that accompany the process. Scoones concludes that creating common understanding about sustainability today is a massive task.

How could the lives of campesinos and their relationship with a MABR contribute to the conversations about conservation and sustainability outlined above? As pointed out before in this text, the present ethnography focuses on the agency of campesinos in maintaining biodiversity while imagining political and ecological transformation.

Next, I will explain how campesinos, who have inspired peasant studies since the 1940s, became actors in the theory and practice of sustainability and conservation of biodiversity. I share an approach of authors working on new ruralities, and I use the self-definition that some campesinos use in the international social movement called *Via Campesina*. These definitions consider campesinos as a diverse group, with various ethnicities, and with a specific political statement.

Campesinos as political and environmental actors in Mexico

Campesinos in Mexico are small-scale farmers and landowners. They are either mestizos or indigenous people. Being mestizo in Mexico implies having a mixed Spanish, African and indigenous ancestry. Mestizos are the fruit of cultural mixing or *mestizaje*; by comparison, the term “indigenous” refers to people with a unique culture, language, territory and history (Boege, 2015). Campesinos in *Josefa Ortiz de Domínguez*, where this ethnography took place,

are mestizos and do not identify themselves with any indigenous group. However, some of the historical events that define their way of living have also shaped much of the contemporary history of indigenous communities. As a consequence, indigenous and mestizo communities in rural Mexico share essential aspects of their livelihood strategy (Boege, 2015).

Campesinos make significant contributions to conversations about the conservation of biodiversity and sustainability (DeClerck *et al.*, 2010; Tscharntke *et al.*, 2012; Altieri and Nicholls, 2017). From an ecological perspective, campesinos transform ecosystems and manage biodiversity. They are key actors for maintaining the majority of the mature forests in the country and supporting the evolutionary processes of agrobiodiversity (Harvey *et al.*, 2008). From a social perspective, the livelihood of campesinos is a controversial topic. Some authors consider it a cultural expression; a post-capitalist political statement that stands on principles of self-sufficiency and autonomy (in this context, autonomy refers to self-rule or self-determination; a concept explained by Barkin, 2006). Others suggest that the livelihood of campesinos is just an act of survival: the search for economic alternatives by poor individuals always excluded from traditional labour markets (FAO, 2017). These two opposed perspectives invite in-depth exploration of the motivations and the challenges campesinos face in their everyday life (Isakson 2009). However, it is rare for environmental research to acknowledge campesinos' perspectives to achieve conservation and sustainability (Isakson, 2009; Bernstein *et al.,* 2018).

The influence of campesinos in peasant studies and new ruralities

According to Silverman (1979), the term “peasant” (campesino in Spanish) appeared in rural studies during the 1940s, influenced by the work Redfield developed in Mexico. Early research on this topic included indigenous and mestizo rural communities. Subsequently, authors such as Eric R. Wolf (1955) published papers about peasant subjects in Latin America. For him, culture, which gives meaning to society and holds individuals together, is especially interesting in rural communities. Sanderson (2005) points out that after the green revolution, peasants became the focus of policies that looked for the alleviation of poverty. With time, debates about the role of peasants in

economic growth evolved into discussing their importance to sustainability and development.

When establishing policies for sustainable development, decision makers and some theorists considered peasants as an obstacle: a social group that reproduces at fast rates and degrades ecosystems (Bernstein *et al.*, 2018). At national and international forums, these negative attitudes toward peasants were often internalised by agendas on economic development and conservation (Narotzky, 2016). Some of the arguments expressed in these forums will be further discussed in Chapter 3 and Chapter 4, but under the term campesinos. What is relevant for me now is contextualising studies on campesinos in political ecology (Perfecto and Vandermeer, 2008; Bernstein *et al.*, 2018). To do this, I use the concept of new ruralities, the term campesinos instead of peasants, and the statements campesinos give as leaders of social movements in Latin America and Mexico.

Nowadays, some rural societies in Latin America call themselves campesinos. Some campesinos, either as individuals or as groups, have come together into a movement called Via Campesina, which started in 1993. With their voice, Via Campesina seeks to strengthen solidarity, to build up social justice, and to participate in environmental governance (Via Campesina, 2018). According to Via Campesina (2018), campesinos are those who use the land; they produce their own food, and they provide goods to their families. Commonly, campesinos take from the surrounding ecosystems what they need: medicine and building materials, among other goods. They may or may not own land. They may develop agriculture, or they may develop other economic activities instead (for example, cattle husbandry or forestry); they might work for a prominent landowner, or they might work for their own family (Narotzky, 2016).

In the voice of Via Campesina (2018): *"Peasants are at the frontline of the struggle against genetically modified organisms, free trade agreements and false climate solutions. Peasants suffer violence and repression; often because they represent real threats to the elites…they are raising their voices in popular tribunals to denounce corporate agribusiness and struggling for rights of peasants at the International Seed Treaty".* Important social and environmental

movements from Latin America are affiliated to organizations such as Via Campesina. One significant contribution of campesinos and their social movements is their critical view on capitalist development and local and global recipes for conservation (Li, 2010; Colburn, 2016)

According to Barkin (2006), when campesinos stay in their communities, they accept specific challenges. These challenges include strengthening their local institutions, restoring and protecting their ecosystems and building a social pact with their neighbours for improving their living standards and their quality of life. While doing this, campesinos reposition themselves as political actors. They find purpose and nurture an identity. Their challenges include facing environmental change and defending their human rights. While finding meaning in their relationship with the environment, they see themselves as part of a historical process that calls for social justice.

For example, in 2017, a campesino woman named Maria de Jesus Patricio Martinez (known as Marichuy) raised a voice against the exploitation of indigenous and campesino territories in the country (Consejo Nacional Indígena, 2018). Marichuy defines herself as campesina (Figure 3). She was the first independent candidate for the national elections for the presidency in Mexico. During the presidential campaign, Marichuy invited citizens to see campesinos, indigenous and the poor, as people committed to the defence of their territories and not as passive receptors of paternalistic governmental policies (Enlace Zapatista de Liberación Nacional, 2018; Congreso Nacional Indígena, 2019). It is important to clarify that the term “territory” might be seen in this political arena as a historically and geographically specific unit for sovereignty and government (Castree and Rogers, 2013).

The emergence of Maria de Jesus Patricio Martinez as a political leader gave fresh life to old debates on peasant studies and modernisation theory. Should campesinos disappear after the entrance of neoliberal policies? Or, might alternative ways of living co-exist with neoliberalism? It is important to clarify that neoliberalism in this scenario is a set of policy discourses which include principles such as privatization, marketization and state deregulation (Igoe and Brockington, 2007). As the debate unfolds, social and economic analysis shows

improvements in the wellbeing of campesinos. Social scientists called this process *peasant resurgence* or *new ruralities* (Martinez-Alier, 2002).

Figure 3. María de Jesus Patricio Martinez (Marichuy) Independent candidate for the Mexican Presidency, September 2017 at CIDECI, Chiapas (Ámbito, 2017)

The concept of *new ruralities* implies that campesinos choose their lifestyle. While doing this, they reproduce their way of living. They innovate when they reinvent themselves through time. Women are particularly important in this process (Hamilton, Dewalt and Barkin, 2016; Narotzky, 2016). Campesinos expose critical thinking through their own perspectives on history, power relationships and through their everyday practices (Cusicanqui, 2012).

Political ecologists, such as Altieri and Toledo (2011) and Bryant (2015) have correctly understood that campesinos from Mexico and Latin America express their struggle as a historical demand (Escobar, Rocheleau and Kothari, 2002; Boege, 2015). Campesinos hold to their values during this process. For example, the land for them is more than a resource; it is much more than soil. For campesinos land is a place of meaning (Welch and Mançano-Fernandes, 2009; DeClerck *et al*., 2010).

Campesinos and their contributions to political ecology

Campesinos must understand the political forces that affect their practices and operate both outside and inside their communities in order to

defend their rights as social actors and to maintain their lifestyle (Scott, 1986; 2012). They also must possess a robust ecological knowledge to interpret the synergies that shape the ecosystems upon which they depend (Bermeo *et al.,* 2014; Martinez-Reyes, 2014).

In Latin America, political ecologists often centre the theoretical contributions of campesinos on cultural modes of power, resistance and other ecologies (Leff, 2011, 2015a, 2015b). For example, the decolonisation of knowledge became one of the fundamental topics political ecologists in the region discuss with ecologists, anthropologists and sociologists concerned in understanding local and global relationships of power (Boaventura de Sousa and Oeste, 2018). These environmental specialists consider that decolonising knowledge is a prerequisite to revive the ecological and cultural meaning of others; it is necessary for giving support to alternative ways of being (West, 2016). Scholars agreed that if humanity wishes to overcome present environmental challenges and make sustainable futures, it is indispensable to recognise other ways of interpreting and living in the environment (Sarukhan *et al.*, 2014).

Therefore, discussions on sustainability should include the ways diverse social groups understand the environment (Biersack, 1999; Leff, 2015b). Some natural scientists have promoted such discussions (DeClerck *et al.*, 2010; Astier *et al.*, 2017). Botanists, agroecologists and ecologists in Mexico consider that present knowledge of tropical plants is a legacy of the wisdom of campesinos, indigenous collectors, and traditional doctors, who have shared and defended their knowledge through time (Barkin, 2006). For example, Arturo Gómez-Pompa (2016), one of the first ecologists in the country, wrote:

> *I visited the majestic forest in the area of Veracruz, and I collected plants of some species that were interesting to me. A c*ampesino *came with me for the whole journey. He was an expert of plants in the region. Someone told him that I was a botanist and that I knew a lot about plants with economic value, and that I would help them . . . While we walked, he pointed to a plant and asked me, and do you know this plant? I answered no. He repeated the question until he said, I think you are selfish,*

> *and you do not want to share your knowledge. I said I did not know about the species of that area. He did not give up and said, what do you think if I teach you about one medicinal plant and you teach me about other plants.*

Among the most relevant ecologists that shaped and added to social perspectives on new ruralities and conservation in Latin America are Arturo Gómez-Pompa (2016) Efrain Hernández-Xolocotzi (1985; 1987) and Jose Sarukhan *et al.* (2014).

During the 1970s, Arturo Gomez Pompa suggested that the biodiversity of the forest in the Mayan peninsula is the result of past and present indigenous practices (Gomez-Pompa, Vazquez-Yanes and Guevara, 1972). His archaeological, anthropological and ecological research examined the use of plants and the management of the mature and the successional vegetation. By using archaeological and anthropological evidence, Gomez-Pompa proposed that Mayas planted the predominant plant species that are now present in the Mayan forest. He suggested that Mayas did this as part of the activities associated with their agricultural system: *la milpa*. Gomez-Pompa also argued that indigenous people created different ecosystems that feed a growing population while maintaining biological diversity. As part of his research, Gomez-Pompa (1987, 2004) questioned the efficiency of current strategies for managing natural resources in the region. He stated that Mayan and indigenous knowledge is part of a human heritage that could help to find solutions to environmental degradation (for further explanation see Chapter 5).

Gomez-Pompa received the influence of other natural scientists, such as the agronomist Efrain Hernández-Xolocotzi (1913-1991). Hernández-Xolocotzi (1987) considered that indigenous knowledge could function as the baseline of productive strategies in rural and poor regions of the country, especially in those where conservation and agriculture collide. He considered that campesinos owned a rich understanding of the environment and a complex agricultural knowledge. In contrast to other agronomists from his generation, Hernández-Xolocotzi rejected the premises behind the implementation of the green revolution.

Hernández-Xolocotzi (2014) stated that Mesoamerican history questioned what the relationship between culture and development was. With time, he became an icon for scientists wanting to work together with campesinos and local communities in conservation and agriculture in Mexico. He was a pioneer in agroforestry in the country (Xolocotzi, 1985). Together with agronomists, ecologists influenced by Hernández-Xolocotzi considered that food sovereignty was a component of the livelihood of campesinos that could also contribute to conservation of biodiversity. He suggested that food sovereignty should be feasible while protecting mature vegetation and managing biological diversity (explained in Chapter 4).

Even though ecologists gave importance to the knowledge and practices of campesinos, both indigenous and mestizos, they rarely debated about the politics of conservation and sustainability. From my viewpoint, ecologists in Mexico saw environmental deforestation as a process promoted mainly by socio-economic policies. They considered that conservation could be addressed by building local strategies together with the owners of the land. The recognition of different approaches for facing environmental degradation would later enrich the discussion of political ecologists in the region.

Political ecology. Local-global interactions and approaches from Latin America

Political ecology was a term first used by Eric R. Wolf in 1972 to refer to the study of how power relations mediate human-environmental relations (Wolf and Hansen 1972; Wolf, 1999). Political ecology is an eclectic discipline. It talks to anthropologists, ecologists, sociologists, geographers, and others addressing the condition and change of social-environmental systems (Bryant, 2015). Political ecology in conservation analyses some of the economic, cultural and political factors involved in defining the ecology and the environment, including degradation, land-use change and the implementation of conservation programs (Martínez-Alier, 2002; Li, 2007; Leff, 2011; Doane, 2012, 2014).

According to Aletta Biersack (1999), political ecology during the 1980s suffered profound changes with postmodernist theories. Among these changes, there

were severe criticisms of the dualistic perspectives of human and nature. Postructuralism also criticised views on linear progress in history and the lack of acknowledging difference. Today political ecology has engaged with at least five theoretical approaches of particular interest here:

1. Recognising that reality is produced “discursively” through signifying practices of various sorts.
2. Criticising the nature/culture dualism and focus upon the reciprocal impacts of nature and culture.
3. Emphasising local-global interactions and their dynamics.
4. Engaging with a theory that addresses agency and events.
5. Drawing inspiration from differences and social inequalities, such as those expressed in feminism studies, race and ethnicity.

Latin American theory and action in political ecology evolved somewhat independently from political ecology in Europe (Biersack, 1999; Sills, 2011; Bryant, 2015). In Latin America, political ecologists and anthropologists received a strong influence of indigenous cultures and campesino movements (Boaventura de Sousa and Oeste, 2007). It was common for social scientists in the continent to centre their studies on the effects that colonialism had on the landscape and the livelihoods of the indigenous and campesinos population. They tried to explain the processes that led to the exclusion of these societies since the colonial times up to now, and to discuss the effects of development policies, such as those promoted by the World Bank. Some political ecologists created bridges for conversations that linked historical relations of power with changes in the environment. Some of these authors were Eduardo Galeano (Galeano, 2009), Joan Martínez-Alier (2002), Arturo Escobar (Escobar, Rocheleau and Kothari, 2002), Leonardo Boff (1987) and Enrique Dussel (2013).

Eduardo Galeano published the *Open Veins of Latin America* in 1971 (Galeano, 2009). In his book, he wrote about the history of Latin America, from the Spanish invasion to the present days. He argued that economic events, from the discovery of the Americas until our times, had repeatedly been transmuted into European – or later, United States – capital. Galeano suggested that: “*We (Latin American societies) lost while others had won*”. For the author, the history

of Latin America‘s underdevelopment is an intrinsic part of the biography of the development of the world`s capitalism.

According to Raynova and Vienna (2014), the philosophy of liberation appeared in the 1960s. It grew in parallel to perspectives of post-colonialism and political ecology. For Leonardo Dussel and Mendieta (2003) for example, the philosophy of liberation in Latin America proposes a world where there is a politics of just and sustainable coexistence. Besides, philosophers of liberation suggest that political projects must be criticised and dismissed if they are unsustainable. A project cannot be sustainable if it negatively affects the victims of exclusionary, exploitative institutions of globalisation. In addition, philosophers of liberation explain that the invention of the Americas and modernisation are tools of domination.

Accordingly, conservation of nature in Latin America exists as a system of domination. In addition, philosophers of liberation consider that environmental struggles led by campesinos leave behind colonialist and post-colonial practices of domination to build autonomy. For these philosophers, history is behind the environmental movements in Latin America. Thus, it is necessary to recognise the past in order to learn about the significance of environmental movements today and to advance in the transformation of the relations between people and nature. Outside Latin America, poststructuralism discusses some of these issues in development and globalisation theory in works such as Ferguson`s *Anti Politics Machine* (1990) and Escobar's *Encountering Development* (2011)
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For Joan Martínez-Alier (Martínez-Alier, 2002, pp. 1-15), the association between consumption, economic growth and environmental conflicts relates with colonialist practices in economic development and conservation. The papers of Guha and Joan Martínez-Alier (1997) and Martínez-Alier (2002) address this topic by connecting theory on economic ecology, environmental justice and environmental governance. In the book *The Environmentalism of the Poor,* Martínez-Alier (2002) centres his argument in the correlation between the growth of environmental movements and the rise of social activism with economic development. The environmentalism of the poor, also called livelihood ecology (Garí, 1999) and liberation ecology (Peet and Watts 2004),

points out that economic growth in some regions of the world mainly means increasing environmental impacts and geographical displacement of sources and sinks in other regions of the world. Martínez-Alier (Martínez-Alier, 2002, pp. 1–15) states that the economy of industrial and rich countries depends on imports from the poor countries, such as Latin American countries. Consequently, this dependence creates repeated impacts in indigenous territories and rural areas.

Environmental impacts of economic development on rural areas and indigenous territories lead to environmental conflicts. This is the focus of analysis of Arturo Escobar (Escobar, Rocheleau and Kothari, 2002). He discusses the politics of difference by understanding specific place-based ethnic and environmental movements in globalisation. Arturo Escobar developed research work with the communities of the Afro-Colombian Pacific (Escobar, 1995). He detailed how communities created an emancipation process that started by claiming their right to take part in a project of conservation of biodiversity. Afro-Colombian communities reconstructed their identity and their struggle for cultural rights, autonomy and territory. At the same time, they declared their solidarity with the struggles of others.

Escobar (1995) goes further on a topic relevant for this dissertation. He locates possibilities for post-development and post-conservation in these grass-roots organisations, popular movements, indigenous people, and so forth. In 2011, the author wrote an article named *Pluriverse for sustainability*. There, he states that sustainable development became a puzzle, absorbed by contradictions and tensions around the impossibility of harmonising the needs of nature with the goals of development. Under the current economic regime, discourses demanding change emerge in different fields, including environmentalism and ecology. These new discourses are intimately connected to social movements, environmental and cultural struggles. They defend the right for different modes of existence. In this essay, Escobar proposes the study of the *Pluriverse* as an altogether different intellectual and political project to development. In the *Pluriverse*, different notions of the human, the natural and the future could be considered.

Similarly, for Leff (2011, 2015a, 2015b), giving meaning to struggles of emancipation implies recognising the existence of diverse environmental rationalities. First, the author argues about the need to recognise local knowledge and allowing the emergence of other environmental rationalities. He suggests that the current environmental crisis is the fruit of an epistemological crisis. Leff considers that sustainability should include the appreciation of diverse cultural rationalities. He asks for understanding the other by recognising the ethics of otherness. Leff proposes that disputes of meanings and designs for the social construction of a sustainable future are at the heart of political ecology. In addition, he suggests that alternative environmental rationalities in Latin America are enriched by cultural diversity.

Finally, other environmental rationalities, or ways of relating to the environment, encourage individuals to examine their interactions with all living creatures. Leonardo Boff (1987) affirms that ecology relates to these interactions. Ecology includes the relationships that humans establish among themselves, with all breathing creatures, and with all that exist (whether alive or not). Therefore, research in ecology should include not solely nature (natural ecology) but also culture and society (human ecology, social ecology). Boff says that nothing remains outside relationships; that ecology and biology reveals the linkage between living beings.

Outside Latin America, other approaches in political ecology are still pertinent for this dissertation, especially those where it is feasible to concentrate on interactions rather than in delimited geographical locations; and in local societies as dynamic actors of environmental transformation.

Biersack and Greenberg (2006) point out that political ecology finds roots in the world system theory of Immanuel Wallerstein and neo-Marxism theories. First generations of political ecologists received a substantial influence from Marx and Foucault. Ethnographers borrowed from Foucault (1980) the notion that power relations permeate all levels of society (Gupta and Ferguson, 1997, pp. 1-29). However, one of the most important theses in political ecology looks at how individuals and social groups relate to issues of subsistence and environmental activities (Robbins, 2012).

Arun Agrawal (Agrawal, 2005) proposes that new environmental conditions create opportunities for local people to present themselves as political actors and emerge as environmental subjects. In Kumaon in 1985 he learned about how local people defended the woodland and formed an environmental movement after having set hundreds of fires during the 1920s. He combined environmental and development studies to illustrate how politics, institutions and identities interact. He explained that new environmental subjects emerge when there are struggles over resources. New institutions and changing identities are two elements involved in this process. The author concluded that power, knowledge, institutions and subjectivities connect. These interconnections need in-depth consideration in theories of development and environmental politics. Agrawal also considers that theory should examine how discourses, such as the development discourse, function as instruments of political control while paradoxically breeding local resistance.

In addition, Biersack (1999) suggested a reconceptualization of globalisation. She argues that within globalisation, local-global interactions and local-global articulations constitute places. She enriched her argument by proposing that for studying place, it is imperative to move from static and hermetic conceptualisations of place to sites of connection and relation. Biersack explains that only by incorporating the analysis of socio-historical and structural roles of power could anthropologists enrich their work.

The nexus between local and global dynamics is also the focus of attention of Gupta and Ferguson (1997). Gupta considers that development studies must approach how peasant activism and resistance shape development. In his book *Culture, Power, Place, Exploitations in Critical Anthropology*, he and James Ferguson examine identity, place, power and resistance in transnational cultural flows in the postcolonial world. The authors trace how dominant constructs of culture are transformed in the power relationships that link localities to a wider system. Gupta and Ferguson emphasise that relationships between the local and the global continuously change because of the political and economic reorganisation of space in the world system.

In addition, Rocheleau and Roth (2007) consider that these interactions are evident in markets, social movements, climate change and land-use change. Rocheleau (2015) considers that networks might work as metaphors to question power relationships and to link culture and nature in social research. Doing this involves connecting the theory of the local and the global. It also implies recognising that some links might represent asymmetrical relations of power. Finally, it requires considering that power interactions might connect territories. This approach helps social scientists to visualise dynamism as part of their understanding of connections. Likewise, it contributes to integrate natural and social networks into their interpretation of environmental conflicts and the study of environmental movements.

As clarified earlier, campesinos might enrich the study of political ecology, conservation and sustainability. In exploring this idea, it is fundamental to know the history of campesinos and their active role in the maintenance of their ecosystems. Next, I summarise some important events that define this history. I explain the role of their institutions in shaping the landscape. I also summarise the evolution of their land-tenure regimes: their right to own or occupy a piece of land exclusively. For this, I use material provided by rural studies, mainly by Assies, (2008), Barkin (2006) and Isakson (2009). I also illustrate the history of the land-tenure regimes where campesinos develop their life and are essential for defining their identity: *Ejidos* and *comunidades agrarias*.

Land-tenure systems in Mexico: *Ejido*s and *comunidades agrarias*

According to Merino and Martínez (2014), nearly 60% of the woodland in Mexico is in the hands of 8,500 rural communities. Here, 14 million men and women live and develop their livelihood. Some 45% of these communities have formal communitarian rules for protecting their forest. Understanding why campesinos stay in rural areas and protect the remaining forest in the country needs a closer look into their history (Alimonda, 2002). Campesinos have lost and won control over land and their territories since colonial times. Their social demands and environmental concerns today are inherently linked to past and future events.

Assies (2008) explains that during the conquest, when Spanish colonists first came to Mesoamerica, the region was a divided territory. Aztecs dominated Mesoamerica and diverse pre-colonial societies paid tribute to them. However, some of these ancient societies, such as Tarascos, Tlaxcaltecos and Purepechas kept their autonomy from the Aztec imperium. Zapotecas and Mixtecos in the state of Oaxaca kept their independence too. Later, during the colonial period, Spanish founded *Nueva España* and created *encomiendas* and *haciendas* in 1519. *Encomiendas* were stretches of land where Spanish soldiers kept indigenous people as slaves and exploited them as a labour force. *Haciendas* were a land-tenure regime for private property owned by Spanish.

Diseases, starvation and overexploitation of labour were the norm in *Nueva España*. In 1542, the Spanish empire dismantled *encomiendas* and established *pueblo de Indios*. Here, indigenous communities could develop agriculture and cattle husbandry while serving Spanish colonists. *Pueblo de Indios* could be seen as the earliest legal predecessor of *ejidos* and *comunidades agrarias*. The Spanish empire gave legal recognition to *pueblo de Indios* for three centuries. However, the conquerors kept command of people and territories. This legal recognition of *pueblo de Indios* helped campesinos to claim legalisation of their colonies during the Mexican Revolution in 1910 and throughout subsequent land reform and redistribution.

Hacendados were the owners of *haciendas*. By the end of the 1600s, *hacendado*s owned half of the fertile territory in *Nueva España. Caciques*, descendants of either indigenous or mestizo people, were overseers for *haciendas.* They were an intermediary actor between the Spanish hegemony and the indigenous labour. Most productive *haciendas* were established in Central and Northern Mexico.

Some indigenous communities evicted from their lands refused to live in *pueblo de Indios* or to become slaves in *haciendas.* They went to the mountains to start a new life. As a consequence, the agrarian landscape of the country turned into a mosaic built by private property in the fertile regions, *pueblo de Indios* in their periphery, and indigenous communities in the most remote areas.

Miriam, an indigenous woman from San Cristobal de las Casas, Chiapas, was one of the leading speakers in a meeting called CONCIENCIAS, a symposium organised by Neo-Zapatistas in December 2015 (Enlace Zapatista de Liberación Nacional, 2017). There, Miriam summarised the story of her community to the participants:

> *"Since the arrival of conquerors, we were dispossessed from our land. They (Spanish conquerors) took our language, our culture. Owners of the land treated us as if they were our owners too. They sent us to work in haciendas, without caring if we were sick, without caring if we had family…Time passed, and we continued working in the landowner's house. We prepared the salt for the cattle and we peeled the coffee grains. From five in the morning to six in the afternoon. In addition, what owners paid was misery. Just what our hand could hold in salt grains and coffee grains. So as time passed, women suffered. If our children were crying or if they were yelling, landowners would laugh at us; they would insult us. They would say: you know nothing, you are worthless. They used us as objects. They sold us as merchandise. We never rested. They arrived at our land and they made their haciendas and their ranches. They arrived with their families, and they stayed there. Therefore, we had to cultivate the coffee, to peel it, to harvest it. We cleared the pastureland; we cultivated the milpa, the beans. However, everything ended in the hands of the land-owner."*

*W*olf (1972) points out that after *Nueva España*, between 1856 and 1857, president Benito Juarez (descendant of an indigenous Zapoteca family) established a law called *Ley de Desamortización de Bienes de Corporaciones Civiles y Eclesiásticas.* This law was further known as *Ley Lerdo (Lerdo Law)*. With *Ley Lerdo*, the federal government gained control of the land owned by the Catholic Church. After *Ley Lerdo*, the government re-distributed land and created a new scheme of private property: *latifundios*.

After the presidency of Benito Juarez, the totalitarian regime of Porfirio Díaz governed from 1877 to 1910, a period of Mexican history known as the *Porfiriato*. During the *Porfiriato*, *latifundios* and *haciendas* were the base of the Mexican economy; they supplied most of the goods the country sold to foreign nations. *Latifundios* and *haciendas* also gave meaning to the Mexican uprising in 1911. Throughout the *Porfiriato*, the president made two distinct laws. First, *Decreto sobre colonización y compañías deslindadoras.* Second*, Ley de ocupación y enajenación de terrenos baldíos*. The Mexican government established both laws to hold jurisdiction over areas of land without landowners and to incorporate those lands into the private property regime. The government gave the responsibility for identifying land without legal owners to foreign corporations, mainly from North America. These companies received 10% of the land in return. The extent of land classified as being without landowners was 59 million hectares. A considerable fraction of this land was inhabited by indigenous communities. However, few of these indigenous communities had land-titles or official documents to back up their claim to their territories. Consequently, indigenous and mestizo communities without land-titles underwent another massive dispossession of land.

During *Porfiriato*, approximately 87% of the territory was under the control of 0.2% of the population. Accumulation of land and exploitation of labour led to a revolution. In 1910, the Mexican revolution started. It transcended class issues and turned into a civil war that lasted ten years and took one and a half million lives.

Among the central characters in the Mexican Revolution were campesinos from Morelos, a state in the central-southern part of the country. In Morelos, campesinos came together under one motto: *land and freedom*. With Emiliano Zapata as a commander-in-chief, they created the *Plan de Ayala* and named themselves Zapatistas. *Plan de Ayala* asked for the restitution of territory to landless people*.* The acts of Zapatistas resonated in the northern part of the country. There, Francisco Villa, another radical leader, agreed with Zapata and distributed the land of haciendas among campesinos, indigenous and mestizos in the states of Chihuahua and Durango during 1913.

At the end of the Mexican Revolution, *Plan de Ayala* became the baseline for writing Article 27 of the 1917 Constitution (Figure 4). Article 27 stated that natural resources, including land, belong to the nation, although the government could give private and collective concessions. Also, the revolution led to the creation of one of the first agrarian reforms on the continent (1930-1980). The government confiscated *haciendas* and distributed the land among people (Bernstein, 2002). The process took nearly six decades (Assies, 2008).

Campesinos who worked in *latifundios* and *haciendas* became the new owners of the land under collective regimes of land ownership. Landless people could ask for membership. Officially, campesinos could ask for gifts of land, additional increase of their territories or restitution of the land formerly owned by them and their ancestors. The government legally recognised these two land-tenure systems as *ejido*s and *comunidades agrarias* (Assies, 2008). Individuals with communal land titles took the name of *ejidatarios* (if living in *ejidos*) or *comuneros* (if living in *comunidades agrarias)*. Members of these two landed-property systems could not sell their land. The land had to be inherited from generation to generation. *Ejidatarios* and *comuneros* were responsible for deciding by whom the land would be inherited within the family.

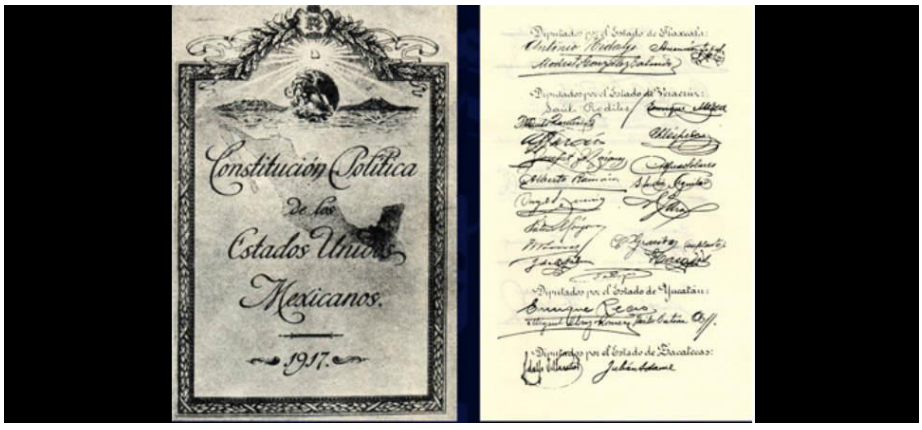

Figure 4. Constitution of 1917 contains Article 27. Natural resources belong to the nation. Private and collective land-tenure is allowed (noticias MVS, 2017).

The land distribution reform started at the end of the Mexican Revolution and officially concluded in 1992 (Figure 4). Most distributions of land took place during the presidency of Lazaro Cárdenas (1934-1940). During this period,

known as *Cardenismo*, campesinos organised their requests for land in the *Confederación Nacional Campesina* (CNC). Article 27 established the limit for the concentration of land under individual ownership. One man or woman could not own more than 2,500 ha. CNC mutated into a political apparatus for the government and it became its major political partner. CNC created a political association called *Partido de la Revolución Mexicana* (PNR). PNR later became *Partido Revolucionario Institutional* (PRI), the political party that held power in the country until December 2000.

During the presidency of Echeverría (1970-1976), campesinos experienced the start of the green revolution. They received seeds, credits, insurances against losses and technological assistance to become primary providers of agricultural stocks. *Ejido*s became powerful political actors important for the economic development in the country. At the end of the 1980s, the Mexican government continued the land reform, but most of the remaining land was poor and unproductive.

As time passed, the agriculture sector became powerless under neoliberal economic policies. Consequently, the improvement of the life of campesinos diminished. People living in communal land regimes became a source of cheap labour for commercial agriculture. It is important to clarify that private owners kept control over most of the fertile land. By the 1990s, campesinos produced 86% of the food and controlled 57% of the agricultural land in the country. As they were small-scale producers, their economy was classified either as subsistence economy (8% of campesinos), below subsistence (56%), or as transition economy (22%). With time, economic policies supported private owners and commercial agriculture, leaving behind *ejidos* and *comunidades agrarias* (Osborn, 2011).

Assies (2008) mentions that, during the last stages of the land reform, the Mexican government recognised over 28,000 *ejido*s and 2,300 *comunidades agrarias*. More than 3.5 million people received land during this period (Table 2). *Ejido*s had an average area of 2,000 ha. Each campesino had land titles for 9 ha divided in 2 plots, as well as land-rights for 28 ha of communal land.

During the presidency of Carlos Salinas de Gortari, a period known as *Salinismo*, land distribution ended (Table 1). In addition, campesinos living in *ejido*s and *comunidades agrarias* received private land-titles. Politicians stated that there was no more land to distribute and that individual ownership would allow people to have better control of their territory.

Table 1. Redistribution of land by presidential period. The land reform gave land to landless campesinos. Major distribution of land occurred during the presidency of Lázaro Càrdenas. The land reform ended with the entrance of NAFTA (1935-1992).

Period	President	Total hectares	Beneficiaries
1934-1940	Lázaro Cárdenas	18,786,131	728,847
1940-1946	Manuel Ávila Camacho	7,287,697	157,816
1946-1952	Carlos Alemán Valdes	4,633,321	80,161
1952-1958	Adolfo Ruiz Cortínes	6,056,773	68,317
1958-1964	Adolfo López Mateos	8,870,430	148,238
1964-1970	Miguel Díaz Ordaz	24,738,199	278,214
1970-1976	Luis Echeverría Álvarez	12,773,888	205,999
1976-1982	José López Portillo	6,397,595	243,350
1982-1988	Carlos de la Madrid Hurtado	5,626,227	248,486
1988-1992	Carlos Salinas de Gortari	551,869	80,692

Based on Bizberg and Meyer 2003, and Assies (2008).

Local governance in *ejidos* and *comunidades agrarias* in Mexico

Ejidatarios and *comuneros* organise their territories through periodic meetings called *asambleas ejidales* or *reuniones ejidales* (ejidal meetings). Here, *ejidatarios* and *comuneros* create formal and informal institutions to guarantee the use of and access to resources (Barkin, 2006). Some of these institutions are built on relations of trust, collaboration and solidarity; some others on local and national legal agreements (Appendini and Nuijten, 2002).

Concerning *ejidos,* Alcorn and Toledo (1998) specify that *ejidatarios* possess land titles and legal rights to vote at *asambleas ejidales*. The committee that organises the activities within the *ejidos* consists of one *comisario ejidal* (ejidal authority), one *secretario* (secretary) and one *tesorero* (treasurer). These three

legal authorities share duties. However, the main authority and legal representative from the *ejido* is the *comisario ejidal*. Decisions take place at the periodic meetings (*reuniones ejidales* or *asambleas ejidales)*, which occur in the *casa ejidal* (arenas designed for communal events). There, resolutions are jointly created by *ejidatarios*.

Garcia-Amado *et al.* (2013) explain that households without right to vote and without land titles receive the name of *pobladores* or *avecindados* (these two names are equivalent in meaning). Generally, *pobladores* or *avecindados* are the descendants and extended family of *ejidatarios*. They can observe and express opinions during ejidal meetings, but they do not have a legal recognition in the governance of the *ejido* (in this case, governance refers to the processes by which decisions are implemented at the community level). Their opinion is relevant since they represent the next generation of *ejidatarios*. *Pobladores* are usually too young to own land or too poor to purchase a parcel from *ejidatarios*. Because of this, they usually rent land, primarily for crops and cattle. Sometimes, *pobladores* might own small businesses where other members of the *ejido* buy bread, sugar and common supplies. At other times, *pobladores* work for *ejidatarios* in exchange for money and some share of the annual harvest of *ejidatarios*.

Campesinos and forestry studies in Mexico

National economic policies have indirectly contributed to the evolution of campesinos as a social group with agency in conservation of biodiversity (Merino-Pérez and Segura-Warnholtz, 2002; Singh and Singh, 2017). As mentioned by Boyer (2011) and Merino and Martínez (2014), the government leased logging concessions to foreign companies in a process parallel to the agrarian reform. The logging companies altered the forest and provided temporary employment to the members of the newly established *ejidos* and *comunidades agrarias*. In consequence, Mexico's forests underwent a radical conversion. As time passed, over-exploitation of resources and over-exploitation of labour motivated campesinos, both mestizo and indigenous, to expel the logging companies from their lands.

Subsequently, campesinos created communal logging enterprises. They took advantage of the expertise obtained while working for the foreign corporations. Women and men became responsible for the extraction, management and sale of timber. Decisions were taken communally at the *asambleas ejidal*. Community forestry became an experiment that flourished in various mountainous and forested localities of the country (Merino Pérez and Segura Warnholtz, 2002, pp. 77–98).

Over time, sustainable community forestry became the focus of some research studies interested in the sustainable management of natural resources (Ostrom and Ahn, 2003; Antinori and Bray, 2005; Wollenberg *et al.,* 2007). However, forestry policies in Mexico kept silent about the efforts of campesinos to manage their *ejidos* and *comunidades agrarias* under sustainable schemes. Mathews (2009) suggests that this silence continued and remains because governmental institutions reject alternative discourses on development and governance of territories. In this sense, the silence regarding these forestry systems and sustainable management strategies meshes together with the discourses of institutions in power. Recognising this paradox is indispensable for transforming national concepts and attitudes towards local conservation and sustainability.

Again, environmental scientists and campesino communities working on sustainable forestry highlight the need to expand the conversations of conservation and sustainability towards different epistemologies and actions. So far, I have outlined some general notions about who campesinos are, the history of their land-tenure systems and their contributions to the theory and practice of political ecology. Likewise, I have set out some general notions and concepts that frame political ecology in Latin America. Now it is time to clarify some topics about ecology and conservation of biodiversity.

Ecosystems and Landscapes. Different approaches for ethnographic studies of campesinos

For achieving conservation and sustainability, it is as important to recognise social factors linked to the maintenance of biodiversity as it is to

grasp the evolution of concepts in ecology and environmental sciences. Such is the case of the ecosystem concept.

Tansley (1935) first used the term ecosystem to define a closed and balanced natural system. This definition soon became insufficient for addressing the complexity of ecological interactions related to the environment. During the 1990s, research on plant-insect interactions led ecologists to acknowledge that ecosystems are dynamic and adaptive systems; they are not equilibrium systems (O'Neill, 2001). More recently in ecology, the concept of ecosystem has been used to define a geographical space where different biological and physico-chemical processes take place (Raffaelli and Frid, 2010). For Willis (1997), ecosystems refer to systems constituted by an association of organisms with their physical and chemical surroundings. They have continuous fluxes of energy and matter at a geographic scale. Today, an explicit imperative in ecology exists: ecosystems cannot be explored without the social structures that affect them. The analysis of ecosystems now includes environmental sciences, social sciences and humanities (Wilshusen *et al.*, 2002).

The evolution of the concept of ecosystem also relates to a particular claim: theory and practice of conservation and sustainability must acknowledge that both environmental and human forces shape biodiversity (Sayre, 2012). Conservation schemes looking to preserve individual species (for example, the Red Data Book of Threatened Species) implemented an approach focused on protecting the habitat of endangered and threatened organisms. Under this approach, protected areas (PAs) became a paradigm for conservation at national and international scales (Binford *et al.*, 1987; Gómez-Pompa, 1987; Atran, 1998). Today, research on conservation investigates how PAs contribute to manage and preserve biodiversity, particularly in regions where the pressure for economic growth guides the decisions of governments concerning the environment (Gómez-Pompa, 2004; Moreno-Calles *et al.*, 2016).

Sayer *et al.* (2013) explain that PAs and similar conservation schemes are moving towards landscape approaches. For example, the landscape concept is used in the Convention of Biological Diversity (CBD) and in the Forest Stewardship Council Principles for Sustainable Forest Management (Opdam,

Steingrôver and Van Rooij, 2006). The reason for this change lies in the need to embrace the human and natural complexity of ecosystems. The concept of landscape gained importance in conservation theory and practice through the principles of island biogeography and the design of the first PAs (discussed in the next chapter). The concept of landscape describes an assemblage of natural and cultural features across different spatial and temporal scales.

Before continuing, it is important to clarify some terms used throughout the chapters. These terms are landscape, landscape unit, livelihood, household and natural resources. I adopt the term landscape unit as stated in the *Oxford Dictionary of Environment and Conservation* (Allaby and Park, 2013). The landscape unit refers to a portion of land that is ecologically homogeneous at one scale level (in Chapters 4 and 5, I explain more about this concept). The landscape is the space where campesinos develop their livelihood strategy. The livelihood strategy refers to the economic strategy of campesinos: the manner in which they manage natural resources to reach their aims within an ecological, economic and social context. Consequently, the livelihood strategy of campesinos is first understood at the family or the household level (Shanin, 1973).

I use the term household to refer to a nuclear family, composed of the husband, the wife and children, with occasional external relatives, specifically, grandparents. After the family level, the community or the village represents the next level of organisation. Here, local institutions, including cooperation and trust, play an important role in regulating the access and management of the resources (Appendini and Nuijten, 2002). In addition, I adopt the term natural resource to refer to the elements of the natural environment with significance in meeting the needs of campesinos. It is essential to keep in mind that productive practices of campesinos depend on factors such as the opportunities to access the market and the applicable governmental policies (Eakin *et al.*, 2014).

Global perspectives on conservation of biodiversity: the Man and Biosphere Reserve Program

In 1986, the UN Convention on Biological Diversity (CBD) defined biodiversity. The term refers to "*the variability among living organisms from all*

sources, including terrestrial, marine and other ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems" (CBD, 1992, p.4).

According to Groves *et al.*, (2002), the CBD highlights two relevant features of biodiversity: its organisation and its quantification. The structural organisation of biodiversity includes genetic variability within and among species, communities, ecosystems and ecological interactions. Quantification relates to the number of individuals of different species. Organisation and quantification generate diverse compositions of communities and ecological interactions. For ecologists, defining communities and ecosystems requires specific measures (Myers *et al.*, 2000; Armsworth, Kendall and Davis, 2004).

As explained by Armsworth, Kendall and Davis (2004), the most common measures for biodiversity are *alpha* or α-biodiversity, *beta* or β-biodiversity, and *gamma* or γ-biodiversity. *Alpha* biodiversity refers to the number of species within an area. *Beta* biodiversity relates to the exchange of species in composition between regions. Finally, *gamma* biodiversity refers to the total biodiversity and assessment of both *alpha* and *beta* biodiversity.

The CBD (1992) defines conservation of biodiversity as the conservation of the variety of living organisms within ecosystems. Conservation has the challenge of preserving healthy populations of flora and fauna through time and space. For example, the CBD emphasises the role of *in situ* conservation. This refers to the conditions where genetic resources remain within ecosystems and natural habitats. In the case of domesticated species, biodiversity and *in situ* conservation looks to safeguard species and the surroundings where these species evolve. To achieve this aim, scientists working in conservation look for a deep understanding of the ecological and evolutionary processes that sustain and promote biodiversity (Olden *et al.*, 2004).

In 1976, the United Nations Educational, Scientific and Cultural Organization created the Man and Biosphere Reserve Program (MAB) (UNESCO, 2017). MABR had one primary purpose: efficiently managing natural resources for the wellbeing of human populations and the conservation of the natural

environment. The strategy included three different functions: conservation, economic development and logistic support (UNESCO, 2017). According to Coetzer, Witkowski and Erasmus, (2014), scientists and practitioners combined two different perspectives in the MAB framework. First, conservation as the result of centralised and technocratic management of nature. Second, conservation as a strategy based on local ecologies. Consequently, MAB included “core zones”, and “buffer zones”. In “buffer zones”, local people could develop their daily activities.

Some strategic aims of the Man and Biosphere Reserve Program (MAB), according to UNESCO, are the following (UNESCO, 2017):

- Conserving biodiversity, restoring and improving ecosystem services, and promoting the sustainable use of natural resources. These aims exist under the premise that biodiversity is necessary for the wellbeing of people. To achieve these aims, it is expected that MAB create alliances at the local, regional and national levels. These aims also consider that local participation is needed for planning how to manage natural resources. Also, they consider that achieving social equality is mandatory.

- Contributing to the creation of sustainable societies. Creating sustainable societies and sustainable futures includes the respect of the natural and cultural patrimony of societies. This aim relies on the recognition of the social, political and economic contexts of conservation of biodiversity. Also, this aim considers that improving health and promoting social equality are two essential components of sustainable societies. One of the indirect contributions of this aim might be improving the ability of people to respond to environmental and economic uncertainties.

- Developing science and education. Science and education are essential for identifying, comprehending and responding to uncertainties and challenges. This aim considers that technology and scientific knowledge might be as necessary as local knowledge for understanding the functioning of ecosystems. They might also be indispensable for facing

the adverse effects of environmental change and for providing tools for coping and adapting to it.

Price, Park and Bouamrane (2010) mention that by 1980, governments had imposed most MABR as national conservation strategies. MABR “core zones” were prioritised in terms of size and monetary investment. “Buffer zones” were almost forgotten by conservation plans. The discrepancy between the MABR framework and its application created controversy and several critiques. Discussions about linking conservation with rural development led to transforming “buffer zones” into “transition areas” or “zones of cooperation”. Here, practitioners in conservation promoted collaboration among local communities, conservation professionals and environmental scientists. Later, these efforts pointed out the lack of frameworks for evaluating the social, economic and ecological performance of MABR.

As pointed out by Groves *et al.* (2002) and Schleper (2008, 2017), MABR assumed the responsibility for seeking new approaches for conservation and sustainable management of ecosystems. The process evidenced specific ecological and social challenges. In terms of conservation theory, MABR was enriched by incorporating ecological and evolutionary processes in their framework. From social theory, MABRs developed methods for promoting local participation and created strategies to strengthen local governance. MABR had the possibility to encourage dialogues for conflict resolution, especially those involving land-tenure and use of natural resources. MABR also looked to integrate concepts of cultural and biological diversity into their rhetoric. They included local knowledge and local practices for managing ecosystems as part of their interests (Wilshusen *et al.*, 2002). In theory, MABRs represented a shift in conservation schemes. The ecological and social theory behind them aimed to set the conditions for improving the relationship between humans and the environment” (Price, Park and Bouamrane, 2010).

However, MABRs often elicited rejection and negative responses from local communities. In Latin America, designation of MABRs resulted in a bureaucratic process. It involved creating PAs that existed only in name. Embracing conservation aims when economic development was a national priority created

a demanding task for governments (Coetzer, Witkowski and Erasmus, 2014). The Mexican government established the first MABR in 1977 (Gomez-Pompa and Kaus, 1992). Some conservationists thought that MABR would become a tool for integrating conservation and human wellbeing in the country. Local people associated MABRs with displacement from their territories and loss of control over their economic activities (Reddeldia 2017b). MABR proved to be incapable of dealing with either ecological or social challenges.

For Schleper (2008, 2017) synergies and trade-offs between conservation and sustainable development are fundamental elements in the theory and practice of MABRs. Failures and critiques under this scenario led to a more interdisciplinary framework for MABRs. In a more recent framework, literature on this topic often refers to socio-ecological systems as their unit of influence. Besides, MABRs emphasise the scale of landscape when discussing successful management and conservation actions (Gonthier *et al.*, 2014). In addition, MABRs implement Integrated Conservation and Development Projects (ICDPs) to reorganise principles and practices related to conservation.

ICDPs focus their efforts on economic activities within rural and poor communities worldwide (Hughes and Flintan 2001). Nevertheless, ICDPs present their own challenges. For instance, they usually fail in addressing economic discrimination inside the communities where they have influence (García-Amado *et al.,*2012). ICDPs have also been criticised for discriminating against local governance systems (Wilshusen *et al.*, 2002).

Challenges for conservation of biodiversity in Man and Biosphere Reserves

By 2008, some ecologists recognized that MABRs were the most important spaces for building sustainable development and contributing to achieve the Sustainable Development Goals (SDGs). MABRs were also considered relevant for following the guidelines of the Millennium Ecosystem Assessment framework (Coetzer, Witkowski and Erasmus, 2014). However, critics like Coetzer, Witkowski and Erasmus (2014) consider that MABR might fail because of the following reasons. First, they often develop strategies that exclude people; by doing this, they perpetuate marginalisation and poverty.

Second, MABRs do not directly address trade-offs between conservation and economic development. Third, the establishment of “core zones” leads to a more rapid change of land-cover in surrounding areas; overall, they lead to a further degradation of ecosystems. Fourth, projects working under the framework of MABRs often imply biased and unequal benefits among people; these projects regularly depend on constant external and unsustainable funding. Finally, timeframes for biodiversity and economic outcomes differ, which makes the integration of objectives extremely difficult.

However, social and natural scientists recognise that protected areas such as MABRs might be the final refuges for biodiversity (Wilshusen *et al.*, 2002). Sadly, they mirror the deforestation processes that take place around them (West, Igoe and Brockington, 2006). In a current analysis made by Laurance *et al.* (2012), ecologists found that 85% of the protected areas trying to preserve tropical forest in Latin America present a deterioration in their surrounding forest over the last 20 to 30 years. Only 2% of the protected areas have gained surrounding forested land.

Factors related to conservation of biodiversity inside and outside MABRs are linked at various scales (Chappell *et al.,* 2013). At the local level, the uncertainty in land-tenure, the absence of economic opportunities and the lack of technological assistance to local people correlates with over-exploitation of resources, land degradation, and deforestation. At the national level, the negotiation between conservation and economic growth usually leads to antagonistic policies where conservation takes second place (Corbera and Martin, 2015). At the global level, the logic of economic growth exceeds ecological thresholds and stimulates an over-demand for resources worldwide (Boege 2008).

The crosscutting forces that shape biodiversity loss and environmental issues also serve as an opportunity to look for new dialogues about conservation and sustainability (Merino and Martínez, 2014). The next chapter opens one of these dialogues. It explains how a campesino community, *ejido Josefa Ortiz de Domínguez,* was built by making use of the landscape. On one hand, this is the history of the economic and social policies that moulded the lives of

campesinos. On the other hand, it is the history of the individuals that confront conservation and economic development inside a MABR.

CHAPTER 3

Political History of a Landscape. The Foundation of the *Ejido Josefa Ortiz de Domínguez* and the Creation of the MABR *La Sepultura*

INTRODUCTION

In Chapter 3, I explain the history of *ejido Josefa Ortiz de Domínguez.* I focus on the story of individuals and families who acted in response to economic and conservation policies that the Mexican Government has established in Chiapas, Mexico since the 1970s. By telling the history of the *ejido,* this chapter also develops an account of forest loss during the 1980s, the subsequent responses of campesinos to the entrance of neo-liberal policies during the 1990´s and the restoration of the forest in the MABR during the 2000s. By combining ethnographic and archival research, I interpret the interplay between external events that incentivise change and the local reasons for change in the *ejido*. External events focus on socio-economic policies. Local reasons for change focus on household decisions. I argue that the interplay of external and local events allows us to figure out why conservation projects are important for campesinos. Conservation projects promoted by MABRs transform the strategies for landscape management. Environmental heterogeneity becomes a pivotal element for explaining why mature forest remains in these territories. Finally, in this chapter I also explain diversification of economic activities. For this, I analyse how people adapt to economic and political conditions, undergoing continual change to build and defend their way of living.

When people invited me to their houses, I used to visit them during the evening. Families had coffee and bread to share as part of their routine after ending a day's work. Campesinos showed interest in telling me about their life and their past. Conversations about these topics became an everyday activity. Jorge and Natalia, two of my friends, would look for me around 7 pm. They would take me

to the house of each family for a presentation first, and for a casual conversation later.

During my early conversations with campesinos, I presented myself and answered questions about my personal life. *Where were you born? What do you study? What do your parents do for a living?* were common topics. Later, families and I talked about what it meant to live inside a Man and Biosphere Reserve. With time, conversations evolved. Campesinos and I told each other about our day. I asked questions about the landscape, the activities they developed in the forest and about the influence they received from la *La Sepultura*. Soon, I realised that talking about the partnership between campesinos and the MABR was not a simple task. It made it necessary for me to know the efforts and the challenges that families in the *ejido* made for preserving the forest as a communal protected area before the appearance of *La Sepultura*. It also made it necessary for me to understand the successes and failures of the conservation projects in the *ejido.*

Recognising the different events that impacted the lives of individuals and families was a starting point for understanding conservation from the viewpoint of campesinos. How did these impacts change people´s perspectives on the land? and how did these impacts influence the decisions taken by *ejidatarios* and *pobladores* regarding the forest? How did campesinos define their alliance with *La Sepultura*? Developing a historical narrative about the *ejido* implied coming to appreciate a community in evolution. Changes resulted from the interplay of events and decisions happening inside and outside the *ejido*. I documented what men and women told me about their arrival in *Josefa Ortiz de Domínguez.* I also documented the transformations the landscape had undergone since that time until now.

The stories presented as follows were collected from evening conversations. Frequently campesinos' offspring, the younger generation, were present. They attended to the stories the adults, principally grandmothers and grandfathers, told me about how they built a community. At other times, the head of the family was alone. She or he would tell the story of her or his personal journey to *Josefa Ortiz de Domínguez* while recounting the history of the *ejido*. How did

families arrive at *Josefa Ortiz de Domínguez*? How did they organize the landscape? And how did *La Sepultura* collaborate with them? What was the role of conservation projects in the *ejido*'s history? And what motivated people to maintain collaboration with the MABR? These general questions led the conversations.

Landscapes, environmental history and the life of campesinos

Three main ideas inspire this chapter. First, that historical perspectives on the landscape allow me to discuss conservation as a dynamic process. Under this context, conservation relates with past, present and future interactions of campesinos with socio-economic and environmental policies (Alimonda, 2002). Second, that these interactions relate to local, national and global structures of power (Biersack, 1999). Third, that by addressing the historical narrative of the landscape, it is possible to explain some factors that determine the ways campesinos interpret and transform the environment (Legorreta, Marquez and Trench, 2014).

Da Silva *et al*. (2017) explained that landscapes are spaces where human groups develop their activities. As landscapes are physical and human constructs, it is essential to understand how management processes modify them through time.

Latin America is a region where political ideas and human actions have shaped the environment together with evolutionary processes and ecological interactions (Boyer, 2011). Here, landscapes are incomprehensible without knowing the history of people and their complex evolutionary past. Da Silva *et al.*, (2017) showed that landscapes in the region require history to be understood and that people keep the memory of the former names and uses of their landscape. Therefore, understanding the reasons and the factors behind their transformation is extremely important for conservation. Some ecologists working in Mexico also consider that the inclusion of history into ecological and conservation theory is necessary (Martinez *et al.,* 2006).

In Mexico, Durand and Lazos (2004) conducted one of the first socio-ecological researches that used a historical narrative to interpret the patterns of tropical

deforestation in the country. For the authors, deforestation was caused by the failure of local institutions responsible for regulating access and use of natural resources and also by the misguided national policies that promoted land-use change since the 1970s up to the 1990s. The authors explain that national economic policies considered that land had no purpose unless the forest was removed. During this period, campesinos had to clear the forest as a prerequisite for obtaining land titles. Many communities rejected the policy, even though they could lose their land rights.

The authors illustrate that as a parallel event, during the 1960s and the 1980s, Mexico attracted 60% of the credits for cattle the World Bank gave to countries in Latin America. This economic assistance, jointly with the prestige that cattle had in Hispanic society and the influence of powerful cattle breeders, formed a particular ideal of prosperity. This process took place in various regions of the country, principally in the south under the support of the land distribution reform. The authors conclude that deforestation resulted from the promotion of land-use change as part of the national economic policies. Local factors, such as demographic growth and the alteration of agricultural cycles, were responsible for deforestation and soil degradation too. The research therefore shows that national and international economic policies focused on land use change have a direct effect on the landscape.

Durand and Lazos (2004, 2008) also clarify that both inside and outside protected areas, deforestation evidences a complex interaction of cultural, ecological, economic and social factors. For example, the authors explain that within the campesino communities, the land is a valuable possession. It is a trophy gained after the Mexican Revolution. As land also means work, the transformation of the landscape is a necessary process for campesinos in defining who they are. Thus, for a deeper understanding of changes in land-use, it is fundamental to address the livelihood of people.

Speelman *et al.* (2014) suggest that campesino communities do not simply remain in their communities and seek for improvements in their way of living. Historically, campesinos respond to uncertainties through coping or adaptation strategies. This happens while they are progressively troubled by the impacts of

international market dynamics, governmental economic policies and nature conservation programs. The research of these authors inside a Man and Biosphere Reserve showed that rural communities transform coping strategies into adaptive strategies. Different factors favour this process happening. Some of these factors include improved social, institutional and political capital; the existence of a communal forest and communal resources; the long-term assistance of an NGO and an extremely motivated community.

Speelman *et al*. (2014) also noted that when conservation projects are successful, the diverse actors involved in these projects make efforts to overcome discrepancies. Consequently, conservation schemes supported by MABR serve to promote social organisation and collective agreements. The authors state that land tenure and distribution of power inside communities are two main issues threatening the adaptive capacity of campesinos. For campesinos, protecting the forest is an ongoing process in which communities and organisations involved must be able to regulate their actions and decisions.

Hamilton, Dewalt and Barkin (2016) used data from 1984 to 1996 to analyse the influence of economic crises in the life of campesinos. They found substantial improvements in the wellbeing of campesino families during this period regardless of the national economic crisis. The explanation the authors give to this phenomenon relies on two events. First, migration and the growth of earnings flows during this time. This provided liquidity for investments in local production and household expenditure. Second, women's increased labour force participation. The authors explain that community activism increased during this time in parallel with sustained livelihoods and welfare improvements. Rural people invested in local production despite the increasing structural inequalities under which they lived. Women and men migrated outside their communities during the economic crisis that took place in Mexico during this period. However, temporary and permanent out-migration did not lead to the abandonment or disintegration of the rural communities. Improvements might have been reached by a steady investment in quality of life, as measured by household possessions, housing quality and better diets. This pattern, observed elsewhere in Latin America, evidences the reproduction of rural realities. The authors conclude that people living in rural communities under disadvantageous

situations move from holding on during national crises, to incrementally investing in becoming more productive. The phenomenon might be interpreted as a reminder. Women and men in rural Mexico are not leaving their territories. They stay as part of the definition of who they are and as part of their wellbeing.

What is sometimes overlooked in historical studies on the landscape is the role that economic and social policies have in conservation. At the same time, conservation often underplays the fact that rural communities evolve together with their landscapes. Among the issues that require further discussion are: How does the transformation of the landscape connect with the development of the livelihood of campesinos? How do campesinos manage areas with mature vegetation? How does the establishment of conservation schemes, such as those promoted by MABR, affect the permanence of the forest? And, is conservation promoted by MABR relevant for dealing with economic and environmental challenges of campesino families living inside a MABR? Next, I approach these gaps referring to the circumstances and reasons that drove the transformation of the landscape in *ejido Josefa Ortiz de Domínguez*. I mainly refer to the events relevant to campesinos for revealing the way conservation agencies and economic policies relate to their economic activities.

Building a community. The history of *Josefa Ortiz de Dominguez*

Josefa Ortiz de Domínguez was founded in 1973 by 12 families. People arrived from nearby villages in Chiapas, such as Villaflores, Villa Corzo and San Cristobal de las Casas. They occupied a portion of land previously controlled by a *hacendado*. Individuals who became ejidatarios of *Josefa Ortiz de Domínguez* were formerly landless individuals; they rented plots from others, or worked for ranches. Families that founded the *ejido* were mestizo, only one indigenous family arrived at *Josefa Ortiz de Domínguez* some years after the establishment of the *ejido*.

In *Josefa Ortiz de Domínguez*, women and men recognize themselves as campesinos, individuals who take care of the land (Figure 5). They do not consider themselves as indigenous as they do not speak any indigenous

language; the only indigenous family received pressure from other ejidatarios to speak in Spanish and to forget their indigenous Tzeltal language.

During the first years of the community, ejidatarios travelled 10 hours on horseback to get to Villaflores, the closest municipality. They undertook the journey every two or three months to purchase soap, candles and sugar. Today, getting from *Josefa Ortiz de Domínguez* to Villaflores takes 2.5 hours by car. Those who own a vehicle are indispensable actors for the community. They are in charge of the weekly journeys to the municipality and for taking people out of the community in case of an emergency.

The ecosystem in *Josefa Ortiz de Domínguez* was historically seen as forest, and the land reform provided a meaningful opportunity for campesinos to acquire land and resources for their livelihood. During the 1970s, the Mexican government obtained control of the land as part of the *Reparto Agrario* and gave subsequent control to campesinos. Families received the right to hold the land under the constitutional form of the *ejido*. Soon, campesinos parcelled out the land. They based their decisions on informal agreements. Each ejidatario owned 75 ha. At the end of the land distribution, campesinos carried out activities using merely their empirical knowledge, some tools and the seeds they carried from their previous homes. Don Julio, son of one founder of the *ejido,* told me the following one day as we sat next to each other in the communal transport:

> *"We came to the mountain because we needed a place to have our tierrita (little land), for developing our milpas. I arrived here when I was a child, with my father, my mother and my siblings. We only brought three sacks of maize, one sack of beans and my father's horse. My mother brought her chickens and her plantitas (little plants). You can ask the other founders of the Ejido…Things were very challenging at the beginning*".

With time, people in *Josefa Ortiz de Domínguez* transformed the landscape. From 1973 to 1980, *ejidatarios* and their families cleared the forest. They built their family houses and designed the common areas for the community. This

included the *casa ejidal*, where ejidal meetings take place, the nursery for plants, the church, the roads, the schools, the playground area and the park.

Figure 5. *Ejidatario* on his weekly journey to *ejido Josefa Ortiz de Domínguez* on the communal transport. Chiapas, Mexico.

The initial actions campesinos developed, hand in hand with building the houses, included establishing *milpas*, *frutales* (fruit gardens) and home gardens (Figure 6). These agroforestry systems secured food for consuming at home. At the start, *milpas* suffered from plagues and diseases, so the annual harvest was not sufficient to satisfy the nutritional demands of the family. Families complemented their food requirements from the forest and home gardens. In the forest, campesinos gathered wild plants, fished and hunted. In home gardens, women harvested fruits, vegetables and medicine. During the first five years of the community, home gardens were also major contributors for cash income. Women raised chickens in their home gardens to trade within the *ejido* or in the market at Villaflores. Meanwhile, men became temporary casual workers for big plantations outside *Josefa Ortiz de Domínguez*.

Figure 6. Home garden at *Josefa Ortiz de Domínguez*, Chiapas. Mexico.

A couple of young *ejidatarios* in *Josefa Ortiz de Domínguez* knew the area because before owning land titles they earned income by extracting leaves of the wild Camedor palm. These *ejidatarios* collected the leaves from the cloud upland forest and sold each leaf in the local market at MXP 0.15 (less than USD 0.01). With time, campesinos manifested their interest in teaching other *ejidatarios* about the activity and in creating a group for selling the leaves. The collective decision was taken on a Sunday, the day for ejidal meetings. Palm extractors would explain to any interested member of the community how to organise the work and sell the product. Small groups of 3-5 *ejidatarios* participated. This was the first organised group in the *ejido* and the first transformation of the forest. Don Ángel remembers:

> "*When I arrived at Josefa Ortiz de Domínguez, I only knew about milpa. Fortunately, my compadres (my close friends), Don Martin and Don Francisco taught me everything about the palm. They told me where to look, how to identify palm from other very similar plants. They said to me that leaves should be measured before cutting them, like this, with the hand, because that way leaves could recover quickly. We selected the healthy leaves*

from the damaged leaves, which were broken or stained. That happened while I was looking for a job after the collective decision for creating the group was taken.

I decided to participate because we were starting our milpas, and milpas would give us maicito (little maize) and frijolito (little beans) for the home consumption, but we needed some money to buy sugar, soap, candles".

Besides *milperos* and *palmeros*, a small group composed of three *ejidatarios* arrived at *Josefa Ortiz de Domínguez* with coffee plants. Women in the home gardens cultivated and nurtured the coffee. Women looked after the plants until they were big enough to survive in small nurseries, an intermediate area between the settlement and the mountain. Don Jesus, a member of the only indigenous family in *Josefa Ortiz de Domínguez*, told me he had harvested coffee for as long as they could remember. He arrived at *Josefa Ortiz de Domínguez* with his partner, his offspring and his coffee plants. He carried the coffee plants because that way he and his family could use the coffee for home consumption and for selling: "*The only goods my family and I had were our coffee and some chickens my wife bought. I had to bring the coffee with me because that is all I knew since I was a child".*

Don Jesus is a polite man; I met him for the first time while walking at night, going back to his house after mass: *"We can talk any day you want. I would only prefer to talk before mass because my wife and I usually go to sleep after that. We sleep very early".* One day, I found him on the road to his home. He invited me to his house and told me about his arrival in the *ejido*:

Well, I arrived here more than 25 years ago. I have friends everywhere, and some of them told me about this place. I came, and I decided to stay. I told my wife and we came with our children. I did not even speak the language very well because I come from San Cristobal de las Casas. I spoke Tzeltal when I arrived at Josefa Ortiz de Domínguez. My wife and I were treated

differently because of our language. People mocked us, so we had to speak Spanish. Now I am forgetting Tzeltal".

While *ejidatarios* experimented with the first *milpas* and learned about palm extraction, women took care of the coffee plants and created the home gardens. In home gardens, women cultivated the plants they brought from their previous homes: fruit trees, vegetables, aesthetic and medicinal plants. At the same time, fruit trees grew in areas next to *milpas* creating fruit gardens. In fruit gardens, men could take a break from their activities in the *milpa*.

With time, campesinos transplanted coffee plants from home gardens and nurseries to designated areas in the uplands. They created the first coffee gardens, also called *cafetales*. Cafetales exist next to areas created by *ejidatarios* for nurturing and extracting palm, these are called *palmares* or palm crops. Coffee received government financial subsidy during the 1990s, and coffee gardens became more popular and more important in monetary terms. Today coffee is cultivated by 21 families in the *ejido*. It represented the primary economic activity for six families before 2013. Things changed after 2013 when coffee leaf rust arrived at the area. Today, *ejidatarios* and *pobladores* cultivate coffee for self-consumption. Because of the damage that the coffee leaf rust causes to the coffee plants, the harvest is not sold in the markets. Once the annual requirements per family are satisfied, they sell the coffee that is left to other families in *Josefa Ortiz de Domínguez*.

Home gardens were situated behind each house; fruit gardens, along the road to *milpas*; *milpas*, between 2 and 4 km from the town and *cafetales* next to *palmares*, at 5 to 8 km from the town. *Milpas*, home gardens and fruit gardens produced food for family consumption. *Cafetales* and *palmares*, for the market.

In the mid 1980s, a private sawmill asked *ejidatarios* in *Josefa Ortiz de Domínguez* for permission to extract wood in a forested area close to the settlement. *Ejidatarios* allowed its entrance on one condition: the sawmill would build the road for entering the community. A formerly 10-hour journey to the nearest municipality became a two-and-a-half-hour trip after the creation of the road.

Agricultural and neoliberal economic policies in Mexico

Bermeo *et al.* (2014) explain that during the post-revolutionary history, economic policies supported the increase of productivity of campesinos and, in particular during the 1940s, economic policies focused on agriculture. During the 1970s a national policy was introduced in rural Mexico under the name of *El Sistema Nacional de Alimentos* (The National Food System) as part of the green revolution working worldwide. During this time and until the 1990s, protectionist and nationalistic policies were the common denominator to describe the way Mexican government related to agriculture and to campesinos. The National Food System involved the creation of two governmental agencies: CONASUPO and BANRURAL. CONASUPO provided access to markets and guaranteed prices. BANRURAL provided credits for technical assistance, seeds, fertilisers and crop failure insurances.

With time, under the influence of the National Food System, families in *Josefa Ortiz de Domínguez* created two types of agriculture: 1) commercial farming, or cash crops, based on mono-cropping dependent on agrochemicals and 2) traditional agriculture, or *milpas*, based on diversified crops including creole maize varieties. In this way, farming would become the everyday productive activity for *ejidatarios* and their families. *Milpas* were part of the home food system while cash crops were fundamental for monetary income. Each year, each *ejidatario* could sell up to 10 tons of maize from cash crops.

> *"We do not want to be rich, there are a lot of rich people and they are not willing to share. However, we tried to cultivate and to be productive with the government support. You see, we worked hard, and cash crops were good. Trucks that came looking for maize and beans left the community fully loaded. That was the time when my children went to school outside Josefa Ortiz de Domínguez. At the time, if they wanted to study in middle school, they had to live in Villaflores. I had four children at the time and I had the possibility of sending them all to school because of the money we earned with maize".*

Meanwhile, people kept extracting palm as a secondary activity for monetary income and took care of the young coffee gardens.

> *"You see, here, we have to do differently. We have the milpita - milpa is the most important. However, you also need others, you need cafetales in case you lose your maize and you need to buy it; you need palm for purchasing sugar, or for the medicines if a child gets sick".*

Appendini and Nuijten (2002) and Sweeney *et al.* (2013) mention that, during the 1990s when Mexico was in an economic crisis, the World Bank demanded austerity and liberalisation policies began, CONASUPO stopped supporting campesinos, and the prices of their products were submitted to the rules of the international market. In 1994, with the signing of the North American Free Trade Agreement (NAFTA), maize production received a subsidy through tariff rates until 2008. However, reforms during this period favoured commercial farmers over campesinos.

According to Hamilton, Dewalt and Barkin (2016), in 1992, as part of the neoliberal policies in Mexico the land tenure system changed and allowed *ejidatarios* to own land as private property. *El Programa de Certificación de derecho ejidal* (The Program for Certification and Ejidal Rights-PROCEDE) promoted the process by measuring and certifying individual plots inside *ejidos*.

In addition, from the 1980s to the 2000s, the economic scenario in Mexico included a debt crisis, the subsequent recession and several peso devaluations. The neoliberal economic reforms transformed the economy of the country. This was evident after the country's participation in the North American Free Trade Agreement (NAFTA). NAFTA demonstrated the inefficiency in market channels for campesinos. At the same time, national policies provided seeds aiming to replace local seeds within campesino communities. Low prices for export of beans and maize created an economic catastrophe for campesinos, a process that deepened with time.

In 1993, a new policy called PROCAMPO was implemented as a subsidy for campesinos, but the effort was insufficient. By 2000, 70% of the people living in rural areas, mainly campesinos, were catalogued as poor (Arellano, 2015). Once considered as main actors in Mexican history, campesinos lost their privileges over time. Some “neo-populism solutions” became part of the neo-liberal policies that directly affected them (Knight, 1996, pp. 1-23). As explained by Hamilton, Dewalt and Barkin (2016), the number of beneficiaries increased, but the amount of money provided was smaller in comparison to the loans distributed during the 1970s and 1980s. These “neo-populism solutions” changed in name and perspective through time; credits once aiming to incentivise the production among campesinos became programs for poverty reduction under the name of PROGRESA (1994-2000) and OPORTUNIDADES (2000-2006).

The end of economic policies for the agricultural sector and the entrance of NAFTA became the events that set off the weakening of campesinos. With NAFTA, agriculture became an open market. Reforms to Article 27 occurred in 1991, and its implementation started in 1992 (Figure 2) (Assies, 2008). From the reform to the first years of the 2000s, only 1.4% of the collective property changed into private property (1.5 million ha approx.) (De ITA 2006).

As explained by Appendini and Nuijten (2002), when Mexico joined the NAFTA, agricultural agreements provided a protected status to maize. However, the government dismantled CONASUPO (1991 to 1999) and BANRURAL (1990 to 2013). With these procedures, the government ended maize market interventions and the economic value of crops became directly dependent on international prices. As a strategy for facilitating farmers’ transition to the new free-market economy, the government created PROCAMPO as a subsidiary program. However, within the new scenario, politicians and society in general considered campesinos as anachronistic and their production systems as unviable.

Agricultural and neoliberal economic policies at *ejido Josefa Ortiz de Domínguez*

In *Josefa Ortiz de Domínguez*, each *ejidatario* received their land-title as private owners in 1993. However, the community agreed to continue with the same land management regime. Each *ejidatario* would manage their plots. They established local agreements for specifying who would have access to their land, including who could become *poblador* or *avecindado. Ejidatarios* also decided that buying and selling land could happen only if the community knew who the buyer was. Preferences would be given to people living in the community. Explicitly, to *pobladores*, as they lived in the *ejido,* but they did not own land titles and they were not allowed to decide on the communal forest. *Pobladores* in the *ejido Josefa Ortiz de Domínguez* refer mainly to the relatives of *ejidatarios*, their kin, and usually, family members who are starting their own families. As *pobladores* do not own land, they often live under difficult circumstances. It is difficult for them to obtain enough profit and to rent a plot to cultivate. Therefore, their economic circumstances limit their ability to choose which activities are better for them to develop during the year.

Table 2. Reforms to the Article 27 in the Mexican Constitution of 1917.

Reforms to Article 27
Land distribution ends.
Land-owners could make economic investments in their land.
Tribunal Agrario would solve disputes of any land tenure system.
Campesinos might acquire individual land-titles if they participate in *Programa de Certificado de Derechos Ejidales y Titulación de Ejidos y Otras Formas de Tenencia de la Tierra.*
*Ejido*s and *comunidades agrarias* could be dissolved or remain as a communal territory.
Ejidatarios and *comuneros* could sell or rent their land to people inside or outside the *ejido* or *comunidad agraria*. If the buyer or renter were an outsider, he or she would need the approval of more than 75% of the territory's members.
Ejidatarios and *comuneros* living outside the *ejido* could remain as owners of their land, and they could allow the entrance of external investors, as long as the external investment occupies less than 49% of the territory.

In *Josefa Ortiz de Domínguez*, Don Martin remembered this part of the history of the *ejido*. He also recalled the arrival of NAFTA. We were coming back from the mountain after visiting the coffee garden. He told me about his friends outside *Josefa Ortiz de Domínguez*, and about how they helped him in difficult times. Then, he told me about one of the most challenging times he and his family faced. It was in 1994, when Salinas de Gortari was the president. He explained to me:

> *"I think the most significant change in Josefa started in 1994. After the entrance of NAFTA, we could not sell maize anymore. We used to sell our maicito to CONASUPO, but after NAFTA we started selling maize to MASECA, where sometimes people did not even open the doors for us".*

Families in *Josefa Ortiz de Domínguez* fell back on traditional *milpas*, *huertos familiares* (home gardens) and fruit gardens for facing the difficult economic circumstances after the drop in maize prices. Meanwhile, coffee gardens (*cafetales*) and palm extraction provided an economic opportunity for some.

> *"After the price of maize dropped, some of us tried to cultivate more maize, and to sell more, even at lower prices, but it was not worth the effort. Soon after that, we started looking for different options. Some focused on cutting palm, my family and me; we relied on the coffee plants we bought when we first arrived at Josefa Ortiz de Domínguez, and on plants that my compadre, another founder of Josefa Ortiz de Domínguez, gave me".*

The creation of the Man and Biosphere Reserve *La Sepultura,* Chiapas

One of the main critiques of conservation that political ecology makes in theory and practice is that groups in power, the government and the conservation agencies, lead conservation by imposing their ideas. This was clear during the first years of *La Sepultura* in the manner the biosphere reserve related with campesinos. Similar problems occur across Latin America. These problems display some of the most important challenges of conservation today (Tscharntke et al., 2012; Gabay and Alam, 2017).

In 1995, the Man and Biosphere Reserve *La Sepultura* was created with minimal consideration of the concerns and reactions of campesinos living in the area. This situation led to a conflict over land-use between *ejidatarios* and *pobladores* living in *Josefa Ortiz de Domínguez* and the staff working at the biosphere reserve. *La Sepultura* imposed restrictive rules on communities: no hunting, no fishing, no cutting trees and no extracting palm. These conditions made people respond with clear opposition, violating rules, distrusting the staff, and withholding participation.

Josefa Ortiz de Domínguez refused to recognise the establishment of *La Sepultura*. However, campesinos were at the same time worried about the potential repercussions of continuing extractive practices in the forest, especially regarding palm extraction. *La Sepultura* authorities threatened palm collectors: they could be sent to jail if they did not cease their operations.

However, people in *Josefa Ortiz de Domínguez* continued with their traditions and got in touch with other communities facing similar problems with the biosphere reserve. Together, different *ejidos* located near the core area and the influence area of the MABR made a clear statement: *La Sepultura* was an unwelcome imposition by the government and negotiations with the director and staff of the biosphere reserve were not possible. Staff from *La Sepultura* belonged to some of the communities resisting the MABR. As members of the staff were friends of people from *Josefa Ortiz de Domínguez*, they never accused anybody of exploiting natural resources without formal permission. One member of the team told me that his *compadre* (close friend) in *Josefa Ortiz de Domínguez* extracted palm, but he knew *ejidatarios* had no other options to earn some money. They had been living as palm extractors for over ten years, long before *La Sepultura* was established. He also told me that *La Sepultura* was giving no alternatives for palm management and that people had to make a living. Those were his reasons for not accusing anybody.

With time, legal permits for palm extraction were given to communities able to fulfil technical requirements. Campesinos had to demonstrate indices of growth and survival rates, as well as organising *ejidatarios* as a legal group. *Josefa*

Ortiz de Domínguez did not participate in this process since *ejidatarios* did not have the money to pay either for the technical requirements or for the legal recognition of the group. After two years of constant negotiation for palm extraction and with no legal permits for its management, *ejidatarios* from *Josefa Ortiz de Domínguez* renounced the activity fearing that government threats would become a reality.

Problems associated with extraction of natural resources and land use change within the biosphere reserve led to communities prohibiting *La Sepultura* staff from entering *Josefa Ortiz de Domínguez* and other *ejido*s. *Ejidatarios* presented constant complaints in the municipality, demanding respect for their land and assistance for the development of productive activities that were consistent with the interests of the biosphere reserve. *Ejidatarios* told me:

> *"We were not against conservation, but we needed to feed our family. Trees are significant for us too. We were not trying to destroy the forest. However, what the reserve did not understand at the time was that the forest is there because of us and that we need the forest, as well as the forest needs us".*

Palm extraction was not an option for *Josefa Ortiz de Domínguez* anymore. The price of maize and beans led to the decline of commercial agriculture. *Ejidatarios* continued looking for alternatives. During this period, campesinos purchased cattle through credits provided by BANRURAL. Some family heads in *Josefa Ortiz de Domínguez* bought cattle and used land previously designated for cultivation for grazing the animals.

One *ejidatario* asked for the credit requirements at BANRURAL and informed the community about what was needed. Campesinos asked for the loan as a group, but the government gave the credit as individuals. The collective loan was not given. This happened because, even though the *ejido Josefa Ortiz de Domínguez* has legal recognition, the economic policies during this time favoured individuals rather than groups. Five *ejidatarios* founded the activity in *Josefa Ortiz de Domínguez* and they continue until now. Each *ejidatario* started the activity with two animals and no technical support. Friends from other *ejidos*

provided information and advice for raising the cattle. Campesinos also found advice from the stores where they bought medicines and food for the animals. The practice for cattle rearing was extensive grazing. The animals were left alone for one or two days to graze in pasture land and the successional forest. Introducing livestock increased deforestation and created problems related to fire management:

> *"With cattle, the forest changed. That was because we let the animals feed on whatever plant they wanted. Animals foraged even in the forest, where no milpas had been developed before".*

The credit from BANRURAL was part of a national policy (as explained in Chapter 2). Land-use change, once promoted by agriculture, continued now under the premise that tropical lands were better suited for cattle raising. Consequently, fires used by campesinos as a tool for promoting land-use change became a concern in national discourses. Deforestation and land degradation indices were then used to accuse campesinos of being environmental villains. The national government restricted their rights. At the same time, it established more Man and Biosphere Reserves in Chiapas. MABRs that followed the establishment of *La Sepultura* were *La Encrucijada* (1998), *El Ocote* (2000), and *Volcan Tacana* (2003).

In 1998, *La Sepultura* was identified as the Protected Area with the most damage caused by fire in the state. The immediate response of authorities was to prohibit any use of burning (from 1998 to 2003). *Ejidatarios* faced a new limitation for the development of their livelihood strategy. Threats started again, this time targeting cattle raisers. Anyone caught using fire would be sent to jail.

Maize had been economically unviable since 1994. Palm extraction was prohibited and had caused confrontation between families in *Josefa Ortiz de Domínguez* and the staff from the biosphere reserve since 1995. The use of fire as a strategy for opening spaces for cattle was banned in 1998. *Ejidatarios* and *pobladores* faced their most significant challenges since the foundation of the *ejido*. At dinnertime, while I was having coffee with one *ejidatario* and his family, he told me:

"We started to think: what are we going to do, what will our families do? Where can we go? As poor people… while the rich - the government took everything. We own this land; we had the right to stay here, the right to use the forest".

"That was the first time I thought I would have to move to the city and find a job to feed my family. That was the first time. We had no money for the children's education. However, my wife told me not to go to the city. She told me that we would find a way".

As time passed, *La Sepultura* recognised their failure to enlist and build on the commitment of communities in their aims for conservation. This failure motivated the director of the biosphere reserve to ask for help from researchers and NGOs working in Chiapas. In 1999, the director and staff started communication with the National NGO *Pronatura Sur AC*. and the research *Institute Colegio de la Frontera Sur* (ECOSUR). Together, staff from *La Sepultura*, staff from *Pronatura-Sur AC*, and academics from ECOSUR carried out surveys and interviews with the few people willing to hold conversations. At the same time, *ejidatarios* were open to discuss their opinion about the land-use change inside the *ejido*. A young *ejidatario* remembered the following in an assembly with campesinos from other communities:

"I became aware of the damage we were doing to the forest. One day I was looking for my cattle, the animals had stayed for two days on the mountain, eating yerbita (grass). I found the cows in the highest mountain, at the peak of "Tres Picos" there, where the quetzal and the tiger (jaguar) live. I never thought cattle would reach that high. After seeing that, I realised we needed to do something, and I spoke to my father. However, nobody wanted to make the first move. Then, La Sepultura and other conservation agencies arrived and asked for a compromise. They were not rejecting our activities anymore, but they were looking for a commitment. That was the decisive moment for us to dare and do something, to work with them".

Besides the local perception of the damage cattle was causing to the forest, in 1999 a tragedy occurred. A fire in *Josefa Ortiz de Domínguez* spread to the coffee gardens. The fire destroyed *cafetales* (coffee gardens) owned by a founder member of the community. In fighting the blaze, one *ejidatario* lost his life. Therefore, *ejidatarios* created an agreement in local meetings. Unsanctioned use of fire would not be tolerated anymore. In case any *ejidatario* wanted to use fire, he should ask for permission to the ejidal meeting, and campesinos would take the decision communally. If campesinos allowed the use of fire, the *ejidatario* would receive the support of other community members. As part of the new negotiations, *La Sepultura* proposed a program for fire management. Participants received equipment and technical support. This was the first time *ejidatarios* officially allowed engagement and intervention by *La Sepultura* staff:

> *"La Sepultura wanted to participate and we needed the support. I asked my wife: should we try it, working together with La Sepultura? Together, my wife and I decided we had to try. We did not want any more damage, any more deaths. No more lost harvest because of the fire, no more lives. We were risking our lives facing fires with our limited knowledge and with no equipment. We were facing fires we did not cause, originated from other communities that were not paying attention and were not concerned about what could happen to the rest of the forest".*

After the fire, conservation in *Josefa Ortiz de Domínguez* represented fully the two sides of its performance in Chiapas. It passed from being considered a tool for land dispossession to be a tool for strengthening the communitarian organisation. The humility and commitment of the actors in this process, *ejidatarios*, the staff and the director of *La Sepultura* allowed a dialogue that evolved in the creation of projects. These projects received the support of local NGOs and universities. The main aim was to provide technical support to *ejidatarios* and to interpret those improvements in ecological terms.

"Conservation cares about Nature, right? When I decided to work here, I thought I was going to protect the animals and the trees, but look at me, here I am, trying to find projects for the people"

I heard this comment when I first met the staff of *La Sepultura*: three men from different communities under the influence of the MABR. In their experience, this is what conservation means: contributing to the livelihood strategy of people by improving or implementing sustainable practices for land use.

Palm extraction. Conflicts and agreements between *La Sepultura* and *ejido Josefa Ortiz de Domínguez*

One of the most critical challenges for conservation and sustainability today relates to power (Coetzer, Witkowski and Erasmus, 2014; Schleper, 2017). Participation and empowerment of local people are two of the most critical processes for achieving the long-term permanence and success of conservation projects inside biosphere reserves (Chapin, 2004). However, people living under the influence of MABR are often misinformed about their rights and the activities they are allowed to develop. In addition, local institutions are often disregarded by conservation agencies, creating conflicts between local communities and conservation projects (Walker *et al.*, 2007).

As explained before, one of the most important economic activities in *Josefa Ortiz de Domínguez* during the 1970s and 1980s was palm extraction. *Ejidatarios* looked for permission to extract palm in 2005. They finally got it with the technical support of *La Sepultura*.

Palms extracted in *Josefa Ortiz de Domínguez* belong to two groups of plants. Cycads and Chamaedor palms. Cycads are living fossil plants classified in three families: *Cycadaceae, Stangeriaceae, and Zamiaceae*. Forty-three cycad species exist in Mexico. They are internationally classified as threatened species and are protected by the International Convention of Threatened Species of Flora and Fauna (CITES). In Mexico, cycads are protected by the Mexican Official Norm (Norma Oficial Mexicana, NOM) NOM-059-ECOL-1994 (Vovides, 2000). With respect to Chamaedor, Mexico is the country with the most species from this genus, scientifically called Chamaedorea. The genus

exists only in the American continent and botanists consider that Mexico is a centre of diversification for the genus. The 50 species that live in the country receive protection from national and international agreements; 38 species are under the NOM-059-ecol-94.

Palms grow wild in the rainforest and pine-oak forest, especially close to rivers, streams and canyons. However, *ejidatarios* created areas in the forest where palms dominated ground vegetation. These areas were next to *cafetales* and they received the name of *palmares*. Almost every family in *Josefa Ortiz de Domínguez* had *palmares* in their plot. During the 1980s, uncontrolled extraction and sale of palms reached almost 50 tons per year. Recognising the possibilities, and under the Biological Diversity Convention, a pilot project started in 2006 under the economic support of CONABIO. The staff from the biosphere reserve and *ejidatarios* from *Josefa Ortiz de Domínguez* remember this project. It constituted the first program where *ejidatarios*, organised and committed as a group, developed a practice approved by the MABR.

In 2000, SEMARNAT began some studies for conservation and sustainable management of palm leaves. The project aimed to start sustainable development based on the idea that protection and commercialisation were achievable at the same time. The program intended to support the participation of communities for conservation projects and to carry out sustainable development projects with the direct involvement of communities. As a result, a legal authorisation status called Environmental Managed Unit (UMA) was created. To obtain the UMA, *Ejidatarios* in *Josefa Ortiz de Domínguez* went through a bureaucratic process for securing funding from SEMARNAT. They received an invitation to become part of an organisation (Asociación Civil, AC) together with members of other communities. Thus, *Josefa Ortiz de Domínguez* achieved two certification processes: getting the UMA and becoming part of the Asociación Civil.

In 2005, the success of the program led the staff from the biosphere reserve to organise new groups within and among communities for extracting and selling palm leaves. With the technical and financial support from *La Sepultura,* campesinos built a refridgerated warehouse for keeping palm leaves fresh until

they were sold. The biosphere reserve also provided technical support required for securing the permits. In 1998 the United States of America market consumed almost two million of green leaves, of which 14% were imported from Mexico. They are used in flower arrangements. Palm leaves from *Josefa Ortiz de Domínguez* were sold to an American company which bought all the leaves that the *ejido* extracted; the palm leaves were collected twice a month in a refridgerated van. *Josefa Ortiz de Domínguez* extracted and sold palm leaves from 2005 until 2010. A group of 14 *ejidatarios* were legal participants in the activity. The contract and the permission for extracting palm ended in 2010, but they are looking for a new authorisation. Meanwhile, *palmares* are kept as a reservoir resource.

Don Ángel, my neighbour and one of the founders of the *ejido,* told me about his experience once the project started working and palm extraction was allowed again:

> *"I was able to cut and sell leaves again and it was easier because now the buyer came to the community, so we did not have to go to the municipality. Size and quality classified the leaves that were for selling. The biggest leaves were paid at MXP 0.80 (less than USD 0.05), and the smallest at MXP 0.50 (less than USD 0.03). If the leaves showed damage, they would not be sold. We had to learn how to be more careful than before, but that was good because we did not have to invest the money we earned in fuel for taking the leaves outside the community. Things were straightforward, and we even met the gringo (the American) who bought the leaves".*

The project ended in 2010 when the permission expired. During the five years the project worked, *ejidatarios* achieved an organisation that remains until today and continues to operate in different projects in collaboration with *La Sepultura*. However, the relationship among *ejidos* was not strong enough. Distrust about how the money was distributed after each payment became a cause for concern. *Ejidatarios* in *Josefa Ortiz de Domínguez* decided to leave the association of *ejidos* and to work without the partnership of any other *ejido*.

Soon after the project in *Josefa Ortiz de Domínguez* ended, a professor at the University of Chiapas (Universidad Autónoma de Chiapas) approached the authorities from the MABR. He proposed a project for “sustainable use and exploitation of palms”, which meant establishing a nursery for cycads. The authorities from the biosphere reserve saw an opportunity and accepted the project. They invited the professor to present his aims at the *Josefa Ortiz de Domínguez*’s ejidal meeting. There, the professor explained that cycads, the plant and not the leaves, were highly valuable for aesthetic purposes outside *Josefa Ortiz de Domínguez*. The economic value of an adult plant could reach over MXP 5,000.00 (USD 264.00) after four years of growth. *Ejidatarios* would receive the material for a nursery and help for the plant’s commercialisation. Families in *Josefa Ortiz de Domínguez* would contribute with their labour and their time. A group of twelve heads of families participated. Together, they created the nursery in the back yard of the house previously built for palm leaf storage. Seeds for the nursery came from the forest. Participants collected the seeds on Sundays, with their sons.

Once the nursery worked and seeds grew, the professor ended the project arguing that there was no market for the plants. *Ejidatarios* were very disappointed, left the nursery without maintenance and gave the plants away to visitors. The professor disappeared from the community and never came back. However, the results from his project are visible at the CONABIO web page (www.gob.mx/conabio). The final report states that the nursery aimed to show the feasibility of propagating the seeds and to develop an ecological analysis of the species of cycad that were found. The report avoids any explanation of the discourse the professor presented to the community to secure collaboration from families in *Josefa Ortiz de Domínguez*.

Ejidatarios who took part in the project of cycads told me that their hard work for finding and nurturing the seeds was not worth it. They spent two months collecting seeds, prioritising this activity over others that demanded their attention. Participants felt they were cheated by the biosphere reserve and by the professor who presented the result of the work of campesinos as a success.

Meanwhile, the staff from the MABR still considers that campesinos could sell the remaining plants in the market.

Pine resin project. Collaboration between *La Sepultura* and *ejido Josefa Ortiz de Domínguez*

Concerns about how the landscape is changing and about the trade-offs related with land-management raise questions about how conservation interests can be harmonised with local interests (Sunderland, Ehringhaus, and Campbell, 2008; Persha, Agrawal and Chhatre, 2011). With this question in mind, *Pronatura Sur A.C.*, a national NGO working in different areas of Chiapas, initiated projects together with *La Sepultura* in 2014. Authorities from *Pronatura Sur A.C.* and *La Sepultura* agreed to address deforestation. They developed projects where sustainability was a vital component in defining how to conserve in collaboration with communities. Again, organisation and trust among *ejidatarios* and their experience gained during the creation of the palm management group facilitated the starting up of the project.

In the case of *La Sepultura*, the initiative aimed to create a new program under the label of sustainable exploitation of the forest. By taking the example of communal projects outside the *ejido Josefa Ortiz de Domínguez*, people from *Pronatura Sur A.C.* started a pilot program of pine resin extraction. Campesinos extracted pine resin from chosen individuals in the successional vegetation. Young people from the community undertake this activity. They are paid MXP 8.00 per kg collected (USD 0.40 approx.). The resin is used in the national industry for cleaning products. For two months, one technician from *Pronatura* explained how the activity should be developed. However, results were poor (Figure 7). Two different opinions exist about the failure of the pine resin project. One opinion refers to the lack of local organisation among campesinos: "*We all want things to be easy, but activities are not easy at the beginning*". The second opinion is about the arrogance among technicians from *Pronatura*. According to campesinos, technicians did not pay attention to the voice of *ejidatarios,* who stated concerns that the environmental conditions of *Josefa Ortiz de Domínguez w*ere not suitable for developing the activity:

"From the *start, we told the technicians that we did not have the same forest as California (the Ejido where pine resin collection was a success), but the technicians told us the pine species were the same and that the project would work. It was only a matter of time, and it would be down to our disposition for developing the activity. In three days we received the capacitation".*

I do not develop the activity; the activity is for my grandson. I accepted because we are always open to new ideas. Besides, the forest destined for pine resin was intended to grow old; I was not going to cut those trees. However, the activity is not working. We are just hurting the trees, taking away their blood, their nutrients. From the beginning, the technicians told us that we should do 15-30 cm cuts in the tree for obtaining the pine resin, but look, now the cuts are over 1 meter. We are hurting the trees. I do not like the activity that is why I am not doing it anymore".

In July 2016, participants told me that after these poor results, the most obvious thing to do was to focus on the other activities they were already developing. Time for harvesting beans was starting, which meant that sons and grandchildren were not available for pine resin extraction. Now, most of the participants have abandoned the project. Only four *ejidatarios* remain in the group; each of them obtains between MXP 700.00 – 900.00 (USD 37.00 – 48.00) per three hundred trees from which they extract resin.

Figure 7. Pine resin extraction in trees of the successional forest. *Ejidatarios* prepare the pine resin they collected at *ejido Josefa Ortiz de Domínguez*, Chiapas. Mexico.

Local institutions at *ejido Josefa Ortiz de Domínguez*

The story of the community in *Josefa Ortiz de Domínguez* is also the story of people's local institutions: the local agreements that regulate the use of natural resources and that guarantee the members of the community access to those resources (Folke *et al*., 2007). The definition of institution promoted by Ostrom (2000) explains that institutions are a group of rules, regulations and processes that govern the decisions among members of a group. Institutions in *Josefa Ortiz de Domínguez* are built from a combination of their history and the decisions that give shape to their landscape through time. Some strengths in their institutions are the following:

- Having clear limits about who has the right to vote in the ejidal meetings and maintaining ejidal meetings as arenas for collective decision.
- Building coherent rules for managing the landscape, respecting the performance of the local institutions.
- Understanding that institutions might change over time, according to what the *Ejido* needs.
- Establishing sanctions to penalise those who break the rules.
- Discussing conflicts when they arise.

Those are some elements relevant to established institutions in *Josefa Ortiz de Domínguez*. Here, institutions can be easily classified as formal or informal. Formal institutions are about written rules whereas informal institutions are about behaviour and conduct (Berkes and Folke 1998). Authorities are generally responsible for establishing and applying formal institutions. Meanwhile, individuals within a community are responsible for informal institutions (Castillo *et al.,* 2005)

Inside *Josefa Ortiz de Domínguez*, campesinos must find agreements (Table 3). They create collective rules for behaviour (Figure 8). In addition, they collectively decide about the management of the landscape. At a deeper level, those rules and decisions evolve into changes in local governance. These changes are indispensable for the *ejido* to maintain control of their forest and their resources. Agreements and collaboration must have meaning for the community and not exclusively for the individuals.

Figure 8. *Ejidatarios* doing communal work for the primary school at *Josefa Ortiz de Domínguez*, Chiapas. Mexico.

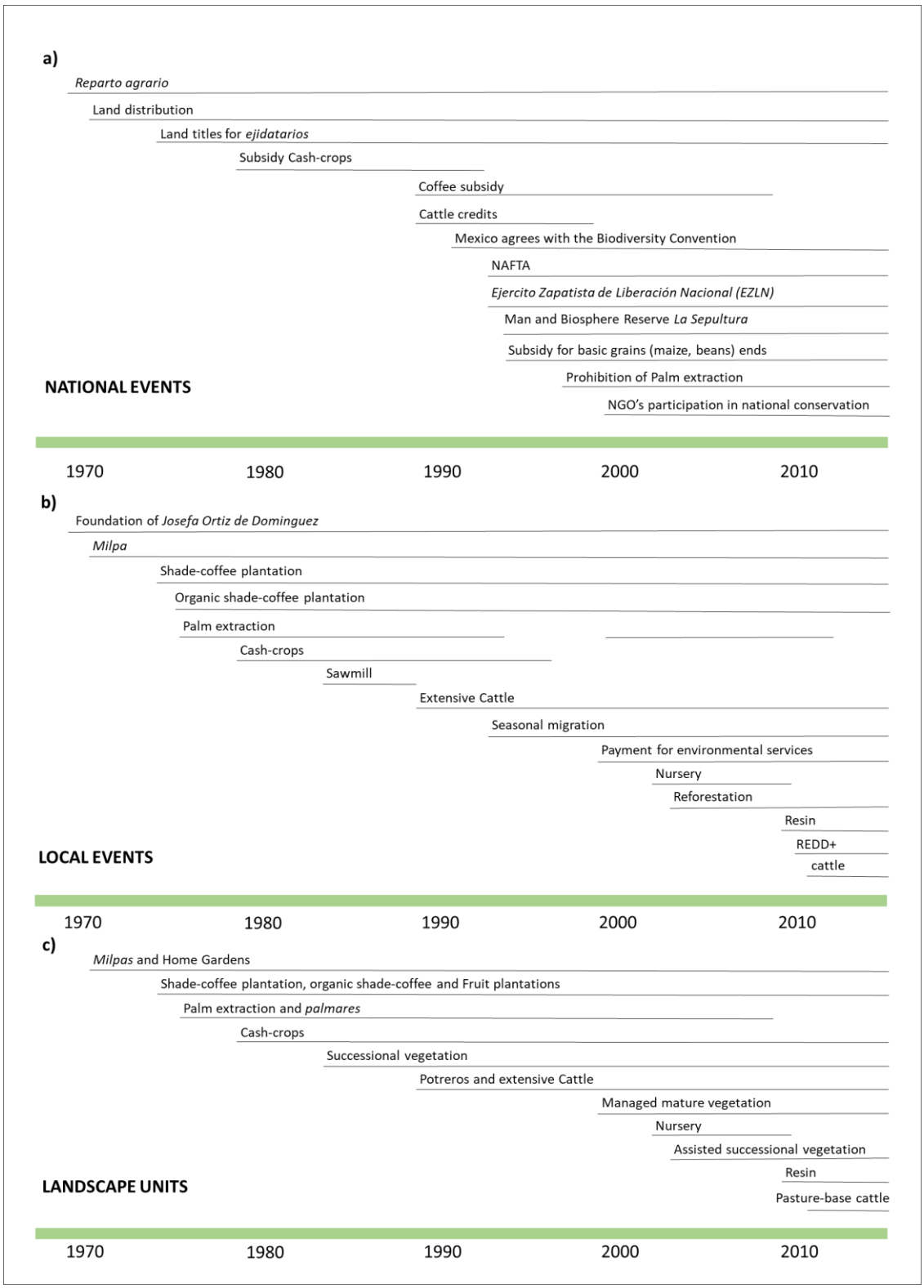

Figure 9. Historical overview of the (a) national events, (b) local events and (c) creation of landscape-units in *ejido Josefa Ortiz de Domínguez* as mentioned by *ejidatarios* and *pobladores (*1970-2017*).*

Table 3. Local institutions that are relevant for the access and use of natural resources in *Josefa Ortiz de Domínguez*, *Ejido* located inside *La Sepultura* Man and Biosphere Reserve, Chiapas. Mexico.

Local institutions
Management of resources
Firewood should only be extracted for home consumption.
Stealing is prohibited in all landscape units and it is mainly regulated by relationships of trust and solidarity.
Management of common areas is defined in *asamblea ejidal*.
Bodies of water should operate under communal agreements.
Vegetation next to water bodies should be conserved.
Hunting is prohibited.
Animals should not graze next to water bodies.
Traditional fishing is allowed.
Access to resources
Within the *Ejido*, nobody can own more than 5% of the total area of the land.
Illegal extraction of natural resources will be penalised by local authorities.
Pobladores should ask for communal approval if they want to buy land in the *Ejido*.
Areas for common management are exclusive for the use of *ejidatarios*.
Areas of common use cannot be seized.
One *ejidatario* can lend land to another *ejidatario* or *poblador* from the *ejido*.

Table 3 (*continuation)*. Local institutions that are relevant for the access and use of natural resources in *Josefa Ortiz de Domínguez*, *Ejido* located inside *La Sepultura* Man and Biosphere Reserve, Chiapas. Mexico.

Local institutions
Membership and limits on resource use
Freedom to organize productive groups
Selling alcohol is prohibited
Communal meetings are the spaces for discussing whether *avecindados* can become *ejidatarios*.
Elements of authority: ejidal assembly, *Comisario ejidal* and *consejo de vigilancia*.
Ejidal Assembly constitutes the highest institution for communal decision-making.
Comisariado ejidal is responsible for allowing agreements during *asamblea ejidal* to occur.
Comisariado ejidal represents and undertakes general management of the *Ejido*.
Comisariado ejidal is represented by president, secretary and treasurer.
Access and membership to resources
All men and women should participate in monthly “cleaning tasks” for the town.
Participation is exclusive for those with land-titles
Participation is considered as voting for a decision.
A person can be considered as an *ejidatario* if they possess land-titles for communal areas.
Pobladores are those who have lived in *Josefa Ortiz de Domínguez* for more than one year in the town and who are recognized as such by communal meetings.
Pobladores might become *ejidatarios* if they acquire communal land and it is authorized by the communal meeting.
Decisions in Ejidal Assembly need 50% plus 1 vote for operating.

Table 3 (*continuation*). Local institutions that are relevant for the access and use of natural resources in *Josefa Ortiz de Domínguez*, *Ejido* located inside *La Sepultura* Man and Biosphere Reserve, Chiapas. Mexico.

Local institutions
Nested institutions and participation of external actors
Projects promoted by external actors must be presented in ejidal meetings.
External institutions might be present during ejidal meetings but they cannot vote.
Credits, projects and subsidies promoted by external institutions should be distributed equally among *ejidatarios*.
Projects implemented by external institutions should not last more than 30 years.
Controlling fires is a shared responsibility between local and external institutions.

Discussion

Approaching environmental issues with a historical perspective is necessary when discussing conservation and sustainability (Alimonda, 2002). This approach is an opportunity for understanding the reasons behind landscape transformation as well as the circumstances that promote or challenge the preservation of the forest. Another important contribution in taking a historical perspective on the environment is that it explains local, national and global interactions. In this sense, the history of *Josefa Ortiz de Domínguez* becomes a space where these interactions take place and define the ecosystem.

In this dissertation the historical perspective on the landscape and the political history of *ejido Josefa Ortiz de Domínguez* become tools for knowing more about campesinos and conservation (Figure 9); for understanding the reasons that persuade campesinos to manage biodiversity and to find out more about what conservation means to them; and for recognising positive dialogues that campesinos and the MABR have had over the years.

Understanding the way conservation and development transform the local livelihood of people around the world is a fundamental element for environmental governance. The interaction between conservation and campesinos shows the evolution of conversations referring to ecology and sustainability.

However, practices that campesinos develop to remain as campesinos are rarely recognised as elements that transform local-global interactions in environmental theory, especially since campesinos are still often ignored.

The concept of sustainability might recognise and capture different ways of knowing and acting towards the environment. For this to happen, a historical perspective on the landscape is more than an analysis of the local-global interactions; it adds to the analysis of contributions of marginalised social groups to defining successful conservation and environmental alternatives for the future.

Non-economic values defining the history and the landscape at *Josefa Ortiz de Domínguez*

The events that define the history of the livelihood strategies in *Josefa Ortiz de Domínguez* demonstrate that values of individuals are not exclusively monetary. This happens in different campesino communities (Barkin, 2006; McMichael, 2008). For them, feelings, attachment to the land and preferences for certain activities are relevant when making decisions. Consequently, the plans and dreams of campesinos for the present and the future of their families represent a constant confrontation for the conservation agenda promoted by *La Sepultura*. This was clear when *ejidatarios* explained the reasons for developing one activity in preference to another. It was also apparent in their motives for choosing *Josefa Ortiz de Domínguez* as a place to live and, finally, in the decisions behind the evolution of their relationship with the MABR. The productive activities of campesinos find meaning in individual stories and family priorities.

Campesinos modified their local institutions after the entrance of *La Sepultura*

The imposition of conservation institutions and practices on *La Sepultura* is not a viable option for conservation in the long term. In the *ejido*, some conservation activities promoted by the MABR harmonize well with the activities developed by families from *Josefa Ortiz de Domínguez*. At other times, discordances dominate the relationship. In the *ejido,* one cause for failure was the incompatibility between conservation projects and the rest of the activities campesinos develop. For example, the resin extraction as an economic activity could not compete in time, energy and material benefits, with agriculture. It could not work as a complementary activity either because it required a lot of time investment. Additional reasons for this failure include the lack of attention technicians paid to the opinions of campesinos. Campesinos anticipated the activity would not work because of the ecological conditions of the forest.

In contrast, two activities that work together, complementing each other, are *milpa* and cattle husbandry. *Milpa* is the most important activity for home consumption and raising livestock is an essential activity for monetary income. Cattle husbandry receives technical support from *La Sepultura*. The interplay

between these two activities with conservation projects resulted in a positive relationship. The feeling of success is shared among campesinos and the staff from the MABR.

Contrasting opinions about the effects of MABR conservation projects at *ejido Josefa Ortiz de Domínguez*

For campesinos living in *Josefa Ortiz de Domínguez*, their institutions and practices experience change. This change depends on the economic, social and political context of individuals, families and the community. Subsequently, their economic strategy also changes. As a consequence, the landscape, where the mature vegetation exists, transforms.

It is evident that inside *La Sepultura* and *Josefa Ortiz de Domínguez*, an interlinked view of the landscape is challenged by the implementation of conservation practices. Particularly, this perspective about the landscape questions a definition of conservation based in a rigid set of rules and a static vision of the forest. Since the foundation of *La Sepultura,* conservation in *Josefa Ortiz de Domínguez* (which will be further discussed also in Chapter 4 and Chapter 6) limited the dynamism of the livelihood of campesinos. Consequently, it limited the dynamism of the landscape too. This created a conflict at the community level. As the establishment of the MABR strengthened some institutions and practices while weakening others, *pobladores* became particularly vulnerable. They are the first members of the community affected by the impositions of the MABR (*pobladores* do not own land and do not have political representation in the ejidal meetings where decisions are made). For some *pobladores,* the conflict seems permanent, and solutions might only come from the community during the ejidal meetings (for further discussion, see Chapter 6).

The landscape units created after the entrance of *La Sepultura* prohibit land-use change. This narrows the available areas for other activities. As a consequence, conservation projects create conflict among *ejidatarios*, *pobladores* and *La Sepultura*. At the same time, negotiation and opportunities related with

conservation have formalised some local institutions. This is a process that most campesinos in the *ejido* consider a positive change.

Conservation projects might enforce activities previously developed by campesinos at *ejido Josefa Ortiz de Domínguez*

In *Josefa Ortiz de Domínguez*, one of the most positive experiences promoted by *La Sepultura* was the program for managing fire. Before the entrance of the MABR*,* deforestation and uncontrolled fires were affecting people's lives and the wellbeing of their families. After the initial conflicts, both staff from *La Sepultura* and people from the community accepted a dialogue that improved people's management of their resources and promoted sustainable practices that continue until now. The implementation of the program for managing fire allowed campesinos to receive technical and economic support for keeping the *ejido* safe from fires. In addition, this event became the starting point for future collaboration between *La Sepultura* and *Josefa Ortiz de Domínguez*. The activity strengthened the ability of campesinos to have control over the activities developed in the forest. Campesinos showed previous interest in this matter. However, they did not obtain support from any governmental agency. The preventive activity now receives annual technical assistance and equipment. This helps campesinos with the monitoring and management of fire. Campesinos develop the activities related to fire management every year, with meaningful improvements year by year.

Main contributions of the history of *Josefa Ortiz de Domínguez* to conservation of biodiversity

The historical narrative of *ejido Josefa Ortiz de Domínguez* shows that campesinos distrust economic and conservation projects. In the experience of campesinos, these projects are temporary and are limited to monetary payments. Regardless of their short-term life, the community use them to diversify their livelihood strategy and to strength their local organisation. This happened with the palm project. After it ended, the palm project served as a starting point for the legal recognition of campesinos as a group. The entrance of cattle as a productive activity within the *ejido* followed this event. Being aware of the temporality of conservation and development projects leads women and men in the *ejido* to sustain the economic strategies that favour change.

The monetary scarcity and the prejudices that people face when living in poverty and inside a biosphere reserve might not determine the life of campesinos. The decision of women and men to settle in *Josefa Ortiz de Domínguez* goes against a pure capitalist logic ruled by profit and competition. Throughout their history in the *ejido,* campesinos have prioritised food security over money. Either as a coping strategy or as a political statement, food security represents one important interest behind the management of the landscape (Jose, 2009). Evidence of this was the creation of home gardens and fruit gardens. In this context, by creating and maintaining heterogeneity of economic activities, campesinos rejected becoming part of the labour force for the cities.

People in *Josefa Ortiz de Domínguez* have a dynamic view of their landscape and recognise themselves as active participants in this dynamism. They aspire to strengthen their local institutions, to build a positive relationship with conservation agencies, and to guarantee that their offspring will have opportunities for education and work in the future. In their relationship with *La Sepultura,* their livelihood strategy becomes an open system where innovation is possible. In this sense, innovation means collaboration with conservationists. And, one characteristic of the economic strategy of campesinos that takes advantage of this innovation is its duality. (For further analysis, see Chapter 4.)

I identified at least three factors that influenced the positive interaction of *La Sepultura* with campesinos at *Josefa Ortiz de Domínguez*. These factors are not exclusively monetary. (1) In some cases, people considered technical support and economic incentives from *La Sepultura* as a recognition of previous efforts tp maintain the forest, some of which have existed since the foundation of the *ejido*. (2) For campesinos at *Josefa Ortiz de Domínguez,* the economic incentives created a scenario for the consolidation of informal institutions and their conversion into formal institutions that regulate the use of the natural resources. (3) In *Josefa Ortiz de Domínguez*, the most important activities promoted by conservation agencies articulated with the existing notions of campesinos about the landscape.

CONCLUSION

A clear contribution of campesinos to *La Sepultura* is the maintenance of a communal protected area before the establishment of the MABR. The second most important contribution is the acceptance of *La Sepultura* as a positive learning experience for their local organisation and their family and community livelihood. In this sense, the history of the *ejido Josefa Ortiz de Domínguez* is more than a record for local successes and failures of conservation projects. It shows the evolution of the interaction between campesinos and a MABR. Also, it evidences the transformation of a local process where individuals and families decide whether they want to remain as campesinos or move to the cities. These historical events give meaning to the landscape of *Josefa Ortiz de Domínguez.*

Chapter 4 focuses on explaining local processes that guide the livelihood of campesinos and translate into an economic logic. Chapter 4 also analyses how conservation projects insert into this logic.

CHAPTER 4

Living in the Forest. Conservation of Biodiversity and the Livelihood Strategy of Campesinos at *Ejido Josefa Ortiz de Domínguez*

INTRODUCTION

In this chapter I explain the livelihood strategy of campesinos. I describe the different productive activities that campesinos developed in *ejido Josefa Ortiz de Domínguez.* As part of this description, I explore how campesinos make use of the landscape in a relational way. I focus on understanding the interaction between economic activities and conservation projects. Furthermore, I consider the ecological elements relevant for organising the productive activities of people in the *ejido* and the diversification of their livelihood strategy. The activities they develop complement each other and create a dynamic economic strategy.

For campesinos living in *Josefa Ortiz de Domínguez*, discourses and practices related to conservation are rather new. The foundation of *La Sepultura* evidenced a new agenda from the government. It was the first time economic policies in the country developed an interest in keeping the mature vegetation instead of encouraging land-use change. As illustrated in the previous chapter, conservation appeared on the political scene in Mexico after over 20 years of policies focused on clearing the forest, increasing agricultural land and extracting natural resources. However, in operational terms, conservation was not different from past economic policies. These policies were only promoted for two to five years, changing in name according to the government in power.

I felt disappointed during my first visit to the *ejido*, at the end of the first conversations I had with *ejidatarios.* The reason for this feeling was that I assumed conservation in *Josefa Ortiz de Domínguez* was limited to the set of practices promoted by the MABR: conservation projects that perpetuated top-down perspectives on environmental governance. I even thought I would have to change to a more promising research location. I gave myself one week to take the decision. During that week, Don Marco, one of the founders of the *ejido*, invited me to *caminar la montaña* (walking the mountain). Because, he said: "*We can talk about the forest here, while we drink coffee in the house; but it is in the mountain where you will understand more about it, and more about what we do"*.

To go to the mountain and the mature vegetation, a person must walk between 7 km to 10 km. Along this journey, that person walks through the town, the milpa, the fruit garden, the successional forest, the reforested areas, the coffee gardens and the *palmares*. The mature vegetation, called *montaña alta*, is a common place for campesinos to stop and rest at the end of their activities, especially during the harvest of coffee. Thus, going there implies moving across a diverse landscape. This is a complex environment full of meaning and memories: the plot where Marco created his first *milpas*, the trees he planted when his first child was born, the coffee gardens where he battles to find a solution for the pests. The journey also implies a gradual change in the local climatic conditions: from drier and higher temperatures near the town and the milpa to more humid and lower temperatures near the successional vegetation and the conserved mature vegetation. Soils are also heterogenous and partially determine the plant communities that exist in each landscape-unit (for more information see Instituto Nacional de Ecología, 1999).

When we arrived at *montaña alta*, it was clear that the mature vegetation of the forest was neither more nor less important for Marco than the rest of the plant communities he manages. Therefore, understanding for what and for whom the forest remains required understanding how the mature vegetation is connected

to the rest of the landscape, and how it connects with the life of the people in *Josefa Ortiz de Domínguez*.

I used the livelihood strategy of campesinos as a central framework for reference and analysis in this chapter for three reasons. First, I think the material relationship between people and the landscape is a good opportunity to enrich political ecology with a bio-ecological perspective. This perspective facilitates a further discussion about what an ecosystem is and what elements define it (Chapter 5). Second, I follow the suggestion of some ecologists and natural scientists who consider that understanding the material relation of people with their environment allows concrete recommendations with respect to the use and conservation of biodiversity (Janzen, 1973; Moguel and Toledo, 1999). Third, when I talked to campesinos about what it means for them to live in *Josefa Ortiz de Domínguez* and inside a MABR, the most salient elements in those conversations were the economic activities they develop there, and the way they see themselves in relation to those activities.

The analysis of the livelihood strategy of campesinos in *Josefa Ortiz de Domínguez* started with the long walks I did together with *ejidatarios* like Marco. Campesinos authorized me to go on one or two walks per week. The main motive for this decision was my safety. *Ejidatarios* considered the walking distances were long for someone unfamiliar with the physical efforts of going uphill, to *montaña alta.* Another reason was their available time; taking me as a companion demanded an extra time investment for them. Campesinos required days in advance for planning my participation in their activities. During our walks, I paid attention to the main characteristics of their livelihood strategy. I took note of the number of productive activities pursued by each *ejidatario*, the area designated for each activity, the destiny of the products obtained from each activity, and how the presence of the biosphere reserve contributed, either in a positive or a negative way, to their everyday activities.

The main contributions of this chapter focus on the following issues. First, it adds to a political ecology that focuses on the agency of campesinos and their moral economy (Biersack, 1999; Toledo *et al.,* 2003; Hamilton, Dewalt and Barkin, 2016). Second, it reveals an economic strategy based in more than monetary values and extractive activities (Raffles, 2005). Third, it explains how productive activities define individuals, families and communities, and their claim for recognition for their means of living (Garí, 1999; Wiersum, 2004). Fourth, the economic strategy of campesinos adds to an ongoing conversation about conservation, alleviation of poverty and sustainability (Boff, 1987; Fischer, Hartel and Kuemmerle, 2012; Dussel, 2013). In what follows, I first explain some general characteristics of the livelihood strategies of campesinos. Later, I analyse the specificities of the economic activities developed by people living in *Josefa Ortiz de Domínguez*.

Moral economy and campesinos in Latin America

Moral economy is a concept developed by Thompson (1968) and Scott (1976). It explains how the contradictions between the market economy and the traditional activities of the poor and working-class people determined the protests in England during the XVII century. Scott (1976, 1998) expanded the analysis of the moral economy to peasants in Europe and the Global South. He included the importance of topics such as land tenure and extraction of resources in the subsistence economy. With time, anthropologists such as Dove (2011, 91-119) and Norget (2012, 85-106) got inspiration from moral economy to introduce the term of moral ecology, which introduced topics of food production and environmental conservation into the debate about how modern practices on the environment act in opposite directions to indigenous and local perspectives on the environment.

Similarly, the Latin American concept of *buen vivir* explains some of the ethical and moral principles of some indigenous cultures and their differences to traditional approaches to development (Gudynas, 2011). *Buen vivir* denotes a system of knowledge and living where natural and human systems are interrelated. It envisions an equal society based in solidarity, promotion of

cultural diversity, social memory, conservation of nature and the maintenance of a healthy environment (Walsh, 2010). Chaves *et al.* (2018) explored the concept of *buen vivir* and showed how this notion is envisioned and practised in Colombia. The authors state that the concept exemplifies a transition narrative occurring in Latin America: a set of habits full of contradictions and challenges that find solutions when people bring them into practice. For the authors, *buen vivir* articulates diverse societal groups (such as indigenous and non-indigenous) around shared values. It reflects on different ways to build relations between nature and people; it is relational and biocentric in the context of sustainability and new ruralities. This means that the approach might suggest opportunities for conservation, development and economic growth.

Campesinos and the land-sharing versus land-sparing debate

One of the most fascinating questions regarding rural studies and conservation addresses the best way of satisfying a growing demand for food alongside the need to reduce negative human impacts on the environment. Promoting small blocks of contiguous forest associated with agricultural land or maintaining big spaces of agricultural land separated from mature vegetation? The first option is known as land-sharing; the second, as land-sparing (Harvey *et al.*, 2008; Tscharntke *et al.*, 2012). Generally, land-sharing perspectives on conservation relate to local management in tropical ecosystems (Noble and Dirzo, 1997). Land-sparing perspectives refer to the intensification of agriculture alongside total restriction of forest management (Phalan *et al.*, 2011). Usually, supporters of land-sharing perspectives consider agriculture as a priority for rural communities and look for sustainable strategies for producing food based on local ecologies and local practices (Faust 2001). Supporters of the land-sparing perspective see agriculture from a productive point of view. They suggest that conservation and economic development benefit by intensifying agriculture, separated from protected areas (Phalan *et al*., 2011).

Sometimes, projects related with these two schemes for conservation lack a critical perspective (Kay, 2006; Fischer *et al.,* 2011, 2017; Fischer, Hartel, and Kuemmerle, 2012). They do not question who should have a say in defining

why biodiversity should be conserved (Scoones, 2009). In such projects, harmonising agriculture, conservation and alleviation of poverty seem impossible and fruitless efforts are discouraging.

Biodiversity indices work for both sides of the debate. Land-sharing and land-sparing approaches recognise that including a landscape perspective and facilitating the mobility of species in conservation schemes could potentially promote biodiversity and productivity in the forest (Liang *et al.,* 2016; Moritz *et al*., 2000). However, these recommendations evidence limitations of conservation projects promoted in many protected areas in Mexico and Latin America. The tradition of these projects is to address conservation and sustainability almost exclusively from the perspective of land-sparing. Another limitation of these projects is focusing on the number of species (*alpha* biodiversity) when defining biodiversity and not on the ecological interactions within and among ecosystems (*beta* and *gamma* biodiversity) (Moreno-Calles *et al.,* 2018).

Concerning who are the important actors when maintaining biodiversity, some PAs are willing to work jointly with local individuals and communities. They accept the possibility of building ecological knowledge and conservation strategies as the product of a collective effort grounded in the local context (Agrawal, 1995; Hardin, 2008). Others consider local people as passive agents of change, who might simply receive information and accept economic incentives from the projects that intend to safeguard biodiversity within their territories (Schleper, 2017).

Agriculture and conservation of biodiversity in the campesino territories

In Latin America and other parts of the world, campesinos usually adopt a livelihood strategy associated with local agriculture and different environmental services. As explained in the previous chapter, this strategy consists of multi-stranded use of natural resources (Gudeman and Rivera, 1990; Esen, 1993). Its analysis in ecology is rare but necessary, especially because ecosystems constitute the material base for campesinos to develop their living (Silverman, 1979; Welch and Mançano Fernandes, 2009).

According to Shanin (1973), livelihood strategies are a recurrent topic in research on new ruralities. For this approach, families and villages constitute different but related levels of organisation in the economy of people (Scoones, 2009). Because of this, three issues are relevant for this dissertation. The first refers to the ways in which a diversified livelihood strategy builds through time. The second is the use of biodiversity as an element for the evolution of this strategy. The third is the economic logic behind it, which defines the participation of campesinos in local markets and national and international socio-economic policies. I explained the first topic in Chapter 3; I explain the second and the third in Chapter 4. Under certain cultural and social circumstances, the livelihoods of campesinos create heterogeneous landscapes ecologists and environmental scientists term agroecosystems (Charnley and Poe, 2007). Therefore, it is first indispensable to explain what an agroecosystem is.

Agroecosystems and *Milpa.* Their role in the economic strategy of campesinos

The *Oxford Dictionary of Environment and Conservation* (Alaby and Park, 2013) defines agroecosystems as "*part of biodiversity related to the intervention of farmers in processes of natural selection over long periods of time… Agroecosystems include the domestication and diversification of plants and animals, the use of wild plants, and the manipulation of natural vegetation. These processes imply human influence on plant communities and ecosystems*".

In material terms, campesinos in Mexico promote a diversified livelihood strategy centred on an agroecosystem called *milpa* (Perfecto and Vandermeer, 2008; DeClerck *et al.*, 2010). *Milpa* possesses a long history that goes back to pre-Colombian times, 9,000 years ago. It is a shifting cultivation system that produces food and transforms the landscape (Altieri, 2004; Castella *et al.,* 2011). It allows the co-existence of different plant species, including various varieties of maize (Perfecto *et al.*, 1996). Together with maize, campesinos cultivate beans (*Phaseolus vulgaris*), squash (*Cucurbita maxima*), chilli (*Capsicum annuum*), and other edible plants in *milpas*; also, they take care of the matrix of mature vegetation around it (Gomez-Pompa and Kaus, 1999;

Perfecto and Vandermeer, 2008). After 5 to 10 years of management, the land where *milpas* grow enters into a resting phase in which natural vegetation starts a successional process; while this happens, a new *milpa* cycle is begun in a different area (Isakson, 2009).

The word *milpa* comes from the Nahuatl words, *mili*, crop field and *an*, on top of. This agroecosystem fosters 65 varieties of maize, and it represents the main economic activity of most campesinos in Mexico (Frece and Poole, 2008). Different semi-domesticated and non-domesticated plant species coexist associated with *milpa*. In the MABR Tehuacan-Cuicatlan for example, people use 1,335 plant species that grow in association with *milpa* and within the successional vegetation units that *milpa* promotes (Casas *et al.*, 2007).

Ecologists working on *milpas* no longer subscribe to simplistic “equilibrium” models of succession in which forest returns spontaneously to a climax state after a disturbance (Nigh and Diemont, 2013). *Milpas* generate a successional forest with seasonal habitats for flora and fauna that transform the landscape in the long term (Moreno-Calles *et al.*, 2016). This successional forest receives the name of fallow agroforestry system or *acahuales*. Here, individuals modify the arrangement of the plant communities by combining agriculture and cattle. Campesinos might also grow coffee plants (*Coffea spp*.), cocoa plants (*Theobroma cacao*), pepper (*Capsicum spp*.), vanilla (*Vanilla vanilla*), fruit trees and citrus trees among others (Alcorn, 1981).

Successional vegetation associated with *milpa* creates a variety of habitats and corridors of vegetation where species coexist. The study by Medellin and Equihua (1998) for example, shows that *milpas* in Chiapas allows a heterogeneity in the landscape that supports a higher population density of small mammals in the region compared to monocrops. Here, some biodiversity remains, and ecological dynamics support the functioning of ecosystems while providing benefits to people (Kleinman, Pimentel and Bryant, 1995).

The efficient functioning of agroecosystems allows the circulation of nutrients (Bhagwat *et al.*, 2008). The rotation between cultivated fields and secondary forest allows woody vegetation to build soil fertility after cultivation (Nigh and

Diemont, 2013). According to Perfecto and Vandermeer (2008), *milpas* are endowed with nutrient-enriching plants, insects' predators, pollinators, nitrogen-fixing and nitrogen-decomposing bacteria. The genetic diversity associated with *milpas* provides security to farmers against diseases, pests, droughts and other stresses. In consequence, campesinos exploit a full range of ecological zones with different soil quality, altitude, slope, and water availability.

In Mexico, one of the most popular and best studied agroecosystems is the Mayan *milpa* (Ford and Emery, 2008; Ford and Nigh, 2009; Nigh and Diemont, 2013). Nowadays, these food production systems adopt a successional dynamic that initiates with the mature forest. Campesinos clear an area of 2-5 ha that they subsequently use to cultivate their crops; after five years, campesinos leave these areas fallow (Frece and Poole, 2008). This process starts a successional dynamic; a cycle of rotation of crops and successional stages of different age (Nigh and Diemont, 2013). The resulting landscape receives the name of Mayan forest garden (Ford and Nigh, 2009). The Mayan forest garden demonstrate that *milpas* possess a particular ecology. In these agroecosystems, herbs, roots, plants of native vegetation live together with crops (Gomez-Pompa, Vazquez-Yanes and Guevara, 1972).

Milpas developed by Lacandones are also well known by ecologists (Stigler 1951). Lacandones are one of the smallest Maya groups but also the one with the most prolonged history of continuous occupation of the Chiapas rain forest. They possess a detailed knowledge of the tropical lowland environment and they practise *milpas* based on maize and a variety of other edible plants. In addition to *milpa*, secondary forest (derived from previous *milpa* cycles), mature woodlands and aquatic or semi-aquatic ecosystems provide various resources to Lacandones.

The Mayan forest garden and the Lacandon *milpa* are two well-known agroecosystems for ecologists in Mexico (Stigler, 1951; Ford and Emery, 2008; Nigh and Diemont, 2013). *Milpas* shape biodiversity in the tropical forest, one of the most biodiverse ecosystems in the country. However, *milpas* are also the most common type of agriculture in rural Mexico (Altieri and Toledo, 2011; Sweeney *et al.*, 2013; Eakin *et al.*, 2014). *Milpas* from different regions of the

country vary in aspects such as the number of species cultivated. Yet, they all share some of the ecological characteristics mentioned above. Differences depend on geographic and cultural circumstances (Moreno-Calles *et al.*, 2016). Different *milpas* have been analysed in campesino and indigenous communities; in communities located at sea level or over 2,000m above sea level (Hernández-Xolocotzi and Bello Baltazar, 1995; Terán and Rasmussen 2009).

It is important to clarify that today in Mexico, *milpas* developed by campesinos are considered the primary motor by which campesinos cause deforestation (Durand and Lazos, 2004). Demographic and economic pressures make people shorten the fallow periods of *milpas* (ENAREDD+, 2014). These pressures interfere with the recovery of the soil and the ecological dynamics associated with it. However, data usually used as evidence against *milpas* often come from different intensified agriculture systems of small-scale farmers (Daniels *et al*., 2008; Harvey *et al.,* 2008; McGee, 2002).

Contributions of *milpa* to the livelihood of campesinos

One of the most striking aspects of *milpas* is what happens with the landscape transformed around them. At the landscape scale, *milpas* integrate production systems to form mosaics of crops with livestock, fallow fields with agroforestry. In this way, diversification creates an agricultural land immersed in a matrix of primary or secondary forest (Perfecto *et al.*, 1996).

However, little academic research deals with the interplay between the *milpa* and the livelihood strategy of campesinos. Toledo *et al.* (2003) developed one of the most relevant academic papers in Mexico involving the complexity exposed above. They combined ecological and social characteristics associated with agroecosystems to explain the livelihood strategies of campesinos in Mexico. They were interested in arguing for the adaptive capacity of campesinos to social and ecological transformations. The authors showed how different societies share the same basic diversified system for managing natural resources associated with *milpa*. This strategy consists of various productive activities that work within a complex environmental matrix. Toledo *et al.* (2003; 2017) suggest that the indigenous and campesino strategies for managing

natural resources represents a case of adaptive management that reacts to modernisation and at the same time maintains biodiversity and ecological resilience.

Other agroecosystems, called coffee gardens, fruit gardens and home gardens are equally important as *milpas* for maintaining high rates of biodiversity (Aguilar-Støen *et al.*, 2011). Furthermore, nutritional analysis shows that the high diversity of plants and animals in these agroecosystems contributes to enrich the family diet (Alayón-Gamboa and Gurri-García 2008).

Contributions of coffee gardens, home gardens and fruit gardens to the livelihood of campesinos

According to Toledo and Barrera-Bassols (2017), Mexico produces nearly one-fifth of the global production of coffee and has been the leader in organic coffee production for more than 20 years. Ninety percent of the coffee production in the country comes from coffee polycrop and coffee gardens of less than 5 ha. Since the 1990s, when subsidies for coffee production and commercialisation ended, hundreds of small-scale coffee producers organised themselves into autonomous cooperatives. Today in Mexico five different systems produce coffee in different regions: rustic polycrop, traditional polycrop, shaded commercial monoculture, two coffee systems under planted trees often known as coffee gardens, and sun-coffee systems. The sun-coffee system is characterised by a reduction in shade and an increase in chemical inputs. They are more prone to water and soil runoff. Meanwhile, coffee gardens have an average of 41-67 species per ha.

In most of the Mexican territory, coffee gardens are established in the rain forests, considered the most biodiverse forest in flora and fauna in the country. Campesinos create these agroecosystems in the mountains, some calling them “man-made forests” or shade coffee gardens. Coffee gardens work as a refuge for biodiversity, predominantly for birds, mammals, flowering plants and insects. In coffee gardens, the canopy of the forest is preserved, and different environmental services are provided. Coffee gardens developed by campesinos have become an important economic activity for indigenous and mestizo

communities as part of a livelihood strategy that builds and strengthens their political autonomy in Chiapas.

Aguilar-Støen *et al.* (2011) studied coffee gardens in Mexico. They found that these agroecosystems are very important for the livelihood strategy of campesinos. Their most positive effect occurs when campesinos have secure land-tenure and a local economy that depends on cash and subsistence activities. The authors show that coffee gardens and other agroecosystems play a crucial role in food security. Campesinos base the maintenance of coffee gardens in their life experience. They create present and future scenarios based on the fluctuation in coffee prices and economic uncertainty. The authors found that these agroecosystems do not demand intensive management, making it possible to maintain them during periods of high and low harvest. Thus, coffee gardens are rarely abandoned.

In the ecological sense, coffee gardens maintain different forest strata: litter, herbs, shade trees, as well as surrounding forest (Perfecto *et al.*, 1996). These agroecosystems allow coffee plants to grow under the shade of the forest canopy and without agrochemicals (Aguilar-Støen *et al.*, 2011). This way coffee gardens preserve the quality of the soil, the water runoff, and work as refuges for biodiversity. This results in one of the most biodiverse agroecosystems in Mexico (Perfecto *et al.*, 1996; Bermeo, Couturier and Galeana Pizaña, 2014)

Regarding fruit gardens, Mellink, Riojas-López and Giraudoux (2016) found that these agroecosystems are relevant for conservation of biodiversity too. They represent low-input systems which give social and ecological benefits. They contribute to enrich ecological interactions where fragmentation is unlikely to be restored. Additionally, Peters *et al.* (2010) mention that abundance and predictability of food resources in fruit gardens increase animal species richness in tropical forests. Their results show that fruit resources support richness in avian communities and contribute to high levels of avian persistence.

Alayón-Gamboa (2015) works on home gardens. He mentions that home gardens are common in campesino communities and that 95% of houses in rural Chiapas possess one. He documented different Spanish names for these

systems: *solares, traspatios, patios.* He explains that home gardens are agroecosystems commonly present as part of the homestead since pre-Colombian times. Their role in safeguarding biodiversity makes them relevant for the study of conservation. Home gardens in Chiapas start when people get married and a new home is established. Home gardens grow as time passes with medicinal, food and other plants being added. It is an agroecosystem mainly crucial for women as it is a place where they interchange knowledge, plants, and strengthen their social relationships.

Sarmiento and García (2017) have also worked on home gardens and found that many of the plant species here are multi-purpose. They analysed the biodiversity of home gardens in a community inside the MABR *La Sepultura*. They found over 40 species, 85% of which were native. The authors conclude that the maintenance of the knowledge regarding this biodiversity through generations is one key point that requires more in-depth analysis in the region.

Also, Gasco (2008) described essential characteristics of home gardens in Chiapas. These characteristics mainly referred to the management of cultivated plants and their destiny as products for home use or sale at local markets. She discusses the increasing acknowledgment of home gardens as sophisticated systems capable of meeting local demands, based on forest management principles advocated by women. Martinez *et al*. (2015) noticed that home gardens are the primary source of food for the most impoverished families in a campesino community in Chiapas. The authors explain that campesinos might not possess land for developing *milpa*, but they might own a home garden in their homestead. The primary contribution of home gardens to the family diet comes mainly from edible plants and fruit trees. This is because low-income families might not have many animals to feed because of their maintenance cost.

Campesinos and agroecosystems. Landscape management and the economic strategy of campesinos

Some ecologists define *milpa* as a resilient, agro-biodiverse practice within the context of recent global land-use changes (Toledo *et al.*, 2003; Ford and Emery, 2008; Altieri and Toledo, 2011). In research on conservation and

alleviation of poverty, *milpas* and similar agroecosystems have received renewed attention, especifically, for combining issues on food security and *in situ* conservation (Zimmerer, 2011). Under certain circumstances, these cultivation systems represent hotspots of high agrobiodiversity (Paré, Robles and Cortes, 2002). Nevertheless, Rocheleau suggests that agroecosystems do not yet receive enough interest from environmental science (Radio Zapatista, 2017). Few people recognise them as part of global solutions to environmental problems. As a result, there are no sufficiently robust underpinning theories related to them.

As mentioned in Chapter 2, in Mexico, the ecological interest on *milpas* started in the 1970s with the pioneering work of Hernández-Xolocotzi. *Milpas* and *agroecosystems* became part of global conversations on conservation of biodiversity during the 1990s. During this time, ecologists rarely enriched the theory of conservation ecology with research frameworks that included management strategies of campesinos. One interesting aspect of approaching *milpas* and diversified livelihood strategies as systems that might contribute to conservation of biodiversity is looking more closely at the people who create these systems: who they are and what is important for them. Luckily, these issues are gaining interest in ecology and political ecology, especially when considering conservation in the long term and sustainability.

Often, conservationists define campesinos as poor people; individuals who depend on natural resources to survive (Neumann 1998; Adams and Hutton 2007; Peluso and Lund, 2011). However, it is less commonly acknowledged that they hold important knowledge that is key to sustainable land use and conservation. In the face of deforestation and degradation of protected areas and their surrounding ecosystems, working with campesinos as active players in conservation implies recognising that successful conservation requires local experience (Rosset and Martínez-Torres, 2012; Bermeo, Couturier and Galeana Pizaña, 2014; Gliessman, 2016). Successful conservation also requires recognising the dual agency of local people in maintaining, as well as using, the forest (Gonthier *et al.* 2014). Sustainable practices for satisfying family demand for material goods work together with the growth of the

agricultural frontier promoted by local, national and international demands (Perfecto and Vandermeer 2008; 2010).

Under the influence of conservation policies, values and interests of campesinos change through time (Hendrickson and Corbera 2015). In a world of unbalanced power interactions and economic pressures, the livelihoods of campesinos internalise failures and successes in conservation (García-Amado *et al.,* 2012, 2013). In this chapter, I show evidence of these processes. They take place where actors create dialogues, share interests and willingness to collaborate (Wilshusen *et al.*, 2002; Persha, Agrawal and Chhatre, 2011). Studying the livelihood of campesinos represents an opportunity for understanding local perspectives on conservation. It also provides information about the economic logic of campesinos. Both issues are key for addressing sustainability and the interplay between humans and the environment (Bryant, 2015).

The Livelihood Strategy of Campesinos at *Ejido Josepha Ortiz de Dominguez*

Today, the livelihood strategy in *ejido Josefa Ortiz de Domínguez* involves at least 15 different landscape units and 21 different activities. The landscape units are: *milpas*, home gardens, frutales (fruit gardens), nurseries for coffee plants, organic coffee gardens, coffee gardens, *palmares* (vegetation where dominant species are Camedor palm), assisted successional forest, successional vegetation under management, mature forest, protected mature forest, extensive cattle grazing, pasture-based cattle rearing, cash crops, streams and springs.

Activities designed to achieve food security at the family level are *milpa*, hunting, fishing, logging, collecting plants, collecting firewood and maintaining home gardens, fruit gardens and nurseries. Activities destined to produce goods for the market or achieving an economic income are: cultivating shade-coffee, cultivating organic shade-coffee, maintaining *palmares*, extracting pine resin, participating in reforestation, maintaining free-ranging cattle and pasture-based cattle, developing a payment for environmental services (PES) initiative,

migrating (temporary), running convenience stores, farming cash-crops (maize, tomato, watermelon and bean), and monitoring native fauna.

Next, I will explain the logic behind the diversified livelihood strategy (Figure 10), the relevance of production activities supporting family consumption, and their interaction with activities intended to produce a cash income. I will start by explaining *milpas* and their role in the identity of campesinos at *ejido Josefa Ortiz de Domínguez.* I will later discuss their role in the creation of opportunities for land-management.

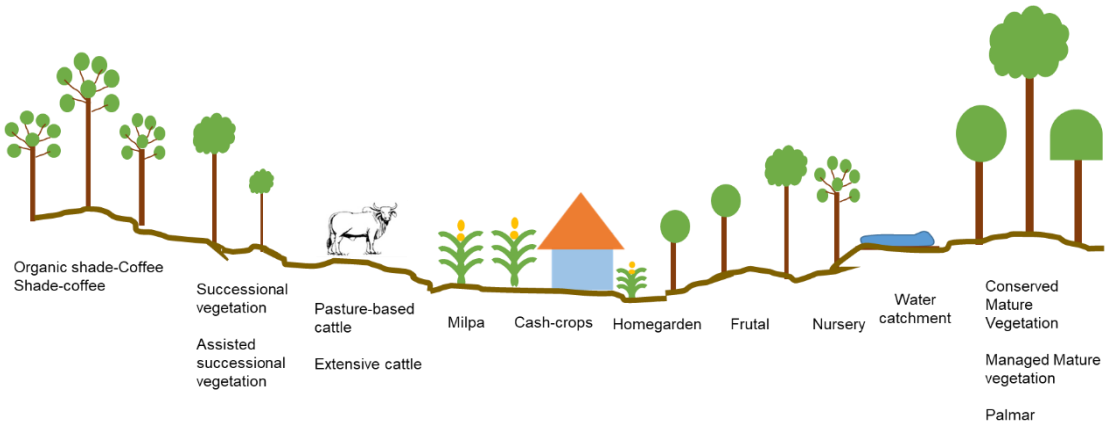

Figure 10. Diagram showing how the livelihood strategy of campesinos define the landscape-units in the mestizo community of *ejido Josefa Ortiz de Domínguez*. There is an altitudinal arrangement of activities. This example is based on the livelihood strategy of one family. Here, the house and home garden are located at 920 m.a.s.l.; milpas and pasture-based cattle, between 950-970 m.a.s.l.; the frutal and the nursery, between 960-1000 m.a.s.l.; successional vegetation and water catchment, between 1000-1060 m.a.s.l.; organic shade coffee and shade-coffee, at 1100 m.a.s.l.; and mature vegetation and *palmares*, at 1200 m.a.s.l.

Milpas:* the life of campesinos at *ejido Josefa Ortiz de Domínguez

In *Josefa Ortiz de Domínguez*, *milpas* have an average size of 2 ha, and they are located at 2 to 4 km from the town. Here, every male head of family maintains *milpa* as a family activity. Fathers, sons, and sometimes wives and daughters cultivate and take care of the maize, bean, squash, chilli and the rest of the plant species making up this agroecosystem. To explain the relevance of

milpas in defining the livelihood strategy in *Josefa Ortiz de Domínguez*, it is necessary to consider how *milpas* and their products contribute to the identity of people living here. In this sense, men and women in *Josefa Ortiz de Domínguez* define themselves as campesinos:

> *"We are* campesinos*. We know about land and milpa; this is what our fathers did, and we are now working for our children. We want them to value our heritage and to achieve a good education. The future of our children is the milpa and the forest, but they need to be prepared and educated for taking advantage of the opportunities".*

In the same manner that heads of family define themselves in terms of the *milpa* and the productive activities they develop (such as harvesting coffee or cutting palm), women and children find meaning in their close relationship with their landscape and with the opportunities they create for them and their families. For example, the role of women goes beyond the house tasks. Just as men do, women diversify their activities. It is common for women in *Josefa Ortiz de Domínguez* to sell candy, homemade ice cream and clothes they have tailored within the *ejido*. This way, women create networks of cooperation among themselves. Furthermore, they exchange plants and animals from their home gardens with other members of the community.

By describing themselves in terms of their activities, people in *Josefa Ortiz de Domínguez* relate to their culture, to their role in society and to their challenges. This was clear from the very start of my experience in the community, when Don Ángel, one of the most beloved *ejidatarios* in *Josefa Ortiz de Domínguez*, talked in his house about the importance of their activities and about the different productive activities he and his family develop. During our conversation, Don Ángel explained to me:

> *"Our maize and our trees are our most valuable treasure; this is our legacy even though nobody considers them essential…We work for the rich and for ourselves, the poor; for people living in the low mountain and for people living in the city".*

Another young *ejidatario* also explained to me the importance of his activities. As for many other campesinos in *Josefa Ortiz de Domínguez,* he is used to travel regularly to the main municipality. However, he has chosen to live as a campesino together with his family:

> *"I like living in Josefa Ortiz de Domínguez because the food is always available, and you still have work. If you travel to the city, you need money for buying everything. Here it is different. If you want maicito or firewood you go to the milpa; if you want fruit or a plant for cooking, you go to the home garden".*

As explained in Chapter 3, milpas represented the first activity developed after the creation of the *ejido*. When families arrived at the forest and established *Josefa Ortiz de Domínguez*, men came with sacks of maize. This maize was the seeds for future milpas and represented the life savings people brought to found their new homes.

Milpas allowed campesinos to survive under precarious circumstances and to face the inherent conditions involved in transforming an entirely different landscape. Campesinos established milpas in *Josefa Ortiz de Domínguez* even before the government gave land-titles. *Milpas* represented the first distribution of land among ejidatarios and their first informal agreements. During the 1990s, campesinos could not sell products from *milpas* and cash-crops. People renounced cash-crops, but *milpas* remained as the most important activity. Even when male heads of the family migrated, their families maintained *milpas*: children, wives and extended relatives.

Women participate in the milpa and transform the landscape and their local institutions at *Josefa Ortiz de Domínguez*. One example of the important role of women in the house economy is Lourdes. She is an active wife and mother. She is always inviting other women to take part in local initiatives. In her free time, Lourdes bakes bread, makes the floral decorations for the church and sells clothes she has designed and made. She was also the first female participating in the group of cattle producers. Today, only two women take part

in the cattle project: Lourdes, who is a *pobladora*, and Doña Josefina, an *ejidataria*. Every day, Lourdes visits her mother. Visits occur before lunch and after dinner. It is important for me to say that her mother, Silvia, was my neighbour. Silvia always dresses in blue. In the course of any one day she receives visits from more than 30 grandchildren. She offers them, and me, pozol (a traditional beverage made with water, granulated maize and sugar).

Lourdes is married to Don Genaro. They got married when she was 18 and he was 20 years old. Together, they have five children: Patri (18 years old), Brenda (15), Alfonso (12), Elisa (10) and Natalia (8 years old). Only Brenda lives in Villaflores while she studies at high school. Lourdes and Don Genaro gave Lourdes`s sister a small room next to their house for her to live. Irma, Lourdes sister, lives in a 10-$m^2$ place together with her two small children, Jorge (8 years old), and Emilio (3). Irma`s husband works outside *Josefa Ortiz de Domínguez* as a construction worker. All the children: brothers, sisters and cousins stay together throughout the day. I met Doña Lourdes and Doña Irma because Natalia and Jorge became my assistants. They took me to the houses of the interviewed; they introduced me to the families and stayed near me until I finished my conversations. Natalia used to wear my hat and my camera, so she became a photographer, creator of many of the photographs that illustrate this dissertation. Jorge, at only 8 years old, introduced me to the forest. He took me on my first field trip. His grandfather warned me that Jorge did not like working in the *milpa*, but that he was very good for names and for catching birds. In the forest, Jorge taught me the names of the plants:

> *"Be careful while you walk in the forest; sometimes it can be dangerous. I will take you and I will show you the plants we have. Come…this is an avocado tree. This, a nanche tree, below ground, camotes are growing. These are for you and your family".*

One day, after I took my daily pozol drink, Lourdes visited her mother, Patri, and her oldest daughter asked me:

“Are you working on your computer? My mom, my sister and I are going to the milpa, my dad is in the camp for the whole week, and we need to take care of the milpa. We will also collect some firewood. Do you want to come? I brought lunch for everybody”.

“All this land belongs to our grandfather. From here, all the way to the mountain. In addition, it is here, very close, where my dad and we have our plot. My dad bought it for our uncle. We don´t make milpa here, but we have some trees, nanche trees and tangerine trees. In case you want some, you can cut the fruit from here. We also have mangos. They are not ready yet, but my youngest sisters eat the mango like that. They put some salt on it and they eat everything. Sometimes there is no more mango to ripen”.

We walked for 30 minutes. Doña Lourdes started to explain:

“Look, Gaby, here is where we have our milpa. This time Genaro cultivated three different types of maize”.

I realised that the *milpa* was divided into three different crops. I asked Doña Lourdes for a more detailed explanation.

“Some maize is criollo, that´s the one we always cultivate here. It belongs to Josefa, it has been cultivated since the Ejido was created, and it is the best maize. We save some seeds from the last harvest, and we cultivate the seeds in the next season.

In addition, we have this other maize, which is smaller. It is called maize-three months because it grows very fast and, supposedly, in three months is ready for the harvest. Genaro found this maize with his friends, and he decided he was going to cultivate it. However, it is taking more than the three months for harvesting, it is smaller, and it requires a lot of water. I don´t think we will cultivate it next year.

The last one: the one that is very tall is called hybrid, is the one that you buy in stores, but it is very expensive. Genaro wanted to try, these are seeds you buy in the market in Villaflores, but it is costly; we are not buying this maize anymore".

Here is also the milpas from my little brothers. We all have our milpas here. Last year my dad divided this big plot and said: here you have two ha for each family. We started the cultivation cycle with beans and now we are cultivating maize.

Do you want to see how the milpa looks like from a distance? It is beautiful. Come. Come with me. Look how beautiful the mountain looks from here. It looks beautiful. Now, let´s rest for a little while. Let´s go, come; we are going to the top, where the guayabo tree is. There we can rest".

Moreover, there at the top of the *milpa*, we four women could see the maize, the successional vegetation and the conserved forest. Then, Doña Lourdes told me:

"I like to live here, on the mountain. I remember when I was pregnant with Alfonso, my son. I only wanted to come here, to the milpa, and to lie down by the tree while Genaro was working. Do you know that when women are pregnant, they want to eat different things? Well, for me that never happened. The only thing I wanted was to be here and to wait for Genaro until he finished his work. And to refresh myself with the air from the mountain.

…Ok, let´s go. Because Alfonso will have his break from school and if he does not find us home he will be mad. Do not forget the firewood. Genaro cut it last Sunday. We have to carry it home. Let´s go girls".

I do not think there is a better way to express the coherence among the actions, the words and the feelings of campesinos like Lourdes. Her conversation connects all the elements that give support and strength to the economic strategy of people in rural Mexico. The experience was enriched when Patri approached me to explain an important lesson she learned in the *milpa*:

> *"My dad comes to the milpa only on weekends, when he can rest from his job in the camp. It is complicated for him because he doesn´t have a day for resting and his knee is hurt. Nevertheless, we help in everything we can. We even come to cut firewood when we need it. Working in the milpa taught me that I could do everything. It is not true that there is work that only men can do. I can do everything that men do. They can do everything that women do as well.*
>
> *The other day, for example, we went to our plot because we have to seed the grass that will be used for the cattle. We had many seeds we had to put in the soil, and everybody went. Elisa, Brenda, Alfonso, Natalia my mom, my dad and me. We started working all together. We have to do everything together because dad cannot work during the week in here; he is in the camp and monitoring fires.*
>
> *I was looking at the soil while I was seeding. Suddenly, I do not know why, I looked back to what we had done until that moment and I saw all the work that needed to be done. I complained to my dad: We still have a lot of work to do, look at all that soil without seeds! My dad answered me: do not look at that Patri, because you will feel overwhelmed. You have to focus on what is in front of you. Focus on that, and everything will be fine".*

The congruity Lourdes revealed is the seed from which environmental movements get a voice in Mexico, and perhaps, in other areas in Latin America. The strength of the environmental movements I discuss in Chapter 6 may come from historical processes of land-dispossession. I am certain that this strength

also grows from the values and the actions of campesinos. These two elements come together in the everyday life of the people like Lourdes and her family, who chose the mountain to develop a living.

In addition, conservation allowed this story to happen for this family. The first person from *Josefa Ortiz de Domínguez* working in *La Sepultura* was Don Genaro, Lourdes's husband (Figure 11). He is a *poblador* in the *ejido*. He and his siblings were born in Villa de la Rosa, a small town near San Cristobal de las Casas. Don Genaro is 38 years old. Women and men know him for the easy way he makes friends, and he explained why he works for *La Sepultura*.

> *"Juvenal (technician from La Sepultura) was my friend. I usually talked to him while he was doing his job…*
>
> *Here in Josefa, I had my milpa, but I was looking for a job to earn some money. One day while I talked with Juvenal, I asked if I could do something in the camp - that is how people name the main office at La Sepultura. He told me he would let me know if something was available.*
>
> *After one month and a half, he came to my house and asked me if I meant what I had said about working in La Sepultura. I said yes. Then, he said, give me your documents. I will come for them tomorrow.*
>
> *Two days later, I started working in the camp. At the beginning, I was in charge of keeping the camp clean. Now, I take notes and identify the footprints of wild animals, I observe birds and I am a forest warden".*

Figure 11. Women attend the *milpa* on weekdays when spouses, *ejidatarios* and *pobladores* have temporary jobs outside *ejido Josefa Ortiz de Domínguez*, Chiapas. Mexico.

The importance of *milpas* at *ejido Josefa Ortiz de Domínguez*

The World Bank prescribes market integration for diminishing poverty in rural regions of the world (World Resources Institute, 2003). Governments and international economic agencies see natural resources as something to capitalize on for economic development (ENAREDD+, 2014). National agencies often avoid recognising ecological and evolutionary meanings in conservation. They also avoid discussing its cultural and historical relevance (Moritz, 2002). Additionally, assumptions behind conservation projects describe campesinos and their families as agents acting either in favour of or against biodiversity. Regularly, the superficial diagnosis of these projects is that campesinos need more markets for selling their products. Money would allow them to buy goods instead of extracting them from ecosystems. However, non-economic values have meaning for individuals and families from rural communities. In addition, campesinos show the interdependence of their different productive activities, and their role in configuring their landscapes (Kosoy, Corbera and Brown, 2008; Durand, 2014).

While I lived in *Josefa Ortiz de Domínguez*, I was part of the everyday family gatherings at night in the houses of *ejidatarios*. *Ejidatarios* and their wives sat together with their sons, daughters and grandchildren. This was a space for spending time together, for making jokes and talking about their everyday experiences. They also talked about their challenges and possible solutions. During these gatherings, issues concerning *milpa* were always part of the conversation, showing how significant social interactions are for the *milpa* process and vice versa.

Only occasionally, products from *milpas* are sold; campesinos use them almost exclusively for family consumption. One *milpa* might produce between 60 and 100 sacks of maize each year, each sack being 80 kg. The annual production of beans is about 6-10 sacks. Where necessary, beans are sold at MXP 10.00-25.00 per kg (USD 0.50-1.20 approximately, data from 2016). People would rarely sell maize. Its price was MXP 3.00-7.00 per kg (USD1.60-0.40 approximately).

Sales of maize and beans occur within the *ejido.* Rarely, family members outside *Josefa Ortiz de Domínguez* buy them. Campesinos also give both crops as a gift to people going through stressful situations and to visitors. During the last harvest of the year, during August and September 2016, I was invited by every family in the *Ejido* to eat maize cooked in every possible way. Maize constituted a gift, an invitation to meet the family, an opportunity to strengthen social links.

Success in *milpas* depends on the cooperation of the family. *Ejidatarios* offer sons and daughters a piece of land for them to harvest. When working the *milpa*, fathers teach their sons and grandparents teach their grandchildren. Alliances through marriages might occur, sometimes involving brothers-in-law or cousins. The alliances also help to distribute products from *la milpa* among those who help.

Younger males of the family work in *milpas*. They learn from the adults. At the same time, they are recompensed by some harvested products or collected plants. This way of organising work also helps to strengthen reciprocity and

relationships between men. In addition, it allows young campesinos to keep some seeds in reserve for the following year. Therefore, experience, reciprocity, learning and saving seeds are ordinary activities related to the communal work while doing *milpas*.

For example, Don Ángel, a leader in the community, lends 2 ha of land to his offspring each year. He has four sons and two daughters living in *Josefa Ortiz de Domínguez*. His descendants cultivate native maize (*maiz criollo*) and collect firewood in these plots. Don Ángel cultivates *milpa* accompanied by his family. Besides *milpa*, he also possesses coffee gardens, *palmares*, reforestation areas, areas for collecting pine resin, and cattle. One of his daughters told me: *"He works hard, and he overcame many difficulties in giving us food and shelter while the ejido was being formed. The situation is not the same now, and things are complicated for us, but he is a good father and he always supports us"*. The diverse activities developed by Don Ángel and kin provide a support system producing material goods and strengthening the relationships among all the members of the family.

Within a home in *Josefa Ortiz de Domínguez,* there must always be maize, beans and coffee. If an *ejidatario* can provide his family with these products, he has accomplished the most important responsibility of the year. Once the male heads of the families have assured the annual harvest of maize and beans, they plan other activities according to the possibilities given by projects in the area and to their personal preferences. Some campesinos prefer to cultivate coffee, others prefer to raise cattle. Some do not have enough land for alternative projects so they work outside *Josefa Ortiz de Domínguez* for big private landowners. Government projects and subsidies are not equally distributed among everybody. As will be explained for PESH in Chapter 6, projects from the government and non-governmental agencies are often given to legal actors, such as *ejidatarios*, and not to *pobladores*; or to an organised group such as the cattle group and not to individuals.

The main crops in *milpas* are maize and beans. However, it is common to find nanche trees (*Byrsonima crassifolia*), orange trees (*Citrus X sinensis*), guava trees (*Psidium guajava*), tomatoes (*Solanum lycopersicum*), chilli (*Capsicum*

annuum), squash (*Cucurbita maxima*), and cucumber (*Cucumis sativus*), among others. Concerning maize, six different types of maize were commonly present in *Josefa Ortiz de Domínguez*: purple maize (*maiz morado*), red maize (*maiz rojo*), spotted maize (*maiz pinto*) native maize (*maíz criollo*), short-term maize (*maíz de temporada corta*) and improved maize (*maíz mejorado*). At least seven bean varieties grew during 2016 in the *ejido*: Black beans (*frijol negro*), white bean (*frijol blanco*), red bean (*frijol rojo*), purple bean (*frijol morado*), spotted bean (*frijol pinto*), small bean (*frijol de grano chico*) and mayflower bean (*frijol flor de mayo*). Beans are harvested twice a year, January and August. Maize is harvested during August and September.

Milpas are productive for 1-4 years. After that, *campesinos* use this area for pasturing cattle during 1 or 2 years. The plot is then left to rest for 2 to 6 years. Then, a new cycle begins. Of the 39 heads of households living in *Josefa Ortiz de Domínguez,* only two *ejidatarios* had stopped doing *milpa.* One of these *ejidatarios* is dedicating his time and effort entirely to cattle. With 60 animals, he is the most prominent cattle breeder in the *ejido.* The second is an old *ejidatario* without family; since he cannot maintain the milpa by himself, he buys maize and beans from his neighbours.

Other activities associated with *milpa* and essential for family consumption are logging, collecting firewood, collecting non-timber forest products, and hunting. *Ejidatarios* allow logging and collecting firewood only for self-consumption. In *Josefa Ortiz de Domínguez,* men made the furniture for their homes by hand using wood from the managed forest. Besides, kitchens cook with firewood. Campesinos collect wood and firewood during the daily walk to *milpas,* and everybody engages in the activity; women, men and children. Families prefer firewood, not only because it is free, *"la leña no cuesta",* but also, as a young mother told me, because *"tortillas and food taste better cooked with firewood than with gas. When my sister comes from Villaflores to visit, the first thing she wants is a hot tortilla from the fire, the fogón".*

Collecting firewood implies collecting pieces of dead trees from the landscape units. Their extraction involves little effort compared to cutting a tree that is alive. The activity also helps the forest. Campesinos clear the forest and the

milpa from combustible material that might turn into a problem during the dry season.

Hunting is an activity directly related with milpas and allowed only for self-consumption, by earlier agreement of the community. Deer and iguana are common animals hunted by ejidatarios in *Josefa Ortiz de Domínguez.* In the morning, when a man goes to the *milpa,* he goes alone or sometimes with his sons. They carry their machetes, water, the traditional pozol drink, tortillas and cooked beans. In case people in *milpas* see a wild animal while doing their activities, they talk about it with other campesinos. They frequently talk about it at night, at the family's daily reunion. In case the animal is a deer or an iguana, men ask women if they want it for any traditional dish. If the response is positive, men will carry their rifle to the *milpa* the next day. They will perhaps start their activities earlier and prepare to observe and follow the animal until they kill it. Animals move through *Josefa Ortiz de Domínguez* during the different seasons of the year. Big mammals like jaguars and pumas can be seen close to *milpas* during the rainy season, but they are not killed because of a local agreement people have for contributing to the conservation of both these species, and as part of their agreement with *La Sepultura*. Deer can be seen eating nanche during the rainy season (May-December) and beans during the harvest season (August).

However, the most valued animal species harvested in *Josefa Ortiz de Domínguez* is an ant from the genus *Atta*. It is known locally as *chicatana.* People eat c*hicatanas* in the states of Oaxaca, Veracruz and Chiapas as part of a Mesoamerican tradition. Especially in Oaxaca and Chiapas, the ant is a main ingredient of the traditional cuisine. In the most expensive restaurants in the city of Oaxaca, tourists can eat them in a sauce with tortilla. People collect the ant only for two or three days when the rainy season starts. In *Josefa Ortiz de Domínguez*, the *chicatanas* appear, falling from the sky near the light bulbs, in May. Families, especially children, anxiously wait for the first rain to appear. Besides their being eaten, chicatanas are also eagerly anticipated because they announce the first week of constant rain, when men will cultivate maize and cash crops.

In the early morning after the first rain, at 3 or 4 am, all members of the family wake up and prepare baskets with some water in them. They will put the ants they catch in these baskets so water traps the insects. Chicatanas congregate around the light bulbs. Campesinos distribute themselves around the lights and collecting the ants as a family activity. I was present during the second night families collected chicatana in *Josefa Ortiz de Domínguez*. Grandparents, children and grandchildren collected the animal together, from 4:00 am to 5:30 or 6:00 am, just before sunrise. After that, men prepared for their daily work at *milpas*, women prepared chicatanas for eating, and children went back to bed. Some helped their mother to prepare the ants to eat. People in the community eat chicatanas in tortillas. They add avocado, cheese and tomato or chilli sauce. Others, such as Don Ángel, prefer to remove the wings and to eat them as if they were nuts.

The interplay among productive activities at *ejido Josefa Ortiz de Domínguez*

The scheduling of different activities practised in *Josefa Ortiz de Domínguez* is of fundamental importance. It requires planning to balance the effort in time and energy that *ejidatarios* invest. The first time I realised this interplay among activities was in my encounter with Don Ricardo. He is a *poblador.* He works together with his father. They manage approximately 40 ha of land. Don Ricardo is 41 years old. He lives with his wife, two daughters, one daughter-in-law, and two grandchildren. He was the first campesino that accepted an interview. After I presented my research interests and myself, Don Ricardo offered me a cup of coffee or *cafecito*. He told his wife:

> *"Give the biologa some coffee; she will like to taste the coffee that grows in our land; it is fresh coffee, this coffee you cannot find anywhere else. It has no chemicals; it grows by itself there, in the mountain".*

They gave me coffee, and they offered me a seat in front of their home garden. Later, I would find out that they often sit there, around the family table. This space is an essential part of the house. Family reunions and planning family

activities all take place here. Don Ricardo and his family explained to me that Lourdes, another *pobladora*, baked the bread in her house.

> *"Doña Lourdes makes the bread in her house. Her daughters were selling bread today, and we bought some. It is delicious bread and children like a lot. She (Dona Lourdes) bakes the food, and her daughters sell it to the members of the community. "Here, have some more, have all you want".*

Don Ricardo seemed friendly and willing to have a conversation with me. Once I was installed at the family table I asked what he and his family did for a living. His answer was this:

> *"Here we do a little of everything. We have milpita (milpa), cafecito (coffee), vaquitas (cattle). We do everything that can be done. However, almost everything is for our home consumption. What we produce in the milpa is for eating at home, especially maicito (maize) and frijolito (beans)".*
>
> *The cafecito (coffee) that grows in the mountain and women's home gardens is also for home consumption. We need coffee with sugar in the morning, and for the children; we all like it a lot. Although sometimes coffee is sold in Villaflores. The problem is that roya (coffee leaf rust) affected the plants some years ago and now we only have coffee for home consumption and not for selling. Coffee will recover; we are taking new small trees to the mountain for replacing the sick ones.*
>
> *We also have some cattle. Cattle is for selling. We keep the animals eating grass on the mountain. We take care of them. If they get sick, we inject them with medicines and we take good care of them.*
>
> *In case we have an emergency, for example, if we had a bad harvest and we run out of maize, if children need something for*

their school, or if somebody gets sick, we sell an animal, and we have MXP 10,000.00 or MXP 12,000.00 (USD 528 to USD 633 approx.). With that money, we can solve the problem.

Here, almost every cattle owner owns eight to twelve vaquitas (animals), no more than that. Only one ejidatario has more than 40 animals; he maintains the animals together with his uncle and his brothers. That family is the only one with that number of animals.

You see, all activities are important.

With milpa, you can run out of money, but you will have something to eat. Tortillita, beans and coffee for sure. Sometimes we do not have a job (paid job)*, but we always have work to do, especially while planting seeds or harvesting. If you do not have a job, you run out of money, but if you worked your milpa; your family would be fine. In the milpa, you can cultivate everything you want. You are free to cultivate what you want, and all you want.*

In addition, you have frutales. Frutales have all the fruit that children like. Mangos, nectarines. Moreover, children are happy with frutales. They will eat all the fruit. Now is time for nanche. Have you tried them? Some make a bolis (a frozen lollipop) with the nanche.

That is what happens here, Biologist. We have a lot of work, although there are no jobs. However, I like living here. Here, the mountain gives us fresh and clean air. For example, if we take the children to Villaflores they start crying, they do not like to stay there because of the noise and the hot weather. They cry all day, and if they do not cry, they want to come back after a couple of hours. Here you have freshness, I think. Freshness comes from

the trees, from the mountain. Also, water. Here we have water that rises from the trees.

If you go to the mountain, it is beautiful there! Everything is green, even when there is no rain. It is far from here; would you like to go someday? It is difficult to arrive there, but it is very nice. You only hear the birds and the wild animals".

Home gardens, fruit gardens and *palmares* at *ejido Josefa Ortiz de Domínguez*

Women manage home gardens. All families have home gardens connected to their house. They constitute spaces where food resources, especially fruits and spices for cooking, are cultivated. Plants used for medical and ornamental purposes also grow here. Besides, in home gardens women raise animals like chickens (*Gallus gallus domesticus*), pigs (*Sus scrofa domesticus*), rabbits (*Oryctolagus cuniculus*), ducks (*Anas platyrhynchos domesticus*), and others (Figure 12, Figure 13).

Whilst speaking of the relevance of animals from home gardens, Doña Lourdes told me one day:

"When my youngest son got sick we lost everything. We travelled to Villaflores for medical attention, and we left milpa without anyone to look after it. Everything: our money and our crops were lost. We ate and sold our chickens and our ducks to have some food".

In some regions of Latin America, home gardens receive little maintenance. However, in *Josefa Ortiz de Domínguez* these polycrop systems receive the attention of women every day. Campesino women take care of the plants and animals in home gardens as part of their daily activities. The products that women nurtured at home gardens are usually shared and given as gifts among neighbours. Goods shared testifies the subtle alliances among members of the community. Sharing shapes informal rules of solidarity and trust that women build as active members of the family economy and part of the community.

In contrast, fruit gardens are present next to different landscape units but, sometimes, they exist in special spaces close to the *milpa*. Fruit plantations take up no more than 1 ha. They receive very little maintenance by campesinos. Here, men plant mostly orange trees (*Citrus X sinensis*), mango trees (*Mangifera indica*), nanche trees (*Byrsonima crassifolia*), nectarine trees (*Citrus reticulata*) and bananas (*Musa paradisiaca*). The products of fruit gardens are for home consumption, though the members of the community often use them as gifts to other members of the community.

Palmares exist next to coffee gardens and extend from 1 to 5 ha. *Palmares* are areas where *ejidatarios* collect *Camedora* palm leaves each time they receive special permission. As explained in Chapter 3, collecting and selling *Camedora* palm leaves became a prohibited activity at a national level in the 1990s: if someone catches a campesino collecting or selling palm without permission, campesinos send him to jail.

Figure 12. Domestic animals such as chickens are commonly found in the home gardens of *Josefa Ortiz de Domínguez*. They are fed mainly with maize and forage, as they range freely.

Figure 13. *Palmar* next to the mature vegetation at *ejido Josefa Ortiz de Domínguez*, Chiapas. Mexico.

Coffee gardens and organic-coffee gardens at *ejido Josefa Ortiz de Domínguez*

The second time I met Don Jesús he was in a rush. He was expecting a friend who would take him to Villaflores. However, he invited me to his house later that day. There, I was introduced to his wife, two of his daughters, and his grandsons. He told me:

> *"I am a cafeticultor (coffee producer). I have always been a coffee producer. I was born on a coffee plantation close to San Cristobal de las Casas. My father worked there, and I was raised there. I remember I learned to read while I was working. I was 7 or 8 years old. The son of the patron (owner of the coffee plantation) was listening to the radio. The radio said that a person could learn how to read and how to write in a particular*

radio program. The person only needed to send a letter asking for a book and then the person could learn by listening to the radio program and following the book. I asked the son of the owner if he could send the letter for me and he did. After some days, I received the book and I started listening to the radio. That's how I learned to write: there, among coffee plants".

During the 1990s, when maize prices crashed, coffee became the primary productive activity for earning money. Each *ejidatario* possesses between 100 and 5,000 coffee plants. Campesinos distribute them in plots located near the highest mountains. Coffee gardens grow next to *palmares* and close to the communal protected areas of mature forest. In case a new coffee plantation is necessary, plants remain in nurseries while they acclimatise to the local environmental conditions and gain sufficient height. People keep a few plants in home gardens for the annual consumption of the family.

In *Josefa Ortiz de Domínguez*, people cultivate different varieties of coffee: Bourbon coffee, Maragogype coffee, Caturra coffee, Costa Rican coffee and Oro Azteca coffee. After the coffee leaf rust affected coffee plants, campesinos looked to re-establish the coffee gardens. The municipality and *La Sepultura* provided young coffee plants and technical support to *ejidatarios*. The municipality gave sun-grown coffee plants and agrochemicals. Meanwhile, *La Sepultura* provided shade-grown coffee plants and technical support for organic production. One coffee plantation could be older than 20 years. The oldest coffee gardens were the most affected by coffee leaf rust. Before this plague arrived at the *ejido*, the coffee produced in *Josefa Ortiz de Domínguez* was shade-grown organic coffee. Today, three coffee producers are experimenting with sun-grown coffee and agrochemicals.

According to what one *ejidatario* told me, coffee gardens frequently raised discussions in ejidal meetings. Questions discussed included: *how much vegetation should be cleared to grow new coffee gardens? What are the reasons for using agrochemicals? Why should we prefer the plants provided by the municipality or by La Sepultura?* The three *ejidatarios* using agrochemicals had coffee as their primary economic activity. They maintained that coffee

plants were incapable of recovering without chemical inputs. Establishing new coffee gardens was a priority for them. They argued that coffee leaf rust was affecting plants with more intensity than previous years. Also, that soil had lost its quality. Then, plants needed an extra input to survive and produce coffee grains. Only one of these three *ejidatarios* was keeping both organic and non-organic coffee gardens. He told me that the soil needed to recover, and he was using agrochemicals for the short term while he established young coffee plants in the new plots destined to coffee gardens.

Concerning the shade from the forest that should be allowed for new coffee plantation, *cafeticultores* put forward two divergent arguments. Those working closely together with *La Sepultura* considered shade as a highly important environmental element for maintaining healthy coffee plants. People not involved with *La Sepultura* considered shade as one of the environmental elements responsible for the propagation of the fungus.

Coffee is another activity where all members of the family take part. Cultivation of coffee and transporting young plants from the nurseries to the coffee plantation are activities for men. Yet the harvest of the coffee, which starts in December, is in the hands of every member of the family, including women and children.

Coffee is sold in a municipality called Villacorzo, Chiapas for MXP 3000.00 (USD 160.00 approx.) per quintal (2016-2017 prices). Typical annual production of coffee was 20-30 qq (quintiles) before coffee leaf rust and 3-4 qq afterwards. Each quintal weights 46 kg approximately. The first technical support *ejidatarios* had for coffee production was 20 years ago. Instead of learning from governmental technical support, people learned from each other and enhanced some practices with time. In 2016, coffee producers received from *La Sepultura* a second technical course related to coffee leaf rust. This was focused on producing an organic fertiliser that could be used as a treatment for sick plants.

Figure 14. Communal work for coffee gardens at *ejido Josefa Ortiz de Domínguez*, planting young seedlings provided by the Government of Chiapas. New plants were distributed in 2016 after coffee leaf rust affected the majority of productive coffee plants.

Cattle areas at *ejido Josefa Ortiz de Domínguez*

Sixteen heads of family have cattle in *Josefa Ortiz de Domínguez*. For all of them, raising livestock represents their main economic activity (Figure 14). As explained in Chapter 3, cattle were established during the 1990s when maize and bean markets collapsed. Cattle areas are of two types: extensively ranging cattle, where animals graze in the successional forest, and pasture-based cattle, where animals are kept in plots and fed with a mix of cut fodder grasses. Both types are practiced in parcels of land representing part of the *milpa* dynamic.

Cattle rearing is a highly respected activity in *Josefa Ortiz de Domínguez* and is closely related with *milpa* and with conservation. On the one hand, cattle are always kept close to *milpas*. This way, men take care of both activities. Once the work in the *milpa* has ended, cattle owners immediately attend to their animals. For example, from May to June while campesinos harvest maize and beans, cattle are close to *milpas* while the younger members of the family look after them. Concerning conservation, extensively ranging cattle constituted

another activity targeted as negative by *La Sepultura* after the program of fire management. Pasture-based cattle constituted a pilot program where 12 cattle owners were taught to manage pasture. People participating in the project have become teachers for other communities inside and outside the biosphere reserve interested in the project.

Regarding the livelihood strategy of campesinos and its diversification, it is essential to mention the following event. During 2015, cattle prices rose 30% above previous years. One calf could be sold at MXP 120 per kg (USD 6.40 approx.), while over past years it would be sold no higher than MXP 80 per kg (USD 4.30 approx.). The extra money earned per animal allowed *ejidatarios* to take a new decision about their livelihood strategy. One option was to rear more cattle and look for extra money. This would mean maintaining a higher number of animals, which would imply more effort, resources and time. The second option was to retain the same number of animals but improve their quality. This would allow cattle owners to have better-priced animals under similar space, resources and time demands. The decision had to be taken in a collective agreement because cattle owners are organised in a productive group. The decision was unanimous. They decided to acquire better cattle instead of increasing the number of animals. They looked for advice in Villaflores where *ejidatarios* and *pobladores* know some cattle breeders.

Cattle became relevant for the monetary income that selling animals brings (Figure 15). Cattle also became important because they provided campesinos with the opportunity to collaborate with *ejidatarios* from other *ejido*s at *La Sepultura*. *Ejidatarios* collaborated with students and local conservationists too. As this activity receives technical support from the biosphere reserve, it is common for participants to visit the University of Chiapas to share their experience with other *ejidatarios* and a wider interested audience.

Ejidatarios and the staff from *la Sepultura* invited me to one of those meetings. There, campesinos became the teachers of young students who prepare to become veterinarians. Around a discussion table, students asked campesinos about their practice. *Ejidatarios* talked about cattle and their reasons for developing the activity. Then, someone asked *ejidatarios* which were their most

significant challenges as cattle breeders. A campesino from a neighbouring community to *Josefa Ortiz de Domínguez* explained:

> *"Uh! We have a lot, and every producer has his or her point of view. For me, one main problem with cattle is pneumonia; in the mountain, animals get sick very quickly and medicine is costly. That´s why we need to build a barn for keeping the animals protected from the weather. We have thought how to do it. We don´t have a lot of money, and we need organisation because we must build it together".*
>
> *Another problem we have concerning cattle is the price of our products. We produce something very special. You name it organic production. This production requires a lot of attention and more effort than the others. However, nobody recognises that, and we sell our animals at the same price as others who feed their animals with chemicals that are bad for our body".*

Then, an *ejidatario* from *Josefa Ortiz de Domínguez*, one of the founders and leaders of the activity, continued:

> *"Look, we value the food we produce. I care for the meat I give to my children, but also, I care for the meat I sell, the meat that could be eaten by any person that buys what we produce, either in Chiapas or any other place in the world.*
>
> *I would not sell something that I would not put on my table for feeding my family. This is because I care about my family, I care about the consumer and I care about the environment.*
>
> *A couple of months ago, I was in another meeting. In that meeting, I approached a big producer because we are in the same activity and I wanted to learn more about how he did his business. He told me the same thing that many others have said*

to me; that I will never overcome my bad economic situation because of how I do things.

I thought to myself. Yes, probably I will always live this way, but this is because I care about the things that are alive and all they care is about the money".

The intervention of these two *ejidatarios* lasted 10 - 15 minutes. In that period, they showed the young students their ethical position as cattle breeders. They explained their motives for maintaining a collaborative relationship with the MABR too. At first glance, the primary aim of the cattle activity is to have a constant monetary income and some savings in each animal. Nevertheless, an ethical responsibility remains and the intention to make sure the activity is ecologically and socially responsible.

Figure 15. *Ejidatario* and his cattle at *ejido Josefa Ortiz de Domínguez*, Chiapas. Mexico.

Figure 16. Nursery for coffee plants and palm trees at *ejido Josefa Ortiz de Domínguez*, Chiapas. Mexico.

Nursery for coffee plants and palm at *Josefa Ortiz de Domínguez*

Nurseries constitute spaces next to the home gardens of almost every house (Figure 16). Their primary role is keeping young plants safe until they are healthy and big enough to be planted out in other landscape units. Nurseries are small, only 100 m^2. However, they represent an essential space for the *ejido*. Here, women and men take care of plants that will be used in economic activities. These are mainly coffee plants, but nurseries also keep palms and cycads which will be transplanted to the mountain.

Activities developed in the successional vegetation at *ejido Josefa Ortiz de Domínguez*

The successional vegetation promoted by *milpa* (the successional forest) is an area in transition with two possible destinies. One, being transformed into *milpa*. Second, being left outside the agricultural dynamic to become secondary forest and a transformed plant community. At present, campesinos develop two productive activities here: assisted reforestation and pine resin extraction. In addition to these activities, some *ejidatarios* opted for reforesting successional vegetation during 2016. There are two ways to reforest. The first is using seeds and plants from the mature forest. Another is looking for the support of CONAFOR to reforest with plants brought from authorised nurseries.

Each *ejidatario* in *Josefa Ortiz de Domínguez* reforests by using seeds and plants from mature vegetation (Figure 17). Nineteen male heads of family received the support of an NGO called *Cooperativa* AMBIO and four received plants from CONAFOR. One type of reforestation takes place along the road to the location of the *milpas,* and sometimes coffee gardens. A second type Involves planting along the margins of *milpas* and grazing areas, much like "*live fences*". A third reforestation scheme functions in specific plots in the communal protected area. This area will be designated later for PESH.

Assisted reforestation associated with PESH is a questionable activity according to women and men living in the *ejido* (see Chapter 6 for more information). As seedlings are brought from nurseries ouside the region, they are not adapted to the climatic and micro-climatic conditions of the forest in *Josefa Ortiz de Domínguez.* As result, some plants die weeks after planting out. Campesinos state that seedlings should come from the mature forest within the *ejido* and not from external nurseries. Others say that reforestation should develop into an activity focused on cleaning the forest and promoting natural succession to happen.

Figure 17. Three generations of current and future *ejidatarios*: grandfather, son and grandsons working on assisted reforestation activities at *ejido Josefa Ortiz de Domínguez*, Chiapas. Mexico.

One of the most meaningful, personal and professional experiences I had in *Josefa Ortiz de Domínguez* took place in the context of the reforestation practices*. Ejidatarios* had waited days for a truck. The vehicle would bring in the pine seedlings to reforest various plots of the forest. The dates established by CONAFOR to deliver the plants and start the activity were a little problematic for campesinos. They needed to look after their coffee gardens during the same period. The clash of the two activities demanded that campesinos worked together with their offspring, grandsons, and other relatives. Some even hired labour from outside their family.

I took part in the activity merely as an observer. Three generations of men, present and future *ejidatarios*, were working and helping each other to accomplish their aims on time, both in reforesting and attending coffee gardens. Even some teenagers did not go to school for two or three days until the reforestation activities were completed. One rainy day, I learned about their perspective on political ecology.

It was 6 am in the morning.

Doña Silvia, Don Ángel`s partner, was in the fogón, preparing the food for everybody including me. Don Ángel`s sons and grandsons arrived one by one. The oldest grandsons joined us: Estevan (18 years old), Alejandro (16), and Juan (12). Three of his sons would also come with us: Luis (35 years old), Isidro (32) and Jesús (22). Don Ángel looked a little anxious; he wanted to start working. Then, he said to me:

> *"Come with me Gaby, let´s take some pictures with the arbolitos (little trees) that we will plant today. We have more than 2,500 trees for planting in the forest. That is a lot of work, and we will finish this week before we start to work on the coffee plantation".*

Don Ángel put trees on the back of Gorrión (the donkey). Meanwhile, Juan, one of his grandchildren, put plants in two wheelbarrows. Juan was the top of his

class; he liked school and was always helping in the activities involving the forest.

> *"Would you mind taking a picture of us, Gaby? And the trees? To show that we are carrying them to the mountain".*

We started walking fast. Don Ángel took the first wheelbarrow. Isidro, his son, took the second wheelbarrow whilst Juan was leading the donkey. Don Ángel started to get tired. He asked us to stop.

> *"Look, Gaby, from here; you can see the entire mountain".*

Jesús, Don Ángel`s youngest son, took the wheelbarrow that was previously pushed by his father. Juan stayed behind Jesús. As the road was tiring, the three men gave each other words of support. After 45 minutes walking, we arrived at the plot to be reforested. The plot was previously destined to *milpa* and after four years of cultivation, it was left fallow for two years for the cattle to graze. It was later destined for natural regeneration. After three years of natural recovery, reforestation under governmental support had started. The compromise for Don Ángel was to reforest the area and preserve the plot for conservation for the following 5 to 10 years. I was witnessing the first stage of the process.

> *"Look, Gaby, these baby trees. We are not cutting those trees; these trees rise by themselves. These trees already won their chance to grow and they will help the others to grow too. They grew without us even planting them, so we have no right to cut them. How can we hurt a plant that is already growing? Others sometimes do it; I do not know why, probably they do not pay attention, or probably they are careless".*

When we arrived at the plot, everybody started working. Men organised three working teams with two members. One of the members made the hole where the plant would grow, and the other member put the plant into the soil. Don Ángel told me: *"I want you to take pictures of what we are doing, Gaby. We will*

send this picture to your professors and to people in CONAFOR to show everybody how we work".

I let Don Ángel direct me. He was proud of his effort, and he wanted to document the moment. He sang while he was working. His face proved he is enjoying the moment. As everybody was working and the walk was long, he took some time to make fun of me in a jaunty fashion.

> *"Gaby, if you need to rest, you can sit over there, with Capricho (the dog). There, you can write all the things you always write. Sit there, down by the fruit tree. Then, if you get hungry, you can eat all the fruit".*

I saw him from a distance, but I came closer to him and his offspring to keep the conversation flowing and learn from them. Don Ángel knew I like walking and taking pictures of the mountain, so he decided to challenge me and to continue his conversation while everyone was working.

> *"You see Gaby, nothing in this life is impossible. In some years from now, my grandsons will take enjoyment from the effort we are making now. They will have the forest to work and have clean air.*
> *This plot was previously destined for cattle, but we decided as a family that it could be left for the mountain to grow. For cattle, we have other plots".*

After a break, he continued explaining:

> *"There are those who calculate their richness in money, us: we measure our richness with the mountain: in the fresh water and in the oxygen that the mountain brings.*
>
> *Many people suddenly got interested in our mountain and our forest. Some people come now with programs, but they never share the money. Other times, conservation agencies ask us to have technicians and experts in order to develop projects. We do*

not have somebody with the technical skills needed for these jobs.

This is why we need to be prepared. The youngest must go to school, but they also need to work here, on the mountain. Everybody says it now. Even professors in the school and in the meetings where we go together with La Sepultura. Those who have a piece of land or some trees are lucky. School is not the only important thing here. Knowing how to work the land is indispensable".

Two of the grandsons of Don Ángel arrived with food for everybody: beans, tortilla, avocado and pozol. We were all together. Don Ángel was the first to be served, whilst I was the second. After we finished our lunch, Juan, one of the grandsons, invited me to take a walk in the surrounding area. I accepted.

Mature forest under two different conservation regimes at *ejido Josefa Ortiz de Domínguez*

Campesinos divided the mature vegetation into two management regimes. One, the communally managed forest, where there is a communal protected area since 2001. Two, a privately managed forest, with individual responsibility from *ejidatarios*. For the communal protected area, each *ejidatario* designated 14.5 ha of his or her own land. The total area under communal protection is 232 ha approximately. One of the main reasons for this PA to exist was to preserve water springs in a healthy state. Concerning the privately managed forest, each *ejidatario* decided the size of the area to preserve and the activities allowed. The smallest area of private mature forest was 5 ha; the biggest, 20 ha.

The communal protected area participates in a Payment for Environmental Services program (PESH) (explained in Chapter 6). *Ejidatarios* and *pobladores* monitor and have restrictive rules for accessing and using natural resources there. Extraction of firewood, timber and the collection of plants are allowed for home consumption. Under PESH, each *ejidatario* receives MXP 14,500.00 per year (approximately USD 765.50).

Uncertainty in the life of campesinos at *ejido Josefa Ortiz de Domínguez*

At 70 years old, Don Martin was a respected *ejidatario*. He walked slowly, but he continued working every day together with his son. Don Martin had over twenty grandchildren. They received most of the goods that Don Martin produced and collected from his land. After 6 pm, it was common to see him relaxing and spending time with the children whilst his wife went to the church. He enjoyed meeting new people. He lived with the belief that everybody was a potential friend and that having friends was very important in life. A long time ago, his friends told him about *Josefa Ortiz de Domínguez.* Back then, they also taught him how to make a living at the mountain. Today, friends share ideas with him about his projects and about what is best for the mountain and the *ejido.*

One day, I joined Don Martin to look after the coffee plants that had recently arrived at the *ejido*. Plants were at the nursery where they could acclimatise to the environmental conditions of *Josefa Ortiz de Domínguez*. Campesinos would later transport the plants upland to the coffee gardens. Don Martin explained to me the inter-dependence among the productive activities that campesinos develop. He explained this while telling me his reasons for being part of a community located in a region that seems so isolated from the rest of the state.

> *"And then, when our youngest son got sick we lost everything. We had to abandon the milpa. I could not take care of it. I was in the hospital, looking for doctors to help my youngest son. Our child needed us.*
>
> *He got sick on the mountain. We were together that day. We were working in the milpa, and he was learning, helping me. He was very young, eight years old.*
>
> *I heard him screaming, asking for help. I ran to see what had happened. I thought a snake had bitten him, but I could not see any bite or change in his body. He told me he could not move his leg. I took him, and we went home. We called Dona Angeles*

because she knows about plants and medicines. She gave him some herbal infusion. After that, we took the child to Villaflores, to see the doctor. In the hospital, doctors could not tell us what the boy had. We thought he would lose his leg, but after several surgeries, doctors did not cut his leg.

We lived in Villaflores for almost one year, coming in and out of hospitals. I had bought a small house because our older son and my daughter were studying for high school there. We stayed in that house.

By the time everything happened, I had 15 head of cattle. I sold them one by one until there were no animals left. Even my wife sold her chickens and her ducks. I could not cultivate my milpa, so we did not have maize for eating.

I came to Josefa occasionally for taking one animal to sell. One day I came, I went to the mountain to see if coffee plants survived the abandonment. Moreover, then, a miracle happened: the coffee plants were full of fruits. We survived because of that. In addition, now I still have my coffee plants. Therefore, for me, the most important activities here are milpa and coffee. However, coffee plants are sick; they started to get sick five years ago; they are affected by coffee leaf rust".

Campesinos decided to live in *Josefa Ortiz de Domínguez* as home. Perspectives for today and the future

"This road that we built is different from the others. You walk through your own road and the road walks through you. For us, the one who walks is not the only important one, because she or he might stop being the one who walks when she or he decides to stop. However, the road always continues. This is why we have to choose: what do you want to be? We chose to be the road. This means that we do not stop. In addition, the walk that we decided to do has a beginning. The beginning is fragile…

so… if something remains, it is the colour of the soil. This is the only thing we are certain about".

(Marcos, 2008)

Barkin (2006) explains that nowadays, campesinos in Mexico live under severe economic and political pressures. Poverty traps make people leave their land and look for jobs in the city. Young people migrate temporarily or permanently. Often, they lose contact with the communities where they were born. Consequently, campesino communities are ageing. Young people live excluded from the institutions and processes related to making decisions within their communities. The phenomenon presents campesinos with concerns they did not face before. Achieving the basics for a living is becoming troublesome.

Beyond the challenges and difficulties related with making a living as campesinos, the reasons for staying are strong. Today, 44.4% of *ejidatarios* and *pobladores* told me they tried to live in the city or semi-urban areas at Villaflores. Villaflores is the municipality closest to *Josefa Ortiz de Domínguez*. There, people might find a job and live on the national minimum wage or a little more (MXP 80.00; USD 4.00 per day by 2017). However, people come back to the *ejido* after 6 or 12 months working outside. A friend from the community told me once, while we were outside his house after a day of work for him and his family:

"In the city, you have to pay for everything. It is impossible to possess a piece of land for cultivating, and then it is impossible to have a milpa. Tortilla, coffee and everything else needs to be bought. Here, in Josefa, we don´t have a lot of money, but we always have food for our family and us. Here we can cultivate anything we want.

…You see, in the city, you feel trapped. You feel you cannot do anything. I cannot have my plants; my children don´t go out because something bad could happen to them. In addition, it is too hot because people cut all the trees and there is no mountain left. We live better here, in Josefa".

For *ejidatarios* and their family, attachment to the land includes valuing non-monetary benefits from the mountain. For people living at *Josefa Ortiz de Domínguez*, it is vital to define themselves regarding the activities they do. As explained earlier, they name themselves campesinos; sometimes, *cafetalero* or *cafeticultor*. They are people who manage the land and produce food for their families. Living in the city keeps them away from who they are.

For women, the reality of living in the city is partially different. As they look after their children, their experience includes providing adequate food to their offspring. In the city and semi-rural areas near Villaflores, women must carry enough money to buy and satisfy children`s needs. On the contrary, in *Josefa Ortiz de Domínguez*, children are free to pick fruit and maize from their parents' and grandparents' houses. Fruit trees are generous and there is always some seasonal fruit to eat and to share with the local fauna (see Chapter 5). Sofia*,* a *pobladora,* told me:

> *"There was this time when we were at Villaflores with my sister. We were preparing ourselves for bed, but my child, the youngest, was hungry. She asked for a tortilla, but I couldn´t give her anything. Shops were closed, and we finished our tortillas at lunch. I felt terrible because I couldn´t give any food to my daughter. There are not even trees for cutting fruit. Here in Josefa, that never happens. If my children are hungry, I can prepare them tortillas by using fresh maicito. Or if they feel hungry during the day, they extend their hand, and they cut any fruit that is in season".*

In *Josefa Ortiz de Domínguez,* women also value the plants and the animals that live in their home gardens. Home gardens are areas for women to nurture the plants they like and use the most. Some plants might work as medicine, food or aesthetics. As women attend home gardens and their animals every day, being away affects them dearly. That is what a female friend told me one day we were sharing our afternoon with her two babies.

"My mother's family lives in Villaflores. Nevertheless, she does not like to stay there, not even one day. If she needs to travel, she goes down with the communal transport at 5 am and she is back with the same transport at 4 pm, like everybody else. She says that Villaflores makes her feel sad and makes her feel ill. She says she cannot go because she needs to take care of her plants and her animals here in the home garden".

Reasons for living in *Josefa Ortiz de Domínguez* are diverse. As shown, campesinos define themselves, creating a sense of freedom and wellbeing. Also, people enjoy what they see. *Pobladores* explained to me:

"I have family there, in Villaflores. When I go to visit them, and I spend more than two days, I start feeling strange. I do not like it there because I have nothing to see. You only see the street. There are no flowers and no mountains there to see".

"In the city, there are neither trees nor water. Here you look at beautiful places; the mountain is magnificent. Children can play in the river every day and they are safe. That kind of life is impossible in the city".

Besides what has been said, campesinos in *Josefa Ortiz de Domínguez* felt proud of their forest and their struggles for building a community. Regularly, these topics come out in conversations. Campesinos refer to the landscape and its transformations; likewise, to the implicit challenges of settling in a distant place such as the mountains inside *La Sepultura*.

"There was one time when I had to be in Villaflores for a reunion. I stayed at my mother-in-law's house. At night I woke up, I could not breathe, and I did not know where I was. Then, I realised I was in Villaflores. I do not know if I felt that way because of the hot weather of that night, but since that day, I decided I would neither live nor sleep in the city. And it doesn't matter if it is very

late, or if there is no transport to Josefa, I always find a way to arrive home".

I like living here. Besides, water arises here. Well, not before. During the time fires were common, water started to leave us. Now we have all these trees and water has come again to the mountain. I have a small spring where my coffee plantation is. You should see it; it is beautiful. Would you like to go? Arriving is not easy, but if you like to walk I could take you there".

DISCUSSION

The livelihood of campesinos in *Josefa Ortiz de Domínguez* might be read as a strategy for social resistance (Bernstein, 2018). It is a creative force that opens dialogues both to campesinos and the MABR for working on conservation and sustainability. The activities defining the landscape in which the mature forest is embedded differ in purpose. Campesinos have interlinked these activities through time to create a particular economic strategy.

Agencies such as FAO suggest that the participation of campesinos in global markets might move them away from poverty (FAO, 2015). Campesinos disagree with the interpretation of international agencies about their economic situation. In the opinion of campesinos living in *Josefa Ortiz de Domínguez,* they might have sporadic market opportunities. However, their perspective on wellbeing does not rely exclusively on monetary income (Shanin, 1973; Naranjo, 2012). Furthermore, contrary to what national and international discourses say about people living in the forest, campesinos do not view land with a purely extractivist logic (Martinez-Alier, 1991). As explained in the history of the *ejido* and the life narratives of campesinos, the values on which the livelihood strategy is built include trust, solidarity and networking (Aiello, 2014).

In the livelihood strategy of campesinos, exchange of plants and animals from home gardens, family work and communal informal agreements evidence non-monetary values important for their everyday life. In addition, some of the activities that individuals develop for their livelihood do not provide a direct monetary income. Examples of these activities are harvesting useful plants from

fruit gardens, hunting animals from the mature vegetation and increasing the density of useful plants in the successional vegetation. Besides, since the foundation of the *ejido*, *ejidatarios* from *Josefa Ortiz de Domínguez* have helped each other and have organised groups for cooperation within the community. In addition, they have connected with actors outside the *ejido*: individuals and agencies that consider the forest must be maintained but not at the expense of the desires and activities of campesinos.

Diversification as an economic strategy at *ejido Josefa Ortiz de Domínguez*

Diversification in *Josefa Ortiz de Domínguez* is feasible because of *milpas*. By cultivating *milpas*, individuals define themselves, they prioritise food self-sufficiency and they create a successional ecological dynamic (Brush, Tandesse and Van Dusen, 2003; Altieri, 2004; Bray, Durand and Molina, 2012). Together, these elements of the livelihood give meaning to the heterogeneous landscape in which the forest is embedded. As explained before, this strategy allows campesinos to maintain 15 different landscape units and to develop 21 productive activities, 7 of which are engaged with conservation projects and *La Sepultura*. From the total range of activities, 9 produce goods for family consumption, and 12 produce goods for the market. However, families give greater preference to the activities destined to family consumption.

The effect of the livelihood strategy of campesinos in the forest and *La Sepultura*

Campesinos transform their landscape in response to their social and economic situation (Fischer *et al.,* 2012). If promoting diversification is an essential aim of their livelihood strategy, how is this important for conservation and sustainability? In *Josefa Ortiz de Domínguez*, the way campesinos manage their landscape indicates a relational logic. For them, productive activities have meaning. This occurs in terms of the goods each activity provides and regarding how it relates in time and space with the rest of the activities. One important aim behind diversification is to maintain a balance between food-sufficiency and economic income. Avoiding specialisation and responding to uncertainties

require family and community effort. To achieve this, the livelihood strategy of campesinos in *Josefa Ortiz de Domínguez* manages biodiversity.

In *Josefa Ortiz de Domínguez*, the attachment campesinos feel for their land defines them. Campesinos also express this attachment as part of their reasons for remaining in the rural community instead of moving to the city. As they have a close, emotional relationship with the land, money for them is not the only relevant criterion when taking decisions. The activities people develop in the *ejido* connect with personal and family histories. "*Not all that is rewarding for people has a monetary value*", is a characteristic response of campesinos to conservation projects aiming to change their landscape without common consent. This way, the economy of campesinos connects with paradigms alternative to development (for example, solidary economies) and the concepts of moral economy and moral ecology (Dove, 2011; Norget, 2012; Hamilton, Dewalt and Barkin, 2016).

In *Josefa Ortiz de Domínguez* as in many other campesino communities in Mexico and Latin America, people manage, rehabilitate and modify the structure of plant communities as they perform their economic activities (DeClerck *et al.*, 2010). Campesinos in *Josefa Ortiz de Domínguez* created fruit gardens and coffee gardens next to and mixed with the secondary and mature forest. Campesinos also used plants and animals from all the landscape units that surround them. While doing this, they transform the landscape in both the short and the longer term (Perfecto and Vandermeer, 2008). The ecological consequences of these practices include the modification of the ecological dynamics and the evolutionary processes of the living organisms there (Bhagwat *et al.*, 2008).

Main contributions of the livelihood of campesinos from *Josefa Ortiz de Domínguez* to conservation and sustainability

Campesinos have encountered social and economic challenges through time. The instability of the prices for the goods they produce encourages them to think that keeping a dynamic balance between activities destined to monetary income and activities destined to self-sufficiency is the best way to maintain a dignified way of living. This is one of the reasons why connectivity among

productive activities is essential for them. For achieving connectivity and the balance among activities, adults and children in the *ejido* are in a constant process of learning (Enlace Zapatista de Liberación Nacional, 2017). Children learn to look after the *milpa*, helping with the cattle and fishing. Adults learn that governmental programs are not to be trusted. They also learn that local institutions must adjust to the internal and external circumstances. Here, education is one of the main responsibilities that adults have toward their offspring. Indigenous leaders say campesinos, mestizo and indigenous communities, achieve two things: they take care of immediate needs while looking after what is important for them in the longer run and more broadly (EZLN, 2016). People in *Josefa Ortiz de Domínguez* accepted the entrance of conservation projects partially because they lack other options to enrich their livelihood. However, they also did it because they find in conservation agencies allies for the management of their landscape in the short term. Thus, understanding the role campesinos have in shaping one of the most biodiverse regions of the world requires more critical approaches towards conservation and sustainability (Raffles, 2005).

Scientists are used to discussing conservation of ecosystems as an essential part of environmental governance. In the process, they take for granted what conservation means. However, discussing this topic and others related to sustainability might first require the recognition of local ways of responding to socio-economic and socio-ecological processes; to local ways of knowing and understanding the environment.

CONCLUSION

Environmental scientists rarely address the socio-political and economic dimensions of agroecosystems in rural communities. However, agroecosystems allow campesinos to reproduce their ways of living and maintain biodiversity. The present chapter explained the moral economy of campesinos at *Josefa Ortiz de Domínguez* and the synergies between economic activities and biodiversity within the heterogenous landscape of the *ejido*. *Milpas* and the successional dynamic associated with them provides campesinos with both monetary and non-monetary benefits. In addition, campesinos attach feelings and meaning toward *milpas*.

Conservation projects at *La Sepultura* interact with the landscape and the livelihood of campesinos. In this interaction, mature vegetation in *Josefa Ortiz de Domínguez* functions as an “open door” for the entrance of specific projects. The result is the continual negotiation among families living in the *ejido* to define which projects might have a positive impact on their livelihood. A different negotiation occurs between the *ejido* and the authorities from *La Sepultura*, for maintaining an heterogenous and dynamic landscape. In this sense, the main challenge for campesinos in *Josefa Ortiz de Domínguez* is to promote diversification of activities. The aim is maintaining a balance between home food-sufficiency and monetary income. In institutional terms, the main challenge is combining rigorous guidelines for conservation and flexible governance of their landscape.

The history of the *Ejido Josefa Ortiz de Domínguez* and the livelihood strategy of campesinos have been explained. Now, there is an opportunity to address the landscape as a complex ecosystem where diverse flora and fauna communities interact. The composition of the landscape and the movement of birds is the topic of the next chapter.

CHAPTER 5

The Ecology of Birds.
Campesinos' Approach to Ecological Interactions at *Ejido Josefa Ortiz De Domínguez*

INTRODUCTION

There is a discrepancy between the definition of conserved ecosystems in international and national projects and the local realities of the forest in Mexico. In this chapter, I use a particular ecological interaction to describe the ecosystem managed by campesinos living next to the core area of the Man and Biosphere Reserve *La Sepultura*. I illustrate how birds move through the landscape, and I explain which components of the landscape are essential for this to happen. This description results from two social processes. One, the technical knowledge campesinos acquired as monitors of avian species. Second, the local perspective of the ecological interactions between birds and the vegetation. The present chapter acknowledges and highlights the role of heterogeneity as a key component of the ecosystem for the movement of birds. They visit the mature forest and the successional vegetation to find food and shelter in different seasons of the year.

As mentioned in previous chapters, some major challenges for conservationists exist today. The present chapter address some of these challenges. First, it explains the influence that societies have exerted over what some scientists consider "pristine" ecosystems. Second, it discusses the role of fragmentation and landscape heterogeneity as concepts relevant for analysing protected areas. Third, it approaches biodiversity as a dynamic and interactive assemblage rather than a fixed stock of species. In facing these issues, I focus on one central assumption: biodiversity is an indispensable element for the functioning of ecosystems which, at the same time, are managed by campesinos and relevant for their livelihood (Gonthier *et al.*, 2014).

My introduction to the agroecosystems at *Ejido Josefa Ortiz de Dominguez*

Jesús and Omar are two young *pobladores*. They told me that an environmental NGO called *Pronatura* (*Pronatura Sur A.C.)* was providing technical assistance to some people in the community for them to become monitors of avian species. I told them I was an ecologist and I knew how *Pronatura* promoted an identical project in another biosphere reserve in Yucatan. They asked me what the purpose of the project was and for whom the information was intended. They also asked me about the scientific names of birds and showed me the books they had for identifying the animals. As days went by, Jesús invited me to walk around the *ejido* with him. I thought the invitation was a good opportunity to understand more about some ecological interactions that define the landscape of the biosphere reserve. The idea was interesting because a particular bird, the *quetzal*, is the flagship species that represents conservation in *La Sepultura*. I thought that the experience would help me to discuss biodiversity and conservation in the MABR and in the *ejido*.

Jesús, Omar and I woke up at 5 am to drink some coffee and eat tortilla prepared by their wives. We had to start our journey before 6 am when the birds start singing. The young *pobladores* led the activity. As we walked, they taught me about how they recognise the birds by their singing. They also taught me the name people give to the animals observed in community lands. In return, I told them about the reasons why birds have a scientific name and how they could look for the name in the books. I decided that if I would question what an ecosystem is, I would do this from the perspective of what Jesús and Omar would teach me (a complete list of the bird species observed at *Josefa Ortiz de Domínguez* during 2016-2017 is shown in Appendix 3; Tables 7 and 8).

The idea of watching the birds together with Jesús and Omar came during a break from the work at *milpas.* Omar told me he was going to San Cristobal de las Casas, to the main office of *Pronatura*, to attend a class about monitoring wild fauna. That was the moment when I told him about the NGO and their work in different biosphere reserves in Mexico. Omar said that *Pronatura* was exclusively interested in the birds of *montaña alta* and the areas for cattle. I asked Omar for his opinion about the activity and about how the observations

were made. Jesús and Omar explained to me that the new activity was good for them because *pobladores* and their brothers could do it in the morning before helping their father in the *milpa.* They also said to me that the training represented a good opportunity for the youngest people, who could stay in *Josefa Ortiz de Domínguez* and work as monitors, to have an extra income instead of looking for a job outside the *ejido*.

The two young *pobladores* invited me to be part of the monitoring group. They informed me about two species of birds that biologists considered rare and vulnerable. However, they told me, everybody in the *ejido* saw these animals in the *potreros*, with the cattle, or in the home gardens. We continued our conversation. Why were those species in danger? And, why should observations of birds be restricted to the fragments of mature forest? When we got back from our walk, Omar and his father sat with me. Together, we agreed I would become Omar´s student. He and his brother would teach me about the movement of birds through the landscape and about the connection birds have with the activities campesinos develop. With time, the rest of the community realised the two young *pobladores* were teaching me and some campesinos, mainly women, engaged in the activity. They informed me about the fruits and the trees animals prefer. Women also told be about how birds accompany with their singing the activities of their husbands. Thus, the details explained in this chapter about the movement of birds derive from the knowledge of two young campesinos. The information they gave me is complemented by individual conversations with different women of the community.

Young campesinos will become the next managers of the *ejido.* I learned from them, and they counted on me for supplementing their practice. Because of the origin and evolution of this experience, I consider their knowledge is in continual change. In this process, the knowledge of young *pobladores* combines with the knowledge of biologists working with them in environmental initiatives (I include myself in this process). What did campesinos know about the bird community before the MABR implemented the activity? How do birds move through the landscape and what resources do they use? Also, what is the relevance of the landscape heterogeneity for birds that fly from the core area of *La Sepultura* to

use the rest of the landscape? These were some questions that guided my conversations with Jesús and Omar.

The topics that give meaning to this chapter refer to three main themes. One, rejecting the nature/culture dualism common in ecological research. Two, engaging with local perceptions of land management that might enrich current discussions about conservation and sustainability. Three, exploring how dialogues among diverse actors with a common interest in the forest might be achieved through ecological descriptions of the environment. This chapter also finds inspiration in Boff's (1987) approach to the environment, which considers that all living beings are interdependent. I explain these topics by first approaching agroecosystems from an archaeological and ecological perspective. I mention some scientific research on avian ecology, and I discuss what biodiversity means in the context of a bio-culturally diverse region.

Agroecosystems. Archaeological and ecological perspectives on the conservation of biodiversity

Balée (2006) states that the idea that humans have manipulated ecosystems through history and prehistory is fundamental for our understanding of the role of societies in modifying natural environments. Humans have meaningful roles in the biotic and abiotic interactions that shape environments over time. Humans might be responsible for degrading tropical ecological systems and losing biodiversity. Yet, they might also be agents for increasing biodiversity through their environmental management techniques.

Archaeological and ecological evidence suggests that human populations have occupied the forests of Latin America for centuries and that they have managed and changed the environment continuously (Posey and Balée, 1989, Denevan, 1976, pp 205-234)**.** According to Miller (2007, pp 8-40), as nature and culture shape each other, the variety of agricultural techniques are an example of the imagination and creative technologies humans have deployed for producing from the land. In Latin America, Amazonians, for example, manipulated the forest to supply their needs for food and resources (Heckenberger *et al.*, 2007). They commonly used species such as Brazil nuts and encouraged the tree's

growth. They modified the vegetation communities of the forest. The same happened in Mesoamerica, where valuable plant species such as *ramon* (*Brosimum alicastrum*) were planted throughout the forest in the Mayan Peninsula; the effects of the management that Mayas gave to the forest extend up to the present day. In Peru, the Incas built more than 6,000 kilometres of terraces near Lake Titicaca; some of these terraces are covered by the forest today. Understanding the role of humans in changing biodiversity and landscapes requires looking for evidence in culture from the past up to the present. Likewise, it demands approaching landscapes as part of this continuous history (Dove, 2006; Nazarea, 2006; Harvey *et al.*, 2008).

The possibility of defining Amazonia as a "complex mosaic of coupled human-natural systems" involves looking at this tropical ecosystem under the influence of anthropogenic transformation. Here, humans managed the forest along the river and interfluvial areas since the Holocene (Bush and Silman, 2007). Archaeological data suggest that people in the Amazon developed agriculture, transformed the forest into heterogeneous landscapes, and modified the soils and the forest communities (Barlow *et al.*, 2012).

According to Levis *et al*. (2012), there is evidence of pre-Columbian management and modification of the forest in the Amazon. Evidence includes unusual species-environment organizations and the unusual composition of some soils. In the Amazon, tree and palm species are present in a higher frequency than expected through different hydrological gradients. Also, there is the creation of *terra preta* soil as a by-product of the pre-Columbian agricultural system. These two examples invite natural and social scientists to approach human activities beyond the dichotomy of people and nature. Specially, if ecologists consider mature vegetation as the baseline for sustainability and, likewise, if science recognises the forest as the legacy of past societies, then science should question the idea of "pristine forests".

Levis *et al.* (2012) addresses the lack of information regarding how much the forest has changed because of the influence of Amazonian people through time. The authors explain that archaeological areas along rivers might be more

altered by human activity than interfluvial areas. However, the authors postulate that human actions have transformed the whole landscape. They conclude that these domesticated landscapes, among the most biodiverse in the world, invite scientists to incorporate human history into the understanding of biodiversity. The authors also declare that people living in the forest today are essential actors in any conservation scheme and in defining the present and the future of those forests.

Clement *et al.* (2015) developed a study about the effect of pre-Columbian Amazonians on their landscape. They chose archaeological sites to analyse the special distribution of woody species domesticated by the Amazonians. These species exist today as part of the forest community. The results show that domesticated tree species are five times more likely to dominate the forest in areas near the archaeological sites. Furthermore, the analysis also supports the argument that there is no such thing as “pristine forests” in America. Current ecological communities were shaped by the influence of people in times long past.

McKey *et al.* (2010) explain that understanding the legacy of past land use is important now. In present times, social and natural scientists search for alternatives to conserve tropical forests and for a sustainable use of resources on the planet. In this context, the authors propose that partially forgotten pre-Columbian agricultural techniques could have practical applications for resource management and sustainability today.

Referring to the Andes, Miller (2007) explains that the region is where a particular form of agriculture was born. Here, pre-Columbian agriculture is considered as part of the popular identity and as a possibility for building the “Andean utopia”. The “Andean utopia” is based in pre-Columbian communal institutions, agricultural techniques and knowledge. The history of agriculture in the Andes is an open invitation to see human relations in the context of the environmental history of the Latin American countries. At present, political activists from the Andes ask for a moral economy that defends the traditional agriculture and works against the exploitation of natural resources.

Agroecosystems managed by indigenous and mestizo communities in Mexico

From the perspective of historical ecology, the effect of human actions on resources relates to how individuals adapt to the environment through social, cultural and political systems (Raffles, 2005). Human strategies for managing biodiversity might be as significant as mechanisms of natural selection. Casas *et al.* (2007), for example, work on the interplay between management strategies and evolutionary processes of agrobiodiversity in Mexico and Latin America. They state that campesinos, indigenous and mestizo, exert an important role in the adaptation and evolution of species consumed outside their communities. Also, the authors explain that the technology and economy of campesinos help science to understand how people in pre-Columbian times managed wild vegetation and manipulated the structure of ecosystems. Finally, the authors state that practices for managing natural resources involve domestication and artificial selection of plants. These practices have influenced ecological and evolutionary processes in the past up to today.

According to Casas *et al.* (2007), ethnobotanical studies in Mexico document that campesinos have practised *in situ* management since pre-Columbian times. Practices associated with the management of the landscape and the vegetation communities include letting individuals of useful plant species stand during clearance of vegetation, encouraging their growth, and protecting them. These ethnobotanical studies show significant differences in morphology, germination patterns and genetic variation among *in situ* managed plants. They argue that forest management and artificial selection might operate to cause domestication at different scales, from species to landscapes.

In the Huastec region in Mexico, Alcorn (1981) discussed the possible effects of human activities in the rainforest during pre-Columbian times. He stated that the management of plants outside the agricultural areas went beyond domestication of species. These human practices need further evaluation in the context of the evolution of ecosystems and landscapes. Consequently, he argues that defining plant communities as pristine forest or untouched forest is problematic. The author showed that pre-Columbian agricultural practices influenced the

composition and distribution of plant communities in the Huastec region. Alcorn goes further and explains that the effect of domestication beyond the impact on species themselves might be direct, such as the configuration of secondary vegetation. Or it might be indirect, such as the changes of the soil and seed resources.

In Mexico, archaeological evidence is present in almost every protected area, including biosphere reserves. For example, Vanderplank, Mata and Ezcurra, (2014) mention that winter rains in North Mexico weathered the calcium of clam shells that humans deposited along the coast for thousands of years and that this calcium has modified the soil properties of the area, resulting in a unique microhabitat where the plant community is very different from those of the surrounding areas.

In South Mexico, paleo-ecological and archaeological research suggests that mature vegetation is the legacy of ecosystems transformed by ancient civilisations, whose members managed the forest hundreds of years ago (Gomez-Pompa and Kaus 1992). The plants that Mayan people once used are now the dominant species in the Mayan forest, and they are still valuable for Mayan communities (Ford and Nigh 2009). Whether Mayas were managers or destroyers of the forest remains unclear.

Gomez-Pompa and Kaus (1992) suggest that Mayan people occupied the forests for more than five millennia and, during this time, they developed agriculture and managed the forest based on successional vegetation dynamics. There is no evidence of areas explicitly destined for conservation in the Mayan forest, but there is evidence of an organised space with the presence of ceremonial sites, rural settlements, managed forest and secondary vegetation. Additionally, paleo-ecological data in the Mayan forest shows that floristic composition at the genus level has been constant for more than 5,000-6,000 years. Absence of biological collapse during the two demographic collapses of Mayan people suggests that they were managers of biodiversity and not destroyers of nature. Data show that human populations had spread throughout the forest 8,000 years ago and not 3,000 as previously supposed. It is now recognized that Mayan and pre-Mayan peoples transformed the forest

and that what scientists once called the “pristine natural forest” of the Mexican neo-tropics is, in reality, a transformed ecosystem (Nations, Nigh and Ronald, 1980; Frece and Poole, 2008, Ford and Emery 2008; Ford and Nigh, 2009).

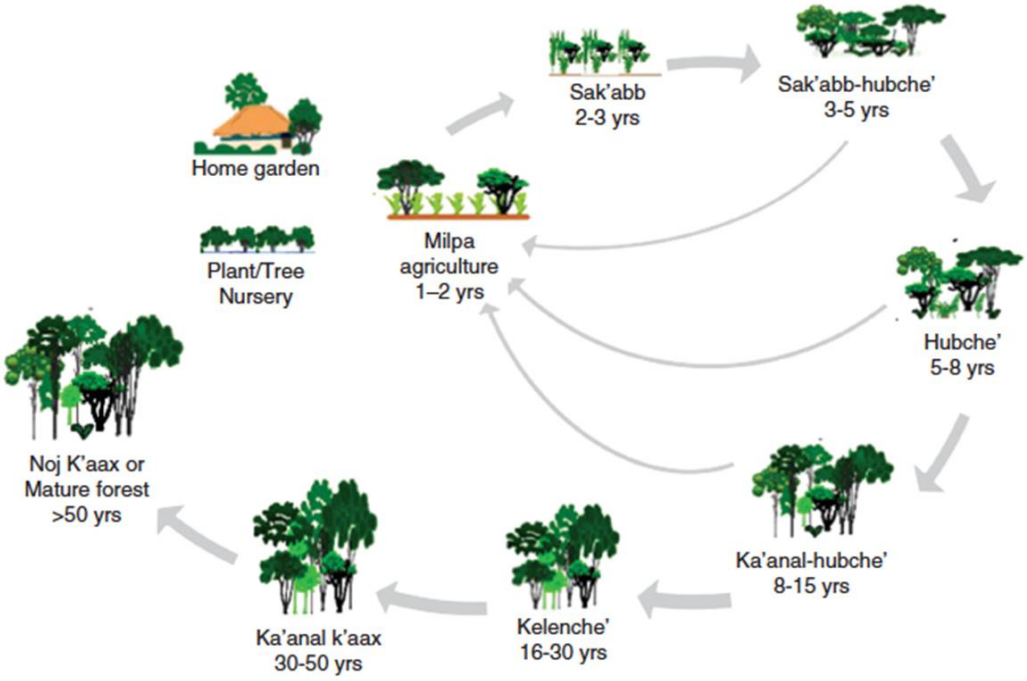

Figure 18. Typical successional dynamic of the vegetation associated with a Mayan *milpa.* Names for each successional stage are written in Mayan language (modified from Barrera-Bassols and Toledo (2003).

Summarising, archaeological research on Latin America, specifically in Mesoamerica, Amazonia and Peru, indicates that conserved forests and biodiverse ecosystems have experienced human influence since pre-Columbian times. As a result, history invites natural scientists to inspect the long and the short-term effects that people now have and have had in the past in manipulating ecosystems and ecological interactions. Two disciplines, ecology and history, coming together in approaches to environmental history, avoid assumptions such as “humans destroy nature” and “the pristine tropical forests”. They open possibilities for thinking about biodiversity as an attribute of ecosystems, potentially positively influenced by human action.

Beyond the nature-human duality. Understanding ecosystems as dynamic elements of the environment

As explained above, ecosystems in Latin America have changed through time, promoted by human action (Barlow *et al*. 2012). Tropical forests in Latin America have received the influence of past civilisations where people cultivated the land and managed plant communities (Clement *et al.* 2015). A "domesticated Amazonia" or an "anthropogenic Mayan forest" considers human actions as part of the evolutionary processes and ecological interactions of ecosystems (Clement *et al*. 2015; Gomez-Pompa and Kaus 1992). This possibility also raises some questions. What does a conserved ecosystem mean? Could human activities enrich ecosystems?

In 2016, Moreno-Calles *et al.* (2016) reviewed more than 100 academic papers about agroecosystems and identified more than seven types of agroecosystems in Mexico. They classified agroecosystems as home-gardens, agroforests, long fallow forests, arid and semi-arid agroforests, terraced and semi-terraced agroforests, wetland agroforestry systems, and agrosilvopastoral systems. They also documented the existence of an average of 121 wild and domesticated plants and 684 animal species in these agroecosystems. Two-thirds of these species are native. Plant species found in these agroecosystems include maize, citrus, and plants used as fences, or food and shelter for animals. Cattle, sheep, and goats are common livestock managed in these agroecosystems.

Gordon *et al.* (2007) studied the relationship of these animals in a heterogeneous landscape where different productive activities and agroecosystems operate in Southern Mexico. The authors show that species richness and abundance of birds is higher in agroecosystems than in monocrops. In the case of coffee, the authors state that biodiverse coffee gardens present a rich avian community. At the same time, they compete in productivity with high profitability coffee systems. The authors conclude that agroecosystems support both conservation and economic development in local communities.

González-Valdivia *et al.* (2014) found that agroecosystems support ecological dynamics while underpinning the local economy. The authors used birds for

understanding how the transformation of the landscape affects ecological interactions. Since birds are excellent indicators of habitat alteration, they found that the animals have specific preferences. For example, while frugivorous animals are rarely seen in areas destined to cattle rearing or agriculture, they are abundant in successional stages. Thus, the authors suggest that birds might provide relevant information for understanding more about the role of humans in the maintenance of conserved ecosystems. Ecological interactions provide information to improve the biotic matrix of the landscapes where protected areas exist. The authors conclude that ecology might be a tool for landscape management and for relating with campesinos in tropical forests.

Concerning birds, DeVictor, Julliard and Jiguet (2008) and Carrara *et al.* (2015) indicate that specialist birds are the most susceptible to habitat loss, while fragmentation of the forest might have a positive effect on generalist birds. However, these studies conclude that maintaining the diversity of birds in tropical forest requires the secondary forest and not exclusively the mature forest.

Sills (2011) compared the knowledge of ornithologists and Aguaruna people in the Amazon. The author found that the two systems of knowledge often agree in the taxonomy and the behaviour of the bird. However, the main difference between the two relates to the reasons scientists and Aguaruna find for explaining the behaviour of the birds. The author explains that for some Amazonians, animals and people share the same cultural and social reality. Furthermore, the author explains that the ecological knowledge of birds in the region goes beyond naming species or individuals and extends to explaining complex ecological relationships. Aguaruna people interpret the behavioural ecology of the birds with respect to their own social life. The author concludes that using more than one epistemological framework is feasible for approaching ecosystems and their relationships. Similar studies do not exist for ethnoecology in Mexico.

Biodiversity and local knowledge in rural communities

It is important to mention that with the passing of years, interest in local knowledge has become relevant for new approaches to conservation of

biodiversity (Berkes, Colding and Folk *et al*., 2000). The interest in local knowledge relies on the possibility to understand the interactions among living organisms, the environment, and people's activities as elements that correlate with each other (Nazarea, 2006). This knowledge exists through observation and constant monitoring that happens over the years and sometimes remains over the long-term (Agrawal, 1995). Agrawal (2005) suggests the possibility of a new way of building experience when we consider local knowledge as an alternative and recognise that science is not the only knowledge available.

As explained by Agrawal (2005), local knowledge could refer to the environment and the connectivity of the space and people. Scientists from the 1970s and the 1980s realised campesinos had a profound ecological knowledge that could provide meaningful contributions to sustainability (Hernández-Xolocotzi 2014). Some ecologists and natural scientists work with campesinos as people who might enrich the discussion about the interlinkages between agriculture and conservation (Gomez-Pompa and Kaus, 1999; Toledo *et al.*, 2003; Martínez *et al.,* 2006). Ecology and agriculture represent the starting point for a dialogue between conservation of biodiversity and the campesino way of living (Astier *et al.* 2017).

According to Gomez-Pompa (2016), after the national policies promoted deforestation in Mexico during the 1970s (explained in Chapter 2), the strategies of campesinos for managing land became of interest to ecologists and anthropologists. They saw these strategies as part of culture and not as part of productive systems alone. Eventually, ecologists considered biodiversity as a product of evolution, the biogeographic history of species and the domestication and development of agriculture (DeClerck *et al.*, 2010). In the country, the combination of these perspectives gave rise to approaches to biocultural diversity and the definition of bio-cultural regions (Maffi 2001).

According to the Global Diversity Foundation (2017), biocultural diversity is the "total variety of the world`s cultures and natural environments". The co-evolution of both elements has generated particular local ecological knowledge and practice. Biocultural diversity is a vital reservoir of experience, understanding and skills that help communities to manage their resources now and in the

future. The existence of biocultural regions implies that territories of indigenous and some mestizo communities overlap with high rates of biodiversity and centres of origin and diversification of species (Maffi 2005). The concept of biocultural diversity opened the possibility to work with indigenous people and campesinos and to understand the ecology of their landscapes (Altieri and Nicholls 2017).

Different efforts of social and natural scientists focus on comprehending the local ecological knowledge in biodiverse ecosystems. In this context, the concept of biocultural diversity became relevant in Mexico because it contributed to analysing the use of biodiversity by different indigenous and cultural groups. Also, it recognised the geographical coincidence between the most biodiverse regions of the country and the presence of indigenous communities. As explained in the previous chapter, the management of biodiversity in these and other rural communities mainly refers to the management of wild, semi-domesticated and domesticated plants and animals as well as to the creation of vegetation patches and the management of ecological interactions (Casas *et al*. 2007).

In Mexico, the domestication of maize and other plant species took place over a period of thousands of years. Here, some societies bloomed in practically every region of Central and South Mexico. Today, the indigenous Mesoamerican population includes about 12 million people distributed across the country. There is an indigenous community in every ecosystem in Mexico. Rural communities using an indigenous language control an area estimated at 28 million hectares (Boege 2015). Their territory includes the most biologically diverse ecosystems (tropical and temperate forests) and the majority of Mexico's agrobiodiversity.

The challenges of agroecosystems in Mexico today

As explained by Gomez-Pompa and Kaus (1992), agroecosystems are relevant for ecology and evolution, as well as for economic and political processes. However, Perfecto and Vandermeer (2008; 2010) have explained that agroecosystems are undergoing fundamental changes. Vegetation cover loss and the impacts of agrochemicals are some of their challenges.

Transformation of agroecosystems also involves the transformation of the plant and animal communities that live in them or that use them as habitat or refuge.

In addition, Pinto *et al.* (2017) mentions that agroecosystems face restrictions today, such as limited land, limited funding, and sporadic technical support. The authors highlight the limited nature of documentation and evaluation as to how people creating and maintaining these agroecosystems innovate and change. By assessing the quality of trees in different agroecosystems, they found that agroecosystems with annual crops (such as maize) help some trees to grow free from the interference of other plant species and that some of these trees receive higher attention from campesinos. They also found that trees growing as part of the canopy of agroecosystems improve the quality of the soil.

Much of the agroecosystem practices rely on campesinos. For many campesinos concerned about the present and the future of their ecosystems, biodiversity is considered a common good, and its conservation is a shared responsibility (Sámano, Durand and Gomez, 2000). However, under the present threats to agroecosystems, local knowledge is not enough for maintaining biodiversity. People from local communities ask for collaboration with scientists. For this collaboration to take place, campesinos ask for respect and equal treatment (Radio Zapatista 2017).

Walker *et al.* (2007) discuss conservation and participation in this context of change and power relationships. They explain that local people aim to build their own development strategies. They also seek to control their land and their resources. However, national and international policies in conservation and sustainability often collide with the interests of local actors. As a consequence, local communities invert the politics of participation and negotiate with development and conservation projects. They achieve this by valuing their knowledge and forms of organisation.

Campesinos create and manage the environmental units described for the movement of birds in this chapter. However, this interaction does not depend on the ecological characteristics alone. People define their ecosystems and use them. The link between ecological characteristics and the economic activities

people develop in each landscape unit is the basis for classifying the environment. Furthermore, this association is essential for explaining how animals move through the space in *Josefa Ortiz de Domínguez*.

Defining the ecosystem through the movement of birds is a reminder that ecosystems are much more than patches of vegetation. Birds move differently through space in order to find resources through the changing seasons of the year. Campesinos use resources within the ecosystem and, together, birds and campesinos represent one of the many interactions that define each landscape unit and the ecosystem at *Josefa Ortiz de Domínguez* as a unity.

THE ECOSYSTEM AT *EJIDO JOSEFA ORTIZ DE DOMÍNGUEZ:* A LANDSCAPE PERSPECTIVE

Chapter 4 explained the different landscape units in which campesinos develop economic activities. These landscape units include native vegetation, successional vegetation and biodiverse crop systems. Landscape units at *Josefa Ortiz de Domínguez* might be classified in two categories: those in constant transformation, associated with temperate forest and secondary vegetation; and those in infrequent transformation, related to the cloud forest and mature vegetation. Landscape units under continuous transformation in the *ejido* are mainly polycrops. These transformed environmental units do not have a vegetation community directly related with the cloud forest and mature forest on the high hills. They relate more closely to the secondary vegetation and the temperate forest at intermediate altitudes. As explained in Chapter 4, coffee gardens and *palmares* are environmental units closer to the mature vegetation and with vegetation associations more intimately linked to the cloud forest. Geographically, each environmental unit is at a different altitude and different distance from the family home.

The campesino ecology of birds in home gardens at *ejido Josefa Ortiz de Domínguez*

All homes have a home garden smaller than 1 ha. Here, women take care of the plants and animals for family consumption. Sometimes, plants from home gardens are exchanged among women in the community (mainly plants

that function as medicine or for ornamental purposes). Common plants in home gardens are: *lima* (*Citrus aurantifolia*), cacao (*Theobroma cacao*), *café* (*Coffea sp.)*, *mandarina* (*Citrus reticulata*), *plátano* (*Musa paradisiaca*), orange (*Citrus sinensis*), *manzanilla* (*Chamaemelum nobile*) and *yerbabuena* (*Mentha spicate*). Aesthetic plants, such as *margaritas* (*Bellis perennis*) and *orquídeas* (*Orchidaceae sp.*) are also present.

In home gardens, chickens (*Gallus domesticus*), ducks (*Anas sp.*), dogs (*Canis familiaris*) and cats (*Felis gatus*) are common animals. Chicken is used for traditional dishes called *tamales* (a steamed bread in a corn husk) and sold to the community.

Birds visit *home gardens* all year round (Figure 19). 47 species were observed by Jesús and Omar during 2016-2017. Most abundant species are *Zope* (*Cathartes burrovianus*); *tortolita* (*Columbina inca*) and *zopilote negro* (*Cathartes aura*). These species live in groups and use the *home garden* to eat grains, including those given as food to domestic doves (*Columba sp. 2*) and chickens.

Bird species that live in *Josefa Ortiz de Domínguez* are not considered pests. Birds are a companion for campesinos during their everyday activities. For example, if *ejidatarios* and *pobladores* use agrochemicals for their crops, they first discuss in the *reunion ejidal* what chemicals they might use for not endangering the birds. Birds are known and respected as animals of the mountain. Sometimes, they are considered as allies. They help to eat the insects and pests of the *milpa* and the ticks that affect the cattle. In the successional forests, the singing of birds makes the journey to coffee gardens pleasant. For campesinos, birds visit them from where the fresh air and the fresh water exist

Species visiting home gardens during summer feed on the fruit trees. Hummingbirds (different genera of the family *Trochilidae*) are bird species highly valued by people because of their colourful plumage. They visit oranges, *nanches* (*Byrsonima crassifolia*) and banana. Different species of hummingbirds are known by the same name: *colibrí*. They are differentiated because of the

colour of their feathers. The most common species of *colibrí* in *Josefa Ortiz de Domínguez* are *Cynanthus latirostris* and *Basilinna leucotis*, which feed from the flowers and play with children.

Other birds that forage in home gardens, especially from *nanche (Byrsonima crassifolia*), are *gambú de montaña* (species not identified), *copetón* (*Myiarchus sp.*), *tangara roja* (*Piranga leucoptera*) and *cenzontle* (*Turdus plebejus*). These species eat fruits and vegetables, mainly *calabaza* (*Cucurbita sp.*) at the beginning of spring. Also in home gardens, *azulejo* (*Sialia currucoides*) looks for the immature coffee grains and *tijereta* (*Tyrannus forficatus*) looks for roosting places. During the summer, these birds remain near the houses and they are recognized because their singing is characteristically during daytime, especially in the morning when people are preparing for work. Sometimes, when birds from the successional forest arrive in home gardens, campesinos say, partially as a joke, that the birds arrive at the house to remind them that there is work that must to be done on the mountain.

One of the most common species of birds seen in the home gardens during the summer is *zanate* (*Quiscalus mexicanus*). *Cenzontle* (*Turdus plebejus*) is known because it makes its nest at the home gardens. *Arrocerito* (*Carduelis psaltria*) feeds from the flowers known as *pata de sapo* (*Eryngium sp.*), while *pedrito* (*Tityra semifasciata*) eats *zaramuyo* or *chirimoya* (*Annona sp.*), and *chiturí* (*Pitangus sulphuratus*) looks in the soil for insects to eat.

Women often refer to their home gardens as places where birds can rest and eat some of the fruits people enjoy too. Sometimes, these birds are even compared with children. Doña Irma for example, grandmother of more than 20 children, used to say to me: "*I planted these trees to have some fruit for everybody. However, children and birds end up eating everything. They are the playful ones responsible for the fruit disappearance*".

During autumn, some birds move from the home garden to other landscape units, including the mature vegetation. In addition, some migrant birds arrive, and others leave for South America. One of these species is *chiturrí* (*Pitangus*

sulphuratus)*;* it arrives in *Josefa Ortiz de Domínguez* to announce the arrival of past spirits on November 1st (when the Day of the Dead is celebrated).

During winter, *hurraca* (*Calocitta formosa*) arrives in *Josefa Ortiz de Domínguez* to eat young vegetables, like *calabaza*. Hummingbirds look for nectar, and *chorcha* (*Icterus gularis*) rests and looks for insects to eat.

Figure 19. Pablo, the grandson of a founder *ejidatario* of *Josefa Ortiz de Domínguez*, caught and explained how hummingbirds feed from the flowers his grandmother nurtures in the home garden. Chiapas, Mexico.

The campesino ecology of birds in *milpas* at *ejido Josefa Ortiz de Domínguez*

In Chapters 3 and 4, I developed the argument that *milpas* represent the basis of the food system for each family in *Josefa Ortiz de Domínguez*. In Chapter 4, I also explained that *milpas* are managed by the whole family, although heads of families are in charge of the decisions concerning cultivating and harvesting. In *Josefa Ortiz de Domínguez,* two *milpas* belong to the kindergarten and the middle school. Parents take care of both *milpas* as part of a community effort. The harvest is destined for the local market, and the money is used for academic activities of children.

In the *milpa*, trees are commonly present, especially those that provide fruit for family consumption: *nanche*, avocado and orange. Oak (*Quercus sp.*) and pine (*Pinus sp.*) are also present; they give shade and a place to rest. Sometimes, trees are kept as reservoirs of wood for building or furniture (Table 4).

Milpa receives the visit of different birds, both specialists and generalist feeders. Jesús and Omar told me about 46 different species during 2016-2017. The most abundant species are *cotorro* (*Aratinga brevipes*) and *zope* (*Cathartes burrovianus*). These two species fly over the *milpa* looking for food. *Cuchi* (*Colinus virginianus*) is also seen in milpas eating *frijolito* (*Phaseolus vulgaris*). This species has a protected status on the International Convention of Threatened Species of Flora and Fauna. *Cheque* (*Melanerpes formicivorus*) rests on the branches of oak trees, and *paloma* (*Zenaida asiatica*) eats young maize.

During spring, *cotorro verde (Aratinga brevipes)* is the most common species in *milpas*. *Cotorros* are often associated with *cuchi* (*Colinus virginianus*) and *cheque* (*Melanerpes formicivorus*) (Appendix 3, Table 7 and Table 8). *Águila real* (*Buteo regalis),* highly appreciated because of its beauty, is seen searching for *pavito* (*Trogon citreolus*) and *tordito* (*Melanerpes hoffmannii*) as prey.

During autumn, the most abundant species are *copetoncito* (*Contopus pertinax*), *chinchoco* (*Melospiza lincolnii*) and *gambú de montaña* (species not identified*)*. *Copetoncillo* eats grasshoppers and *gambú de montaña* eats worms. *Taupis* (*Tangara episcopus*) and *pijuy* (*Crotophaga sulcirostris*) eat *nanche*. In this season of the year *hurraca* (*Calocitta formosa)* sings, together with *chiqui* (*Colinus virginianus*) and sometimes, *tucanes* (*Pteroglossus torquatus*). *Cheque* (*Melanerpes formicivorus*) and *piturri* (*Pitangus sulphuratus*) live in the canopy of the oak and the pine trees.

During winter, *cotorro cabeza blanca* (*Pionus senilis*) flies in flocks over *milpas*. *Paloma ala blanca* (*Zenaida asiática*) eats maize, and *chipe* (*Setophaga dominica*) eats insects together with *cuichi* (*Colinus virginianus)*. Over the

higher trees live *gavilan* (*Leptodon cayanensis*), *cocoa 1* (*Dendrocolaptes picumnus*), and *carpintero sarado* (*Melanerpes pygmaeus*).

The campesino ecology of birds in fruit gardens at *ejido Josefa Ortiz de Domínguez*

Fruit gardens (*frutales*) often work as corridors of vegetation that go from *milpas* to mature vegetation, passing through *potreros*, *palmares* and *cafetales*. The average size of fruit gardens is 2-4 hectares per family. *Frutales* are areas for relaxing and raising tropical trees with fruit that children enjoy.

When fruit gardens are created, *mango* (*Mangifera indica*), *plátano*, *mandarina, guayaba* or *guava* (*Psidium guajava*), and *nanche* are the most common species. Fruit gardens have two or three strata. The undergrowth is the place for vegetables: *calabaza, tomate* (*Solanum lycopersicum*). *nanche*, *naranja* and *guayaba* constitute the medium strata, and the canopy has *mangos,* avocado and *plátanos*. Some fruit gardens were created since the foundation of the *ejido*. Others are created after marriage, when a woman and a man become wife and husband and their parents lend them a piece of land to start a new life as a married couple.

Fruit gardens are rich in bird diversity. 38 bird species lived in this landscape unit. *Hurraca* (*Calocitta formosa*) eats squash and banana; *cotorro verde* (*Aratinga brevipes*) rests in fruit gardens and accompanies campesinos in their activities; *pedrito* (*Tityra semifasciata*) feeds from fig trees and rests in avocado trees; and *cocoa 1* (*Dendrocolaptes picumnus*) eats insects. When fruit gardens are near or parallel to streams, they are a place to observe *ave pescadora* (*Chloroceryle americana)*.

During spring, *colibrí* (*Basilinna leucotis*) eats from the banana flowers. In the canopy, *paloma oscura* (*Columba sp.1)* and *pájaro sabio* (*Piaya sp.*) eat from the squash. Also, it is easy to find *gambú de montaña* (species not identified), *tagara sagrada (Thamnophilus doliatus*) and *taupis* (*Tangara episcopus*) eating and resting on the tangerine trees. *Pavito blanco* (*Basileuterus lachrymosus*),

paserina azul (*Passerina cyanea*) and *tucán* (*Pteroglossus torquatus*) are also present (Appendix 3, Table 7 and Table 8).

During autumn, *colibríes (Basilinna leucotis*) make their nests in fruit gardens. In winter, *chinchoco* (*Aimophila rufescens*) and *chipe 2* (*Basileuterus rufifrons*) do the same. In the undergrowth, *hurraca* (*Calocitta formosa*), *cuchi* (*Colinus virginianus*), *paloma de pata roja* (*Leptotila verreauxi*) and *chituri* (*Pitangus sulphuratus)* are recognised because of their singing. Another bird community in fruit gardens is created by *cheque (Melanerpes formicivorus), chara verde* (*Cyanocorax yncas*) and *clicli* (*Falco sparverius*).

The campesino ecology of birds in *potreros* at *ejido Josefa Ortiz de Domínguez*

Potreros represents the resting period for the land previously used for *milpas*. Soil fertility in this environmental unit is low. *Potreros* are the place where cattle rest and drink water during the day (cows are maintained in areas next to home gardens during the night). These areas are cultivated for two or three years before campesinos put them on fallow. This can last from 5 to 8 years, sometimes even 10 years, until a new *milpa* starts.

In *potreros,* grasses and seedlings dominate the vegetation. Besides grasses, some common plants present in *potreros* are oak trees, pine trees and *camotes* (*Ipomoea batatas*). These species have a value for campesinos, who often keep them as a source of wood and food. They also have environmental functions providing seeds for the ecological succession, giving shade to the plantlets, retaining water, and contributing to the recovery of the soil after *milpa*.

Some 33 species of birds are observed in *potreros*. More abundant bird species are *chiturrí* (*Pitangus sulphuratus*), *zopilote* (*Coragyps atratus*) and *pijuy* (*Crotophaga sulcirostris*). Less common species are *gavilán negro* (*Buteogallus anthracinus*), *gorrión* (*Chlorostilbon assimilis*) and *tecolote* (*Glaucidium gnoma*). Most of these species feed on insects, ticks and parasites that affect cattle. Because of this service, birds in *potreros* are highly appreciated by people. They are seen as the company of cattle, and as helping the livestock to stay healthy.

During spring, campesinos commonly see *pujuy* (*Crotophaga ani*), *cuichi* (*Colinus virginianus*) and *cheque* (*Melanerpes formicivorus*) eating insects. Meanwhile, *paloma azul* (*Patagioenas flavirostris*), *tirano* (*Tyrannus vociferans*) and *tortolita* (*Columbina inca*) rest in the canopy surrounding *potreros*, in the oak and pine trees. *Copetoncito* (*Contopus pertinax*) and *chinchoco* (*Melospiza lincolnii*) are present during summer, resting on the back of the animals, eating ticks and insects. *Carpintero* (*Hylatomus lineatus*) and *cheque cabeza amarilla* (*Melanerpes aurifrons*) use *potreros as a place to rest*.

During autumn common species in *potrero* are *chinchoco* (*Melospiza lincolnii*), *gavilán negro* (*Buteogallus anthracinus*) and *pájaro sabio* (*Piaya sp.*). During winter, it is possible to find *cheque* (*Melanerpes formicivorus*) and *copetoncito* (*Contopus pertinax*). All of these species eat insects.

The campesino ecology of birds in the secondary vegetation of the forest at *ejido Josefa Ortiz de Domínguez*

When talking with campesinos in *Josefa Ortiz de Domínguez,* conversations about the environment also concern the history of the environment. This includes remembering the activities people have developed, the plant communities, the vegetation height, and the fauna present in each environmental unit. All of these are variables that people from *Josefa Ortiz de Domínguez* regularly use to define their ecosystems.

As explained before, *milpas* generate an ecological successional dynamic. The clarity campesinos have for understanding and describing this dynamic is, from my perspective, the product of in-depth knowledge of the history and the management of the area. It is by understanding the history of land management that campesinos understand their ecosystem.

The *milpa* cycle is relevant because it means that areas available for agriculture become open to different management and different associated knowledge. As explained in Chapter 3, the last successional stages are kept as secondary vegetation, a successional stage closer to the mature vegetation. Here, conservation and management practices combine their efforts, and the mature

vegetation combines with the coffee gardens or palm plantations and creates different plant communities.

Monte bajo (*montaña baja*) and movement of birds at *ejido Josefa Ortiz de Domínguez*

Montaña baja is an environmental unit that campesinos in *Josefa Ortiz de Domínguez* identify as the first environmental unit they transformed into a conservation and reforestation area (Figure 20). For this, they received a 5-year financial payment (Payment for Hydrological Environmental Services: PESH) (for further explanations, see Chapter 6).

Montaña baja has grasses as dominant vegetation, but also plantlets of oak and pine; it is the first plant community of the successional vegetation where campesinos differentiate between canopy and undergrowth. The height that campesinos associate with this successional vegetation is 1-2 meters. The soil starts recovering from the *milpa*. However, the establishment of the pine trees is considered the most critical event in defining this successional stage.

In *Josefa Ortiz de Domínguez*, the term *montaña* has a broad meaning. (1) It might refer to the altitude of the terrain; (2) to vegetation that is more than 2 m high; (3) to the vegetation that is growing in association with the native vegetation; (4) the mature forest, (5) the last stages of the successional dynamic and (6) trees that are part of the native vegetation and are located near *milpa* or *potrero.*

Some plant species become particularly relevant at *monte bajo* because of the shade they provide or because of the food resources they give to animals and people. In *monte bajo*, one of the most valuable trees is *aguacatillo* (*Persea americana*). Bird species associated with *aguacatillo* are *trepador* (*Dendrocincla homochroa*), *pedrito* (*Tityra semifasciata*), *piranguita* (*Piranga bidentate*); two species of *chorcha* (*Icterus mesomelas),* and *carpinteros* (*Hylatomus lineatus)*. The tree provides a lot of shade, and birds enjoy resting on its branches.

During spring and summer, *chara verde* (*Cyanocorax yncas*), *chituri* (*Pitangus sulphuratus*) and *chorcha* (*Icterus gularis*) are commonly seen eating *lulito*.

Chorcha (*Icterus mesomelas*) use this space for making nests. It is also in *monte bajo* where *cenzontle* (*Turdus plebejus*) rests. *Cenzontle* is very important for campesinos because it announces the starting of the rainy season. These birds have a particular singing that alerts campesinos when the weather is changing and where they must prepare the land for a new *milpa* cycle.

During winter it is common to see *cotorro verde* (*Aratinga brevipes*) and *cotorro cabeza blanca* (*Pionus senilis*) in *montaña baja*. Bird species are seen mainly resting, singing, and playing (Appendix 3, Table 7 and Table 8).

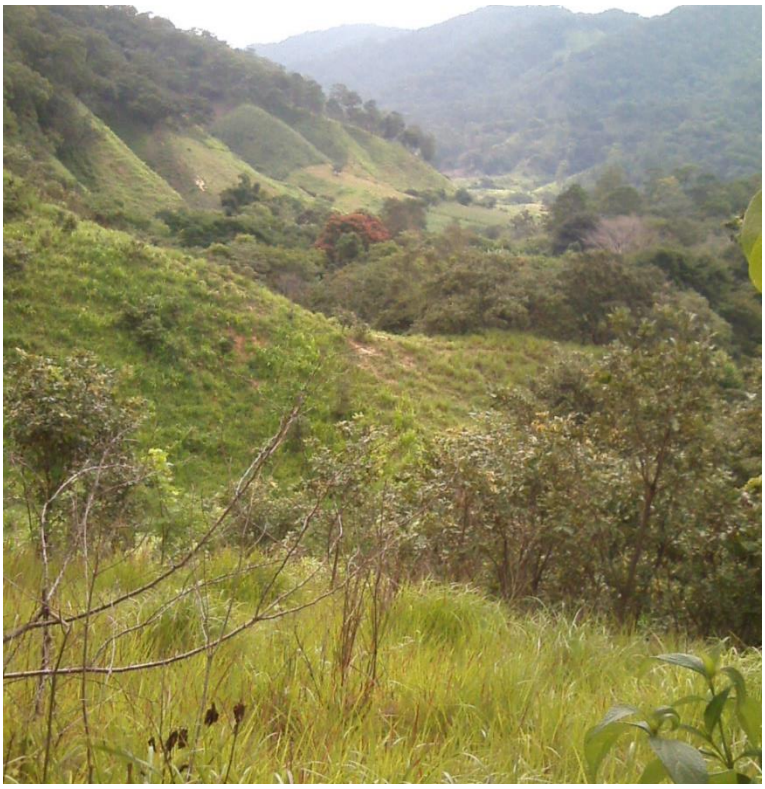

Figure 20. *Monte bajo* and *monte mediano* (Successional forest) at *ejido Josefa Ortiz de Domínguez*, Chiapas. Mexico.

Monte mediano* (*montaña mediana*) and movement of birds at *ejido Josefa Ortiz de Domínguez

Monte mediano or *montaña mediana* refers to the secondary vegetation after *milpas*, *potreros* and *monte bajo* (Figure 21). The age of the vegetation is between five and ten years. Here, two vegetation strata are identified. Grasses diminish in presence and palms become frequent. Pine, oak and fruit trees are also abundant, as some of them were planted during the previous stage, *monte bajo*. The height of the vegetation community is between three and five meters.

Jesús and Omar identified 46 bird species in 2016-2017. During spring and summer, the most common species associated with *montaña mediana* are *colibrí* (*Cynanthus latirostris*), *chara verde (Cyanocorax yncas), gambú de montaña* (species not identified), and *tucán* (*Pteroglossus torquatus*).

During winter, *chipes* (*Cardellina pusilla*) are common, together with *chorcha* (*Icterus gularis*) and *cotorro cabeza blanca* (*Pionus senilis*). These species are omnivorous. They feed on insects and fruits, and they rest on the oak and the pine. Birds highly valuable for conservation, such as *zopilote rey* (*Sarcoramphus papa*), *quetzal* and *pavo de monte* rarely use this environmental unit. During autumn, species commonly seen are *cotorro verde* (*Aratinga brevipes*), *chipe* (*Basileuterus rufifrons*) and *guauco* (*Buteo brachyurus*).

Figure 21. Late successional forest next to coffee gardens at *ejido Josefa Ortiz de Domínguez*, Chiapas. Mexico.

The species in *monte mediano* are a good indicator of the stage of the forest. The birds that move and spend their time here are not seen in the previous environmental units with the same frequency. Excepting *cotorro verde*, the birds

present on *montaña mediana* are probably more specialist and have more specific habitat requirements.

Monte alto (*montaña alta*) and movement of birds at *ejido Josefa Ortiz de Domínguez*

All the landscape of *Josefa Ortiz de Domínguez* has some level of management and transformation from recent times (Figure 22). This is either because of colonisation by campesinos or because of exploitation of resources before campesinos founded the *ejido*. Consequently, there is no clear distinction between mature vegetation and the term *montaña alta*. *Montaña alta* is formed by a late successional stage of the vegetation dynamic and its protection is relevant for conservation agencies. It was one of the most important motives for creating the biosphere reserve. During the foundation of the biosphere reserve *La Sepultura*, collective agreements established that each *ejidatario* would designate 14 ha of *monte alto* for conservation.

For this dissertation, the description of the observed birds in *montaña alta* is incomplete. An earthquake with an epicentre in Chiapas affected the community in 2017 during the last stage of fieldwork. Campesinos re-built the community from zero as the catastrophe destroyed their previous homes (see the methods section). Registering the movement and the observation of birds during this time was not possible.

However, the following record provides an understanding of how birds move through this space and about how people relate to this interaction. Observations are few but enough to show the characteristic dynamic and seasonal use that birds display through the year.

Pine and oak trees dominate the plant community in *montaña alta*. This vegetation constitutes the cloud forest and the temperate forest. Trees reach 15 meters high. In this environment, *cotorro* (*Aratinga brevipes*) remains as a common species, together with *chara verde (Cyanocorax yncas)*. *Pavo* (*Penelope purpurascens*) and *búho* (*Megascops asio*) are also present and not observed or associated with any other environmental unit.

During spring and summer, some common species seen in *montaña alta* are *gambú de montaña* (species not identified) and *pavita* (*Pharomachrus mocinno*). During autumn, *cocoa 2* (*Xiphorhynchus susurrans*), *trogon* (*Trogon citreolus*), *pajuil* (*Penelopina nigra*) and *pava común* (*Penelope purpurascens*) are present. In winter, birds moving in the *montaña alta* are *pajuil* (*Penelopina nigra*) and *codorniz* (*Dactylortyx thoracicus*), both endangered species.

Figure 22. *Montaña alta,* next to *palmares* and coffee gardens at *ejido Josefa Ortiz de Domínguez*. Chiapas. Mexico.

The campesino ecology of birds in *cafetales* at *ejido Josefa Ortiz de Domínguez*

Cafetales or coffee gardens exist in areas no more extensive than 2-5 ha. The largest is 8 ha. In *Josefa Ortiz de Domínguez:* coffee gardens started with the foundation of the *ejido*. As explained in Chapter 3, cultivation of coffee was one of the first activities established by campesinos and rapidly became one of the essential activities for their families. During 2016 and 2017, coffee gardens witnessed a process of re-planting. The older coffee plants died due to

coffee leaf rust. As almost all coffee plants had the same age (20-15 years old), the majority of coffee plants were affected and died.

Jesús and Omar told me about 20 bird species living or visiting coffee gardens. During spring and summer, the most common species are *hurraca* (*Calocitta formosa*), *chorcha* (*Icterus mesomelas*) and *pava* (*Penelope purpurascens*). During autumn and winter, *carpintero sarado* (*Melanerpes pygmaeus*), *gambú de montaña* (species not identified) and *pajuil* (*Penelopina nigra*) are seen eating the coffee fruits before the harvest. Other species seen in coffee gardens are *pez pescador* (*Chloroceryle americana*), hummingbirds (*Basilinna leucotis)* and *zopilote rey* (*Sarcoramphus papa*: another protected species according to the International Convention of Threatened Species of Flora and Fauna). Finally, during autumn, *gambú de montaña* (species not identified) and *paloma* (*Zenaida asiática*) are often together, close to the coffee plants.

The campesino ecology of birds in *palmares* at *ejido Josefa Ortiz de Domínguez*

Cutting palm was a profoundly influential activity for *ejidatarios* during the foundation and first stages of the community. As explained in Chapter 2 and Chapter 3, during the creation of the *ejido* campesinos cut and sold palm trees, which represented their most important economic activity. The government prohibited the business during the 1990s, and campesinos were obliged to stop until they created a new environmental unit for cultivating palms and acquired a certificate. The process allowed them to sell palm leaves without any restriction as the exploitation of the palm was “sustainable”. All the campesinos participated in this project, so all the *ejidatarios* own a palm plantation or *palmar*.

In this landscape unit, palms dominate the vegetation community. Some coffee plants might also be present, as coffee gardens and palm plantations are usually next to each other. 22 different bird species were recognised as part of the bird community in palm plantations.

During spring and summer, the most abundant species are *cotorro cabeza blanca* (*Pionus senilis*), which moves through the *niquidambar* trees

(Liquidambar styraciflua), and *chara verde* (*Cyanocorax yncas*), associated with the *cacate* trees (*Oecopetalum mexicanum*). *Paloma ala blanca* (*Ramphastos sulfuratus*), *tangara ala amarilla* (*Tangara abbas*) and *pedrito* (*Tityra semifasciata)* forage from the shorter trees. During winter, palm plantations are visited by *colibríes* (*Basilinna leucotis*), although the most abundant specie are *cotorro verde* (*Aratinga brevipes*) and *chipre* (*Habia fuscicauda*), a bird highly appreciated because of their singing on the *guarumo* trees (*Cecropia obtusifolia*). In autumn, it is possible to find communities of *carpinterito* (*Piculus sp.*), *tangara ala amarilla* (*Tangara abbas*), *pajuil* (*Penelopina nigra*), and *trogon* (*Trogon violaceus*).

What is the significance of these descriptions? This catalogue of the bird species in *Josefa Ortiz de Domínguez* has one deeper intention. The descriptions derive from what Jesús and Omar, two young men and future *ejidatarios,* told me about ecological interactions in different seasons of the year. While sharing this information with me, they allowed me to get closer to some of their knowledge. At the same time, they evidenced their ideas about the role they, their families and the community play in defining the functioning of their ecosystems. As explained by the young campesinos, the plant species that birds use as a refuge, as a place to rest or as a source of food, are mostly plant species that people also use in their everyday life. The trees that provide fruit to children are the same trees that provide fruit to the birds. The hidden thoughts behind these descriptions are the active link that exists between people`s activities and the biotic interactions that defines how ecosystems work. From my perspective, campesinos position the role of human activities in the dynamism inherent to ecosystemic processes.

Table 4. Some common plant species associated with the community of birds inside *ejido Josefa Ortiz de Domínguez*, Chiapas. Mexico.

Common name	Scientific name	Name in English
Lima	*Citrus aurantifolia*	Lime
Cacao	*Theobroma cacao*	Cacao
Café	*Coffea sp.*	Coffee
Mandarina	*Citrus reticulata*	Nectarine
Plátano	*Musa paradisiaca*	Banana
Naranja	*Citrus sinensis*	Orange
Manzanilla	*Chamaemelum nobile*	Chamomile
Yerbabuena	*Mentha spicate*	Mint
Margaritas	*Bellis perennis*	Daisy flowers
Orquídeas	*Orchidaceae sp.*	Orchids
Palma	*Chamaedorea sp.*	Palm
Cedro	*Quercus sp.*	Oak
Nanche	*Byrsonima crassifolia*	Nanche
Calabaza	*Cucurbita sp.*	Squash
Pata de sapo	*Eryngium sp.*	---
Lulito	*Psidium friedrichsthalium*	Costa Rican guava
Frijolito	*Phaseolus vulgaris*	Beans
Ocote	*Pinus montezumae*	Pine
Maíz/Elote	*Zea mays*	Maize
Mango	*Mangifera indica*	Mango
Guayaba	*Psidium guajava*	Guava
Tomate	*Solanum lycopersicum*	Tomato
Camote	*Ipomoea batatas*	Sweet potato
Aguacatillo	*Persea americana*	Avocado
Niquidambar/estorasque	*Liquidambar styraciflua*	Sweetgum
Cacate	*Oecopetalum mexicanum*	---
Guarumo	*Cecropia obtusifolia Bertol*	trumpet tree

DISCUSSION

In *Josefa Ortiz de Domínguez*, birds move through the landscape while they look for food and places to rest, to nest and to pair. The way campesinos refer to the birds resembles the way an older brother would talk about their younger siblings. In the rural community, emotions allow people to connect with

their surroundings (Hamilton 2002). Emotions are not exclusive to interactions between individual beings (Kay 2006). It is clear that in *Josefa Ortiz de Domínguez*, animals and plants are part of emotional connections of people.

Birds and campesinos at *Josefa Ortiz de Domínguez.* Feelings and thoughts

From an ecological perspective, the environmental heterogeneity of the landscape at *Josefa Ortiz de Domínguez* allows animals to find diverse habitats and resources. This heterogeneity builds on the combination of human activities, ecological and geographical attributes (Gardner *et al*. 2009). The forest, its successional dynamic and the agroecosystems provide the animals with food during the different seasons of the year. Also, they provide the animals with places for resting and nesting. Birds are selective. They move through the different landscape units, depending on the available resources (DeVictor, Julliard and Jiguet 2008; Carrara *et al.* 2015). Abundance and diversity of food are the primary variables used by campesinos for defining the movement of these animals.

Critics of the livelihood strategy of campesinos argue that, although agroecosystems maintain high levels of biodiversity, they do not provide enough habitat for endemic and rare species (Fischer *et al.* 2011; 2017). This argument often assumes that campesinos promote deforestation and forest degradation under a growing demand for resources and population growth. Does this mean that landscapes managed by campesinos have limited conservation significance? From what I noticed in *Josefa Ortiz de Domínguez* and what I discussed with campesinos, the answer is not straightforward. Different landscape units working as habitats and corridors for the movement of species might be beneficial for conservation and work against forest degradation. This idea is further discussed by ecologists working on fragmented landscapes (Bhagwat et al. 2008). It is possible to consider that conservation and campesinos might learn from each other. It is desirable to look for processes where both actors contribute to a shared comprehension of the landscape (Sayer *et al.* 2013).

Campesino ecology of birds at *ejido Josefa Ortiz de Domínguez:* contribution to current dialogues on conservation of biodiversity

Different authors suggest that generalist birds are less sensitive to fragmented landscapes than specialist species (Mellink, Riojas-López and Giraudoux 2016). This is one reason why ecologists suggest that mature vegetation is more important than successional vegetation when establishing a protected area. However, the complex ecological and social reality of the mature forest under the influence of local communities and MABR raises questions about how to better apprehend social and ecological impacts of conservation projects (West, Igoe and Brockington 2006; Kainer *et al.* 2009).

One of the arguments politicians and conservationists in Chiapas commonly used for delimiting the "core areas" for biosphere reserves, such as *La Sepultura,* is that birds (and wild species) highly valuable for conservation live in the mature vegetation. They also argue that some of these birds are so specialised that they are absent in the successional forest. According to campesinos, this is the case of the *quetzal*. However, the rest of the species considered by *La Sepultura* as endangered species use the heterogeneity of the landscape for their life cycle Birds that visit *milpas* during spring have their nests in the *monte (bajo, mediano)* and *potreros*. These and other species might have resting areas in the home gardens. In this sense, human intervention in *Josefa Ortiz de Domínguez* provides bird species with a variety of habitats.

Despite the presence of the MABR, the decisions regarding what activities to do, and how to do them are still in the hands of campesinos. Activities such as the observation of birds by young campesinos gives indications for a possible understanding between ecological scientific knowledge and the elements campesinos define as important to interpret their environment (Gadgil, Berkes and Folk 1993; Agrawal 2005; Atran 1998).

CONCLUSION

According to campesinos, two bird communities, or groups of bird species, are present in Josefa Ortiz de Domínguez. One group prefers *milpas*

and first successional stages of vegetation while the second group prefers the late successional stages of vegetation and the mature forest. Campesinos understand the ecology of birds as a function of at least three variables. One, the presence or absence of the species in the different landscape units. Two, the actions that the birds display in each landscape unit. And three, the plants with which the bird species interact. A remarkable element of this knowledge is that most of the plant species mentioned by campesinos as a critical resource for the birds are species planted by them. Another remarkable aspect of this description of the landscape is that every landscape unit mentioned by campesinos connects to particular emotions and empathy towards the animals. Recognising that campesinos understand their landscape with regard to these socio-ecological interactions opens new conversations (Reiter 2018). These conversations relate to *La Sepultura*, its notions about ecosystems and its approach on conservation. Here, campesinos are in the centre of the ecological complexity where bird communities exist and adapt.

The fact is that protected areas in Mexico and Latin America are not enough for protecting the biodiversity in the region (Blackman, Pfaff and Robalino, 2015). Moreover, agroecosystems alone cannot ensure the maintenance of the forest under the political and economic pressures related to their performance (Wezel *et al.* 2016). Conservation needs collaboration (Corlett 2015; Woodhouse *et al.* 2015; Oldekop *et al.* 2016). Ecological knowledge shared between campesinos and environmental science might represent a central element for building communication (Sarukhan *et al.* 2014) and, also, for building policy and action regarding conservation and sustainability in the area.

Conservation as a political event that shapes rural landscapes in Mexico is the starting point of the next chapter. Chapter 6 explains different approaches to conservation of biodiversity in the context of raising mobilising and environmental movements in the country. Therefore, the next chapter attempts to reveal synergies and trade-offs relevant for sustainability and biodiversity.

CHAPTER 6

Political Ecology of Campesinos. Questioning Conservation of Biodiversity in Mexico

INTRODUCTION

There is an information gap regarding the ways in which conservation discourses relate to the historical demands of campesinos in Mexico. Because of this, Chapter 6 explores some of the links between conservation of biodiversity and campesinos' resistance. It explores certain antagonisms and synergies that define the interaction between global conservation projects and management initiatives developed at the local level. I explain how PESH projects inside the Man and Biosphere Reserve *La Sepultura* interact with the interests of people at *ejido Josefa Ortiz de Domínguez*, where the forest and their resources constitute elements of the identity of campesinos.

As was mentioned in Chapter 2 and Chapter 3, conservation still has several challenges to overcome. Some of these challenges consist of understanding failure at the local, regional and national levels. Failure includes the common incoherence between economic and environmental policies (Corbera and Martin 2015; Hendrickson and Corbera 2015), the difficulties to keep conservation projects working in the long term, the lack of interest among local people (Buscher *et al.* 2012), the need for technical support, and the mismatch between different interests and perspectives on conservation (Martinez-Reyes 2014). These failures translate into the poor contributions of conservation practices to the wellbeing of families and the maintenance of biodiversity (FAO 2015; Schleper 2017).

Dialogue could allow collaboration among all actors involved in conservation (Dove 2006; Price, Park and Bouamrane 2010). Similarly, recognising the culture and the local traditions of people should match with overcoming the challenges of conservation (Wilshusen *et al*. 2002; Boege 2015). However,

Romero *et al.* (2012) explain that the leading global agencies for conservation receive rising criticism. On the one hand, they have enriched themselves in a few years. On the other hand, they have received the complaints and doubts from human rights activists. Some conservation agencies see ecological and technical requirements as a priority, leaving behind the social backgrounds in which they operate.

Chapter 6 engages with the critiques that campesinos as local actors bring to conversations about biodiversity and sustainability worldwide. In addition, I explain the main arguments behind some of the most relevant environmental movements happening in Latin America today, especially in Mexico. As McKey *et al.* (2010) mention, biodiversity plays a critical role in the history of how livelihood strategies of indigenous and mestizo campesinos evolve. At the same time, these livelihood strategies are central elements of the identity of people (Cusicanqui 2012). The identity and the voice of campesinos represent critiques of the current paradigms of economic development and conservation of biodiversity (Escobar, Rocheleau and Kothari 2002; Leff 2011).

First, I introduce the case of Cherán Keri and the agroecological movement in Mexico to explain perspectives of conservation interlinked with the local organization of people. I also present some connections between Neo-Zapatismo and different social and environmental demands. Finally, I discuss the conservation scheme of Payment for Environmental Services in Mexico and I present an in-depth case study of the emergence of an environmental conflict at *ejido Josefa Ortiz de Domínguez.*

The voice of campesinos. Critical thinking on conservation of biodiversity and sustainability

As mentioned by Martinez Alier (2014), political ecology is not exclusively a research field for geographers and anthropologists but also a space for critical thinking and environmental activism. Political ecology analyses of conservation underpin and constitute an active social and political movement in Latin America. In this context, some authors argue that the recognition of different cultures and notions of the environment associated with biodiversity creates

new critical thinking and establishes new conditions for producing critical thinking (Boaventura do Santos and Oeste 2007: 17).

In Mexico, a country considered one of the wealthiest countries in Latin America, campesinos still live under the highest rates of poverty, inequality and lack of education. In this scenario, different economic and social programs have tried to extinguish agricultural systems managed by campesinos (Harvey *et al.* 2008). As mentioned before in this thesis, the resistance of campesinos to abandoning their lifestyle and their production systems invites us to ask about the role these social actors have in the conservation of ecosystems today (Barkin 2006).

Some suggest that the ecological questions regarding the maintenance and use of biodiversity are too complex to be relegated exclusively to natural scientists. Concerning sustainability, it is impossible to develop a robust panorama of human and environmental interactions without considering the way in which different human groups have impacts on ecosystems and ecological dynamics (Miller 2007; Steffen *et al.* 2011). So, how do campesinos in Chiapas respond to new environmental and social challenges? The declaration of an environmental leader (Radio Zapatista, 2017) is unequivocal:

> *"Before, nobody cared about us, nobody thought about us. We were expelled to the mountain. Therefore, the best land was left to those who owned all the money. The land was left to them for extensive agriculture while communities were left in isolation. If our grandparents and great-grandparents went to ranches to find a job they were badly treated. However, we imagined a better way to live. We did not receive education; we did not receive health system, we received nothing…and 20 years ago, capitalism developed an interest in our land. It was not enough for them to have the best land for their animals, they realised our mountains also had value: the richness of Nature.*
>
> *Now, they want the richness of Nature too. This is a new way of dispossession. What did they do to trick us? They privatised*

land. They wanted us to sell and to buy our Mother Earth. The government says that everything is legal…

Some say we are the cause of the soil becoming infertile, but this soil allows us to produce our maize. We recovered our land, and we work collectively. This means that we needed much practice, we needed to find out how things work. Therefore, together, we maintained our milpas…However, because of the rain, milpas sometimes didn´t work…

The important thing is not to give up. We had to face it; we had to do it, we had to look for solutions, to invent them, to create them".

López and García-Guerreiro (2016) concur with campesinos in Chiapas when they state that contemporary modes of appropriation of land and resources promoted as sustainable, are actually built on new forms of land dispossession. In this regard, Galicia-Luna (2016) explains that Mexico has given major concessions to mining and hydrological enterprises inside Natural Protected Areas in recent years. In her analysis, the author shows that Chiapas is the state where these concessions are more common. She argues that the rise in number of protected areas in the region correlates with the rising number of mining and hydrological projects.

Furthermore, some authors consider that social injustice and environmental injustice are correlated (Dussel 2013) and that a legitimate notion of ecology should maintain an alliance of solidarity among people and nature (Boff, 1995). Martinez-Alier (1991 2002) explains that some social struggles by the poor might represent ecological struggles. He suggests that if poverty leads to environmental degradation and if poverty is rooted in unequal power relations, social movements that oppose political domination oppose the unequal use of resources. Therefore, the struggle for survival implies defending the access to and use of resources.

Different social movements emerge from the voices of campesinos in Mexico

The social movements that have emerged in Mexico since the 1990s consider that agricultural areas and forests are spaces for food sovereignty, for conservation, and for social autonomy (Enlace Zapatista de Liberación Nacional 2017). In the words of Rocheleau (Radio Zapatista 2017), the land management strategies and the ecosystems associated with the livelihood of campesinos represent an opportunity for understanding humans as living organisms within a world with other living organisms.

The voice of campesinos turned into the defence of the forest in Cherán, Michoacán. Cherán is a region that acted in the name of human rights and conservation of their natural resources and ecosystems. Cherán is a municipality in Michoacán, where Purépecha (an indigenous group) and mestizo campesinos live. At sunrise on April 15th, 2011, women and children from Cherán, Michoacán stopped three trucks carrying illegal wood taken from the mountain. Illegal loggers cut the trees around a spring called *la cofradía* located in the conserved communal forest. It was here where some of the oldest trees in Cherán stood.

When the illegal logging penetrated to the spring waters in the heart of the forest, women were worried. Fewer trees implied less water for everybody. Neither cattle nor people could have fresh water. As illegal loggers were violent and were armed, talking to them was inconceivable. After realising what was going on, women met in secret. They were tired of thefts and deforestation of their communal land. Women realised that Illegal logging and narcotraffic were responsible for the environmental degradation in their forest. The uprising of Cherán started at midnight. Women met in the church and closed the roads for the illegal loggers. People from Cherán came together, and they expelled the local politicians and the police since they were collaborating with the criminals. They established barricades to prevent the entrance of the illegal loggers. Campesinos in the community banned political parties. With time, Cherán transformed their government and proclaimed their autonomy. They established an alternative local authority, based in the Purepecha tradition. People organised themselves to create a local law enforcement and the communal

forest police. Since that time, men patrol the temperate forest every day, and campesinos, women, men and youths have planted 3,000 ha of pine trees in five years.

Since land is owned communally in Cherán, families use it but individuals do not have land-titles. Anyone who wants to cut a tree needs approval from the communal authorities. Today, Cherán is the leading community in reforestation practices in the state of Michoacán. Communal teams created nurseries of *abies* and *oyamel* trees. By using seeds from the standing forest, they planted more than 50,000 trees in one week of community work (España-Boquera and Champo-Jiménez 2016; Cherán Keri 2018).

Besides Cherán, the voices of campesinos organise environmental action in other regions of Mexico. In 2001, biologists found genetic contamination of native maize in *milpas* in the state of Oaxaca (Figure 23). A social movement known as “without maize, there is no country” (*Sin maíz no hay país*) emerged under the leadership of campesinos and a small group of environmental scientists. During the process, maize became an emblematic icon of political discourses and social demands. These demands included the rejection of genetically modified crops, the right to food sovereignty and the defence of territories against land grabbing. At the same time, organisations such as the Centre for Integral Small Farmer Development in the Mixteca (CEDICAM in Spanish acronym) became noticed and empowered. The organisation of campesinos (from a region called the *Mixteca Alta*, Oaxaca) won the Goldman Environmental Prize in 2008. They combined local knowledge related to *milpa* and indigenous ecological knowledge related to successional vegetation to enrich agroecological practices. As a consequence, campesinos restored their forests and developed sustainable agriculture in the region. CEDICAM allowed the convergence of communities of campesinos and coffee producers with NGOs and universities. As time passed, they influenced what it is now called the Mexican agroecological movement (Toledo and Barrera-Bassols 2017).

Figure 23. Agroecological movement and environmentalists in the campaign *Sin Maiz no hay país* in Cuernavaca, Morelos. Mexico (La Jornada, 2011).

For some political ecologists, the diversity of Latin American society is crucial for understanding the environmental history of the region and for contextualising environmental issues today (Alimonda 2002; Bridge *et al.* 2013). This was clear to Avila-Calero (2017) who studied the expansion of large-scale wind energy projects in the Isthmus of Tehuantepec (Mexico). By using political ecology, she evaluated the way wind energy is embedded in a framework of power relations. She noticed that in the Isthmus of Tehuantepec, people fight against the enclosure of their communal lands. Communities resist the private appropriation of benefits and the lack of democratic processes related to control over land. The author emphasises the role of communal identities and institutions in building successful networks of resistance based on collaboration and solidarity.

In the 1990s in Mexico when the national policies about land ownership changed (as explained in Chapter 3), the last version of PROCEDE excluded communal ownership and allowed only private property. Different communities declined to participate in PROCEDE under this land-ownership regime. In Chiapas, the following announcement became popular on placards along the road: *"You are arriving at a free territory. Here it is not allowed to buy or sell the land, if you are here for that, you are not welcome".* The media described people from the affected communities and from communities that rejected

PROCEDE as ignorant, violent individuals responsible for environmental degradation (Reddeldia 2017c).

Diverse social movements that rejected PROCEDE focused their arguments on the role that natural resources, social justice and power relationships have in defining environmental interests. This is the case of the Neo-Zapatista movement. Neo-Zapatistas demand the right of indigenous and mestizo people to live in autonomy (for more in-depth reading see Jan de Vos (2002) and www.enlacezapatista.com). The first public presentation of Neo-Zapatismo took place on the 1st of January 1994. Their emergence was an active response to NAFTA, PROCEDE and neoliberal policies arising in Mexico (See Chapter 2). Neo-Zapatistas contextualised their claims as the recognition of their human rights. They demanded their right to own land, education, and dignity (Enlace Zapatista de Liberación Nacional 1994). Different communities in Mexico supported EZLN. Among them were Catholic groups working with forest communities and cooperatives of campesinos. In 1996, Neo-Zapatistas and different indigenous communities published *Los Acuerdos de San Andrés Larraiza* (Sámano *et al.* 2000). In this document, they demanded their right to live in autonomy and in concordance with their culture. In this document, they consider conservation as a responsibility shared among communities for taking care of nature.

It is crucial to acknowledge that the Neo-Zapatista movement is highly influential in the state. As people migrate looking for better places to live, it is common to find former Neo-Zapatista members in communities outside Neo-Zapatista territories. This was the case of one religious leader living in *Josefa Ortiz de Domínguez* with his wife and three children. He left Neo-Zapatismo to become a priest. He left the mountains in the north to become part of the community in the southern mountains in the state.

Neo-Zapatismo organises annual conferences where campesinos invite environmental scientists to explain climate change and environmental science (Enlace Zapatista de Liberación Nacional 2017). According to Neo-Zapatistas, these conferences offer an arena for campesinos and scientists to listen to each other and to build projects under common agreements. Neo-Zapatistas started

a journey in which direct communication with civil society was fundamental. *The Story of the Others* presented in Appendix 2 outlines the perspective of Neo-Zapatistas concerning their voice and their interest in finding agreements among different actors.

Escobar (1995) suggests that the diversity of environmental movements happening in Latin America today might enrich critical thinking in conservation. Here, individuals express their identity as a group. Social and environmental struggles in Mexico and Latin America have their own language and invite social and natural scientists to discuss and distinguish between population pressure on resources and the pressure of production on resources.

Payment for Environmental Services in Mexico and Chiapas. Effects on campesino communities

What happens to campesinos under global environmental and conservation regimes? Avila-Calero (2017) suggests that commodification of nature and the enclosure of their land is common. This happens because conservation projects are often built under the neoliberal logic of markets and private property. Politicians in charge forget the social and cultural significance of land and the environment (Igoe and Brockington 2007).

Furthermore, one of the major critiques of commodification of nature is that it can replace local strategies by activities focused on monetary income and utilitarian ends (Gabay and Alam 2017). These activities create global-local interactions ruled by market transactions. As a result, conservation projects disrupt local institutions and local systems of values change. This happens in the case of PES schemes and Conservation and Development Projects (ICPDs).

Martìnez-Reyes (2014) explains that conservation and development projects (ICPDs) followed the establishment of biosphere reserves in Mexico. These projects aimed to integrate local people into the global discourse of development and conservation. He analysed the failure of two projects for forest wildlife management in Yucatán. The author found that local people expelled the NGO responsible for these projects. Two factors caused this failure. First,

the lack of an agreement among state agencies, the NGO and the local community about the aim of the project. Second, the unequal relationship among actors (technicians dictated how local people could take part in the conservation projects). Martínez-Reyes concludes that autonomy and recognition of local institutions are critical components establishing democratic and participatory processes for conservation and management.

García Amado *et al*. (2012) explain that ICDP projects started in the country in 1995 in collaboration with the Program for Conservation and Forest management (*Programa para la Conservación y Manejo Forestal*). On the other hand, PES started in 1996 as part of the Regional Sustainable Development Program (Programa de Desarrollo Regional Sustainable or PRODERESU). Today, PES works under the influence of CONAFOR and CONABIO. The program is divided into hydrological PES (PESH), and Carbon and Biodiversity PES (PES-CAPBSA). It operates in all the biosphere reserves of the country. In Chiapas, the authors found that people receiving PES think about conservation as an activity related mainly to monetary income. They detected that campesinos' preference for conservation increased as the length of time receiving PES increased.

In contrast, Hendrickson and Corbera (2015) examined how PES-related projects were promoted and adopted by communities in Chiapas. The authors focused on *Scolel Té*, the first project of carbon sequestration that operated in Mexico. The project paid local people to carry out tree-planting activities. 60% of the sale price of carbon offsets was for participants. Almost half of that income was used for paying the administrative and technical costs of the project. The results of this study evidence two factors that encourage people to participate. One, the modification of the local norms for the management of resources. Second, the financial and physical assets obtained. The potential of *Scolel Té* to strengthening cooperation among participants and ease social division was considered an important element for success. Therefore, the authors highlight the willingness of local people to engage in these projects and consider that PES schemes might contribute to transforming the livelihood and institutions at local levels.

McAfee and Shapiro (2010) highlight that one particularity for PES in Mexico is that distribution of payments follows local institutions and local agreements. As 54% of the territory is communal, PES schemes are re-shaped by local communities. Here, people insist that the value of ecosystem services does not derive from the market but from their contributions to the everyday lives of people. This means that benefits of environmental services cannot be quantified or sold. The research concludes that one of the main reasons why PES schemes often fail is because of the collision of the market logic with the values, interests and priorities of people. Also, because of the imposition of one view over the other.

The effect of PES might go beyond economic incentives because they support and mobilise local institutions and social relations. The research studies mentioned above showed that financial incentives are not the only important motive for participating in PES. Willingness to participate relates to economic and social factors. Therefore, opportunities to strengthen social relationships might be more relevant for promoting participation in PES than economic incentives alone. The premise that money incentivises farmers to adopt conservation practices should be re-thought. It is indispensable to move scientific analysis beyond the effect of PES on economic incentives and extend it to participation and social benefits. Furthermore, as Osborne (2011) argues, it is indispensable to analyse PES schemes at a landscape level. Otherwise, PES might work as an enclosure mechanism that constrains land use.

PAYMENT FOR HYDROLOGICAL ENVIRONMENTAL SERVICES AND THE VOICE OF CAMPESINOS AT *EJIDO JOSEFA ORTIZ DE DOMÍNGUEZ*

> *"One day, government could ask us to leave. All because of the war for water and the land. We are running out of water and here in Josefa is where water arises"*.

Chiapas is the state with the most indigenous languages spoken and one of the most biodiverse. Likewise, Chiapas is the state with the highest levels of poverty and inequality in Mexico (CONEVAL 2018). Here, conservation exists both as a tool for land dispossession and as a tool for strengthening communal organisation. Under certain contexts, conservation in protected areas might violate human rights and the right of autonomy of indigenous and mestizo communities. Under different circumstances, it might be an ally of communal efforts to build sustainability and conservation based on local perspectives (Altieri y Toledo 2011; Speelman *et al*. 2014).

As I wrote at the beginning of this dissertation, I chose Chiapas for research on conservation because of its social, economic, political and cultural complexities. During the time I lived there, moving between San Cristobal de las Casas and *Josefa Ortiz de Domínguez*, I was an observer at different academic and non-academic forums (Appendix 1, Table 6). Issues discussed included conservation, human rights, and economic development. For example, I had the opportunity to hear Joan Martínez-Alier and Leonardo Boff at Unitierra, the academic forum founded by Neo-Zapatistas. Also, I attended a forum about *The Communal Earth* (*La Tierra Común*) where indigenous people from Latin America came together in parallel with the visit of Pope Francis to San Cristobal de las Casas in 2016. I was invited to regional forums on sustainable practices and economic development, and I participated in national forums to discuss the challenges of conservation inside protected areas. In different scenarios, each time a campesino or a member of an indigenous group had the microphone, I found more similarities than disagreements with their opinions. Agreements referred to their present and their future challenges. In *Josefa Ortiz de Domínguez*, campesinos clearly manifested those challenges when talking about the program of Payment of Environmental Services-Hydrologic (PESH).

When PESH started at *Josefa Ortiz de Domínguez,* campesinos had divergent opinions about its guidelines. These opinions remain today. The arguments against PESH in the *ejido* share common points with the arguments of campesino movements and indigenous movements in other parts of the country, even though campesinos from *Josefa Ortiz de Domínguez* do not take part in any political movement. I suggest that these similarities come from the

vision and the history that individuals, families and communities in rural Mexico share. It is only a question of time for these movements to continue growing and connecting (Lemos and Agrawal, 2006).

Which are the elements of conflict between the PESH and *ejidatarios*, and how do differences between these two actors become the starting point for creating alliances with others? Those are the questions that lead the narrative of this chapter. At times, conflicts between *La Sepultura* and campesinos constituted a topic too delicate to be mentioned. I first took the opportunity to discuss them in a focus group with *ejidatarios* working closely with the MABR. Subsequently, I extended the conversations by talking with the *ejidatarios* that openly spoke against PESH at ejidal meetings. Campesinos and I developed sufficient trust to talk to each other about this issue after one comment the *Comisario ejidal* gave to encourage us. He said that *"I should hear everybody, because everybody has their own opinion and all opinions are important. The young, the old; the ejidatario, the poblador".*

In previous chapters, I explained that the aim of the diversified livelihood of people in *Josefa Ortiz de Domínguez* is nurturing choice. They achieve this by managing a heterogenous landscape. As the community is not isolated, they enrich the diversity of their economic activities with remittances (temporary work outside the community), governmental subsidies, and collaboration with different communities and with environmental agencies such as *La Sepultura.* For their economic strategy to work, the ecological knowledge of campesinos works at different scales. On the scale of genetic diversity, it works to create polycrop systems. On the scale of species, it works for managing agrobiodiversity. On the scale of plant communities, it creates different landscape units. And, on the scale of the landscape, it works to manage the conservation schemes under the regime imposed by *La Sepultura*.

Chapter 3 set out how in *La Sepultura*, the lifetime of conservation projects is no longer than five years (Figure 24). This biosphere reserve in Chiapas is no different from other protected areas in Latin America. Here, both local people and the staff of the PAs consider that lack of technical support, difficulties in creating market chains for the goods produced, and the lack of efficient

communication among actors are the main factors responsible for the failure and the poor performance of conservation projects. As one campesino at *Josefa Ortiz de Domínguez* told me:

> *"At the beginning, when La Sepultura started, the reserve prohibited us to cut palm leaves; if we continued we would go to jail…they want us to cultivate trees that are not acclimated to the mountain, trees that do not belong here, and they want us to nurture them, to give attention to them, more than the attention we give to our animals…where is the logic in that?"*

Conservation projects might fail, but the experience people gain from them is a constantly evolving process. After 20 years of short-term conservation projects in *La Sepultura,* campesinos from *Josefa Ortiz de Domínguez* consider these projects are ephemeral and inconstant; they operate as part of the strategy politicians use to attract widespread support. However, beyond the short-term life of conservation projects, people learn to relate to institutions while these projects exist (Bermeo, Coutuier and Galeana Piaña 2014).

In the history of *Josefa Ortiz de Domínguez*, it is evident that sometimes campesinos work with local authorities, scientists and people from NGOs. As explained before, these forms of collaboration encouraged me to pay closer attention to the way people make their living. Campesinos learn to negotiate and to express their opinion. They take decisions and use their power as individuals but also as a community. Public meetings remain as the primary tool for decision-making. Here, individuals in the community discuss the most suitable activities to develop under what circumstances. However, prior discussions and decisions might occur at the family level. Here, people prioritise activities and practices. This way they build an economic rationale and evidence non-economic values (Chapter 3 and 4).

Chapter 3 explained that by 2000, *La Sepultura* and *Josefa Ortiz de Domínguez* had established a working relationship. Staff from the biosphere reserve approached *ejidatarios* in *Josefa Ortiz de Domínguez* and offered them a

payment scheme for hydrological environmental services (PESH). They explained the payment scheme to the community in the ejidal assembly; only *ejidatarios* and heads of family participated.

Figure 24. *Ejidatario* at a regional meeting on sustainable practices for cattle. Municipality of Villaflores, Chiapas. Mexico.

From what *ejidatarios* recall, the staff of the biosphere reserve described *Josefa Ortiz de Domínguez* as a special territory: located in a forested area and integrated to the *Tablon* basin. Consequently, *ejidatarios* were *"the guardians of springs"* that provided water to the communities downstream. For this reason, CONAFOR and the MABR promoted a program that would ensure that the forest would remain untouched. If *ejidatarios* accepted the PESH, they should reserve a forested area for ten years without extraction of natural resources. In exchange, people would receive MXP 14,500.00 per year (approximately USD 765.50). At the beginning, *ejidatarios* did not want the payment; they wanted to use a section of the forested area to cultivate maize and to develop *milpa*.

> *"When the reserve told us about the PESH, they asked us: how much money would you obtain if you plant maize and beans in*

this land? We made our calculations; MXP 12,000.00 (USD 634.00) pesos we said. Moreover, that was the exact money we received each year".

At first glance, accepting PESH was about money. However, beyond that, for *ejidatarios* in *Josefa Ortiz de Domínguez,* PESH was about the creation of job opportunities and about the chance of being recognised. At the beginning of the project, most of the *ejidatarios* considered PESH as an award for their efforts. For others, PESH was only another temporary project.

Today, there is the perception that PESH has contributed to the environmental changes happening within the *ejido*. The forested area has increased since the arrival of the program. Water, which has always been considered important for *ejidatarios,* became a sign of the forest's improving condition. One *ejidatario* told me:

"Our springs started to dry. Before, I saw the spring water emerging from the trees like little threads, here, in my plot. I had two springs of water, but after the fires, I did not see them anymore. I supported the PESH program because we needed to do something, and they (La Sepultura) were giving us money just for keeping the forest without management, a forest that I had already destined for my grandchildren".

For others, PESH represented an opportunity to modify some of the practices *ejidatarios* and *La Sepultura* considered were detrimental to the forest. As not all *ejido*s decided to participate in PESH and as not all the candidates were accepted, the program became the representation of new responsibilities for *ejidatarios*:

"The reserve offered us the payment as a prize, as a recognition for the conservation efforts we were doing. We suffered from a fire that came from a neighbouring community, but we fought it anyway, and we lost one "compadre" (close friend) because of that. We witnessed how the forest was destroyed. In La Sombra

(the neighbouring community) for example, you cannot see the forest; it is almost gone. People there did not care about protecting the mountain. They never reached collective agreements in their meetings, I know that because my son-in-law belongs to that community. People there did not care about their trees. As we were committed to protecting the forest after the last fire, the payment was offered to us. Technicians from SEMARNAT came and made their measurements and their observations, and they told us: "you have a good forest, everything looks fine, and you should get the payment… we just came from the other community (La Sombra) and the forest is different there, there is no forest anymore". Then, we had the payment as a reward for our work. However, the money is not enough because pobladores are not receiving anything; if they get any of the money it is because their father or their father-in-law distributes his payment among his family".

I think PESH is working because I now see springs that had once disappeared from my plot. All the water we use comes from the mountain and that water exists because of the trees. You can see how the water emerges from a tree that is close to my cafetal. Five years ago, the water spring was dead, but now it is here again. I will take you there for a picture".

However, PESH generates contrasting opinions. As the project limits the available space to develop productive activities, some campesinos living in *Josefa Ortiz de Domínguez* consider the program as a constraint. They also acknowledge that some individuals are more vulnerable than others under this environmental regime. The entrance of PESH implied less land for agriculture and cattle. Then, *pobladores*, those who do not possess land titles, had less available plots to rent for developing their productive activities. *Pobladores* and some *ejidatarios* saw PESH as an unjust alternative for conservation:

"I think PESH should disappear. The trees are there, and we take care of them, but the mountain is also there for us to use it.

When the project started, ejidatarios did not realise they were compromising their land. Now, they cannot cultivate anymore. …Where will they have their milpas now? If they cannot cut the trees because of the PESH, what are pobladores going to do? Their relatives, those with land titles, preferred to receive some money, only crumbs. They earn too little while others must look for areas outside Josefa Ortiz de Domínguez to cultivate maize. The money has no use then.

For pobladores, the situation is worst. They migrate and leave their families, like my son. They have no land to cultivate, and they cannot have access to the animals and the trees in the mountain. This is why I think PESH should disappear. We need to take care of the mountain, but not with the rules imposed by the PESH and the reserve. The reserve only cares about the trees, while we need to take care of our families".

The opinion of another campesino, a *poblador* who works outside *Josefa* as a temporary seasonal worker for cattle ranches, was the following:

"People cannot cultivate anymore, they hanged themselves by accepting the entrance of the reserve and the PESH program. Now, ejidatarios cannot increase the area they intend to cultivate. Ejidatarios cannot cultivate milpa in the areas protected by PESH and they do not need people to help them to cultivate and harvest in the rest of their land. This is why PESH is wrong. As I cannot cultivate more, I don´t pay for the help of pobladores and now pobladores are facing very difficult economic circumstances".

One day, after my visit to a plot reserved for PESH, I was taking a break together with the women of one family. Women usually come together before lunchtime, while their husbands are still working in the *milpa* or in the mountain and children are at school. They usually come together in the house of the oldest woman present, who is often the grandmother, the wife of an *ejidatario*.

That day I received a valued lesson from a young *pobladora*, the daughter of an *ejidatario.* She explained to me why PESH existed and about who benefits from it:

> *"Did you know that in other countries there are no more mountains? People cut the trees; they do not have any more forest. Therefore, they need us and need our forest now. That is probably the reason why you received your scholarship, and that is probably the reason why they are paying for us to maintain the forest. Those remote places have no more oxygen, no more clean air and they give money to countries like Mexico that have some forest remaining.*
>
> *Nevertheless, sometimes the money does not reach places like Josefa Ortiz de Domínguez. All the money is taken by the people in the government or by institutions like Cooperativa AMBIO. Those people receive all the money, they say they will distribute the money, but they make almost nothing. They do not conserve; we are the ones who take care of the trees and the ones to make the promise to not cut the trees or make the mountain disappear. However, they leave us with almost nothing. We just receive a very small amount of money for what we do; even though we are making the most significant effort.*
>
> *Now tell me, are you going to be one of those people? Are you going to end your studies and are you going to forget about us?"*

The voice of campesinos at *ejido Josefa Ortiz de Domínguez* in response to extractivism at *La Sepultura.*

One of the main challenges of *La Sepultura* is promoting successful conservation projects that work in the long term. In this case, success refers to ecological and technical improvements but equally important is the positive opinions they generate among people living inside the biosphere reserve. However, social activists consider that many of the conservation discourses, ideas and projects operating in Chiapas are part of a national attempt to

dismantle territories and collective decision-making institutions (McAfee 1999; McAfee and Shapiro 2010; Rocheleau 2015).

It is undeniable that PESH creates conflicting opinions among ejidatarios and *pobladores*. However, other issues concerning water are gaining attention during the everyday conversations of families. At night, conversations in *Josefa Ortiz de Domínguez* are rich in topics: the weather, milpas, local news. One day, Luis told us of a regional meeting that just happened further downhill, in the *ejido* called Chanona. A senator from Chiapas organised the meeting. The reason: he wants to take water from the river to Villaflores. He needs ejidal signatures for the water extraction project to start. The project intends to create a system that extracts water from the river and delivers it to Villaflores, the municipality. Luis explained to us that some ejidal authorities were previously informed about the issue. They looked for guidance from lawyers and from the staff of *La Sepultura.* Previous experiences advised them to be cautious.

Water is a highly valuable good in the mountain, and people think the project could create a problem of water scarcity. According to Luis, the meeting ended abruptly because people from *ejido*s yelled and kicked out the senator and his advisors. The final statement from *ejido*s is that nobody will take water from the river. *Ejido*s should prepare themselves for a legal battle and look for political alliances. The first named ally: the Director of *La Sepultura*. Within the MABR, water extraction is not allowed.

Luis told us about a discussion among ejidal authorities from different *ejido*s. Some think that water extraction is not important for those living upland. "*This could create a division; some ejidos could say yes to the project while others could say no. We need to be very careful, politicians always look for division*". His father continued:

> *"I think we all would suffer the same scarcity, because the water is the same (it has the same origin), running from one place to the other. It arises here, but the river and the streams are connected. If you take too much water from one side of the mountain, you will leave the other side without enough water.*

This happened to me here, in my plot. I needed water to irrigate my grass, the grass I use for feeding the cattle. In the beginning, everything seemed ok, but after a couple of days, I saw that the hose I used for irrigating the milpa was not carrying water anymore. This happened in the milpa where I work together with my sons and my daughter's husbands. Therefore, it was imperative. I thought: why did this happen?

Moreover, I started to look for water leaks in the hose. Then, I realised that the grass and the milpa had different hoses, but the same stream fed them. I saw that the hose for the grass was bigger, and I understood that water pressure was higher, and it was taking all the water. I think the same would happen with the extractivist project. If the senator takes the water, the first affected people will be those living downhill, but it would be a question of time until we are left without water too".

A couple of days after my conversation with Luis, I shared a car ride and breakfast with the staff from *La Sepultura*. After breakfast, the first conversation was about the senator's petition. One of the technicians from *La Sepultura* told us that the director from the biosphere reserve attended a meeting at the National Congress in Mexico City. He was trying to demonstrate that water extraction should not be allowed and argued that, if accepted, the project needed a previous analysis about how much water could be taken from the river.

"Letters with death threats are arriving at the office. Some are directed to the director from La Sepultura; others, to the office. Are ejidatarios responsible for those letters? Is the government? Could be both. However, for the director and us, the most important thing is to resist. Finding all the information and the arguments for responding to the particular interests of the politicians. Now, people are looking at us with a magnifying glass; any mistake could make the difference...What the government wants now is to dismiss the Director. People from

the government want to change those in charge of the reserve, and very important people in the highest political elites are behind this issue. The important thing is not to give up. These problems have always existed. The important thing is not to be afraid and keep working".

People in *Josefa Ortiz de Domínguez* looked alert after the news arrived. The problem was not discussed at dinner during the daily family reunions, but it seems that ejidatarios were expecting more information. Some ejidatarios refused to talk to me about the conflict. Distrust and avoiding difficult conversations could partially explain the silence about the issue. However, as days passed, some ejidatarios had something to say and talked indirectly about the problem. One ejidatario told me about his daughter, Sara, who lives in Villaflores. She lives there with her husband and four small children.

Water arrives at Sara`s home only three times per week, during the mornings. A couple of months ago, their house did not receive water. The problem lasted more than one month. As Sara has four children, aged between 1 and 12 years, she had much laundry to do. She took the dirty clothes and went to the nearest stream to wash them there. Once in the stream, Sara realised the water was contaminated; it had a bad odour and looked muddy. As money is scarce (her husband works as a moto-taxi driver) she was unable to buy water. Therefore, she decided to make the journey to *Josefa Ortiz de Domínguez* and to stay there, with her parents, until the water scarcity was over down in Villaflores. She took her four children with her; her husband stayed working. One day the conversation became more personal, and Sara's father explained to me:

"Problems like these are not important for rich people. They can go anywhere to get water. Alternatively, if they do not travel, they can buy it, or they build water collectors. For them, money solves everything, so they do not see the problem".

The stream and the springs are considered a treasure, and both constitute a valuable resource in *Josefa Ortiz de Domínguez*. In springs, campesinos can fish every day and provide some protein for their family. Besides, children living

in *Josefa Ortiz de Domínguez* spend their time swimming and playing in the water. Water is one of the reasons why *Josefa Ortiz de Domínguez* receives regular visitors during dry seasons. Family members who live outside the *ejido* often visit their relatives and spend some time in the streams. Their conservation and management are a shared responsibility. *Ejidatarios* owning land with stream banks and springs pay attention to the activities developed there and often maintain these areas without converting them to production. Since the stream provides water to the community, every head of the family is in charge of their weekly supervision.

Figure 25. Streams are common along the roads at *ejido Josefa Ortiz de Domínguez*, Chiapas. Mexico.

Don Carlos explained to me the value of this resource (Figure 25). We used to walk to his nearest plot to talk about his life in the mountain. He explained how his perception about water had changed over the years. He is another founder

of the *ejido,* so he walks slowly and only for short distances. His descendants are now in charge of managing his land. However he is still the one with the final decision about the activities he and his family develop.

> *The most important value here is water. The next war will be for water, did you know? The government and the Bible have already told us.*
>
> *Before, rain was constant. When we first arrived, it rained every day. It was difficult to open the milpa and to cut palm. Rain could last for weeks; it was also very cold, we had to wear sweaters. However, the mountain changed, and the weather became warmer over time. Now there is less rain and, sometimes from June to August, it is too hot.*
>
> *The mountain is growing again, and the water is returning to the mountain. This is one of the reasons we have the PES program. People from the government said it was because of hydrological services, which means that here we have water and we take care of it. We take care of both, the mountain and the water.*
>
> *Water arises from the trees. When water arises, it seems like a small stream; it looks like a little thread connected to the tree, just like that. This happens not in one or two trees; this happens in different trees. Then, the little threads of water come together, and they create the river, which becomes stronger as it passes through the mountain. Before, we could see where the water was rising. There were many places where you could see it. But with time, water became scarce. Now, there are places where water does not arise anymore, and I do not know the reasons why. Maybe it is because we were cutting too many trees from the mountain, or probably it is because the rain is not as frequent as before.*

Water is scarcer every day. That is why people from other communities want to live here in the mountain. Don Andrés, for example, will sell a small plot and somebody from outside wants to buy the plot. We are not allowing people from outside to buy land here but, with time, this will be more common and then the war will begin. They will want our land, even if they do not buy it. That happened in Las Palmas. We call a place at the top of the mountain Las Palmas. People from San Cristobal de las Casas who did not speak Spanish were demanding that land for themselves. We arranged things. They understood that land belonged to us. They realised they had to look for another place. These problems will continue.

Moreover, us, we take care of the water but sometimes do not think about these issues, not even for those living downhill. Sometimes we let the animals, the cows, graze near the river. This is wrong because their faeces contaminates the water and many people downhill depend on this water. We always discuss this in the common reunions, but sometimes people do not listen. If that happens, we have to punish the owner of the animal. With time, laws for animals and activities like cattle will change. Eventually, cattle will remain in pens.

Gaby, take a picture of me here for me, under this tree. Because in this place water rises in the rainy season. You can take a picture now. I will bring you back in the rainy season and you will see how different it looks".

It is clear that PESH creates a conflict among *ejidatarios* and *pobladores* living inside *Josefa Ortiz de Domínguez.* The role of PESH in supporting family decisions about conservation or interfering with the successional dynamic of the *milpa* is highly controversial within the *ejido.* Other authors have focused on the effects of these conflicts and the need to understand the socio-political processes that could support equal access to resources and environmental services (Bennett *et al.* 2015). Furthermore, the conversation that is

indispensable for campesinos to have is the following: Are PESH and *La Sepultura* allies in issues that go beyond the preservation of the forest? That is a question that remains without answer. As shown in this chapter, campesinos from *Josefa Ortiz de Domínguez* might think of PESH as a positive or as a restrictive activity. However, the conflict regarding the water extraction challenges the fragile relationship between campesinos and *La Sepultura*.

In 2015, directors and staff of protected areas in Chiapas met at a regional conference in San Cristobal de las Casas. People from local communities, scientists and NGOs working in conservation were present. Participants in the conference identified and discussed their challenges: empowerment of people living in protected areas, conflicts over land tenure, conflicts of interests between developers and conservationists, degradation of natural resources and mining were some of the topics discussed. At the end of the conference, one campesino said:

> *"How is it possible that the same institutions that talk about conservation, those that have forbidden us to cut the trees for years, are the same institutions allowing the entrance of the mining industry into the forest today?"*

DISCUSSION

As shown at *ejido Josefa Ortiz de Domínguez*, sometimes conservation agencies and local communities hear each other and find common agreements. Consequently, conservation becomes a dialogue where concepts, values, and aims feed on and enrich each. The lessons that conservation agencies might take from this experience are diverse. One lesson might be seeing themselves within complex power interactions. A second lesson might be recognising and respecting differences. In this context, new dialogues require an extra effort. These new dialogues do not eliminate the conflict around conservation; they transform it into new theory and practice (Cusicanqui 2012).

West (2016) suggests that critical thinking is needed to overcome challenges regarding conservation. She also suggests decolonizing practices as a necessary step for sustainability. In her opinion, failures in conservation

practices occur because conservation policies come from top-down agencies and not from the local practices of people. In parallel, Boege (2015) proposes a way of environmental thinking founded in local ecological and cultural aspects. This way, social and natural scientists might enrich their perspectives on conservation and contribute to build sustainability. For this, both authors argue for a system of knowledge that takes responsibility for their impacts on the environment, and for an environmental perspective that goes beyond commercial interests and opens possibilities to social and cultural projects.

Dialogue between *ejido Josefa Ortiz de Domínguez* and *La Sepultura.* Main contributions to conservation of biodiversity and sustainability

I set out two realities in this chapter. First, the explicit critique that campesino communities use to challenge international and national perspectives on conservation. Second, the conservation initiatives that local people develop once they negotiate with biosphere reserves. This means that conservation in Chiapas is not reduced to a group of practices nor a single debate. Conservationists working in biosphere reserves, people living in communities within biosphere reserves, and communities resisting the intrusions of environmental projects show different strategies and diverse values related to conservation. However, there is a subtle communication among these actors, so conservation develops an identity; singularities are intrinsically embedded in each experience and, sometimes, they translate into global conversations.

CONCLUSION

The constant negotiation between campesinos living in *ejido Josefa Ortiz de Domínguez* and *La Sepultura* implies working towards agreements. Inside the *ejido,* campesinos use their local institutions to express their concerns and their opinions regarding the forest and their water springs. The negotiation and dialogue regarding the forest and PESH are under constant scrutiny. Campesinos and conservation agencies distrust each other. In the case of *Josefa Ortiz de Domínguez,* events such as the entrance of extractivist projects become meaningful as campesinos challenge *La Sepultura*. Campesinos ask

the MABR for a clear statement, a clear plan and concrete actions for protecting the forest. People in *Josefa Ortiz de Dominguez* are concerned. Some campesinos rejected PESH because it limited the land available for *milpas*; especially for *pobladores*, the most vulnerable population in the *ejido*. Campesinos who supported PESH took the decision to protect their water springs and the forest for their grandchildren and the economic benefits that the project implies. However, the whole community now faces the threat of the water extraction project and campesinos do not receive clear answers from *La Sepultura.*

Discussion about conservation and avoiding deforestation should consider a broad framework of values and interests (Chazdon 2014). Yet, it should include a more in-depth exploration of the economic and historical reasons associated with the maintenance of the forest in the short and long term (Chazdon *et al.* 2009). In this process, campesinos engage with natural and social scientists. Campesinos ask specialists to keep in mind that producing theory about the experiences that includes them as active political actors on sustainability must not be simply a fashion (Enlace Zapatista de Liberación Nacional 2017). Furthermore, campesinos also engage with environmental agencies and ask them for integrity. In what is stated by campesinos in *Josefa Ortiz de Domínguez*, integrity refers to coherence in their motives, their discourse and their actions.

As explained by Scoones (2016), different regimes of truth articulate different policies. Consequently, conservation constitutes an opportunity for global and local actors to discuss what biodiversity implies for the wellbeing of people and for the emergence of sustainability. He also mentions a growing consensus on sustainability in social, economic and environmental terms among policy makers and environmental specialists. Therefore, it is indispensable to approach conservation and poverty alleviation as processes embedded in particular political contexts. The role of biodiversity in the livelihood of campesinos differs from the role it plays as element of a trade-off between conservation and economic growth (Sunderland, Ehringhaus and Campbell

2008). Campesinos, as do many other local actors, enrich the way sustainability is approached. Their knowledge, their culture and their practices need recognition. These are the key themes for the final remarks of this dissertation.

CHAPTER 7

Conclusion

Some questions that guided this ethnography wereas follows. How do conservation projects inside the Man and Biosphere Reserve of *La Sepultura* interact with campesinos? What do campesinos think about conservation? And, how does, or could, this interaction contribute to enrich discussions about conservation and sustainability? To answer these questions, I used a political ecology perspective, and I explored the debates about campesinos and conservation through the articulation of four approaches: the historical narratives of campesinos, their material relationship with the landscape, the ecological interactions that define their landscape, and the events that could lead to conflicts or alliances between conservation and campesinos. Throughout this ethnography I focused on the everyday life of the owners and managers of the land. I argued that campesinos play an active role in managing and preserving their mature forest, an ecosystem that exists closely connected with other ecological and social elements of the environment. This ethnography shows that knowledge grounded in the cultural, historical and environmental context of campesinos seems viable and desirable for conservation in the region.

Campesinos contribute to conservation perspectives

In *Josefa Ortiz de Domínguez*, some conservation projects promoted by *La Sepultura* are enforced by the community. These projects modify the management of the landscape. Campesinos use them to formalise rules for accessing and using the forest, and avoiding specialisation on economic activities. As a consequence, the mature forest remains as a protected area, and the watershed function is conserved. The opinion that campesinos have about conservation challenges the arguments of conservationists that consider success in terms of monetary income. In contrast, it agrees with those authors

who consider that conservation projects should promote social organization and collective agreements (Berkes 2013; Speelman *et al.* 2014; Fischer *et al.* 2017). For campesinos, if conservation agencies wish to advance the preservation of the mature forest, they should first recognise the economic, social and ecological factors that relate to the forest, and the way these factors interact.

Campesinos have a genuine interest in understanding how conservation agencies operate. Here, failures in conservation have also become experiences for learning. After negotiating the entrance of the MABR, campesinos opened a dialogue with different conservation agencies, including *La Sepultura*. As other studies with small-scale farmers in Latin America suggest, campesinos at *Josefa Ortiz de Domínguez* acknowledged and experienced some of the positive links that conservation of biodiversity had in their everyday life (Buscher *et al*. 2012; Martinez-Reyes 2014; Corbera and Martin 2015; Hendrickson and Corbera 2015).

Campesinos choose a lifestyle where biodiversity has an active role

In *Josefa Ortiz de Domínguez*, biodiversity is appreciated beyond its monetary value and as part of their moral economy (Biersack 1999; Hamilton, Dewalt and Barkin 2016). This ethnography showed that agroecosystems and biodiversity relate with the way women and men describe themselves, establish what is relevant for them and create emotional relationships with their environment. This is evident when campesinos migrate to Villaflores but come back to the forest after they experience the life in the city. They choose to cultivate their *milpas* and live a life within the forest.

The environmental heterogeneity promoted by campesinos in *Josefa Ortiz de Domínguez* has an important ecological function. It provides complementary habitats for animals. Birds visit the mature forest, the successional vegetation and the agroecosystems in the ejido to get food and shelter in different seasons of the year. Campesinos have a deep understanding of this ecological dynamic and consider themselves as key agents allowing and promoting these and other ecological interactions to happen. However, more research is needed in order to understand the role of environmental heterogeneity in the ecological

sustainability of the region. Further studies should include ecological analysis of ecosystem functions and sustainability.

Another issue not discussed in this dissertation and relevant for the present and the future of rural regions in Mexico is the lack of strategies that campesinos have for facing climate change. During the last decades, men and women from *Josefa Ortiz de Dominguez* have witnessed changes in the weather and the landscape. Rising temperatures, frequent droughts and irregular rain are recognised and discussed in family gatherings, but poorly understood. Therefore, solutions are scarce. The presence of coffee leaf rust, the loss of the harvest and the absence of strategies for safeguarding varieties of maize are some of the problems people associate with these issues. Information and building capacities are urgently needed, as well as collaboration with external institutions.

Fragile relationships of trust mediate the collaboration between campesinos and conservation

This dissertation (Chapter 6) also showed contrasting opinions that might lead to conflicts between conservation and campesinos. For example, for implementing PESH, authorities from *La Sepultura* named campesinos as “guardians of the forest”, responsible both for the forest degradation and preservation. Campesinos accepted PESH. The project would create job opportunities, regional and national recognition, and a strategy to manage fire and promote water management. At the beginning, PESH worked; fire management was efficient, and the forest apparently recovered from past deforestation. However, as time passes, social effects of PESH become meaningful. Campesinos now discuss the negative consequences of reserving land exclusively for conservation. PESH imposed limitations for accessing the successional forest and developing *milpas*. As population grows, the scheme affects the most vulnerable part of the community, *pobladores*. PESH might continue, but the conflict takes a new meaning when extractivist projects challenge the fragile relationship between campesinos and conservation agencies.

Conservation agencies keep silent when the shared agreements for managing the forest between campesinos and *La Sepultura* are violated by external actors and economic interests, such as extractivist projects. In this new scenario, campesinos confront *La Sepultura* and other conservationists. They question the aims of the conservation projects and accuse conservation of being a silent accomplice of extractivism. As in other regions, conservation agencies are losing campesinos' trust, and conservation is perceived by some local people as a threat (Haenn 2005; Fairhead, Leach and Scoones 2012; García-Luna 2016).

In terms of the synergy between conservation projects and campesinos, one of the most significant challenges for conservation agencies lies in the ability to offer coherence in the manner they present themselves and act toward campesinos. Coherence for campesinos refers to the continuity between what is stated and what is done. If conservation is interested in improving the life of people, campesinos argue that projects should move beyond a monetary income and strict conservation practices. Under the current uncertainties and challenges, women and men at *Josefa Ortiz de Domínguez* seek expertise and scientific knowledge to improve their practices while preserving the mature forest. Campesinos also ask for education for the youngest generation: the young people living in the mountain who will face the future challenges of the rural communities. Sharing knowledge and finding common questions and answers constitute demands that campesinos make regarding conservation (Gómez-Pompa 2017: Enlace Zapatista de Liberación Nacional 2018).

Campesinos contribute to the practice and theory of conservation

Economic duality is a fundamental element of the moral economy of campesinos (Toledo *et al.* 2003; Barkin 2006). For individuals, families and the community, protecting the forest is as relevant as supporting an ecological dynamic and monetary income is as crucial as achieving food sufficiency each year. Biodiversity is in the centre of their strategy. For campesinos, conservation should be a process that nurtures their livelihood and its complexity, not a sum of short-term projects working only on supporting one landscape unit separated from the rest.

This dissertation recognises campesinos as active political and conservation actors. This approach required the recognition of their political history, their effort to apprehend biodiversity as a cornerstone of their livelihood, and their perspective on the landscape as an open and dynamic ecosystem. I think that acknowledging these elements could help projects and agencies to approach conservation with respect to the rights of campesinos and recognition for their way of living. The link that connects these elements is immensely dynamic and creative. This gives the opportunity to develop theory and practice related to political ecology, conservation and rural studies for understanding the relevance of these local actors (Guha and Martinez-Alier 1997; Martinez-Alier 2002). I hope that this dissertation contributes to this change.

Contributions of campesinos to political ecology of conservation

Summarising, how to interpret and give meaning to the campesino way of living in the context of political ecology of conservation? This ethnography explained that most conservation practices and techniques in *Josefa Ortiz de Domínguez*, as in other communities in Latin America, rest on the monetary value of nature, on scientific knowledge (represented by technicians working in *La Sepultura*), and on conservation regimes planned and operated by international agencies such as MABRs (Buscher *et al.* 2012; Fairhead, Leach and Scoones 2012).

Some of the conservation schemes operating in the community might contribute to poverty alleviation at the family level (Sims and Alix-García 2017). However, campesinos concur with theory on conservation when they recommend that conservation practices move beyond direct incentives and focus their efforts on strengthening social organization and the livelihood of campesinos at the family and the community level (Kosoy, Corbera and Brown 2008; Berkes 2013; Corbera and Martin 2015; Hendrickson and Corbera 2015).

This ethnography documented that campesinos participate in some conservation schemes and, at the same time, they transform them. These ongoing, almost silent, processes of remaining in the forest and transforming their relationship with conservation might be also interpreted as an action of resistance (Barkin 2006; Durand 2014; Bernstein 2018). Campesinos as

political actors respond to conservation and other socio-economic challenges by promoting links or articulations with other actors outside their community (Rochelaeu and Roth 2007; Rocheleau 2015).

The process of remaining in the forest, resisting and transforming their relationship with conservation does not emerge as a novel event. Its antecedents go back to the social and political actions that defined campesinos as political actors in Mexico during the XXth century (Escobar 2010; Bernstein, 2018). At the same time, this process finds meaning in the local knowledge of campesinos, their interpretation of the landscape and their relationship between their livelihood and other living beings (Gudeman and Rivera 1990; Toledo *et al*. 2003; Persha, Agrawal and Chhatre 2011).

In *Josefa Ortiz de Domínguez*, the political dynamics and their implications for the ecology, the landscape and the livelihood of campesinos create a particular perspective that might reject conservation schemes or might work with conservations as allies (Scoones 2016). One possibility is that campesinos and conservation create a space for dialogue and negotiation, which implies collaboration (Buscher, *et al*. 2012; Reiter 2018). Collaboration might be effective for a period of time. However, new pressures challenge this relationship. The pressure on the forest and the water puts pressure on campesinos too. Specifically, in defining who has access to the resources, and who determines the rules for managing the land (Gomez-Pompa and Kaus 1999; Fairhead, Leach and Scoones 2012; Scoones 2016). Campesinos need allies to maintain a life style that includes their permanence in the forest (Corlett 2015; Erisman *et al.* 2016). At the same time, conservation needs to learn from local actors and collaborate with local institutions if they expect to contribute to the SDGs (Berkes 2013; Chazdon 2014).

Hopefully, this ethnography will contribute to a perspective that sees conservation as a collaborative process with democratic participation of all actors. If conservation and campesinos manage to create common ground in their shared interests, it will be possible to strengthen relationships and work under a framework of respect for the rights of campesinos to remain in their

land and nurture their lifestyle (Wilshusen *et al.* 2002; Boff 1995; Leff 2015a; 2015b).

If collaboration with conservation is not achieved, campesinos will look for collective action that connects people under similar challenges and perspectives on their resources and the forest outside the community (Altieri 2004; Rocheleau 2015, Scoones 2016). Collective action might emerge in political alliances, acknowledging different values related to the forest, ecological knowledge and social organization (Leff 2011; Toledo and Barrera-Bassols 2017). Thus, if the study of conservation and sustainability gives relevance to particular places and people, this ethnography contributes to an understanding of the factors that promote those alliances to emerge, their fragility and their possibilities to become meaningful.

APPENDIX 1

Table 5. Formal interviews done during fieldwork (October 2015 to February 2017) in Chiapas, Mexico. Actors interviewed, institutions and main topics discussed related to conservation, socioenvironmental movements and local organization in Chiapas, MABRs and *La Sepultura*.

Interviewed	Institution and Place	Topic
November 2015		
Member of Agroecology Research Group, ECOSUR.	ECOSUR, main campus. San Cristóbal de las Casas, Chiapas	Fieldwork and political ecology in Chiapas
Researcher, Political Ecology ECOSUR.	ECOSUR, main campus. San Cristóbal de las Casas, Chiapas	Networking and agroecology in Chiapas
Member of Agroecology Research Group, ECOSUR.	ECOSUR, main campus. San Cristóbal de las Casas, Chiapas	Agroecology and political ecology in Chiapas
Staff, *Pronatura Sur* A.C.	*Pronatura*, main Office, San Cristóbal de las Casas, Chiapas	Conservation projects in Protected Areas, Chiapas and Communitarian development
December 2015		
Regional Director, Protected Areas Chiapas.	ECOSUR, main campus. San Cristóbal de las Casas, Chiapas	Challenges of protected areas and conservation projects at *La Sepultura*
Director, Otros Mundos AC.	Otros Mundos AC, main office. San Cristóbal de las Casas, Chiapas	Payment for environmental Services and environmental conflicts in Chiapas
Member of Political Ecology Research Group, ECOSUR	ECOSUR, main campus. San Cristóbal de las Casas, Chiapas	Environmental Conflicts in Chiapas
February 2016		
Staff member, Fray Bartolomé de las Casas.	Fray Bartolomé de las Casas, main office. San Cristóbal de las Casas, Chiapas	Social conflicts and local resistance to economic and development projects in Chiapas
Director, MABR *La Sepultura.*	National Commission of Natural Protected Areas. Regional office. Tuxtla Gutierrez, Chiapas	Collaboration and conservation Projects in *La Sepultura*
Staff members. MABR *La Sepultura.*	*La Sepultura,* office. Villaflores, Chiapas	Conservation projects, failures and successes at *La Sepultura*

Table 5 (*continuation)*. Formal interviews done during fieldwork from October 2015 to February 2017 in Chiapas, Mexico. Actors interviewed, institutions and main topics discussed related to conservation, socioenvironmental movements and local organization in Chiapas, MABRs and *La Sepultura*.

Interviewed	Institution and Place	Topic
February 2016		
Staff member, Fray Bartolomé de las Casas.	Fray Bartolomé de las Casas, main office. San Cristóbal de las Casas, Chiapas	Social conflicts and local resistance to economic and development projects in Chiapas
Director, MABR *La Sepultura.*	National Commission of Natural Protected Areas. Regional office. Tuxtla Gutierrez, Chiapas	Collaboration and conservation Projects in *La Sepultura*
Staff members. MABR *La Sepultura.*	*La Sepultura,* office. Villaflores, Chiapas	Conservation projects, failures and successes at *La Sepultura*
March 2016		
Ejidal Authorities. *Ejido Los Ángeles.*	House of the ejidal authority. *La Sepultura*	Conservation projects, local organization and opinions about *La Sepultura*
Ejidal Authorities. E*jido California.*	House of the ejidal authority. *La Sepultura*	Conservation projects, local organization and opinions about *La Sepultura*
Ejidal Authorities *Ejido Tierra y Libertad.*	House of the ejidal authority. *La Sepultura*	Conservation projects, local organization and opinions about *La Sepultura*
Ejidal Authorities. *Ejido La Sombra.*	House of the ejidal authority. *La Sepultura*	Conservation projects, local organization and opinions about *La Sepultura*
Former director, MABR *La Sepultura* and MABR *Montes Azules.*	*La Sepultura,* office. Villaflores, Chiapas	Fire management in MABRs and *La Sepultura*
Staff member, CONAFOR.	*La Sepultura,* office. Villaflores, Chiapas	Fire management and local organization in MABRs and *La Sepultura*

Table 5 (*continuation)*. Formal interviews done during fieldwork from October 2015 to February 2017 in Chiapas, Mexico. Actors interviewed, institutions and main topics discussed related to conservation, socioenvironmental movements and local organization in Chiapas, MABRs and *La Sepultura*.

Interviewed	Institution and place	Topic
April 2016		
Communitarian Technician, AMBIO.	House of the interviewer. *Josefa Ortiz de Domínguez*, Chiapas	Carbon sequestration projects and Payment of Environmental Services in Chiapas
Staff, MABR *La Sepultura.*	House of the interviewer. *Josefa Ortiz de Domínguez*, Chiapas	*La Sepultura*, local organization and working in conservation
Sub-Director, *La Sepultura.*	*La Sepultura,* office. Villaflores, Chiapas	Relationship with *ejidatarios*, challenges and lessons
Staff members, CONAFOR.	Casa ejidal. Josefa Ortiz de Domínguez	Reforestation projects at *La Sepultura*
May 2016		
Director, AMBIO.	AMBIO, main office. San Cristóbal de las Casas, Chiapas	Carbon sequestration projects and sustainable cattle at *La Sepultura*
Technical staff, AMBIO.	*Casa ejidal. Josefa Ortiz de Domínguez*	Reforestation and local ecological knowledge
June 2016		
Staff, *Pronatura Sur A.C.*	*Pronatura*, main office, San Cristóbal de las Casas, Chiapas	Biological monitoring and conservation projects at *La Sepultura*
August 2016		
Local environmental leaders.	*Universidad Autónoma de Chiapas, Villaflores, Chiapas*	Cattle projects and landscape management
Staff members, CONAFOR.	*House of ejidatario. Josefa Ortiz de Domínguez, Chiapas*	Reforestation projects and local organization at La Sepultura
Staff, La Sepultura	*Local Restaurant, Villaflores, Chiapas*	Environmental Conflicts at La Sepultura
September 2017		
Sub-Director, La Sepultura	*National Commission of Natural Protected Areas. Regional office. Tuxtla Gutiérrez, Chiapas*	Damages and recovery after earthquake

Table 6. Main official events I attended during Fieldwork (October 2015-February 2017) in Chiapas, Mexico.

Event	Institution
November 2015	
Conference. Joan Martínez-Alier. *Environmentalism of the poor*.	CIDESI *Neo-Zapatista* educational centre.
Seminar. *Agroecology and Political ecology in Chiapas.*	ECOSUR-Research Institute.
Seminar. *Protected Areas in Chiapas. Challenges for the future.*	ECOSUR-Research Institute.
Seminar. *Protected Areas and biological monitoring.*	ECOSUR-Research Institute.
December 2015	
Seminar. *Environmental Conflicts in Chiapas*	CIDESI *Neo-Zapatista* educational centre.
Conference. *Social conflicts in Chiapas and Guatemala*	ECOSUR-Research Institute.
CONCIENCIAS. Annual meeting for natural scientists and *Neo-Zapatistas.*	CIDESI *Neo-Zapatista* educational centre.
February 2016	
Forum. *Social justice and environmentalism in Chiapas*	Fray Bartolomé de las Casas, main office, Chiapas.
Seminar. *Social and environmental conflicts in Chiapas*	CIDESI *Neo-Zapatista* educational centre.
Workshop for ejidal authorities*. Controlling and managing fire*	*La Sepultura*, main office.
March 2016	
Annual meeting between *ejidatarios* from *Josefa Ortiz de Domínguez* and CONAFOR authorities	*Ejido Josefa Ortiz de Domínguez, casa ejidal.*
April 2016	
Meeting between Local Authorities and MABR Staff.	*La Sepultura,* main Office.
May 2016	
Conference. Leonardo Boff. *Theology of liberation and ecology in Latin America.*	CIDESI *Neo-Zapatista* educational centre.
Seminar. *Social Justice in Chiapas.*	CIDESI *Neo-Zapatista* educational centre.
CONARTE. Annual meeting of artists and *Neo-Zapatistas*	CIDESI *Neo-Zapatista* educational centre.
September 2016	
Annual reunion of small-scale farmers. *Sustainable Practices in MABRs, Chiapas.*	Autonomous University of Chiapas.
September 2017	
International Conference. *Environmental Services in the Neo-tropics*	Environmental education in MABRs.

APPENDIX 2

The story of the others (translated from Marcos, 2008)

The oldest of the elders who settled in these lands told that the highest gods, those who gave birth to the world did not all think the same way.

That is to say, they did not all have the same thoughts, but each one of them "felt" his thoughts and, among themselves, they listened to each other, and respected each other.

The oldest among the old saying that that is the way it was, because if it had not been so, the world would never have been born, because the fist gods would have spent all their time fighting since the thoughts they felt was different.

The oldest of the old saying that that is why the world came out with many shapes and colours, as many as the thoughts the highest gods, and the first among them had.

Seven were the highest gods, seven were the thoughts each one of them had, and seven times seven are the shapes and colours with which they dressed the world. Old Antonio tells me that he asked the oldest of the old how the first gods were able to come to an agreement and talk to each other since the thoughts they felt were so different.

The oldest of the old responded to him, Old Antonio tells me, that there was a meeting of the seven gods, together with the seven different thoughts each one had, and that al that assembly they came to an agreement.

Old Antonio says that the oldest of the old said that that assembly of the first gods, those who gave birth to the world, was a long time before yesterday, that it was precise when there wasn`t yet time. They said that during that assembly each one of the first gods said this piece and they all said: "My thought that I feel is different from that of the others".

Then the gods kept quiet because they realised that when each one of them said "the others", they were talking about different "others". After they remained quiet for a while, the first gods realised that they already

had the first agreement and that was that there were "others" and that those "others" were different from the one each was. So that the first agreement the very first gods had was to recognise the difference and accept the existence of the other. What else could they do anyway since they were all gods, all first, and they had to accept this because there wasn`t one who was more or less than the others, except that they were different, and that is how they had to walk.

After this first agreement came to the discussion because it is one thing to recognise that there are others who are different, and the very different thing is to respect them. So that they spent quite a while talking and discussing as to how one was different from the others, and they did not mind spending much time in that discussion because there was no time yet.

Afterwards, they all kept quiet, and each one of them spoke about his difference and every other of the gods who were listening realised that by listening and learning about the difference of the other, he could understand better what in him was different. Then they were delighted and started to dance, and they danced for a long time, but they did not care because at that time did not exist. After the dance, the gods came out with the agreement that it is a good thing that there exist others who are different and that one must listen to them to know oneself.

Moreover, after that agreement, they went to sleep because they were exhausted after having danced so much. They were not tired of talking because these first gods, those who gave birth to the world, happened to be very good at talking, and they were only beginning to learn how to listen.
I did not notice at what time Old Antonio left. The sea is already asleep and there only remains a shapeless wax spot of the little candle stump. Above, the sky is beginning to dilute its blackness into the morning light…

APPENDIX 3

Table 7. Bird community in *ejido Josefa Ortiz de Domínguez*. Scientific, English and local name are given for each species. *Species under threat or in danger to disappear.

Scientific name	English name	Local name
Aimophila rufescens (Swainson, 1827)	Rusty sparrow	chinchoco 2
Amazilia cyanocephala (Lesson, 1829)	Azure-crowned hummingbird	colibri 3
Aratinga brevipes (Lawrence, 1871)	Green Parakeet	cotorra verde
Arremonops rufivirgatus (Lawrence, 1851)	Olive Sparrow	Chinchoro 3
Basileuterus lachrymosus (Bonaparte, 1850)	Fan-tailed Warbler	Pavito ala blanca
Basileuterus rufifrons (Swainson, 1838)	Rufous-capped Warbler	Chipe 2
Basilinna leucotis (Vieillot, 1818)	White-eared Hummingbird	Colobri
Buteo brachyurus (Vieillot, 1816)	Short-tailed Hawk	Guaco
Buteo regalis (Gray, 1844)	Ferruginous Hawk	Águila real
Buteogallus anthracinus (Depp, 1830)	Common Black Hawk	Gavilán negro
Calocitta formosa (Swainson, 1827)	White-throated Magpie-jay	Hurraca
Cardellina pusilla (Wilson, 1811)	Wilson's Warbler	Chipe
Carduelis psaltria (Say, 1823)	Lesser Goldfinch	Arrocerito
Cathartes aura (Linnaeus, 1758)	Turkey Vulture	Zopilote
Cathartes burrovianus (Cassin, 1845)	Lesser Yellow-headed Vulture	Zope
Chloroceryle americana (Gmelin, 1788)	Green Kingfisher	Martín pescador
Chlorostilbon assimilis (Lawrence, 1861)	Garden Emerald	Gorrión
Colinus thalassinus (Swainson, 1827)	Green Violetear	Cuichi
Colinus virginianus (Linnaeus, 1758)*	Northern Bobwhite	Cuichito
Columba sp. 1	Pigeon	Paloma oscura
Columba sp. 2	Pigeon	Paloma doméstica
Columbina inca (Lesson, 1847)	Inca Dove	Tortolita
Contopus pertinax (Cabanis & Heine, 1859)	Greater Pewee	Copetonsito

Table 7 (*continuation*). Bird community in *ejido Josefa Ortiz de Domínguez*. Scientific, English and local name are given for each species. *Species under threat or in danger to disappear.

Scientific name	**English name**	**Local name**
Coragyps atratus (Bechstein, 1983)	American Black Vulture	Zopilote negro
Crotophaga ani (Linnaeus, 1758)	Smooth-billed Ani	Pijuy
Crotophaga sulcirostris (Swainson, 1827)	Groove-billed Ani	Pijui
Cyanocorax yncas (Boddaert, 1783)	Green Jay	Chara verde
Cyclarhis gujanensis (Gmelin, 1789)	Rufous-browed Peppershrike	Saltarín
Cynanthus latirostris (Swainson, 1827)	Broad-billed Hummingbird	Colobrí
Dactylortyx thoracicus (Gambel, 1848*)*	Singing Quail	Codorniz
Dendrocincla homochroa (Sclater, 1859)	Ruddy Woodcreeper	Trepador
Dendrocolaptes picumnus	Black-banded woodcreeper	Cocoa 1
Egretta thula (Molina, 1782)	Snowy Egret	Garza
Falco sparverius (Linnaeus, 1758)	American Kestrel	Cicli
Geococcyx velox (Wagner, 1836)	Lesser Roadrunner	Correcamino
Habia fuscicauda (Cabanis, 1861)	Red-throated Ant-tanager	Chipre
Hylatomus lineatus (Linnaeus, 1766*)*	Lineated Woodpecker	Carpintero
Icterus auratus (Bonaparte, 1850)	Orange Oriole	Chorcha
Icterus cucullatus (Swainson, 1827)	Hooded Oriole	Chorcha 4
Icterus gularis (Wagler, 1829)	Altamira Oriole	Chorchita
Icterus mesomelas (Wagler, 1829)	Yellow-tailed Oriole	Chorcha
Icterus wagleri (Sclater, 1857)	Black-vented Oriole	---
Leptodon cayanensis (Latham, 1790)	Grey-headed Kite	Gavilán
Leptotila verreauxi (Bonaparte, 1855)	White-tipped Dove	Paloma pata roja
Megascops asio (Linnaeus, 1758)**	Eastern Screech-owl	Búho

Table 7 (*continuation*). Bird community in *ejido Josefa Ortiz de Domínguez*. Scientific, English and local name are given for each species. *Species under threat or in danger to disappear.

Scientific name	**English name**	**Local name**
Melanerpes aurifrons (Wagler, 1829)	Golden-fronted Woodpecker	Cheque cabeza amarilla
Melanerpes chrysogenys (Vigors, 1839)	Golden-cheeked Woodpecker	Cheque
Melanerpes formicivorus (Swainson, 1827)	Acorn Woodpecker	Cheque común
Melanerpes hoffmannii (Cabanis, 1862)*	Hoffmann's Woodpecker	Cheque sarado
Melanerpes pygmaeus (Ridgway, 1885)*	Yucatan Woodpecker	Carpintero sarado
Melanerpes uropygialis (Baird, 1854)*	Gila Woodpecker	Cheque
Melospiza lincolnii (Audubon, 1834)	Lincoln's Sparrow	chinchoco
Mniotilta varia (Linnaeus, 1766)	Black-and-white Warbler	Chipre
Molothrus aeneus (Wagler, 1829)	Bronzed Cowbird	Tordito
Momotus mexicanus (Swainson, 1827)	Russet-crowned Motmot	Gambu
Morococcyx erythropygus (Lesson, 1842)	Lesser Ground-cuckoo	---
---	---	Gambu de montaña
Myiarchus sp. ---		Cotetón
Myioborus miniatus (Swainson, 1827)	Slate-throated Whitestart	Raquerito
Myioborus pictus (Swainson, 1829)	Painted Whitestart	Pavito
Ornithion semiflavum (Sclater & Salvin, 1860)	Yellow-bellied Tyrannulet	---
Passerina ciris (Linnaeus, 1758)*	Painted Bunting	Paserina
Passerina cyanea (Linnaeus, 1766)	Indigo Bunting	Paserina azul
Patagioenas flavirostris (Wagler, 1831)*	Red-billed Pigeon	Paloma azul
Penelope purpurascens (Wagler, 1830)	Crested Guan	Pava
Penelopina nigra (Fraser, 1852)	Highland Guan	Pajuil
Pharomachrus mocinno (De la Llave, 1832)	Resplendent Quetzal	Pavita
Piaya sp.	---	Pájaro sabio

Table 7 (*continuation*). Bird community in *ejido Josefa Ortiz de Domínguez*. Scientific, English and local name are given for each species. *Species under threat or in danger to disappear.

Scientific name	**English name**	**Local name**
Piculus sp.	---	Carpinterito
Pionus senilis (Spix, 1824)	White-crowned Parrot	Cotorro cabeza blanca
Piranga bidentata (Swainson, 1827	Flame-colored Tanager	Piranguita
Piranga leucoptera (Trudeau, 1839)	White-winged Tanager	Taranga roja
Piranga rubra (Linnaeus, 1758)	Summer Tanager	Avispera
Pitangus sulphuratus (Linnaeus, 1766)	Great Kiskadee	Chituri
Pteroglossus torquatus (Gmelin, 1788)	Collared Araçari	Pico real
Quiscalus mexicanus (Gmelin, 1788)	Great-tailed Grackle	Zanate
Ramphastos sulfuratus (Lesson, 1830)	Keel-billed Toucan	Tucán
Saltator atriceps (Lesson, 1832)	Black-headed Saltator	Saltador
Sarcoramphus papa (Linnaeus, 1758)*	King Vulture	Zopilote rey
Setophaga chrysoparia (Sclater & Salvin, 1861)*	Golden-cheeked Warbler	Chipe
Setophaga dominica (Linnaeus, 1766)	Yellow-throated Warbler	Chipe
Sialia currucoides (Bechstein, 1798)*	Mountain Bluebird	Azulejo
Tachycineta bicolor (Vieillot, 1808)	Tree Swallow	Golondrina
Tangara abbas (Deppe, 1830)	Yellow-winged Tanager	Taranga ala amarilla
Tangara episcopus (Linnaeus, 1766)	Blue-grey Tanager	Taupis
Thamnophilus doliatus (Linnaeus, 1764)	Barred Antshrike	Batara sarada
Thryophilus sinaloa (Baird, 1864)	Sinaloa Wren	Salta pared 1
Thryothorus maculipectus (Lafresnaye, 1845)	Spot-breasted Wren	Salta pared 2
Tityra semifasciata (Spix, 1825)	Masked Tityra	Jesus torres
Trogon citreolus (Gould, 1835)	Citreoline Trogon	Pavita
Trogon massena (Gould, 1838)	Slaty-tailed Trogon	Trogón

Table 7 (*continuation*). Bird community in *ejido Josefa Ortiz de Domínguez*. Scientific, English and local name are given for each species. *Species under threat or in danger to disappear.

Scientific name	**English name**	**Local name**
Trogon violaceus (Gmelin, 1788)	Violaceous Trogon	Pavito
Turdus plebejus (Cabanis, 1861)	Mountain Thrush	Censontle
Tyrannus forficatus (Gmelin, 1789)	Scissor-tailed Flycatcher	Tijereta
Tyrannus vociferans (Swainson, 1826)	Cassin's Kingbird	Tirano
Venilornis fumigatus (BirdLife International, 2004)	Smoky-brown Woodpecker	Carpintero café
Vireo leucophrys (Lafresnaye, 1844)	Brown-capped Vireo	---
Xiphorhynchus susurrans (Jardine, 1847)	Cocoa Woodcreeper	Cocoa 2
Zenaida asiatica (Linnaeus, 1758)	White-winged Dove	Paloma ala blanca
Zenaida sp. (Temminck, 1809)	---	Paloma dorada

Table 8. Presence of birds in the different landscape units of *ejido Josefa Ortiz de Domínguez*, located near the core area of the Man and Biosphere Reserve *La Sepultura,* Chiapas. Mexico. HG (Home garden); M (*Milpa*); FG (Fruit garden); Po (*Potrero*); MB (*montaña baja*); MM (*Montaña mediana*); MA *(Montaña alta*); CG (Coffee garden) and Pa (*Palmar*).

*Species under threat or in danger to disappear.

Name	**HG**	**M**	**FG**	**Po**	**MB**	**MM**	**MA**	**CG**	**Pa**
Aimophila rufescens (Swainson, 1827)									
Amazilia cyanocephala (Lesson, 1829)									
Aratinga brevipes (Lawrence, 1871)									
Arremonops rufivirgatus (Lawrence, 1851)									
Basileuterus lachrymosus (Bonaparte, 1850)									
Basileuterus rufifrons (Swainson, 1838)									
Basilinna leucotis (Vieillot, 1818)									
Buteo brachyurus (Vieillot, 1816)									
Buteo regalis (Gray, 1844)									
Buteogallus anthracinus (Depp, 1830)									
Calocitta formosa (Swainson, 1827)									
Cardellina pusilla (Wilson, 1811)									
Carduelis psaltria (Say, 1823)									
Cathartes aura (Linnaeus, 1758)									

Table 8 (*continuation)*. Presence of birds in the different landscape units of *ejido Josefa Ortiz de Domínguez*, located near the core area of the Man and Biosphere Reserve *La Seputura,* Chiapas. Mexico. HG (Home garden); M (*Milpa*); FG (Fruit garden); Po (*Potrero*); MB (*montaña baja*); MM (*Montaña mediana*); MA *(Montaña alta*); CG (Coffee garden) and Pa (*Palmar*).

*Species under threat or in danger to disappear.

Name	**HG**	**M**	**FG**	**Po**	**MB**	**MM**	**MA**	**CG**	**Pa**
Cathartes burrovianus (Cassin, 1845)	■	■							
Chloroceryle americana (Gmelin, 1788)			■					■	
Chlorostilbon assimilis (Lawrence, 1861)	■			■					
Colinus thalassinus (Swainson, 1827)									■
Colinus virginianus (Linnaeus, 1758)*	■	■		■					
Columba sp.1		■	■				■	■	
Columba sp.2	■								
Columbina inca (Lesson, 1847)	■	■	■	■					
Contopus pertinax (Cabanis & Heine, 1859)	■	■	■	■	■	■	■		
Coragyps atratus (Bechstein, 1983)	■	■	■	■					
Crotophaga ani Linnaeus, 1758				■					
Crotophaga sulcirostris Swainson, 1827		■		■					
Cyanocorax yncas (Boddaert, 1783)					■	■	■	■	■
Cyclarhis gujanensis (Gmelin, 1789)	■		■		■	■			

Table 8 (*continuation*). Presence of birds in the different landscape units of *ejido Josefa Ortiz de Domínguez*, located near the core area of the Man and Biosphere Reserve *La Seputura,* Chiapas. Mexico. HG (Home garden); M (*Milpa*); FG (Fruit garden); Po (*Potrero*); MB (*montaña baja*); MM (*Montaña mediana*); MA *(Montaña alta*); CG (Coffee garden) and Pa (*Palmar*).

*Species under threat or in danger to disappear.

Name	**HG**	**M**	**FG**	**Po**	**MB**	**MM**	**MA**	**CG**	**Pa**
Cynanthus latirostris (Swainson, 1827)	■				■	■			
Dactylortyx thoracicus (Gambel, 1848) (D)							■		
Dendrocincla homochroa (Sclater, 1859) (D)					■	■			
Dendrocolaptes picumnus	■		■		■	■			
Egretta thula (Molina, 1782)				■					
Falco sparverius (Linnaeus, 1758)	■	■	■	■	■	■			
Geococcyx velox (Wagner, 1836)		■	■	■					
Habia fuscicauda (Cabanis, 1861)									■
Hylatomus lineatus (Linnaeus, 1766)		■		■	■	■			
Icterus auratus (Bonaparte, 1850)	■		■	■					
Icterus cucullatus (Swainson, 1827)					■	■			
Icterus gularis (Wagler, 1829)	■	■			■	■			
Icterus mesomelas (Wagler, 1829)	■				■	■		■	
Icterus wagleri (Sclater, 1857)	■								
Leptodon cayanensis (Latham, 1790)	■	■			■	■			

Table 8 (*continuation*). Presence of birds in the different landscape units of *ejido Josefa Ortiz de Domínguez*, located near the core area of the Man and Biosphere Reserve *La Sepultura,* Chiapas. Mexico. HG (Home garden); M (*Milpa*); FG (Fruit garden); Po (*Potrero*); MB (*montaña baja*); MM (*Montaña mediana*); MA *(Montaña alta*); CG (Coffee garden) and Pa (*Palmar*).

*Species under threat or in danger to disappear.

Name	**HG**	**M**	**FG**	**Po**	**MB**	**MM**	**MA**	**CG**	**Pa**
Leptotila verreauxi (Bonaparte, 1855)		■							
Megascops asio (Linnaeus, 1758)							■		
Melanerpes aurifrons (Wagler, 1829)	■		■	■					
Melanerpes carolinus (Linnaeus, 1758)		■							
Melanerpes chrysogenys (Vigors, 1839)		■							
Melanerpes formicivorus (Swainson, 1827)	■	■	■	■					■
Melanerpes hoffmannii (Cabanis, 1862)	■	■							
Melanerpes pygmaeus (Ridgway, 1885)	■	■	■					■	
Melanerpes uropygialis (Baird, 1854)		■							
Melospiza lincolnii (Audubon, 1834)		■		■					
Mniotilta varia (Linnaeus, 1766) (D)			■					■	
Molothrus aeneus (Wagler, 1829)		■	■						
Momotus mexicanus (Swainson, 1827)	■	■	■	■	■	■	■	■	
Morococcyx erythropygus (Lesson, 1842)							■		

Table 8 (*continuation*). Presence of birds in the different landscape units of *ejido Josefa Ortiz de Domínguez*, located near the core area of the Man and Biosphere Reserve *La Sepultura,* Chiapas. Mexico. HG (Home garden); M (*Milpa*); FG (Fruit garden); Po (*Potrero*); MB (*montaña baja*); MM (*Montaña mediana*); MA *(Montaña alta*); CG (Coffee garden) and Pa (*Palmar*).

*Species under threat or in danger to disappear.

Name	**HG**	**M**	**FG**	**Po**	**MB**	**MM**	**MA**	**CG**	**Pa**
Momotus momota (Linnaeus, 1766)									
Myiarchus sp.									
Myioborus miniatus (Swainson, 1827)									
Myioborus pictus (Swainson, 1829)									
Ornithion semiflavum (Sclater & Salvin, 1860)									
Passerina ciris (Linnaeus, 1758)*									
Passerina cyanea (Linnaeus, 1766)									
Patagioenas flavirostris (Wagler, 1831*									
Penelope purpurascens (Wagler, 1830)									
Penelopina nigra (Fraser, 1852)									
Pharomachrus mocinno (De la Llave, 1832)									
Piaya cayana (Linnaeus, 1766)									
Piculus sp.									
Pionus senilis (Spix, 1824)									

Table 8 (*continuation*). Presence of birds in the different landscape units of *ejido Josefa Ortiz de Domínguez*, located near the core area of the Man and Biosphere Reserve *La Seputura,* Chiapas. Mexico. HG (Home garden); M (*Milpa*); FG (Fruit garden); Po (*Potrero*); MB (*montaña baja*); MM (*Montaña mediana*); MA *(Montaña alta*); CG (Coffee garden) and Pa (*Palmar*).

*Species under threat or in danger to disappear.

Name	**HG**	**M**	**FG**	**Po**	**MB**	**MM**	**MA**	**CG**	**Pa**
Piranga bidentata (Swainson, 1827					■	■			
Piranga leucoptera (Trudeau, 1839)	■	■							
Piranga rubra (Linnaeus, 1758)			■						
Pitangus sulphuratus (Linnaeus, 1766)	■	■	■	■		■			■
Pteroglossus torquatus (Gmelin, 1788)	■	■	■	■	■	■			■
Quiscalus mexicanus (Gmelin, 1788)	■	■							
Ramphastos sulfuratus (Lesson, 1830)									■
Saltator atriceps (Lesson, 1832)	■		■	■	■	■		■	■
Sarcoramphus papa (Linnaeus, 1758)*									
Setophaga chrysoparia (Sclater & Salvin, 1861)*					■	■		■	
Setophaga dominica (Linnaeus, 1766)		■	■						
Sialia currucoides (Bechstein, 1798)*	■								
Spindalis zena (Linnaeus, 1766)	■								
Tachycineta bicolor (Vieillot, 1808)	■								
Tangara abbas (Deppe, 1830)	■		■					■	■

Table 8 (*continuation*). Presence of birds in the different landscape units of *ejido Josefa Ortiz de Domínguez*, located near the core area of the Man and Biosphere Reserve *La Seputura,* Chiapas. Mexico. HG (Home garden); M (*Milpa*); FG (Fruit garden); Po (*Potrero*); MB (*montaña baja*); MM (*Montaña mediana*); MA *(Montaña alta*); CG (Coffee garden) and Pa (*Palmar*).

*Species under threat or in danger to disappear.

Name	**HG**	**M**	**FG**	**Po**	**MB**	**MM**	**MA**	**CG**	**Pa**
Tangara episcopus (Linnaeus, 1766)	■			■					
Tangara palmeri (Hellmayr, 1909)	■								
Thamnophilus doliatus (Linnaeus, 1764)			■	■	■	■			
Thryophilus sinaloa Baird, 1864				■					
Thryothorus maculipectus (Lafresnaye, 1845)	■								
Tityra semifasciata (Spix, 1825)									
Trogon citreolus (Gould, 1835)		■			■	■	■	■	
Trogon massena (Gould, 1838)					■	■			
Trogon violaceus Gmelin, 1788					■	■			■
Turdus plebejus (Cabanis, 1861)	■				■	■			
Tyrannus forficatus (Gmelin, 1789)	■								
Tyrannus vociferans (Swainson, 1826)	■			■					
Venilornis fumigatus (BirdLife International, 2004)		■							

Table 8 (*continuation*). Presence of birds in the different landscape units of *ejido Josefa Ortiz de Domínguez*, located near the core area of the Man and Biosphere Reserve *La Seputura,* Chiapas. Mexico. HG (Home garden); M (*Milpa*); FG (Fruit garden); Po (*Potrero*); MB (*montaña baja*); MM (*Montaña mediana*); MA *(Montaña alta*); CG (Coffee garden) and Pa (*Palmar*).

*Species under threat or in danger to disappear.

Name	**HG**	**M**	**FG**	**Po**	**MB**	**MM**	**MA**	**CG**	**Pa**
Vireo leucophrys (Lafresnaye, 1844)									
Xiphorhynchus guttatus (Lichtenstein, 1820)									
Xiphorhynchus susurrans (Jardine, 1847)									
Zenaida asiatica (Linnaeus, 1758)									
Zenaida aurita (Temminck, 1809)									

REFERENCES

Adams, W. M. (2013). ‘Conservation in the Anthropocene: biodiversity, poverty and sustainability’, in *Biodiversity conservation and poverty alleviation: exploring the evidence for a link,* edited by Roe, D., Elliott, J., Sandbrook, C. and Walpole, M. Chichester, United Kingdom: John Wiley and Sons, Ltd, pp. 304–315.

Adams, W. and Hutton, J. (2007). ‘People, parks and poverty: Political ecology and biodiversity conservation’. *Conservation and Society* 5 (2), pp. 147-183.

Agrawal, A. (1995). 'Dismantling the divide between indigenous and scientific knowledge'. *Development and change*, 26 (3), pp. 413-439.

Agrawal, A. (2005). *Environmentality: Technologies of Government and the Making of Subjects*. Durham; Duke University Press, pp. 20–44.

Aguilar-Støen, M., Angelsen, A., Stølen, K. A. and Moe, S. R. (2011). 'The emergence, persistence, and current challenges of coffee forest gardens: A case study from Candelaria Loxicha, Oaxaca, Mexico'. *Society and Natural Resources*, 24 (12), pp. 1235-1251.

Aiello, L. C. (2014). 'Crisis, Value, and Hope: Rethinking the Economy: Wenner-Gren Symposium Supplement 9’, *Current Anthropology*, 55.

Alayón-Gamboa, J. A. (2015). 'Ganadería de traspatio en la vida familiar. La ganadería en la frontera sur: una perspectiva “amigable” y eficiente'. *Revista Ecofronteras*, 19 (54), pp. 6-9.

Alayón-Gamboa, J. A. and Gurri-García, F. D. (2008). 'Home Garden production and energetic sustainability in Calakmul, Campeche, Mexico'. *Human Ecology* 36 (3), pp. 395–407.

Alcorn, J. B. (1981). 'Huastec noncrop resource management: Implications for prehistoric rain forest management'. *Human Ecology*, 9 (4), pp. 395–417.

Alcorn, J. B. and Toledo, V. M. (1998). 'Resilient resource management in Mexico’s forest ecosystems: the contribution of property rights', in *Linking social and ecological systems: Management practices and social mechanisms for building resilience*. Edited by Berkes, F., Folke, C, and Colding, J. Cambridge:

Cambridge University Press, pp. 216-249.

Alimonda, H. (2002). *Ecología política: naturaleza, sociedad y utopía*. Clacso.

Allaby, M., and Park, C. (2013). *A dictionary of environment and conservation.* Oxford: Oxford University Press.

Altieri, M. A. (2004). 'Linking ecologists and traditional farmers in the search for sustainable agriculture'. *Frontiers in Ecology and the Environment,* 2 (1), pp. 35-42.

Altieri, M. A. and Nicholls, C. I. (2017). 'Agroecology: a brief account of its origins and currents of thought in Latin America'. *Agroecology and Sustainable Food Systems*. 41 (34), pp. 231–237.

Altieri, M. A. and Toledo, V. M. (2011). 'The agroecological revolution in Latin America: Rescuing nature, ensuring food sovereignty and empowering peasants'. *Journal of Peasant Studies*, 38 (3), pp. 587–612.

Ámbito. (2017). '¿Quién es Marichuy, la indígena que peleará por la presidencia en México?'. Available at: https://www.ambito.com/quien-es-marichuy-la-indigena-que-peleara-la-presidencia-mexico-n3996179. (Accessed: 21 December, 2018).

Andam, K. S., Ferraro, P. J., Sims, K. R., Healy, A. and Holland, M. B. (2010). 'Protected areas reduce poverty in Costa Rica and Thailand'. *Proceedings of the National Academy of Sciences USA* 107 (22), pp. 9996–10001.

Antinori, C. and Bray, D. B. (2005). 'Community forest enterprises as entrepreneurial firms: economic and institutional perspectives from Mexico'. *World development*, 33 (9), pp. 1529-1543.

Appendini, K., and Nuijten, M. (2002). *El papel de las instituciones en contextos locales*. Ciudad de Mexico, *Revista de la Comisión Económica para América Latina.*

Arellano-González, J. (2015). 'Efectos de los cambios en el programa Procampo en la economía rural del sureste mexicano'. *Economía, Sociedad y Territorio,* 15 (48), pp. 363-395.

Armsworth, P. R., Kendall, B. E. and Davis, F. W. (2004). 'An introduction to biodiversity concepts for environmental economists'. *Resource and Energy*

Economics, 26 (2), pp. 115–136.

Assies, W. (2008). 'Land tenure and tenure regimes in Mexico: An overview'. *Journal of Agrarian Change*, 8 (1), pp. 33–63.

Astier, M., Argueta, J. Q., Orozco-Ramírez, Q., González, M. V., Morales, J., Gerritsen, P. R. and Sánchez-Sánchez, C. (2017). 'Back to the roots: understanding current agroecological movement, science, and practice in Mexico'. *Agroecology and Sustainable Food Systems,* 41 (34), pp. 329-348.

Atran, S., Chase, A. F., Fedick, S. L., Knapp, G., McKillop, H., Marcus, J., Schwartz, N. B. and Webb, M. C. (1993). 'Itza Maya tropical agro-forestry'. *Current anthropology*, 34 (5), pp. 633-700.

Atran, S. (1998). 'Folk biology and the anthropology of science: Cognitive universals and cultural particulars'. *Behavioral and Brain Sciences*, 21 (4), pp. 547–609.

Avila-Calero, S. (2017). 'Contesting energy transitions: wind power and conflicts in the Isthmus of Tehuantepec'. *Journal of Political Ecology,* 24 (1), pp. 992-1012.

Balée, W. (2006). 'The research program of historical ecology'. *Annual Review of Anthropology*, 35, pp. 75-98.

Barkin, D. (2006). 'Building a future for rural Mexico'. *Latin American Perspectives*, 33 (2), pp. 132–140.

Barrera-Bassols, N. and Toledo, V.M. (2005). 'Ethnoecology of the Yucatec Maya: symbolism, knowledge and management of natural resources'. *Journal of Latin American Geography*, 4 (1), pp. 9-41.

Barlow, J., Gardner, T. A., Lees, A. C., Parry, L. and Peres, C. A. (2012). 'How pristine are tropical forests? An ecological perspective on the pre-Columbian human footprint in Amazonia and implications for contemporary conservation'. *Biological Conservation,* 151 (1), pp. 45-49.

Bennett, E. M., Cramer, W., Begossi, A., Cundill, G., Díaz, S., Egoh, B.N., Geijzendorffer, I. R., Krug, C. B., Lavorel, S., Lazos, E. and Lebel, L. (2015). 'Linking biodiversity, ecosystem services, and human well-being: three challenges for designing research for sustainability'. *Current Opinion in*

Environmental Sustainability, 14, pp. 76-85.

Berkes, F. (2013). 'Poverty reduction isn't just about money: community perceptions of conservation benefits', in *Biodiversity conservation and poverty alleviation: exploring the evidence for a link*. Edited by Roe, D., Elliott, J., Sandbrook, C. and Walpole, M. Chichester: John Wiley & Sons, Ltd, pp. 270-285.

Berkes, F., Colding, J. and Folke, C. (2000). 'Rediscovery of traditional ecological knowledge as adaptive management'. *Ecological applications*, 10 (5), pp. 1251-1262.

Berkes, F. and Folke, C. (1998). *Linking social and ecological systems: management practices and social mechanisms for building resilience*. Cambridge: Cambridge University Press.

Bermeo, A., Couturier, S. and Galeana Pizaña, M. (2014). 'Conservation of traditional smallholder cultivation systems in indigenous territories: Mapping land availability for milpa cultivation in the Huasteca Poblana, Mexico'. *Applied Geography*, 53, pp. 299-310.

Bernard, H. R. (2017). *Research methods in anthropology: Qualitative and quantitative approaches* (6th ed.)*,* London: Rowman & Littlefield.

Bernstein, H. (2002). 'Reform: Land Reform: Taking a Longer view'. *Journal of Agrarian Change*, 2 (4), pp. 433-463.

Bernstein, H., Friedmann, H., Van der Ploeg, J.D., Shanin, T. and White, B. (2018). 'Fifty years of debate on peasantries, 1966–2016'. *The Journal of Peasant Studies*, 45(4), pp. 689-714.

Bhagwat, S. A., Willis, K. J., Birks, H. B. and Whittaker, R. J. (2008). 'Agroforestry: a refuge for tropical biodiversity?'. *Trends in Ecology and Evolution*, 23 (5), pp. 261-267.

Biersack, A. (1999). 'Introduction: From the "new ecology" to the new ecologies.' *American Anthropologist*, 101 (1), pp. 5-18.

Biersack, A. and Greenberg, J. (2006). 'Reimagining political ecology', in *New Ecologies for the Twenty-First Century.* Edited by Biersack, A. and Greenberg J. Durham: Duke University Press

Binford, M. W., Brenner, M., Whitmore, T. J., Higuera-Gundy, A., Deevey, E. S., and Leyden, B. (1987). 'Ecosystems, paleoecology and human disturbance in subtropical and tropical America'. *Quaternary Science Reviews,* 6 (2), pp. 115-128.

Bizberg, I. and Meyer, L. (2003). *Una historia contemporánea de México*. Ciudad de México: Oceano .

Blackman, A. Pfaff, A., Robalino, J. (2015). 'Paper park performance: mexico's natural protected areas in the 1990s'. *Global Environmental Change* (31), pp. 50–61.

Bridge, G., Bouzarovski, S., Bradshaw, M. and Eyre, N. (2013). 'Geographies of energy transition: Space, place and the low-carbon economy'. *Energy Policy,* 53, pp. 331-340.

Boaventura de Sousa S. (2010). *Refundación del Estado en América Latina: Perspectivas desde una epistemología del Sur*. La Paz: Plural editores.

Boaventura de Sousa, S. (2018). *The End of the Cognitive Empire: The Coming of Age of Epistemologies of the South*. Durham: Duke University Press.

Boaventura de Sousa, S. and O. Queni. (2007). *Another knowledge is possible: Beyond northern epistemologies*. Edited by Boaventura de Sousa Santos London: Verso.

Boege, E., (2008). *El patrimonio biocultural de los pueblos indígenas de México: hacia la conservación in situ de la biodiversidad y agrodiversidad en los territorios indígenas*. Ciudad de México: Instituto Nacional de Antropología e Historia

Boege, E. (2015). Em direção a uma antropologia ambiental para a apropriação do patrimônio biocultural dos povos indígenas na América Latina. *Desenvolvimento e Meio Ambiente*, 35.

Boff, L. (1987). *Introducing liberation theology.* Kent: Burns and Oates.

Boff, L. (1995). *Ecology and Liberation: A New Paradigm.* New York: Maryknoll.

Boyer, C. R. (2011). 'Geographic Regionalism and Natural Diversity'. *Companion to Mexican History and Culture*, pp. 119–130.

Bray, D. B., Duran, E., and Molina, O. (2012). 'Beyond harvests in the commons: multiscale governance and turbulence in indigenous/community conserved areas in Oaxaca, Mexico'. *International Journal of the Commons,* 6 (2), pp. 151-178.

Brightman, M. and Lewis, J. (2017). 'Introduction: the anthropology of sustainability: beyond development and progress', in *The Anthropology of Sustainability* (pp. 1-34). New York: Palgrave Macmillan.

Brush, S. B., Tadesse, D., and Van Dusen, E. (2003). 'Crop diversity in peasant and`industrialized agriculture: Mexico and California'. *Society and Natural Resources,* 16, pp. 123-141.

Brundtland Commission (1987). *World commission on environment and development. Our common future*. Available at: http://www.un-documents.net/our-common-future.pdf. (Accessed: 4 January 2019)

Bryant, R. L. (2015). 'Reflecting on Political Ecology', International Handbook of Political Ecology, 2, pp. 14–24.

Bush, M. B. and Silman, M. R. (2007). 'Amazonian exploitation revisited: Ecological asymmetry and the policy pendulum'. *Frontiers in Ecology and the Environment*, 5 (9), pp. 457–465.

Buscher, B., Sullivan, S., Neves, K., Igoe, J. and Brockington, D. (2012). 'Towards a synthesized critique of neoliberal biodiversity conservation'. *Capitalism nature socialism*, 23(2), pp.4-30.

Carrara, E., Arroyo-Rodríguez, V., Vega-Rivera, J. H., Schondube, J. E., de Freitas, S. M. and Fahrig, L. (2015). 'Impact of landscape composition and configuration on forest specialist and generalist bird species in the fragmented Lacandona rainforest, Mexico'. *Biological Conservation* 184, pp. 117-126.

Casas, A., Otero-Arnaiz, A., Perez-Negron, E. and Valiente-Banuet, A. (2007). 'In situ management and domestication of plants in Mesoamerica'. *Annals of Botany*, 100 (5), pp. 1101-1115.

Castella, J. C., Lestrelin, G., Hett, C., Bourgoin, J., Fitriana, Y. R. and Heinimann, A. (2011). 'Effects of landscape segregation on livelihood vulnerability: moving from extensive shifting cultivation to rotational agriculture

and natural forests in northern Laos'. *Human Ecology*, pp. 1-14.

Castillo, A., Magaña, A., Pujadas, A., Martínez, L. and Godínez, C. (2005). 'Understanding the interaction of rural people with ecosystems: a case study in a tropical dry forest of Mexico'. *Ecosystems,* 8 (6), pp. 630-643.

Castree, N., Kitchin, R. and Rogers, A. (2013). *A dictionary of human geography*. Oxford: Oxford University Press.

CBD. (1992). Convention of Biological Diversity. Available at: https://www.cbd.int/doc/legal/cbd-en.pdf. (Accessed: 21 December 2018).

Chapin, M. (2004). 'A Challenge to Conservationists'. *World Watch*, 17 (6), pp. 17–31.

Chappell, M. J., Wittman, H., Bacon, C. M., Ferguson, B. G., Barrios, L. G., Barrios, R. G. and Soto-Pinto, L. (2013). 'Food sovereignty: an alternative paradigm for poverty reduction and biodiversity conservation in Latin America'. *F 1000 Research*, 2.

Charnley, S. and Poe, M. R. (2007). 'Community Forestry in Theory and Practice: Where Are We Now?'. *Annual Review of Anthropology*, 36 (1), pp. 301–336.

Chaves, M., Macintyre, T., Verschoor, G. and Wals, A. E. (2018). 'Radical ruralities in practice: Negotiating buen vivir in a Colombian network of sustainability'. *Journal of Rural Studies*. 59, pp. 153–162.

Chazdon, R. L., Harvey, C. A., Komar, O., Griffith, D. M., Ferguson, B. G., Martínez-Ramos, M., Morales, H., Nigh, R., Soto-Pinto, L., Van Breugel, M. and Philpott, S. M. (2009). 'Beyond reserves: A research agenda for conserving biodiversity in human-modified tropical landscapes'. *Biotropica,* 41 (2), pp. 142-153.

Chazdon, R. L. (2014). *Second growth: the promise of tropical forest regeneration in an age of deforestation*. Chicago: University of Chicago Press.

Cherán Keri. (2018). Available at: http://michoacancheran.blogspot.co.uk/2011/11/cheran-keri.html. (Accessed: 21 December 2018).

Clement, C. R., Denevan, W. M., Heckenberger, M. J., Junqueira, A. B., Neves,

E. G., Teixeira, W. G. and Woods, W. I. (2015). 'The domestication of Amazonia before European conquest'. *Proceedings of the Royal Society B: Biological Sciences,* 282 (1812), p. 20150813.

Coetzer, K. L., Witkowski, E. T. and Erasmus, B. F. (2014). 'Reviewing Biosphere Reserves globally: Effective conservation action or bureaucratic label?' *Biological Reviews*, 89 (1), pp. 82–104.

Colburn, F.D. (2016). *Everyday forms of peasant resistance*. New York: Routledge.

Comisión Económica para América Latina (2017). 'Proyecciones demográficas en México'. Available at: https://www.cepal.org/es/temas/proyecciones-demograficas/estimaciones-proyecciones-poblacion-total-urbana-rural-economicamente-activa. (Accessed: 21 February 2019).

Comisión Nacional de Áreas Naturales Protegidas (2018). *100 años de conservación en México: Áreas Naturales Protegidas de México*. Ciudad de México; SEMARNAT-CONANP.

Consejo Nacional de Evaluación de Política Social (CONEVAL). (2018). índices de pobreza en México. Available at: ttps://www.coneval.org.mx/Medicion/Paginas/PobrezaInicio.aspx. (Accessed: 21 December, 2018).

Congreso Nacional Indígena (2019). *El andar del Congreso Indígena de Gobierno y Marichuy*. Available at: https://www.congresonacionalindigena.org/category/el-andar-del-cig-y-marichuy/. (Accessed: 4 Enero 2019).

Corbera, E. and Martin, A. (2015). 'Carbon offsets: Accommodation or resistance?' *Environment and Planning,* 47 (10), pp. 2023–2030.

Corlett, R. T. (2015). 'The Anthropocene concept in ecology and conservation'. *Trends in ecology and evolution*, 30 (1), pp. 36-41.

Cusicanqui, R. S. (2012). 'Ch'ixinakax utxiwa: A Reflection on the Practices and Discourses of Decolonization'. *South Atlantic Quarterly*. 111 (1), pp. 95–109.

Daniels, A. E., Painter, K. and Southworth, J. (2008). 'Milpa imprint on the

tropical dry forest landscape in Yucatan, Mexico: Remote sensing and field measurement of edge vegetation'. *Agriculture, Ecosystems and Environment,* 123 (4), pp. 293-304.

Da Silva, T. C., Medeiros, M. F. T., Peroni, N. and Paulino Albuquerque, U. (2017). 'Folk classification as evidence of transformed landscapes and adaptative strategies: a case study in the semiarid region of northeastern Brazil'. Landscape research, 42 (5), pp. 521-532.

DeClerck, F. A., Chazdon, R., Holl, K. D., Milder, J. C., Finegan, B., Martinez-Salinas, A. and Ramos, Z. (2010). 'Biodiversity conservation in human-modified landscapes of Mesoamerica: Past, present and future'. *Biological Conservation,* 143 (10), pp. 2301-2313.

Denevan, W. M. (1976). *The aboriginal population of Amazonia. The native population of the Americas in, 1492.* Wisconsin: University of Wisconsin Press. 205-234.

DeVictor, V., Julliard, R. and Jiguet, F. (2008). 'Distribution of specialist and generalist species along spatial gradients of habitat disturbance and fragmentation'. *Oikos*, 117 (4), pp. 507-514.

De Vos, J. (2002). *Una tierra para sembrar sueños: historia reciente de la Selva Lacandona.* Ciudad de Mexico: CIESAS-Fondo de Cultura Economica

Doane, M. (2012). *Stealing Shining Rivers: Agrarian Conflict, Market Logic, and Conservation in a Mexican Forest.* Tucson: University of Arizona Press.

Doane, M. (2014). 'From Community Conservation to the Lone (Forest) Ranger: Accumulation by Conservation in a Mexican Forest.' *Conservation and Society* 12 (3): 233–44.

Dove, M. R. (2006). 'Indigenous people and environmental politics'. *Annual Review. of Anthropology*, 35, 191-208.

Dove, M. R. (2011). 'Rubber Kills the Land and Saves the Community: An Undisciplined Commodity', in *Beyond the Sacred Forest: Complicating Conservation in Southeast Asia*. Edited by Michael R. Dove, Percy E. Sajise, and Amity A. Doolittle, 91–119. Durham, NC: Duke University Press.

Durand, L. (2014). '¿Todos ganan? Neoliberalismo, naturaleza y conservación

en México'. *Sociológica (México)*, 29 (82), pp. 183-223.

Durand, L. and Lazos, E. (2004). 'Colonization and tropical deforestation in the Sierra Santa Marta, Southern Mexico'. *Environmental Conservation*, 31 (1), pp. 11–21.

Dussel, E. and Mendieta, E. (2003). *Beyond philosophy: Ethics, history, Marxism, and liberation theology.* Lanham, Md: Rowman & Littlefield.

Dussel, E. (2013). *Ethics of liberation: In the age of globalization and exclusion.* Durham: Duke University Press.

Eakin, H., Perales, H., Appendini, K. and Sweeney, S. (2014). 'Selling maize in Mexico: The persistence of peasant farming in an era of global markets'. *Development and Change*, 45 (1), pp. 133-155.

ENAREDD+. (2014). *Estrategia Nacional para REDD+.* Available at*:* www.conafor.gob.mx:8080/documentos/docs/35/5559Elementos%20para%20el%20diseño%20de%20la%20Estrategia%20Nacional%20para%20REDD_.pdf (Accessed: 21 Dicember 2018).

Enlace Zapatista de Liberación Nacional. (2004). Comunicados de prensa. Available at: https://radiozapatista.org/?p=24923&lang=en. (Accessed: 21 February 2019).

Enlace Zapatista de Liberación Nacional. (2017). *Comunicados de prensa.* Available at: https://radiozapatista.org/?p=24923&lang=en. (Accessed: 21 February 2019).

Enlace Zapatista de Liberación Nacional. (2018). *Comunicados de prensa.* Available at: http://enlacezapatista.ezln.org.mx/. (Accessed: 21 December 2018)

Erisman, J. W., Van Eekeren, N., de Wit, J., Koopmans, C., Cuijpers, W., Oerlemans, N. and Koks, B. J. (2016). 'Agriculture and biodiversity: a better balance benefits both'. *Agriculture and Food,* 1 (2), pp. 157-174.

Escobar, A. (1995). *Encountering development: The making and unmaking of the Third World.* Princeton: Princeton University Press.

Escobar, A. (2010). 'Latin America at a Crossroads: Alternative Modernizations, PostLiberalism, or Post-Development?' *Cultural Studies,* 24 (1), pp. 1–65

Escobar, A. (2011). 'Sustainability: Design for the pluriverse'. *Development*, 54 (2), pp. 137–140.

Escobar, A., Rocheleau, D. and Kothari, S. (2002). 'Environmental social movements and the politics of place'. *Development*, 45 (1), pp. 28-36.

España-Boquera, M. L. and Champo-Jiménez, O. (2016). 'Proceso de deforestación en el municipio de Cherán, Michoacán, México (2006-2012)'. *Madera y bosques,* 22 (1), pp.141-153.

Fairhead, J., Leach, M. and Scoones, I. (2012). 'Green grabbing: a new appropriation of nature?'. *Journal of Peasant Studies*, 39 (2), pp. 237-261.

FAO (2017). *El Estado Mundial de la Agricultura y la Alimentación.* Available at: http://www.fao.org/3/a-I7658s.pdf. (Accessed: 4 January 2019).

FAO. (2018). Agroecology knowledge hub. Available at: http://www.fao.org/agroecology/en/. Accessed: (21 December 2018).

Ferguson, J. (1990). *The anti-politics machine: "development", depoliticization and bureaucratic power in Lesotho*. Minnesota: University of Minnessota Press.

Fischer, J., Batáry, P., Bawa, K. S., Brussaard, L., Chappell, M. J., Clough, Y., Daily, G. C., Dorrough, J., Hartel, T., Jackson, L. E. and Klein, A. M. (2011). 'Conservation: limits of land sparing'. *Science,* 334 (6056), pp. 593-593.

Fischer, J., Hartel, T. and Kuemmerle, T. (2012). 'Conservation policy in traditional farming landscapes'. *Conservation Letters*, 5 (3), pp. 167-175.

Fischer, J., Abson, D. J., Bergsten, A., Collier, N. F., Dorresteijn, I., Hanspach, J., Hylander, K., Schultner, J. and Senbeta, F. (2017). 'Reframing the food–biodiversity challenge'. *Trends in Ecology & Evolution*, 32 (5), pp. 335-345.

Folke, C., Pritchard Jr, L., Berkes, F., Colding, J. and Svedin, U. (2007). 'The problem of fit between ecosystems and institutions: ten years later'. *Ecology and society*, 12 (1).

Ford, A. and Emery, K. F. (2008). 'Exploring the Legacy of the Maya Forest'. *Journal of Ethnobiology*, 28 (2), pp. 147–153.

Ford, A. and Nigh, R. (2009). 'Origins of the Maya Forest Garden: Maya Resource Management'. *Journal of Ethnobiology*, 29 (2), pp. 213–236.

Foucault, M., and Gordon, C. (1980). *Power/knowledge: Selected interviews and other writings, 1972-1977*. Harlow: Longman.

Frece, A. and Poole, N. (2008). 'Constructing livelihoods in Rural Mexico: Milpa in Mayan culture'. *Journal of Peasant Studies*, 35 (2), pp. 335–352.

Gadgil, M., Berkes, F. and Folke, C. (1993). 'Indigenous knowledge for biodiversity conservation'. *Ambio*, pp. 151-156.

Gabay, M. and Alam, M. (2017). 'Community forestry and its mitigation potential in the Anthropocene: The importance of land tenure governance and the threat of privatization'. *Forest Policy and Economics* 29, pp. 26-35.

Galeano, E. (2009). *Open veins of Latin America: Five centuries of the pillage of a continent.* London: Serpent's Tail.

Galicia-Luna, V. (2016). *Cartografía del deseo en Chiapas: entre la conservación y el extractivismo.* MSc. El Colegio de la Frontera Sur El Colegio de la Frontera Sur. Available at: http://bibliotecasibe.ecosur.mx/sibe/book/000013387. (Accessed: 8 May 2018).

García-Amado, L. R., Pérez, M. R., Iniesta-Arandia, I., Dahringer, G., Reyes, F., and Barrasa, S. (2012). 'Building ties: social capital network analysis of a forest community in a biosphere reserve in Chiapas, Mexico'. *Ecology and Society,* 17 (3).

García-Amado, L. R., Pérez, M. R., and García, S. B. (2013). 'Motivation for conservation: assessing integrated conservation and development projects and payments for environmental services in La Sepultura Biosphere Reserve, Chiapas, Mexico'. *Ecological Economics,* 89, pp. 92-100.

Gardner, T. A., Barlow, J., Chazdon, R., Ewers, R. M., Harvey, C. A., Peres, C. A. and Sodhi, N. S. (2009). 'Prospects for tropical forest biodiversity in a human-modified world'. *Ecology letters*, 12 (6), pp. 561-582.

Garí, J. (1999). 'Biodiversity and Indigenous Agroecology in Amazonia: the Indigenous Peoples of Pastaza'. *Ecological Research*, 5 (7), pp. 21–37.

Gasco, J. (2008). 'Le Da Alegría Tener Flores Homegardens In The Soconusco Region Of Chiapas, Mexico'. *Journal of Ethnobiology*, 28 (2), pp. 259–277.

Gibbs, G. R. (2007). *Analyzing qualitative data, Qualitative research kit*, London SAGE Publications.

Gliessman, S. R. (2016). Agroecology: Roots to resistance to industrialized food systems. In: *Agroecology: A transdisciplinary, participatory and action-oriented approach.* Edited by V. E. Méndez, C. M. Bacon, R. Cohen, and S. R. Gliessman, 23–35. Florida: CRC Press, Taylor & Francis Group.

Global Diversity Foundation (2017). *Theory of Change.* Available at: https://www.global-diversity.org/theory-of-change/. (Accessed: 21 December, 2018).

Gómez-Pompa, A. (1987). 'On maya silviculture'. *Estudios Mexicanos*, 3 (1), pp. 1-17.

Gómez-Pompa, A. (2004). 'The Role of Biodiversity Scientists in a Troubled World'. *BioScience*, 54 (3), pp. 217–225.

Gómez-Pompa, A. (2016) *Mi vida en las selvas tropicales*. Ciudad de Mexico: Rebosan.

Gomez-Pompa, A. and Kaus, A. (1992). 'Taming the Myth Wilderness'. *BioScience*, 42 (4), pp. 271–279.

Gomez-Pompa, A. and Kaus, A. (1999). 'From Pre-Hispanic to Future Conservation Alternatives: Lessons from Mexico'. *Proceedings of the National Academy of Sciences of the United States of America*, 96 (11), pp. 5982–5986.

Gomez-Pompa, A., Vazquez-Yanes, C. and Guevara, S. (1972). 'The Tropical Rain Forest: a nonrenewable resourse'. *Science*, 177 (3), pp. 762–765.

Gonthier, D. J., Ennis, K. K., Farinas, S., Hsieh, H. Y., Iverson, A. L., Batáry, P. and Perfecto, I. (2014). 'Biodiversity conservation in agriculture requires a multi-scale approach'. *Proceedings of the Royal Society of London*., 281 (1791), pp. 20141358.

González-Cruz, G., García-Frapolli, E., Casas, A. and Dupuy, J. M. (2015). 'Responding to disturbances: lessons from a Mayan socio-ecological system'. *International Journal of the Commons,* 9 (2), pp. 831-850.

González-Valdivia, N., Barba-Macías, E., Hernández-Daumás, S. and Ochoa-Gaona, S. (2014). 'Avifauna en sistemas silvopastoriles en el Corredor

Biológico Mesoamericano, Tabasco, México'. *Revista de Biologia Tropical*, 62 (3).

Gordon, C., Manson, R., Sundberg, J. and Cruz-Angón, A. (2007). 'Biodiversity, profitability, and vegetation structure in a Mexican coffee agroecosystem'. *Agriculture, Ecosystems and Environment,* 118 (14), pp. 256-266.

Groves, C. R., Jensen, D. B., Valutis, L. L., Redford, K. H., Shaffer, M. L., Scott, J. M. and Anderson, M. G. (2002). 'Planning for Biodiversity Conservation: Putting Conservation Science into Practice: A seven-step framework for developing regional plans to conserve biological diversity, based upon principles of conservation biology and ecology, is being used extensively by the nature conservancy to identify priority areas for conservation'. *AIBS Bulletin,* 52 (6), pp. 499-512.

Gudeman, S., and Rivera, A. (1990). *Conversations in Colombia: the domestic economy in life and text.* Cambridge: Cambridge University Press.

Gudynas, E. (2011). 'Buen Vivir: today's tomorrow'. *Development,* 54 (4), pp. 441-447.

Guha, R., and J. MartInez-Alier. (1997). *Varieties of Environmentalism: Essays North and South*. London: Routledge.

Gupta, A. and Ferguson, J. (1997). *Culture, power, place: Explorations in critical anthropology.* Durham: Duke University Press.

Haenn, N. (2005). *Fields of Power, Forests of Discontent: Culture, Conservation, and the State in Mexico*. Tucson: University of Arizona Press.

Hamilton, S., Dewalt, B. R. and Barkin, D. (2016). 'Household Welfare in Four Rural Mexican Communities: The Economic and Social Dynamics of Surviving National Crises'. *Mexican Studies*, 19 (2), pp. 433–462.

Harding, S. (2008). *Sciences from Below.* Durham: Duke University Press.

Harvey, C. A., Komar, O., Chazdon, R., Ferguson, B. G., Finegan, B., Griffith, D. M. and Van Breugel, M. (2008). 'Integrating agricultural landscapes with biodiversity conservation in the Mesoamerican hotspot'. *Conservation biology,* 22 (1), pp. 8-15.

Heckenberger, M. J., Russell, J. C., Toney, J. R. and Schmidt, M. J. (2007).

'The legacy of cultural landscapes in the Brazilian Amazon: implications for biodiversity'. *Philosophical Transactions of the Royal Society of London B: Biological Sciences*, 362 (1478), pp. 197-208.

Hendrickson, C. Y. and Corbera, E. (2015). 'Participation dynamics and institutional change in the *Scolel Té* carbon forestry project, Chiapas, Mexico'. *Geoforum*, 59, pp. 63–72.

Hernández-Xolocotzi, E. H. (1985). 'Maize and man in the greater Southwest'. Economic Botany, 39 (4), pp. 416-430.

Hernández-Xolocotzi, E. (1987). 'Experiences leading to a greater emphasis on man in ethnobotanical studies'. *Economic Botany*, 41 (1), pp. 6–1.

Hernández-Xolocotzi, E. and Bello Baltazar, E., (1995). *La milpa en Yucatán: un sistema de producción agrícola tradicional.* Ciudad de México: Colegio de Postgraduados.

Hernández-Xolocotzi, E. (2014). Efraín Hernández-Xolocotzi: Sin maíz no hay país. Available at: https://www.youtube.com/watch?v=tbTG28bnyMw&t=189s. (Accessed: 5 March 2019).

Homewood, K. (2017). '"They Call It Shangri-La": Sustainable Conservation, or African Enclosures?' In *The Anthropology of Sustainability* (pp. 91-109). New York: Palgrave Macmillan.

Hughes, R. and Flintan, F. (2001). *Integrating conservation and development experience: a review and bibliography of the ICDP literature.* London: International Institute for Environment and Development.

Instituto Nacional de Ecología. (1999). *Plan de Manejo de la Reserva de la Biosfera La Sepultura. Mexico.* Mexico: Comision Nacional de Areas Naturales Protegidas

Igoe, J. and Brockington, D. (2007). 'Neoliberal conservation: a brief introduction'. *Conservation and Society,* 5(4), pp. 432-449.

Isakson, S. R. (2009). 'No hay ganancia en la milpa: the agrarian question, food sovereignty, and the on-farm conservation of agrobiodiversity in the Guatemalan highlands'. *The Journal of Peasant Studies*, 36 (4), pp. 725-759.

Isbell, F., Gonzalez, A., Loreau, M., Cowles, J., Diaz, S., Hector, A. and

Turnbull, L. A. (2017). 'Linking the influence and dependence of people on biodiversity across scales'. *Nature*, 546 (7656), p. 65.

Janzen, D. H. (1973). 'Tropical agroecosystems'. *Science*, 182 (4118), p. 1212.

Jose, S. (2009). 'Agroforestry for ecosystem services and environmental benefits: an overview'. *Agroforestry systems,* 76 (1), pp. 1-10.

Kainer, K. A., DiGiano, M. L., Duchelle, A. E., Wadt, L. H., Bruna, E. and Dain, J. L. (2009). 'Partnering for greater success: local stakeholders and research in tropical biology and conservation'. *Biotropica*, 41 (5), pp. 555-562.

Kay, C. (2006). 'Rural Poverty and Development Strategies in Latin America'. *Journal of Agrarian Change*, 6 (4), pp. 455–508.

Kleinman, P. J. A., Pimentel, D. and Bryant, R. B. (1995). 'The ecological sustainability of slash-and-burn agriculture'. *Agriculture, Ecosystems and Environment*, 52 (2–3), pp. 235–249.

Knight, A., (1996). *Salinas and social liberalism in historical context. In Dismantling the Mexican state?* London: Palgrave Macmillan.

Kosoy, N., Corbera, E. and Brown, K. (2008). 'Participation in payments for ecosystem services: case studies from the Lacandon rainforest, Mexico'. *Geoforum*, 39 (6), pp. 2073-2083.

La Jornada (2011). *Exigen proscribir transgénicos en el campo mexicano.* Available at: https://www.jornada.com.mx/2011/09/30/estados/036n1est. (Accessed: 21 December, 2018).

Laurance, W. F., Useche, D. C., Rendeiro, J., Kalka, M., Bradshaw, C. J., Sloan, S. P., and Arroyo-Rodriguez, V. (2012). 'Averting biodiversity collapse in tropical forest protected areas'. *Nature*, 489 (7415), p. 290.

Leff, E. (2008). 'Decrecimiento o desconstrucción de la economía: Hacia un mundo sustentable.' *Polis* 7 (21): 81–90.

Leff, E. (2011). 'Forging an environmental rationality for a sustainable future'. *Development*, 54 (2), pp. 174–176.

Leff, E. (2015a). 'Encountering political ecology: epistemology and emancipation', in *The international handbook of political ecology,* edited by

Bryant, R. L. Cheltenham: Edward Elgar Publishing. pp. 44–56.

Leff, E. (2015b). 'Political Ecology: a Latin American Perspective'. *Desenvolvimento e Meio Ambiente*, 35, pp. 29–64.

Legorreta, C., Márquez, C. and Trench, T. (2014). *Paradojas de las tierras protegidas en Chiapas. México*: Chiapas, México: UNAM (CEIICH-CRIM)–UACh.

Lemos, M. C. and Agrawal, A. (2006). 'Environmental governance'. *Annual Review of Environmental Resources,* 31, pp. 297-325.

Levis, C., de Souza, P. F., Schietti, J., Emilio, T., da Veiga Pinto, J. L. P., Clement, C. R. and Costa, F. R. (2012). 'Historical human footprint on modern tree species composition in the Purus-Madeira interfluve, central Amazonia'. *PloS one*, 7 (11), p. e48559.

Li, T. M. (2007). 'Practices of Assemblage and Community Forest Management.' Economy and Society 36 (2): 263–93.

Li, T.M., Amita, B., Cramb, R., Ghosh, K., Idrus, R., Peters, P.E., Postero, N., Rata, E., Wenk, I. and Li, T.M. (2010). 'Indigeneity, capitalism, and the management of dispossession'. *Current Anthropology*, 51 (3), pp. 385-414.

Liang, J., Crowther, T.W., Picard, N., Wiser, S., Zhou, M., Alberti, G., Schulze, E.D., McGuire, A.D., Bozzato, F., Pretzsch, H. and De-Miguel, S. (2016). 'Positive biodiversity-productivity relationship predominant in global forests'. *Science*, 354 (6309), p. 8957.

López, F. L. and García-Guerreiro, L. (2016). *Pueblos originarios en lucha por las autonomías: Experiencias y desafíos en América Latina.* Buenos Aires, Clacso.

Maffi, L. (2001). *On biocultural diversity: Linking language, knowledge, and the environment.* Washington, D.C; London: Smithsonian Institution Press.

Maffi, L. (2005). 'Linguistic, Cultural, and Biological Diversity'. *Annual Review of Anthropology*, 34 (1), pp. 599–617.

Marcos, S. (2008). *Los Otros cuentos: relatos del Subcomandante Marcos.* Chiapas: Red de Solidaridad con Chiapas.

Martinez-Alier, J. (1991). 'Ecology and the Poor: A Neglected Dimension of Latin American History'. *Journal of Latin American Studies*, 23 (3), pp. 621–639.

Martínez-Alier, J. (2002). *The Environmentalism of the Poor: A Study of Ecological Conflicts and Valuation*. Cheltenham, England: Edward Elgar.

Martinez-Alier, J., Anguelovski, I., Bond, P., Del Bene, D., Demaria, F., Gerber, J.F., Greyl, L., Haas, W., Healy, H., Marín-Burgos, V. and Ojo, G. (2014). 'Between activism and science: grassroots concepts for sustainability coined by Environmental Justice Organizations'. *Journal of Political Ecology*, 21, p.20.

Martínez, M. L., Manson, R. H., Balvanera, P., Dirzo, R., Soberón, J., García-Barrios, L., Martínez-Ramos, M., Moreno-Casasola, P., Rosenzweig, L. and Sarukhán, J. (2006). 'The evolution of ecology in Mexico: facing challenges and preparing for the future'. *Frontiers in Ecology and the Environment,* 4 (5), pp. 259-267.

Martinez-Reyes, J. (2014). 'Beyond Nature Appropriation: Towards Post-development Conservation in the Maya Forest.' *Conservation and Society*, 12 (2), p. 162.

Martínez, T. L., Méndez, R.M., Izaba, B.S., González-Jácome, A. and Kleisser, E.W. (2015). 'Aporte de Alimentos del Huerto Familiar a la Economía Campesina Ch'ol, Suclumpá, Chiapas, México'. *Etnobiología*, 7 (1), pp. 30-44.

Mathews, A. S. (2009). 'Unlikely Alliances'. *Current Anthropology*, 50 (1), pp. 75–101.

McAfee, K. (1999). 'Selling Nature to save it'. *Environment and Planning,* 17, pp. 133–154.

McAfee, K. and Shapiro, E. N. (2010). 'Payments for ecosystem services in Mexico: nature, neoliberalism, social movements, and the state'. *Annals of the Association of American Geographers,* 100 (3), pp. 579-599.

McKey, D., Rostain, S., Iriarte, J., Glaser, B., Birk, J. J., Holst, I. and Renard, D. (2010). 'Pre-Columbian agricultural landscapes, ecosystem engineers, and self-organized patchiness in Amazonia'. *Proceedings of the National Academy of Sciences*, 107 (17), pp. 7823–7828.

McGee R. J. (2002). *Watching Lacandon Maya lives.* Boston: Allyn and Bacon.

McMichael, P. (2008). 'Peasants make their own history, but not just as they please'. *Journal of Agrarian Change*, 8 (23), pp. 205-228.

Medellín, R. A. and Equihua, G. (1998). 'Mammal species richness and habitat use in rainforest and abandoned agricultural fields in Chiapas, Mexico'. *Journal of applied Ecology* 35, pp. 13–23.

Mellink, E., Riojas-López, M. E. and Giraudoux, P. (2016). 'A neglected opportunity for bird conservation: The value of a perennial, semiarid agroecosystem in the Llanos de Ojuelos, central Mexico'. *Journal of Arid Environments*, 124, pp. 1–9.

Merino-Pérez, L. and Segura-Warnholtz, G. (2002). *Las políticas forestales y de conservación y sus impactos en las comunidades forestales en México de México*. México: Instituto Nacional de Ecologia y Cambio Climatico.

Merino-Pérez. L. and Martínez, R. A. (2014). *A vuelo de pájaro. Las condiciones de las comunidades con bosques templados en México*. Ciudad de Mexico: Universidad Nacional Autonoma de Mexico

Miller, S. W. (2007). *An Environmental History of Latin America*. Cambridte: Cambridge University Press

Moguel, P. and Toledo, V. M. (1999). 'Society for Conservation Biology Review: Biodiversity Conservation in Traditional Coffee Systems of Mexico Biodiversity Conservation in Traditional Coffee Systems of Mexico'. *Conservation Biology Conservation Biology*, 13 (1), pp. 1–21.

Moreno-Calles, A. Casas, A., Rivero-Romero, A. D., Romero-Bautista, Y. A., Rangel-Landa, S., Fisher-Ortíz, R. A., and Santos-ita, D. (2016). 'Ethnoagroforestry: integration of biocultural diversity for food sovereignty in Mexico'. *Journal of Ethnobiology and Ethnomedicine,* 12 (1), 54.

Moreno-Calles, A. Calderón-Patrón, J. M., Martín-Regalado, N., Martínez-Falcón, A. P., Ortega-Martínez, I. J., Rios-Díaz, C. L. and Rosas, F. (2018). 'Measuring species diversity in the tropics: a review of methodological approaches and framework for future studies'. *Biotropica*, 50 (6), pp. 929-941.

Norget, K. (2012). 'Surviving Conservation: La Madre Tierra and Indigenous Moral Ecologies in Oaxaca, Mexico', in *Nature, Science and Religion:*

Intersections Shaping Society and the Environment. Edited by Catherine M. Tucker, 85– 106. Santa Fe: School for Advanced Research Press.

Moritz, C. (2002). 'Strategies to Protect Biological Diversity and the Ecolutionary Processes That Sustain It'. *Systematic Biology*, 51 (2), pp. 238–254.

Moritz, C., Patton, J. L., Schneider, C. J. and Smith, T. B. (2000). 'Diversification of rainforest faunas: an integrated molecular approach'. *Annual Review of Ecology and Systematics,* 31 (1), pp. 533-563.

Myers, N., Mittermeier, R. A., Mittermeier, C. G., Da Fonseca, G. A. and Kent, J. (2000). 'Biodiversity hotspots for conservation priorities'. *Nature*, 403 (6772), p. 853.

Naranjo, S. (2012). 'Enabling food sovereignty and a prosperous future for peasants by understanding the factors that marginalise peasants and lead to poverty and hunger'. *Agriculture and Human Values*, 29 (2), pp. 231–246.

Narotzky, S. (2016). 'Where Have All the Peasants Gone?' *Annual Review of Anthropology*, 45 (1), pp. 301–318.

Nations, J. D., and Nigh, Ronald B. (1980). 'The Evolutionary Potential of Lacandon Maya Sustained-Yield Tropical Forest Agriculture'. *Journal of Anthropological Research*, 36 (1), pp. 1-30.

Nazarea, V. D. (2006). 'Local Knowledge and Memory in Biodiversity Conservation'. *Annual Review of Anthropology*, 35 (1), pp. 317–335.

Neumann, R. (2004). 'Nature, state, territory: toward a critical theorization of conservation enclosures, in *Liberation ecologies,* (2nd edn). Edited by: R. Peet and M. Watts. New York: Blackwell.

Nigh, R. and Diemont, S. A. (2013). 'The Maya milpa: Fire and the legacy of living soil'. *Frontiers in Ecology and the Environment*, 11 (1).

Noble, I. R., and Dirzo, R. (1997). 'Forests as human-dominated ecosystems'. *Science,* 277 (5325), pp. 522-525.

Nolte, C., Agrawal, A., Silvius, K. M., and Soares-Filho B. S. (2013). 'Governance regime and location influence avoided deforestation success of protected areas in the Brazilian Amazon'. *Proceedings of the National Academy of Sciences* 110, pp. 4956–4961.

Noticias MVS (2017). *La constitución Mexicana ha sido reformada al menos 707 veces.* Available at: https://mvsnoticias.com/noticias/arte-y-cultura/constitucion-politica-mexicana-ha-sido-reformada-al-menos-707-veces/ (Accessed: 21 December, 2018).

O'Neill, R. V. (2001). 'Is it time to bury the Ecosystem Concept?' *Ecology*, 82 (12), pp. 3275–3284.

Oldekop, J. A., Holmes, G., Harris, W. E. and Evans, K. L. (2016). 'A global assessment of the social and conservation outcomes of protected areas'. *Conservation Biology*, 30 (1), pp. 133-141.

Olden, J. D., Poff, N. L., Douglas, M. R., Douglas, M. E. and Fausch, K. D. (2004). 'Ecological and evolutionary consequences of biotic homogenization'. *Trends in Ecology and Evolution*, 19 (1), pp. 18-24.

Opdam, P., Steingröver, E. and Van Rooij, S. (2006). 'Ecological networks: a spatial concept for multi-actor planning of sustainable landscapes'. *Landscape and urban planning,* 75 (3-4), pp. 322-332.

Osborne, T. M. (2011) 'Carbon forestry and agrarian change: Access and land control in a Mexican rainforest'. *Journal of Peasant Studies*, 38 (4), pp. 859–883.

Ostrom, E. (2000). 'Collective action and the evolution of social norms'. *Journal of economic perspectives*, 14 (3), pp.137-158.

Ostrom, E. and Ahn, T. K. (2003). 'A social science perspective on social capital: social capital and collective action'. *Revista Mexicana De Sociologia*, 65 (1), pp. 155-233.

Paré, L., Robles, C. and Cortes, C. (2002). 'Participation of indigenous and rural people in the construction of developmental and environmental public policies in Mexico'. *IDS Bulletin,* 33 (2), pp.1-10.

Peet, R. and M. Watts. (2004). *Liberation ecologies: Environment, development, social movements* (2nd edn). London: Routledge

Peluso, N. L. and Lund, C. (2011). 'New frontiers of land control: Introduction'. *Journal of Peasant Studies*, 38 (4), pp. 667–681.

Perfecto, I., Rice, R. A., Greenberg, R., and Van der Voort, M. E. (1996). 'Shade

coffee: a disappearing refuge for biodiversity: shade coffee plantations can contain as much biodiversity as forest habitats'. *BioScience,* 46 (8), 598-608.

Perfecto, I. and Vandermeer, J. (2008). 'Biodiversity conservation in tropical agroecosystems: a new conservation paradigm'. *Annals of the New York Academy of Sciences*, 1134, pp. 173–200.

Perfecto, I. and Vandermeer, J. (2010). 'The agroecological matrix as alternative to the land-sparing/agriculture intensification model'. *Proceedings of the National Academy of Sciences*, 107 (13), pp. 5786-5791.

Persha, L., Agrawal, A. and Chhatre, A. (2011). 'Social and Ecological Synergy'. *Science*, 331 (6024), p. 1606.

Peters, V. E., Mordecai, R., Carroll, C. R., Cooper, R. J. and Greenberg, R. (2010). 'Bird community response to fruit energy'. *Journal of Animal Ecology*, 79 (4), pp. 824-835.

Phalan, B., Onial, M., Balmford, A. and Green, R. E. (2011). 'Reconciling food production and biodiversity conservation: land sharing and land sparing compared'. *Science,* 333 (6047), pp. 1289-1291.

Pinto, L. S., Martínez, M. A., Zurimendi, P. M. and Jiménez-Ferrer, G. (2017). 'Tree quality in agroforestry systems managed by small-scale mayan farmers in chiapas, Mexico'. *Small-scale Forestry,* 16 (1), pp. 103-118.

Posey, D. A. and Balée, W. L. (1989). *Resource management in Amazonia: indigenous and folk strategies*. New York: New York Botanical Garden.

Price, M. F., Park, J. J. and Bouamrane, M. (2010). 'Reporting progress on internationally designated sites: The periodic review of biosphere reserves'. *Environmental Science and Policy*, 13 (6), pp. 549–557.

Radio Zapatista, 2017. *The Zapatistas and CONCIENCIAS for Humanity.* Available at: https://radiozapatista.org/?page_id=19520&lang=en (Accessed: 21 December, 2018).

Raffaelli, D. G. and Frid, C. L. (2010). *Ecosystem ecology: a new synthesis.* Cambridge: Cambridge University Press.

Raffles, H. (2005). 'Towards a critical natural history'. *Antipode*, 37 (2), pp. 374–378.

Raynova, Y. B. and Vienna, S. (2014). ‘Interview to Enrique Dussel. Philosophy as Commitment to Reality’, *Labyrinth* 16 (1), pp. 13–26.

Reddeldia (2017a). *Declaratoria sobre Montes Azúles y REDD*+. Available at: http://reddeldia.blogspot.com/p/declaratoria.html. (Accessed: 8 May 2018)

Reddeldia (2017b). *Noticias. Caso Selva Lacandona.* Available at: http://reddeldia.blogspot.com/p/noticias.html. (Accessed: 21 Decempber 2018)

Reddeldia (2017c). *REDD+ para comunidades.* Available at: http://reddeldia.blogspot.com/p/materiales.html. (Accessed: 21 Decempber 2018).

Reiter, B. (2018). *Constructing the pluriverse: the geopolitics of knowledge.* Durham: Duke University Press.

Robbins, P. (2012). *Political ecology: A critical introduction* (2nd ed). Sussex: Wiley-Blackwell.

Rocheleau, D. (2015). 'Networked, rooted and territorial: Green grabbing and resistance in Chiapas'. *Journal of Peasant Studies*, 42 (3-4), pp. 695-723.

Rocheleau, D. and Roth, R. (2007). 'Rooted networks, relational webs and powers of connection: Rethinking human and political ecologies'. *Geoforum*, 38 (3), pp. 433–437.

Roe, D., Mohammed, E. Y., Porras, I. and Giuliani, A. (2013). 'Linking biodiversity conservation and poverty reduction: de-polarizing the conservation-poverty debate'. *Conservation Letters*, 6 (3), pp. 162-171.

Romero, C., Athayde, S., Collomb, J. G. E., DiGiano, M., Schmink, M., Schramski, S. and Seales, L. (2012). 'Conservation and development in Latin America and Southern Africa: Setting the stage'. *Ecology and Society*, 17 (2).

Rosset, P. M., and M. E. Martínez-Torres. (2012). Rural social movements and agroecology: Context, theory, and process. *Ecology and Society* 17 (3):17

Sámano, A. M., Durand, C. and Gómez, G. (2000). 'Los Acuerdos de San Andrés Larraínzar en el contexto de la declaración de los Derechos de los pueblos americanos'. Ponencia presentada en la X Jornadas Lascasianas Internacionales.

Samberg, L. H., Gerber, J. S., Ramankutty, N., Herrero, M. and West, P. C. (2016). 'Subnational distribution of average farm size and smallholder contributions to global food production'. *Environmental Research Letters,* 11 (12), p.124010.

Sanderson, S. (2005). 'Poverty and conservation: The New Century's "Peasant Question?' *World Development*, 33 (2), pp. 323–332.

Sarmiento, O. F. and García, C. O. (2017). 'Plantas útiles multipropósitos en una comunidad del área de influencia de las reservas de la biosfera La Sepultura y El Ocote, Chiapas, México'. *Lacandonia*, 9 (1), pp. 37-44.

Sarukhán, J., Urquiza-Haas, T., Koleff, P., Carabias, J., Dirzo, R., Ezcurra, E. and Soberón, J. (2014). 'Strategic actions to value, conserve, and restore the natural capital of megadiversity countries: the case of Mexico'. *BioScience,* 65 (2), pp. 164-173.

Sayer, J., Sunderland, T., Ghazoul, J., Pfund, J. L., Sheil, D., Meijaard, E. and van Oosten, C. (2013). 'Ten principles for a landscape approach to reconciling agriculture, conservation, and other competing land uses'. *Proceedings of the national academy of sciences,* 110 (21), pp. 8349-8356.

Sayre, N. F. (2012). 'The Politics of the Anthropogenic'. *Annual Review of Anthropology*, 41 (1), pp. 57–70.

Schleper, S. (2008). 'The Contribution of Population and Community Biology to Conservation Science'. *Annual Review of Ecology and Systematics,* 19 (1988), pp. 473-511

Schleper, S. (2017). 'Conservation Compromises: The MABR and the Legacy of the International Biological Program, 1964-1974'. Journal of the History of Biology, 50 (1), pp. 133-167.

Scoones, I. (2009). 'Livelihoods perspectives and rural development'. *Journal of Peasant Studies*, 36 (1), pp. 171–196.

Scoones, I. (2016). 'The politics of sustainability and development'. *Annual Review of Environment and Resources*, 41, pp. 293-319.

Scott, J. (1976). *The Moral Economy of the Peasant: Rebellion and Subsistence in Southeast Asia*. New Haven, CT: Yale University Press.

Scott, J. (1986). 'Everyday forms of peasant resistance'. *The Journal of Peasant Studies*, 13 (2), pp. 5-35.

Scott, J. (1998). *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed*. New Haven, CT: Yale University Press.

Scott, J. (2012). *Decoding Subaltern Politics: Ideology, Disguise, and Resistance in Agrarian Politics*. London: Routledge.

Shanin, T. (1973). 'The Nature and Logic of the Peasant Economy: A Generalisation'. *The Journal of Peasant Studies*, 1 (1), pp. 63–80.

Shrestha, K., Ojha, H., Paudel, G., Paudel, N. and Pain, A. (2017). 'Reframing community forest governance for food security in Nepal'. *Environmental Conservation*, 44 (2), pp. 174-182.

Sills, J. (2011). 'Limits of Land Sparing'. *Science*, 334 (4), pp. 48109–48109.

Silverman, S. (1979). 'The Peasant Concept in Anthropology'. *The Journal of Peasant Studies*, 7 (1), pp. 49–69.

Sims, K. R. and Alix-Garcia, J. M. (2017). 'Parks versus PES: Evaluating direct and incentive-based land conservation in Mexico'. *Journal of Environmental Economics and Management*. 86, pp. 8–28.

Singh, R. and Singh, G. S. (2017). 'Traditional agriculture: a climate-smart approach for sustainable food production'. *Energy, Ecology and Environment,* 2 (5), pp. 296-316.

Speelman, E. N., Groot, J. C., García-Barrios, L. E., Kok, K., Van Keulen, H., and Tittonell, P. (2014). 'From coping to adaptation to economic and institutional change–trajectories of change in land-use management and social organization in a Biosphere Reserve community, Mexico'. *Land Use Policy*, 41, pp. 31-44.

Steffen, W., Persson, Å., Deutsch, L., Zalasiewicz, J., Williams, M., Richardson, K., and Molina, M. (2011). 'The Anthropocene: From global change to planetary stewardship'. *Ambio*, 40 (7), p. 739.

Stigler, G. J. (1951). 'The Division of Labor is Limited by the Extent of the Market'. *Journal of Political Economy*, 59 (3), pp. 185-193.

Sunderland, T.C., Ehringhaus, C. and Campbell, B. M. (2008). 'Conservation

and development in tropical forest landscapes: a time to face the trade-offs?' *Environmental Conservation,* 34, pp. 276–279.

Sweeney, S., Steigerwald, D. G., Davenport, F. and Eakin, H. (2013). 'Mexican maize production: Evolving organizational and spatial structures since 1980'. *Applied Geography*, 39, pp. 78-92.

Tansley, A. G. (1935). 'The use and abuse of vegetational concepts and terms'. *Ecology*, 16 (3), pp. 284-307.

Terán, S. and Rasmussen, C. H. (2009). *La milpa de los mayas* (2nd edn). Mexico City, Mexico: Universidad Nacional Autónoma de México.

Thompson, E. P. (1968). *The Making of the English Working Class.* London: Penguin.

Toledo, V.M., Ortiz-Espejel, B., Cortés, L., Moguel, P. and de Jesús Ordoñez, M. (2003). 'The multiple use of tropical forests by indigenous peoples in Mexico: a case of adaptive management'. *Conservation Ecology*, 7(3).

Toledo, V. and Barrera-Bassols, N. (2017). 'Political agroecology in mexico: A path toward sustainability'. *Sustainability*, 9 (2),pp. 268.

Tscharntke, T., Clough, Y., Wanger, T. C., Jackson, L., Motzke, I., Perfecto, I. and Whitbread, A. (2012). 'Global food security, biodiversity conservation and the future of agricultural intensification'. *Biological conservation,* 151 (1), pp. 53-59.

UNESCO. (2017). *Programa sobre el Hombre y la Biosfera*. Available at: http://www.unesco.org/open-access/terms-use-. (Accessed: 21 December 2018).

United Nations. (2018). *UN rights chief welcomes new text to protect rights of peasants and other rural workers*. Available at: https://news.un.org/en/story/2018/12/1028881. Accessed: 4 January 2019).

Vanderplank, S. E., Mata, S. and Ezcurra, E. (2014). 'Biodiversity and Archeological Conservation Connected: Aragonite Shell Middens Increase Plant Diversity'. *BioScience*, 64 (3), pp. 202–209.

Vovides, A. (2000). 'México: Segundo Lugar mundial en Diversidad de Cícadas'. *CONABIO-Biodiversitas,* 31:5-10

Walsh, C. (2010). Development as Buen Vivir: Institutional arrangements and (de) colonial entanglements. *Development*, 53(1), pp.15-21.

Walker, D., Jones III, J. P., Roberts, S. M. and Fröhling, O. R. (2007). 'When participation meets empowerment: The WWF and the politics of invitation in the Chimalapas, Mexico'. *Annals of the Association of American Geographers,* 97(2), pp. 423-444.

Welch, C. and Mançano Fernandes, B. (2009). 'Peasant movements in latin America: Looking back, moving ahead'. *Latin American Perspectives*, 36 (4), pp. 3–8.

West, P. (2016). 'An Anthropology for “the Assemblage of the Now"'. *Anthropological Forum*, 26 (4), pp. 438–445.

West, P., Igoe, J. and Brockington, D. (2006). 'Parks and peoples: the social impact of protected areas'. *Annu. Rev. Anthropol*., 35, pp. 251-277.

Wezel, A., Brives, H., Casagrande, M., Clément, C., Dufour, A. and Vandenbroucke, P. (2016). 'Agroecology territories: places for sustainable agricultural and food systems and biodiversity conservation'. *Agroecology and sustainable food systems*, 40 (2), pp. 132-144.

Wiersum, K. F. (2004). 'Forest gardens as an ‘intermediate’land-use system in the nature-culture continuum: characteristics and future potential'. *In New Vistas in Agroforestry,* pp. 123-134.

Willis, A. J. (1997). 'The ecosystem: an evolving concept viewed historically'. *Functional Ecology* 11, pp. 268 –271.

Wilshusen, P. R., Brechin, S. R., Fortwangler, C. L. and West, P. C. (2002). 'Reinventing a square wheel: Critique of a resurgent" protection paradigm" in international biodiversity conservation'. *Society and Natural Resources*, 15 (1), pp. 17-40.

Wolf, E. (1955). 'Types of Latin American Peasantry: A Preliminary Discussion'. *American Anthropologist*, 57 (3), pp. 452–471.

Wolf, E. (1999). *Envisioning power: Ideologies of dominance and crisis.* Berkeley, London: University of California Press.

Wolf, E., and Hansen, E. (1972). *The human condition in Latin America.* New

York, London: Oxford University Press.

Wollenberg, E., Merino, L., Agrawal, A. and Ostrom, E. (2007). 'Fourteen years of monitoring community-managed forests: learning from IFRI's experience'. *International Forestry Review*, 9 (2), pp. 670-684.

Woodhouse, E., Homewood, K. M., Beauchamp, E., Clements, T., Mc Cabe, J. T., Wilkie, D. and Milner-Gulland, E. J. (2015). 'Guiding principles for evaluating the impacts of conservation interventions on human well-being'. *Philosophical Transactions of the Royal Society B: Biological Sciences,* 370 (1681), p. 20150103.

World Resources Institute. (2003). Ecosistemas y bienestar humano. Marcos para su evaluación. Informe del Grupo de Trabajo sobre Marco Conceptual de la Evaluación de Ecosistemas del Milenio, Available at: www.unep.org/maweb/es/Reports.aspx. (Accessed: 11 December 2018).

Zimmerer, K. S. (2011). 'Conservation Booms" With Agricultural Growth?' *Latin American Research Review*, 46 (2008), pp. 82–114.