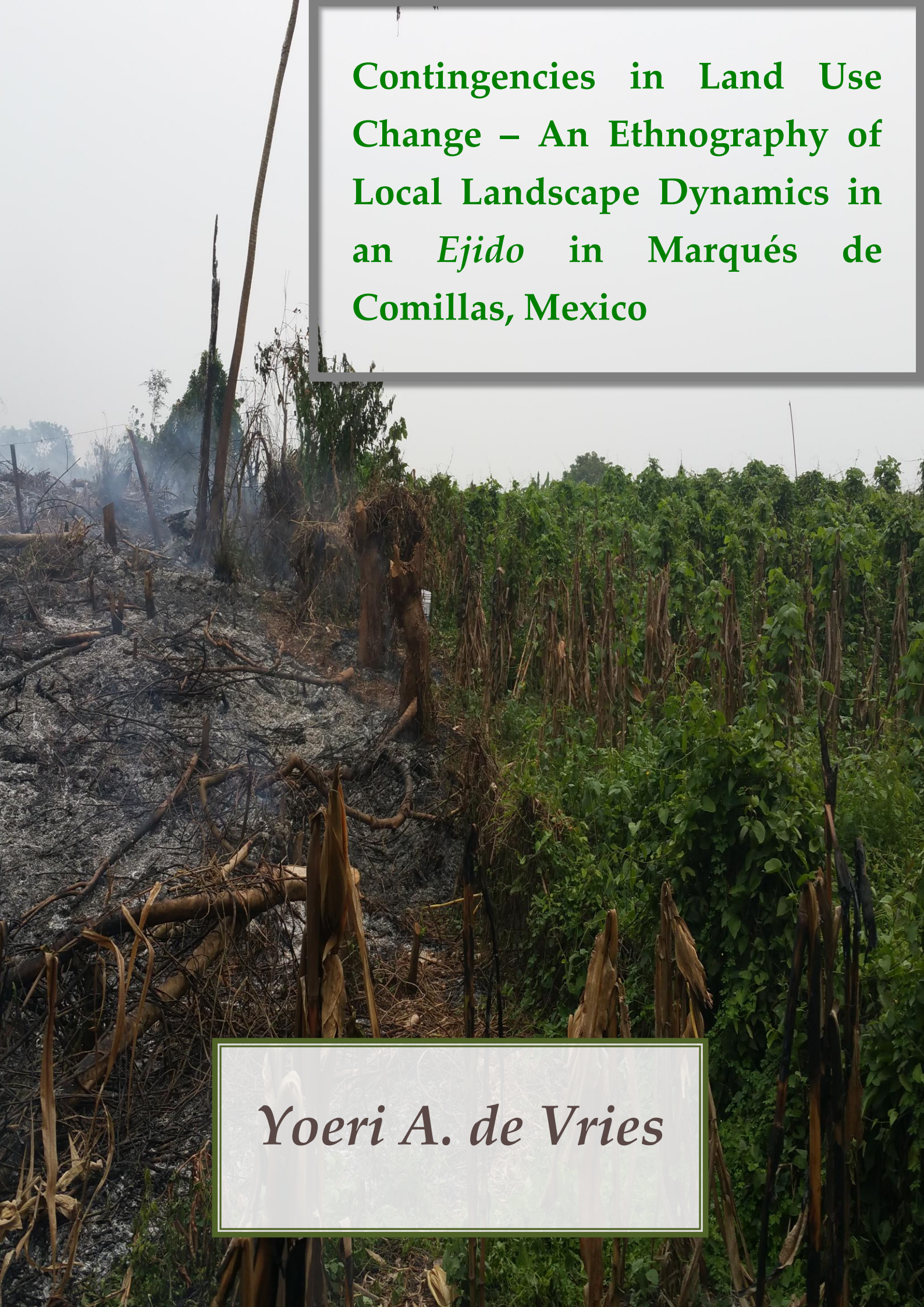

Contingencies in Land Use Change – An Ethnography of Local Landscape Dynamics in an *Ejido* in Marqués de Comillas, Mexico

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List of Acronyms

CILA	International Boundary and Water Commission between Mexico and Guatemala (*Spanish: Comisión Internacional de Límites y Aguas entre México y Guatemala)*
EZLN	Zapatista Army of National Liberation (*Spanish: Ejército Zapatista de Liberación Nacional)*
FOREFRONT	Nature's benefits in agro-forest frontiers: linking actor strategies, functional biodiversity and ecosystem services
GATT	General Agreement on Tariffs and Trade
LCS	Land Change Science
LULC	Land Use and Land Cover
MOCRI	Independent Regional Peasant Movement (*Spanish: Movimiento Campesino Regional Independiente)*
NAFTA	North American Free Trade Agreement
PEMEX	Mexican Petroleums (*Spanish: Petróleos Mexicanos)*
PES	Payment for Ecosystem Services program
PESA	Special Program for Food Security *(Spanish: Programa Especial de Seguridad Alimentaria)*
PPF	Pilot Forestry Plan (*Spanish: Plan Piloto Forestal)*
PROCAMPO	Program for Direct Assistance in Agriculture *(Spanish: Programa de Apoyos Directos al Campo)*
PROCEDE	Program for Certification of Ejidal Rights (*Spanish: Programa de Certificación de Derechos Ejidales y Titulación de Solares)*
PROGAN	Sustainable Management of Livestock Production and Beekeeping Program (*Spanish: Programa de Producción Pecuaria Sustentable y Ordenamiento Ganadero y Apícola)*
UNAM	National Autonomous University of Mexico (*Spanish: Universidad Nacional Autónoma de México)*

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Abstract

Agro-forest frontier areas are highly relevant and interesting areas for science and policy, both because of the environmental value of the region and because of the socio-environmental processes that can be witnessed. Marqués de Comillas in the south of the Mexican state Chiapas is one such region. Much of the literature on land use change in this region focuses on the general land use changes and attempts to explain these through studying the influence of macro-processes and organisations. The land use practices of peasants are then conceptualized as the deterministic result of these two factors. Through studying the logics of peasants regarding their land use practices, this thesis underlines the importance of acknowledging the role of agency for understanding land use changes. Following the analysis, it is shown how land use changes are not deterministic but that they rather are contingent on the logics of peasants. These logics relate to three key issues: 1) politico-economic concerns, 2) environmental consciousness, and 3) external events; the landscape dynamics in the case study of this thesis have largely been contingent on these three key issues. This thesis concludes that we can obtain a more comprehensive image of landscape dynamics when these are studied on different scales, with different focus, and based on different sources. Furthermore, in understanding the socio-environmental causes of landscape dynamics research is needed that acknowledges the importance of both the existing macro-structures and the micro-agency of peasants.

1 Introduction

Land use change, especially the conversion of (primary) forest to agro-pastoral land, are local phenomena which, cumulatively, are one of the main drivers for global environmental change (Lambin & Meyfroidt 2011). Because of the global relevance of land use change, many different academic disciplines concern themselves with the science of studying human-environmental interaction (Turner et al. 2007). The international academic research on this topic is known as the Land Use and Land Cover Change project (LULC) (Reenberg 2006). This research has argued that there is need for more interdisciplinary research to further enhance our understanding of land use change (Reenberg 2006), which has led to the relatively recent interdisciplinary effort known as Land Change Science (LCS) (Rindfuss et al. 2004). LCS is a joined effort of the human, environmental, and geographical sciences, and one of its objectives is to study how human-environmental processes cause land use changes (Turner et al. 2007). This endeavour of enhancing our understanding of the causes of land use change is an important one, because the contemporary understanding is one in which the human-environmental processes are often simplified and not always supported by case studies (Lambin et al. 2001).

Socio-environmental phenomena are complex to study as they depend on the scale in which they are analysed, and often different socio-environmental phenomena interact within and between scales with each other (Reenberg 2006). It is therefore tricky to assume that large-scale phenomena and processes can simply be superimposed on locales to explain the local phenomena. Following Prudham (2004) in his argument that it is necessary to consider the scale-specificity of processes of neoliberalism, he argues that there is not one neoliberalization process but that each specific case of neoliberalization stands on itself. This reasoning does not restrict itself to neoliberalization, but is also the case for processes of land use change because the "high variability of biophysical nature in space and time only intensifies the need for careful attention to context and scale" (McCarthy & Prudham 2004: 279). Explanations of land use change based on macro-analyses may not align with the findings of micro-analyses, nor can local phenomena be understood separated from the larger social context (Stahl 1982; Lambin et al. 2001). For a more comprehensive understanding of landscape dynamics in a region, it is thus necessary to acknowledge the value of land use change studies that have been performed on different scales in that region.

A specific type of area where land use changes are prevalent are agro-forest frontier areas. Such areas are the forefront of agricultural expansion, where pristine forest is often converted into pastures and agricultural lands. Due to the environmental implications of this land use and land cover conversion, such areas attract considerate attention of researchers and environmental organizations worldwide (Bryant et al. 1997). Agro-forest frontier areas are also highly relevant and interesting areas for science and policy because of the socio-environmental processes that can be witnessed and studied there. Schoneveld (2014) identifies three main macro-processes that often characterize such areas, which are high rates of environmental degradation, political tension, and agribusiness expansion. In line with this focus on macro-processes, many studies that aim to contribute to our knowledge on landscape dynamics in agro-forest frontiers do so through studying the (multiple) property right systems in such areas (e.g. German et al. 2014; Cronkleton & Larson 2015; Schmidt & McDermott 2015; McCarthy 2005).

Despite different locales in agro-forest frontier areas all being subjected to these socio-environmental macro-processes, Turner et al. (2007) argue that the trajectory of land use change tends to not be similar between locales. Other authors also argue that macro-processes tend to be over-valued as all-explaining factors to land use changes; rather than macro-processes being a driving factor they are one among many determinants (Perz 2003; Ruff et al. 2015). Individual reason and local processes are important factors to take into consideration as they affect or shape the process of land use change in specific locales (Schmidt & McDermott 2015). This means that land use changes are situational phenomena (Arts et al. 2014), and therefore macro-studies cannot explain how and why landscape dynamics in a certain locale have taken a specific form. Ethnographic research of land use change in a local case study can stress the importance of acknowledging the particularity of specific contexts, and of the role of individual peasants in understanding land use changes. Focussing on the land use practices of peasants and the agency of individual peasants corresponds to the goal of LCS, since that will study how macro-structure and micro-agency both steer landscape dynamics (Lambin et al. 2003; Bourdieu 1990a).

This thesis is based on ethnographic research conducted in a small village in southern Mexico, located near the municipality of Marqués de Comillas which is part of an agro-forest frontier area as colonization and cultivation encroaches upon the Lacandon rainforest. The thesis is part of the larger international academic research program called FOREFRONT (Nature's benefits in agro-forest frontiers: linking actor strategies, functional biodiversity and ecosystem services), which for this study mainly involves the National Autonomous University of Mexico (UNAM) and Wageningen University, the Netherlands. The objective of FOREFRONT is threefold:

1) to identify and understand the ecological and social drivers that shape agro-forest frontier landscapes and their ecosystem services,
2) to explain temporal changes in the social-ecological system and their consequences for landscape configurations,
3) to design adaptive strategies to balance and optimize the supply of ecosystem services in changing landscapes.

Through performing a local ethnographic study in the agro-forest frontier area Marqués de Comillas, this thesis adds to research on local socio-environmental processes that has been performed in this region. The number of such micro-studies is fairly limited, with the exception of a recent study by Valle-García (2016) on the Lacandon rainforest. That study is based on ethnographic research and aims to understand the socio-territorial impact of government initiatives. He combines ethnographic methods with cartography in his study, which resemble the methods used in this thesis. However, in his study the subject remains very much 'programs', rather than the peasants and their practices. The impact of governmental policies on communities is analysed in his study, resulting in practices not being studied in itself but according to an a priori defined frame. This thesis studies the reasons of peasants to perform their practices, which can show how land use change is contingent rather than deterministic, and unpredictable rather than generalizable. In doing so this thesis adds to the first and second objective of the FOREFRONT program.

The following section of this chapter provides a description of the region Marqués de Comillas, this is followed by an overview of the state-of-the-art academic literature on land use change in this region

in section 1.2, in which there is a main focus on two factors: macro-processes and organisations. Based on the analysis of that literature Section 1.3 provides the problem statement where is argued for the necessity to focus on a specific locale in order to analyse the logic of peasants regarding their land use practices. Chapter 2 discusses the concepts and methods used for this thesis to reach its objective and answer its research questions. Chapter 3 covers the empirical data of the performed research; it describes the stories and logics of peasants regarding their land use practices. In chapter 4 these logics are analysed to identify key issues to which these logics apply, and on which the landscape dynamics are mostly contingent. Chapter 5 is the conclusion and discussion of this thesis where the role of scale, focus, and source for research is underlined, and the importance of agency for understanding the choice of peasants for certain practices is stressed.

1.1 Marqués de Comillas - A description of the region and its history

The region now known as Marqués de Comillas was for a long time a largely uninhabited region in the southern Lacandon rainforest, until the government allowed colonization of the region in the 1970s. The region derives its name from a Spanish marquis, who was given the land concessions of this region in 1900. Due to the relatively recent colonization of the area and the high rate of conversion of forest into agriculture and pastures, the region is regarded as one of the world's agro-forest frontiers (Romero 2014; Zermeño-Hernández et al. 2016). The region is located in the south-east of the Mexican state Chiapas, and is part of the southern Lacandon rainforest . It is a region of 204,400 ha and borders Guatemala in the south and east, and in the north-west it is separated from the Montes Azules Biosphere Reserve by the Lacantun river (De Jong 2000a). There is some ambiguity regarding the region referred to by the name 'Marqués de Comillas'. Historically, the region just described is referred to as Marqués de Comillas, and the term for this region is still used for this region in much of the academic literature. However, politically this area has been divided in two municipalities: Marqués de Comillas and Benemérito de Las Américas. Figure 1 shows the geographical location of the region in the state Chiapas. Note that in this map only the municipality Marqués de Comillas is coloured black. In this thesis is referred to the entire region when speaking about Marqués de Comillas, unless it is clearly stated that it is the municipality Marqués de Comillas that is referred to. As this section and the following section are quite dense when it comes to the historical events in and outside Marqués de Comillas that have had considerate impact on the landscape dynamics there, Table 1 at the end of this section provides a list with key events.

Colonization of the Marqués de Comillas started in the 1970s, when the state expropriated the land from large landholders and allowed the establishment of several when several *ejidos*[1] in the region. The *ejido* land tenure system is a result of the agrarian reforms that emerged from the Mexican revolution led by the Zapatistas in 1910. These reforms led to the expropriation of land from large landholders, after which that land was declared national territory in order to give it to Mexican citizens (Assies 2008; De Ita 2006; Harvey 1995). The Zapatista uprising was a result of the fact that before the revolution, 96% of the Mexican population was landless, while 97% of all the Mexican

[1] One of the three forms of land ownership in Mexico (the other two being private property and communal property), in which the state remains the ultimate owner of the land. An *ejido* consists out of people that have applied for a land grand, and manage it collectively through an *ejido* commission (Harvey 2005). This type of land ownership was a result of the Zapatista revolution in 1917 (Dunn 2000). An *ejidatario* is consequently the name of a person living in an *ejido* and who also possesses land in that *ejido.*

territory was in the possession of merely 1% of the population (Luers et al. 2006). However, this expropriation of territory did not happen in Chiapas as fast as in other parts of Mexico because for a long time the state attempted to protect the large private landholder's interests (Castillo-Santiago et al. 2007; Harvey 1995). From 1860 until the colonization in the 1970s the state's main intention for the southern Lacandon rainforest was to obtain money from its natural resources through commercial logging by foreign companies (González Ponciano 1991; Flores González 2011). During this time, the land was the private property of merely 3 enterprises, the Spanish marquis that Marqués de Comillas derives its name from being one of these large landholders. The logging was focused only on mahogany and cedar during the 'golden age' of mahogany exploitation (1895-1913), and therefore the environmental consequences remained little. This limited environmental impact is also a result of the fact that until the mid-20th century there was no permanent settlement, extensive infrastructure, or large scale clearing of the forest (Bray & Klepeis 2005; Harvey 1998).

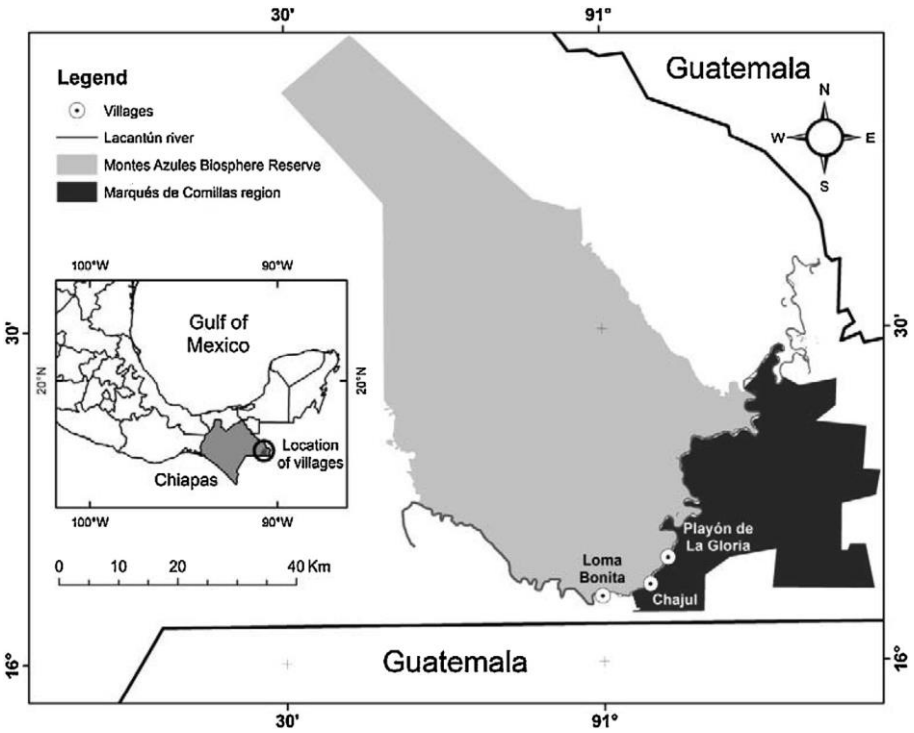

Figure 1. Geogrpahic location of Marqués de Comillas and of the study site, the *ejido* Loma Bonita (Zermeño-Hernández et al. 2016).

The start of the second half of the 20th century marked the beginning of the colonization of the northern Lacandon by Mexican peasants. This resulted in permanent settlement, and the start of cattle ranching which lead to more and more deforestation. In order to meet the continued demand for land from landless peasants and to limit deforestation in the northern Lacandon, the government decided to create a plan for the colonization of Marqués de Comillas. Already in the 1960s the government had plans for the establishment of several *ejidos* in Marqués de Comillas, but it took until 1974 for the state to successfully open up the region Marqués de Comillas for colonization (Flores González 2012; González Ponciano 1991). From off the end of the 1980s Marqués de Comillas gained importance for the state due to the Guatemalan civil war, the entrance of PEMEX (the parastatal oil drilling company) in the region, and the continued deforestation (Harvey 2005). Since the opening up of Marqués de Comillas for colonization, around 10,000 peasants had entered the

region (Flores González 2012). The number of inhabitants would increase drastically in the region due to the Guatemalan civil war in the 1980s. The Mexican government opened its borders to Guatemalan refugees, which resulted in more than 60,000 refugees settling in at least 126 camps along the south border (Romero 2014; González Ponciano 1991). The migration flux following the events of colonization by Mexican and Guatemalan peasants caused a 40% decline of primary rainforest in 20 years (Harvey 1998; De Jong 2000a). As an attempt to control this unregulated colonization and deforestation the state declared the southern Lacandon national territory in order to initiate controlled colonization there (Christman et al. 2015; Bray & Klepeis 2005; Durand et al. 2014). Now that the land was national territory, no more forestry concessions were granted to logging companies.

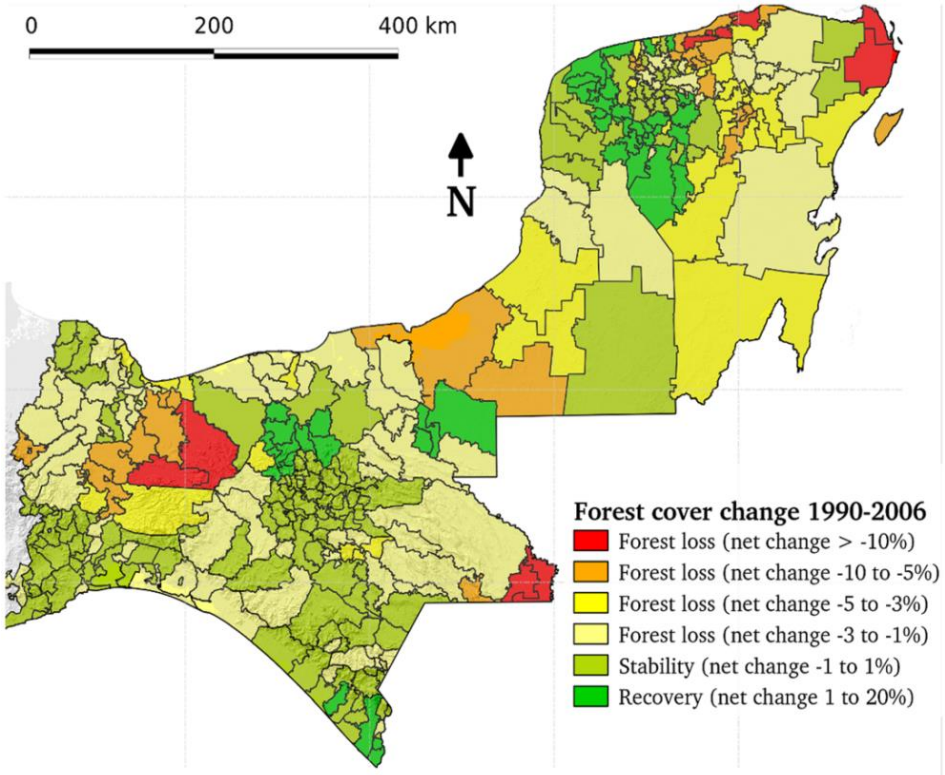

Figure 2. Forest cover change from 1990-2006 in Chiapas. Source: Vaca et al. (2012).

In attempts of both controlling colonization and preserving natural areas, the state issued a decree in 1992 that placed a large portion of the Lacandon rainforest under possession of the people known as the 'Lacandon Maya' (Durand et al 2014; Bray & Klepeis 2005). This decree in combination with the establishment of the *ejido* land tenure system in the region caused a legal and political mess, enabling the parastatal logging company to benefit from this and start logging again (Bray & Klepeis 2005; Marquez-Rosano 2006; Harvey 1998). Following these events, deforestation rates increased rapidly and worldwide environmental concern for the region grew, pressuring the government to establish several protected areas in southern Chiapas, among which the Montes Azules Biosphere Reserve in 1978 (Bray & Klepeis 2005; Flores González 2012; Harvey 1990; Yetman & Burquez 1998). There was (and continues to be) international environmental concern for the region because Marqués de Comillas is part of the Mesoamerica biodiversity hotspot and located next to one of Mexico's last pure forest frontiers (Bryant et al. 1997; Jantz et al. 2015; Durant et al. 2014). More specifically, it is part of the ecoregion 'Petén-Veracruz moist forests', and in that ecoregion Marqués

de Comillas is one of the areas where the highest levels of deforestation have occurred, as can be seen in Figure 2, where Marqués de Comillas is the red area in the lower-middle area of the map (Bonilla-Moheno et al. 2012; Vaca et al. 2012). The environmental value of the region combined with the high level of (socio-)environmental changes has led to a considerate body of academic literature regarding landscape dynamics in that area (see for example Valle-García 2016 and Ramos et al. 2012).

Table 1. List of key events regarding the socio-environmental changes in Marqués de Comillas.

Year(s)	Key events
1860	Commercial logging in the Lacandon rainforest by foreign companies
1895 - 1913	'Golden age' of mahogany exploitation, environmental consequences remain little
1910 – 1917	Zapatista revolution that results in the agrarian reforms and the start of the *ejido* land tenure system
mid-20th century	Beginning of the colonization of the northern Lacandon by Mexican peasants
1974	Opening up of the region Marqués de Comillas for colonization
1978	Establishment of the Montes Azules Biosphere Reserve
1982	Mexican debt crisis
1980s	Guatemalan civil war
	Entrance of PEMEX in Marqués de Comillas
	Environmental concern due to high rates of deforestation
1986	Mexico enters into the General Agreement on Tariffs and Trade (GATT)
1987 - 1988	State attempts to regulate logging through issuing permits to *ejidos*
1989	Complete logging ban in Marqués de Comillas
1990	Trade liberalization through decreasing import tariffs and eliminating guarantee prices for all crops except corn and beans
1992	Article 27 of the Mexican constitution is changed which ends the agricultural land reforms
	State issues a decree that places a large portion of the Lacandon rainforest under possession of the 'Lacandon Maya'
1994	Signing by Mexico of the North American Free Trade Agreement (NAFTA)
	Zapatista uprising
	State proposes a redrawing of municipal boundaries in Marqués de Comillas
1995	Establishment of the Pilot Forestry Plan (PPF)
1999	Establishment of the municipalities Marqués de Comillas and Benemérito de Las Américas
2000	Finalization of the Southern Border Highway connecting Comitán de Domínguez with Palenque
2007 - 2012	Government promotes and invests in biofuel plantations
2008	Entrance of the Payment for Ecosystem Services program (PES) in Marqués de Comillas

1.2 Analysing the academic literature on the landscape dynamics in Marqués de Comillas

Much of the literature that aims at explaining the land use change in the area focuses on the influence of two factors: macro-processes and organizations. Regarding the macro-processes, the socio-political and economic macro processes are analysed as a way to understand and explain the land use changes. With organizations is referred to governmental, industrial, and peasant organizations, and to other programs present in the region. Land use changes are linked to the presence and influence of these organizations and their programs. The boundaries between macro-processes and organizations are not rigid and clear-cut, as the two have a certain overlap. Organizations and their specific programs can be part of macro-processes (such as the entrance of oil companies in the region which is related to processes of neoliberalization), and macro-processes can sometimes be understood as a result of certain organizations (the process of modernization can be regarded as a result of specific decisions of state agencies). The distinction between these two factors is made in this chapter to stress and show the prominent role these two factors take up in the literature. The first section focuses on the macro-processes that are present in the literature to explain the land use changes in Marqués de Comillas. The second section covers the (governmental) organisations and programs that deal with land use practices in the region. The information this body of literature provides us regarding the processes affecting land use change is valuable, because it explains certain phenomena and events, it describes the historical, social, and environmental context of the region, and it brings forth questions that otherwise might not have been asked.

1.2.1 Macro-processes

In the literature on landscape dynamics in Marqués de Comillas, mostly the general patterns of land use change in the entire region are analysed. Figure 3 for example shows the conversion of primary forest to cultivated land and secondary vegetation in the entire region of Marqués de Comillas. This conversion is linked to macro-processes, of which one of the most prominent macro-process in the is the process of colonization. The accelerated rate of deforestation that can be seen in Figure 3 is linked in the literature to the increased population as a result of the Mexico opening its borders to Guatemalan refugees and of the Mexican policy of controlled colonization (e.g. Carabias 2012). Especially along the south border and the Lacantun river the primary forest had been converted into pasture, agriculture, and/or secondary vegetation (see the 1986 map in Figure 3), further strengthening the link between deforestation and the socio-political processes.

Furthermore, much literature analyses the socio-political and economic processes that resulted in the colonization of the region (e.g. Harvey 1998; Marquez-Rosano 2006; Bray & Klepeis 2005; Cruz Burguete 2008; González Ponciano 1991; Klepeis & Vance 2003; Castellanos-Navarrete & Jansen 2013). The colonization of Marqués de Comillas and the land use changes following the colonization are linked in the literature to the 'neoliberal restructuring' (albeit not always that explicitly) of Mexico in the 1980s and 1990s (Harvey 1996). The neoliberal policy changes that the government made, were the result of the 1982 debt crisis in Mexico (Howard & Homer-Dixon 1995; Perramond 2008). This prompted the government to initiate economic reforms oriented towards liberalisation, privatisation and deregulation (Pastor & Wise 1997). Under supervision of the International Monetary Fund (Eakin 2005), the government restructured its financial system by selling state-owned companies, and by reducing market controls, subsidies, and public credit (Howard & Homer-

Dixon 1995). In 1986 Mexico entered into the General Agreement on Tariffs and Trade (GATT), which resulted in the replacement of import licenses with import tariffs (Harvey 1996). This was followed in 1990 by trade liberalization through a further decrease of these tariffs and by the elimination of guarantee prices for all crops except corn and beans. This was the first time the governmental policy changes were felt by the peasants. In 1992 Article 27 of the Mexican constitution was changed, which resulted in the end of the land reforms that characterized the last 70 years, and in the privatization of the *ejido* sector (Foley 1995; Assies 2008; De Ita 2006). The privatization of land to end the *ejido* land tenure system was deemed necessary as the *ejido* system was regarded as incompatible with the market system. However, the process of privatization in Chiapas did not go smoothly due to the Zapatista Rebellion which was a response to these socio-political changes (Hindley 2002; Stephen 1998).

The reforms to Article 27 destroyed the social nature of the agrarian sector that the Zapatistas had fought for with the 1910-1917 revolution and therefore caused much opposition, especially in the regions where the Zapatistas had more support such as Chiapas (Harvey 1995). These steps to reform the constitution were taken in order for the state to sign the North American Free Trade Agreement (NAFTA) in 1994, through which Mexico, Canada, and the United States became trade partners (Harvey 1996; Foley 1995). As a result of the entrance into NAFTA, import tariffs and quotas were eliminated, leading to a severe drop in prices for all crops. Up until then, corn and beans were protected by guaranteed prices, but under NAFTA this also came to an end, making corn and beans dependant on the free market which meant peasants could not compete with the high production and low prices of corn from the United States (Harvey 1995). Result of these reforms was, that as the state support for agriculture diminished the peasants became more and more dependent on their location and socio-economic context (Perramond 2008). Without state support the productivity of agriculture decreased, resulting in less output and thus less income. Especially in tropical regions such as the Lacandon rainforest, where the soil is generally unsuitable for sustainable agriculture, this had negative environmental consequences. To maintain their income and subsistence needs, peasants needed to increase the area they dedicated to agriculture. Many peasants turned to cattle ranching as new source of income, which also turned out to be vulnerable to the economic reforms. This meant peasants could still not capitalize on their production and thus also needed to continue clearing forest for corn and bean production to provide for their subsistence needs (Harvey 1995).

In Chiapas, the liberalization of agricultural trade and a decrease of government subsidies left peasants with little alternatives to earn money besides illegal logging. The existence of a forestry ban thus angered the peasants, and this dissatisfaction with the state led to the Zapatista uprising in 1994, and with the organization MOCRI (Independent Regional Peasant Movement, established in 1991) joining forces with the Zapatista organisation EZLN (Zapatista Army of National Liberation) to plead for the removal of this forestry ban (Harvey 2005). As the state realized its incapability of controlling this illegal activity, and to prevent the unrest from spreading to other regions, the threat these organizations posed to the state security if their conditions would not improve, the government decided to end the forestry ban in Marqués de Comillas as part of a new plan to promote sustainable development (Harvey 2005; Harvey 1998; Bobrow-Strain 2004). The government granted forestry permits to 18 *ejidos*, but the restrictions set in these permits (such as the prohibition of felling live mahogany trees) were broken, quotas were exceeded, and illegal logging had continued. This resulted in the government imposing fines on these *ejidos*. The fines

created a political debate whether or not the government should pursuit a policy of integration and self-regulation of *ejidos*, or a policy in which the *ejidos* are forced to participate in state programs with strict rules and punishment in case of disobedience (Harvey 1998). As the strict punishment-and-control type of governance had already proven to be difficult in the area, the political answer to this debate was more to allow the peasants more freedom in using the forest, while decentralizing government control to decrease the distance between the government and the peasants in the region. In the next section will be elaborated on the development of this new political course.

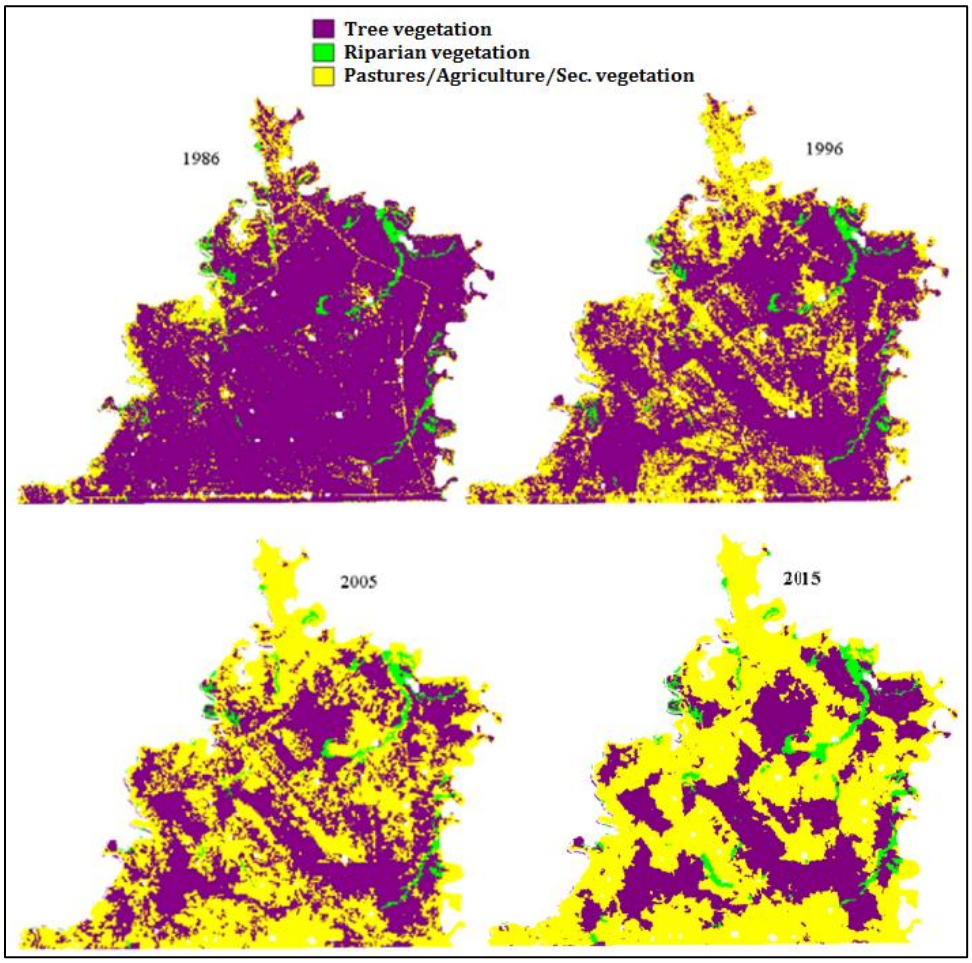

Figure 3. Land cover change in Marqués de Comillas from 1986 to 2015. The 2015 map is a future scenario based on the current trend in land cover change (Castillo 2009).

1.2.2 Organizations

The second main factor according to which land use changes and land use practices are analysed and explained in the literature is the presence of (governmental) organizations. Through time the government has initiated several programs in the region, and as the accessibility of the region and the (environmental) interest in the region grew more organizations with all their own objectives entered the region. The current literature consequently places great attention on the influence these organizations and programs have had on the historical landscape dynamics.

The social, environmental, and political events in the region prompted the government to start two programs: the Plan del Sureste, which had as goal to orderly manage the colonization of the southern border, and the Plan Chiapas, which had as goal to improve the livelihoods of the people in Chiapas and to strengthen the incorporation of Chiapas into the state (Harvey 1998). In this same decade PEMEX (Mexican Petroleums), the state-owned oil company, entered the region and established its headquarter in Zamora Pica de Oro. It drilled several exploratory wells[2], which it subsequently abandoned, and started the construction of the border highway, which would then remain unfinished for another 20 years (Harvey 2005; Flores González 2012; Vasquez et al.1992; González Ponciano 1991). Combined with (renewed) government plans to build dams for generating hydroelectricity (Wilkerson 1986), and the continued commercial and illegal logging of mahogany, the (inter)national environmental concern for the region lead to the state undertaking action. In 1987 and 1988 it attempted to regulate logging through permits, but illegal logging continued. Under pressure from (inter)national environmental organizations, this resulted in the state imposing a complete logging ban in 1989 (Harvey 2005; Harvey 1998; Bray and Klepeis 2005; Christman et al. 2015). Despite this ban staying in force until 1994, due to limited means for law enforcement and limited economic alternatives for peasants, illegal logging never disappeared during the ban (Harvey 1998).

As deforestation continued substantially in Marqués de Comillas (see the difference between the 1986 and the 1996 map in Figure 3), the government needed to establish a plan which constrained deforestation while taking into account the economic and social environment. In trying to manage its natural resources and the social complications in Marqués de Comillas, the state established the Pilot Forestry Plan (PPF) in 1995, which aimed at a more sustainable and diversified forest use, thus diverting from the traditional punishment-and-control type of governance[3] (Harvey 2005; Marquez-Rosano 2006). However, due to the political turmoil and the social unrest, and the fact that the PPF was a project from Quintana Roo and therefore not designed to fit the social environment in Chiapas, PPF did not prove successful). A lasting effect of the presence of PPF in Marqués de Comillas was how it had altered the existing political power-network (Harvey 2005; Flores González 2012).

In 1994 the government proposed the redrawing of municipal boundaries in Marqués de Comillas, due to its distance to the head in Ocosingo that resulted in the government having little control over the region. This caused some political turmoil between several organizations, both governmental organizations and peasant organization, that resulted in 1999 in the establishment of two new municipalities: Marqués de Comillas (with its council in Zamora Pica de Oro), and Benemérito de Las Américas (with its council in the village carrying the same name).[4] The establishment of these new municipalities enhanced the ability for the government to perform development projects and

[2] The number of wells differs in the literature, ranging from 11 (Flores González 2012) or 12 (Harvey 2005), to 20 (Vasquez et al. 1992).

[3] Through the last decades, this had already proven to be a difficult, if not impossible, type of governance in the region due to absence of state presence. This is exemplified by the intensification of the use of agrichemicals that were brought in from Guatemala in the 1990s, despite the use of such products being prohibited in Mexico (Carabias 2012).

[4] A few *ejido*s, among which the *ejido* Loma Bonita where my research was focused on, ended up not being included in the municipality of Marqués de Comillas but remained part of Ocosingo, despite their involvement in the process of establishing the municipality (Flores González 2012).

provide social services. In the year 2000 the Southern Border Highway was finalized, which connects Comitán de Domínguez with Palenque and passes through Marqués de Comillas. This road increases the accessibility to land for peasants in the villages, and the accessibility to the region itself for the rest of the country, which in turn increased land prices and also increased government support (Harvey 2005; Harvey 1998; Flores González 2012).

It was around this time that the government program PROCEDE (Program for the Certification of *Ejido* Land Rights and the Tiling of Urban Housing Plots) arrived in the region (Carabias et al. 2012). This program had already existed since 1994, but due to the hostility towards the government in Chiapas, this program had until this time not been able to advance in Marqués de Comillas (Snyder 1998; Stephen 1998). In the first decade of the new millennium the majority of *ejidos* entered the program and privatized their lands (Carabias et al. 2012). The increased deforestation in the map of 2005 in Figure 3 is seen in some literature in the light of the combination of increased accessibility through the construction of the highway (increased accessibility to the region Marqués de Comillas, but also for peasants to their parcels), and the privatization of *ejidos* and liberalisation of agricultural trade which enabled a more commercial use of the area (Carabias et al. 2009; Castillo-Santiago et al. 2007; De Jong et al. 2000a; Romero 2014).

Two other events of the 2000s that have had significant impact are the entrance of the biofuel (palm oil and rubber) sector and of the PES (Payment for Ecosystem Services) program. Regarding the biofuel sector, the price for palm oil rose greatly in the period of 2000 until 2011, which prompted actors to get involved in this business. From 2007 to 2012 the government invested in this practice, and promoted it as a 'green' type of land use. In this period the amount of oil pam hectares has increased from practically nothing to more than 10,000 hectares in the Southern Lacandon (Marqués de Comillas and Benemérito de Las Americás combined) (Castellanos-Navarrete & Jansen 2013; Castellanos-Navarrete & Jansen 2015). Due to different opinions on the effects and benefits of palm oil and rubber, this has led some peasants or *ejidos* to enthusiastically start practicing this type of land use, while others disapproved of it or even have banned it from their *ejido* (Castellanos-Navarrete 2015; Cano Castellanos 2014). The other program with substantial impact was PES, which aimed at developing a market for environmental traits (such as carbon storage) that until then had not been commoditized and therefore had no economic or monetary value (McAfee & Shapiro 2010; Kosoy et al. 2008). This program was started in 2008, and is linked to other goals, such as the development of ecotourism and the preservation of biodiversity. This more environmentally focused program reflected the grave prospects regarding land cover and land use change by academics and environmental organizations, such as the 2015 map in Figure 3. The PES program does divert a bit from the neoliberal course, as state-based public organizations buy the ecosystem services according to mandatory quota, meaning these services are not (or at least not entirely) part of the free market (Kosoy et al. 2008; Carabias et al. 2012).

1.3 Problem Statement

The above overview of the literature provides useful and relevant information regarding the landscape dynamics in Marqués de Comillas as agro-forest frontier area. It discusses much of the (governmental) organisations that have affected land use change in the region, as well as the economic, social, and political processes that have steered the land use changes.

In the previous section it can be noted that there is a high focus on organisations and their programs and objectives as driver for changes in land use change practices in Marqués de Comillas. Besides these organisations much of the literature analyses the economic, social, and political processes to explain the land use changes in the region. These processes vary on scale from transnational (e.g. the signing of the NAFTA treaty), to national (e.g. the constitutional reforms), to regional (e.g. colonization of the southern Lacandon rainforest). These two factors in the literature (macro-processes and organizations) are not distinct features but rather overlap each other. It is, however, not the identification of these factors or the way they are distinct from each other in the literature that is interesting. Rather, they are interesting because of the underlying problem, or shortcoming, in the contemporary land use change analysis that they point to. In attempting to understand landscape dynamics, much of the literature seeks cause-and-effect relations to explain why certain land use changes happened. These cause-and-effect relations are then found in the two factors, macro-processes and organizations, by assuming a unilateral relationship in which these factors precede and influence the actions of peasants. The result of such analyses is that there is very little focus on the perspective of the individual peasants and on the micro-processes of land use change. Currently the (changing) land use practices are thus analysed as deterministic phenomena that, when the two mentioned factors are studied, can be understood. In search of such a deterministic relationship the land use practices are a priori framed. Consequently, the practices are not studied in their entirety, leading to an incomplete understanding of the landscape dynamics and to potentially missed or misunderstood drivers for land use change. Placing the land use practices as central subject of study, rather than the two factors which renders the practices as mere causal effects, enables the study of the logics behind the practices and can show how the choice for certain practices can be much more contingent than one would expect based on the literature.

Through a focus on macro-processes such as 'neoliberalization' (e.g. McAfee & Shapiro 2010; Klepeis & Vance 2003; Castellanos-Navarrete 2015; Christman et al. 2015; Harvey 1990; Castellanos-Navarrete & Jansen 2013) and on general trends in land use changes on a large scale (see Figure 3), cause-and-effect relations are drawn that recognize such processes as drivers for the land use change phenomena. However valuable the information of this literature, it fails to answer certain question regarding land use change. To put it plainly, questions regarding why peasants do what they do, why they choose to participate in certain programs, and how the macro-processes actually affect an individual peasant, remain largely unanswered or even completely outside the analysis. An example is the study of Kosoy et al. (2008) on PES participation in the Lacandon rainforest. They attempt to deterministically explain and predict PES participation by identifying key factors (such as economic benefits and whether or not the program fits the social structure of the community) that determines whether and why an *ejido* participates in the PES program or not. In such an analysis the *ejido* is understood as a decision-making unit whose decisions can be explained through cause-and-effect relations with these key factors, rendering individual logic irrelevant. They acknowledge this as a shortcoming, but this lack of analysis regarding individual logic of peasants regarding their practices comes back in several articles. Another example is the study by Castellanos-Navarrete & Jansen (2013: 16) on the practice of biofuel plantations, in which they state that "nobody pressured peasants to plant oil palm; they themselves planted and demanded inputs, they themselves founded their organisations, and they actively constructed their own pro-oil palm discourses." Both these articles mention the need for research on the micro-processes and on the reasons of individual peasants regarding land use practices.

In the scientific maps covering land use and land cover change in Marqués de Comillas the micro-processes can also not be analysed or witnessed. The maps tend to be small-scale[5] in order to cover the entire region, so that the maps can be linked to changing political or environmental discourses or to economic processes. Such maps are useful as they can visualize the relevance of deforestation in the region, because land use percentages and land conversion rates can be calculated. However, the downside of such maps is that they do not show the specific land use changes on a local level in an *ejido*. The maps have a limited categorization to point out large processes and trends, and cannot provide us with much information on the actual landscape dynamics, leading to such maps having a low usefulness for understanding and explaining the local mosaic of land uses that characterize agro-forest frontier areas. Furthermore, as such maps are created by academics through converting satellite images and/or aerial photographs, the local knowledge behind such maps is limited. The classifications used may not correspond with the perception of land use and land cover by local peasants, resulting in the micro-processes of land use change and the reasons for this change being outside the scope of such small-scale maps. The maps are thus mainly used as a tool to support or visualize the deterministic nature of landscape dynamics and of land use practices that is assumed in the literature. To add to our knowledge on landscape dynamics, local maps and narratives that focus on specific changes in the landscape and that include the knowledge of the peasants living and working in that region can provide us with information on how general land use change trends play out in a specific locale. Local maps on land use change can both provide information on the perception of these trends by the local peasants, and on the reasons and logic of the peasants behind their practices. In doing so, local land use maps enable an analysis of the landscape dynamics that take into account the specifics of land use change in a certain locale.

The macro-processes analysed in the literature as explained above can provide us with a description of the socio-political context in which communities are located. However, the problem is that the macro-processes are projected onto the micro-level practices and phenomena as causal explanation, but in reality this relation might not exist or be as strong or unidirectional as assumed. Macro-processes as cause to local changes are supported by several local examples, but this does not mean that macro-processes can be superimposed on all localities. Due to the high number of potential examples to construct the relation between macro-processes and local phenomena, researchers are forced to select a manageable number of specific cases to support this relation and to underline its relevance. The problem with explaining landscape dynamics through macro-processes is that in the selection of these examples, “either the representativeness or the importance of the issue is claimed to be used as the criteria.” (Sertel 1982 : 136). It is important to notice however, that the relationship between the macro-processes and the micro-processes cannot be presumed as being equal for all localities, or even for all peasants in a specific locale (Martin 2000; Mayntz 2004). Therefore, studying the land use changes in a specific locale without a priori prejudging the importance of political or economic processes can nuance the relationship between the macro-processes and the local changes in practice, and thus help to explain differences in land use change trajectories between locales (Jollivet 1982; Bourdieu 1990a). Also, as different research methods describe different aspects of the same studied object, a local ethnographic study can shed light on how the macro-processes play out

[5] Note that a small-scale map means that the map covers a large region. A map that represents a larger area results in the scale ratio of the map being smaller since this ratio represents a fraction. The gradation of maps covering small to large regions thus represents an inverted gradation of large to small scale ratio of maps.

in the field, and on what other processes are relevant to landscape dynamics (Sertel 1982; Jollivet 1982). Such an ethnographic study that focuses on the particularity of a specific locale enables one to analyse the social logics driving certain practices in situ, preventing one to force a coherence on these practices in search of deterministic cause-and-effect relations, but rather acknowledge and the contingencies the practices are a result of (Bourdieu 1990a).

The shortcoming in the current body of knowledge on landscape dynamics in Marqués de Comillas is thus the overemphasis on macro-processes and organizations. I call it a shortcoming not because the information of this literature is irrelevant to understanding the landscape dynamics, but rather because a vital aspect of landscape dynamics is largely overlooked now. This aspect is the local, empirically located side of landscape dynamics. Due to the virtual absence of an individual peasant's reasons and logic regarding his or her land use practices, and the limited attention that is given to the micro-processes affecting the landscape dynamics in the literature, there is little knowledge on how and why the land use changes are what they are in a specific locale. This is also the reason I regard it as a singular shortcoming, and not two shortcomings of the literature. The (over)emphasis on the two mentioned factors prevents an analysis that does not a priori frame the landscape dynamics, and consequently such research does not embrace the totality of factors that may influence land use change practices in a certain locale. Through performing an ethnographic study focussing on the land use practices of individual peasants, it can be shown how the landscape dynamics are often more contingent on a multitude of factors and on the specific logic of a peasant, instead of the dynamics being mere deterministic results of cause-and-effect macro-processes. This is in line with McCarthy & Prudham (2004), as they argue that there is a need for local research that take into account the particularity of a specific context, in order to understand how macro-processes work out 'on the ground'.

Following the larger academic debate on land use change covered in the introduction and on the analysis of the literature on land use change in Marqués de Comillas, this thesis aims to contribute to the knowledge on landscape dynamics in agro-forest frontier areas through studying the logic of peasants regarding their land use practices. By adding this knowledge to the contemporary knowledge on land use change in agro-forest frontier areas, this will result in a more comprehensive understanding of the socio-environmental processes underlying landscape dynamics (Schmidt & McDermott 2015; Medras 1982).

2 Theory and methodology

This chapter covers the conceptual framework (Section 2.1) which deals mainly the concepts 'practice' and 'logic'. In Section 2.2 the research questions of this thesis are briefly explained, followed by Section 2.3 which discusses what methods are used to operationalize these research questions together with a description of the study site.

2.1 Conceptual framework

In order to analyse specific changes in land use practices, and to study how the logic of peasants for adopting certain practices is contingent on a multitude of factors, studies should not be too restricting in their framing of this change. Ethnography prevents the a priori framing of the research subject, thus enabling a view on land use practices that can take into account the micro-processes and individual logic of peasants, allowing for a better understanding of the (history of) landscape dynamics (Lillis 2008; Nyerges 1996). Therefore, this thesis follows the quite open definition of practice provided by Arts et al. (2014: 6), where they define practice as:

> *An ensemble of doings, sayings and things in a specific field of activity. The 'doings' refer to social and society-nature interactions, the tacit knowledge and skills that people employ, and the scripts that they follow; 'sayings' refer to people, their discursive interactions, as well as the explicit rules, norms, and knowledge that they utter; and 'things' refer to materials and artefacts, like rocks and technologies, as well as nature more in general. These elements together are constituted in a 'specific field of activity'.*

As argued in the previous chapter, currently much of the literature seeks to explain land use change through cause-and-effect relations, and in that pursuit it conceptualizes the practices of peasants as deterministic effect of specific factors (Wortham 2012). Subject of study is then a specific aspect of the context in which these practices are performed, such as the presence of governmental programs. Consequently, these studies do not incorporate or acknowledge the full scale of factors that influence land use practices, nor the role of agency of individual peasants. As Bourdieu (1990: 86) stated, "practice has a logic which is not that of the logician". This means that if land use change is studied independently from the logic of local peasants, then researchers are inclined to ascribe a logic to perceived phenomena that might not reflect the local reality or the logics of individual peasants.

Ethnography, with its aim to take a local reality as vantage point of study, enables one to study the logic of peasants and avoids the making of "presuppositions about what may or may not be significant to participants in specific sociohistorical contexts at specific moments in time" (Lillis 2008: 372). This does not mean ethnography does not have its limitations. There exist substantial debate about the tendency of ethnographers to base their arguments and data on a 'naïve realism' (Hammersley 2002). Ethnographic research often results in vivid descriptions of certain phenomena based on local knowledge, and in a glorification of this local reality. Explaining phenomena solely based on such research may result in the interpretations of the researcher resting "on thick description but thin ice" (Guyer & Lambin 1993). To overcome this limitation, Guyer & Lambin (1993) combine ethnographic research data with data from quantitative methods such as remote sensing in their study on land use in Nigeria.

To visualize land use change and to support land use change analyses, categorized maps based on satellite images and aerial photographs are often used in the literature (e.g. Carabias et al 2012; Castillo 2009; De Jong et al. 2000a; Flores González 2012; Vaca et al. 2012; Valle-García 2016). The majority of these maps are small-scale and include a limited categorization of types of land use and land cover. Choices such as map-scale and level of categorization are made to increase the map readability and the (environmental) relevance of the map, but it also simplifies the world that is represented in the map. The simplification of reality is an inherent process in the creation of maps and cannot, nor should be, avoided. In order for maps to be useful they need to reduce the complexity of the world (Keates 2014). However, it is important to realize that the choices that are made when reducing this complexity are conscious choices made to ensure that the map conveys a certain message or supports a certain argument (Harley 1989). Therefore, rather than maps being objective representations of reality they should be understood as rhetoric devices that are constructed to produce and reproduce certain kinds of knowledge (Kitchin et al. 2011).

The local knowledge concerning their land use practices and the specific changes in land use are absent in the scientific maps such as the ones in Figure 3. To visualize the local reality of landscape dynamics and of land use practices, and to include the local knowledge behind these practices, this thesis makes use of participatory mapping. Such mapping provides an alternative way of documenting and representing a landscape, and of giving meaning to phenomena that can be perceived in the map (Sletto 2012). Furthermore, participatory mapping enables one to move from a conceptualisation of a map as a mere object, to a map as a process (Caquard 2014). When one looks at maps as a process, the narrative power of maps can be better understood and acknowledged. First of all, as argued earlier, there is a power embedded in maps (through processes of omission and simplification) that makes a map stimulate and support a certain narrative (Harley 1989; Caquard & Cartwright 2014). An alternative way of mapping land use change can thus result in the visualization and representation of an alternative narrative to the same phenomena. Second, there is also a narrative dimension to the process of creating the map. Since a participatory map on land use change is constructed through local knowledge and by local peasants, the map cannot be understood separated from the stories and narratives of these peasants when they created it (Caquard & Cartwright 2014). Therefore, the landscape dynamics visualized in the local maps of this thesis and the stories of peasants regarding their practices, are part of the same process of understanding and analysing the specific trajectory of land use change in a certain locale. As the maps are based on the knowledge and stories of the concerned peasants, such ‘story maps’ (Caquard & Cartwright 2014) visualize the land use practices as ongoing processes of being shaped and reshaped (Scott 1985; Bourdieu 1990b). Through that, story maps can show how land use practices are the contingent and temporal result of certain logics deployed by peasants, rather than being a deterministic outcome of cause-and-effect relations. The participatory mapping of local land use change can thus visualize the specific changes in practices, and support the ethnographic endeavour to analyse the local reality of landscape dynamics and the logic of peasants behind their practices.

Studying the logic of peasants regarding their land use practices places the emphasis on the *process* of practice rather than on the *ends* of practices (Lau 2004). This difference implies that practices are not the deterministic result of certain processes aimed at specific end-goals, but are rather a continuous process of being shaped and reshaped (Scott 1985; Lau 2004; Bourdieu 199b). In approaching practices from this conceptual point of view, the logic of peasants regarding their

practices and the contingency of this logic can be acknowledged. I do not argue that there is no level of rational consideration when a peasant chooses a path of action. Indeed I agree with van der Ploeg & Bolhuis (1985) that practices of peasants are the result of rational and deliberate choices of peasants based on the ends they pursuit and the means available to them at a certain moment in time. Generally, the main causes that peasants pursuit are towards achieving economic growth, and retaining a level of autonomy from the state (van der Ploeg 2009; Lau 2004). However, the means available to a peasant to pursuit these end-goals change over time, and these end-goals are also not fixed goals towards which peasants structurally direct their action. Using the concept of peasant logic still acknowledges the pursuit of peasants towards abstract or ideal end-goals, but it does not regard the actions of peasants as result of a certain structural determinism (Bourdieu 1990b; Scott 1985). This may seem to contradict with van der Ploeg & Bolhuis (1985) who describe practices as the result of conscious and rational choices of peasants based on a present structure, and who conceptualize the incoherencies in practices between peasants as systematically structured styles. However, I would argue it is rather a difference in the scope of analysis with regard to time and scale. A peasant makes the choice to perform a certain practice at some point in time, and at that time this has likely been a choice based on the specific means available to that peasant to reach the specific ends that individual was pursuing at that time.

It thus seems obvious to state that there exists a rationality in the behaviour of peasants. Where I disagree with van der Ploeg & Bolhuis is in the fact they conceptualize practices as the deliberate and causal result of a present structure. Arts et al. (2014) identify three schools of thought according to which social action is often understood, and the conceptualization of van der Ploeg & Bolhuis fits somewhat in two of these schools of thought. The three schools of thought they mention are 1) the model of rationalism, in which peasants are ascribed the identity of the *Homo economicus*, 2) the model of institutionalism, in which peasants are ascribed the identity of the *Homo sociologicus*, and 3) the model of practice, where peasants are understood as *Homo practicus*. The first two explain practices mainly according to the (economical) rational choice of humans and the 'rules of the game' of the social structure. Following the focus of van der Ploeg & Bolhuis on ends and means to explain practices, one can argue that as context changes over time the ends and means are never fixed, resulting in the logic of peasants being continuously adjusted to the changing context (Scott 1985). Therefore I would argue to analyse practices more in line with the third model. According to this model the choices of peasants to perform certain practices is guided by structure (or 'scripts and principles' as Arts et al. 2014 phrase it), but agency still plays a considerate role as peasants can improvise, and (re)interpret and (re)shape the given structure which leads to practices being situational and therefore contingent. To link back to the fact that I agree with van der Ploeg & Bolhuis that practices are the result of deliberate and rational choices, this then does not mean practices are the result of deterministic patterns of action but rather means that peasants have agency and that their action is not random (Arts et al. 2014; Castellanos-Navarrete 2015). Moreover, when the focus of analysis is based on a predefined framework that regards practices as the result of deterministic cause-end-effect mechanisms, one runs the risk of forcing a coherence upon practices to align them with the predefined rationality of the chosen framework (Bourdieu 1990a).

Bourdieu argues that the strategies of peasants to improve their livelihood are based on a sort of 'feel for the game'. However, due to the semantics attached to the term 'strategy' I will stray from using this term, because the risk in using it is that it 'inclines one to a naively finalist conception of

practice‘ (Bourdieu 1990b: 90). Despite terms such as ‘rationale’, ‘logic’, and ‘rationality’ describing quite similar processes of thought, and despite them being used interchangeably at times in and between some academic literature (e.g. Quintana et al. 1998; Barry et al. 2008; Behagel & Arts 2014; Landini 2011), this thesis analyses the land use practices through the term ‘logic’. The term ‘rationality’ tempts one to think in a dichotomous way of thoughts and action being reasonable or sensible or not. Furthermore, the ’rationality’ of thoughts and practices will be, as argued before, dependent on the specific context in light of which these are analysed. Thus, following Foucault (Foucault 1991: 79 in Lemke 2002: 55), this will risk in “applying the term empirically in a completely arbitrary way”. The terms ‘rationale’ and ‘logic’ do not differ significantly in meaning, but due to the connotation of ‘rationale’ with the same dichotomous way of thinking linked to ‘rationality’ the term ‘logic’ is preferred over ‘rationale’. ‘Logic’ is also used because this thesis analyses the local land use stories of peasants, and in doing so adds to literature that uses concepts such as ‘peasant logic’ and ‘logic of practice’[6] (van der Ploeg & Bolhuis 1985; Bourdieu 1990a). Moreover, the term is also used in this thesis to maintain a cohesion within the thesis and between this thesis and other articles using this concept to analyse rural phenomena and peasantry processes (e.g. Sardan 1988; Bryceson 2000; McAffee et al. 2010).

Analysing land use change through the concept of logic, enables the analysis to take into consideration the entirety of the peasant logics regarding their land use practices. Rather than focussing on the *ends* of practice (and therefore on seeking the causal relations between this end-goal and the practice), this thesis analyses practice as a *process* of peasants (Scott 1985). Following Scott (1985), the relationship between thought and action is not clear-cut and unidirectional; one does not precede the other or as Scott states it, neither are ‘unmoved movers’. Whereas Scott relates this to issues of resistance and domination, I would argue it is true also for practices regarding land use change. Following the definition of practice provided by Arts et al. (2014) that this thesis uses, practice extends beyond mere physical or bodily movement or enactment. The practices of peasants might manifest themselves through the performance of certain actions, which can be observed and to which one can ascribe a specific place and time, but I would argue that it restricts our ability to study land use change in such a way. Practices do not have a specific begin and end, because practices also include aspects such as rules, norms, and knowledge. A change of one practice to another might thus seem to have a specific begin and end, but it is rather part of an ongoing process; it is in studying this process, and in understanding practices in terms of a process, that we can analyze the logics of peasants regarding their practices.

This way, the (historical) landscape dynamics in a specific locale can be better understood, and the logic of peasants to choose certain land use practices can be analysed without being bounded in a predefined frame. Practices themselves and the logics of them are then the central subject of study, rather than the processes and programs surrounding these practices. This does not mean macro-processes are deemed irrelevant or that these are completely outside the scope of analysis of this thesis. As argued, macro-processes set the stage for the micro-processes and influence the logic of individual peasants. However, the link between macro-processes and local practices can be

[6] And all of varieties or applications of the terms “peasant” and “practice”, such as “farmer”, “cattle ranching”, and “deforestation” (Hecht 1993; Fairhead & Leach 1997; Latawiec et al. 2015; van der Ploeg et al. 2009).

understood in two ways (Drazin & Van de Ven 1985). The first way resembles the approach in the current literature discussed in the previous chapter; namely the uniform superimposition of these processes on the practices in all locales, without taking into consideration local contextual differences and individual agency. The second way is a more situational approach that takes into account contextual differences between locales, and also how context in one locale is ever-changing. This second approach allows for an analysis of practices that acknowledges how practices are contingent. Rather than attempting to uncover how macro-processes and (historical) factors have determined social practices, it aims to understand how the specific local land use changes are an amalgamation of situated individual agency in a specific social field (Frangie 2009; Arts et al. 2014). This relates to the The Bourdieusian concept of *habitus*, as this concept acknowledges the importance of both structure and agency. It argues that practices are the result of both an objective (social) world that frames and constrains an individual's choices and possibilities, and of an individual's subjective logic when discovering the multiple possibilities for action (Fuchs 2003; Frangie 2009). Such a conceptualization of practice is useful for studying land use change phenomena, because it is "sufficiently psychological to avoid physical determinism, [and] sufficiently nonpsychological to be embodied" (Schatzki et al. 2001: 17). However, using the concept of *habitus* would imply the (re)studying of structure itself in combination with agency to explain social change. This thesis focuses primarily on the role of the agency of individual peasants within the structures that have been outlined in the literature discussed in the Chapter 1, in order to stress the role of agency and to show how landscape dynamics are contingent rather than deterministic. Therefore the concept of habitus is not used as central concept in this thesis, but the idea of understanding social change and social practices as being the result of an interplay between structure and agency is. Linked to the quote of Schatzki et al. (2001) above, and in line with the argument made by Arts et al. (2014), such a conceptualization of practice thus enables an understanding of practice being situational phenomena; practices are embodied within a specific structure, and since this structure is not rigid and stable and since the concept of agency infers the subjectivity (or creativity) of individual logic, practices are contingent rather than deterministic.

2.2 Research questions

To achieve the object of this thesis through using the concept of logic as discussed in the previous section, this thesis will answer the following research questions:

1. What are the logics of peasants in choosing certain land use practices?
2. How do these logics add to our current understanding of land use change in Marqués de Comillas?

To answer the first question the reasons of peasants for certain practices are analysed to understand why land use changes have followed a certain trajectory. Furthermore, recurrent types of logics are identified to find what the key issues are for peasants in choosing certain practices. In answering the second question this thesis shows that socio-environmental phenomena such as land use change is a contingent phenomenon that can only be understood by taking into account the role of agency through the study of individual logic. The next section elaborates on the methods used to operationalize the research questions and describes the study site where the research has taken place.

2.3 Methods and study site

This research is based on an approximately two month ethnographic research in the *ejido* Loma Bonita in the months May and June of 2016. The methods used to collect data were participant observation, open-ended and semi-structured interviews, and participant mapping. When semi-structured interviews were used, these were based on the information achieved from open-ended interviews. The primary tool of documentation was through the use of a notebook. Regarding participant mapping, with permission of the commissioner a copy of the map of the region belonging to Loma Bonita was created. For practical reasons, participant mapping was not conducted directly on this map. Since the map was on an A4 sized paper, peasants had to draw meticulously where their *milpa*[7], forest, or pasture was located in their parcel. Therefore, the shape of their parcel was drawn in a field note book, where a single parcel could be drawn as big as an A4. The peasants could then more easily, and more precisely, map their parcel(s), after which I re-drew this map into the corresponding parcel in a digital version of the *ejido* map. The role of cartography for this research has mainly been practical; it enabled the visualization of the mosaic of land uses, and the identification of the main land use types (and the striking lack of certain land use types). Furthermore, participant mapping as method enabled peasants to share their knowledge regarding the (historical) landscape dynamics, and to explain how and why these have occurred in a specific way.

Loma Bonita is an *ejido* that belongs to the municipality of Ocosingo (See Figure 1 in the previous chapter for its geographical location). However, due to its geographical proximity to the municipality Marqués de Comillas, and due to the socio-environmental history of Loma Bonita resembling that of the *ejidos* in Marqués de Comillas, an ethnographic study in Loma Bonita can provide useful information regarding the landscape dynamics in Marqués de Comillas. According to information Zermeño-Hernández et al. (2016), who used data from INEGI which is dated to 2010, the area belonging to Loma Bonita is 1731 ha big, and the *ejido* counts 164 inhabitants. This last number is either outdated or wrong due to unregistered inhabitants, because according to the inhabitants themselves the *ejido* counts approximately 300 people, who belong to around 25 families. Loma Bonita is located between the Montes Azules Biosphere Reserve in the north, from which it is separated by the Lacantun river, and the Guatemalan border in the south. The land belonging to Loma Bonita stretches to the Chajulio river in the east; this river functions as border between Loma Bonita and the *ejido* Boca de Chajul. West of Loma Bonita is the ranch Puerto Rico located, this border does not follow a certain river or geographical landmark. A bit further to the west, on the other side of Puerto Rico, is the *ejido* Trece de Septiembre. For a full image of the *ejido* area see Figure 4, which is a copy of a satellite image from Google Maps. Written in yellow are the neighbouring communities. The red line indicates the border between the territory of Loma Bonita and that of Puerto Rico and Boca de Chajul, these are drawn based on the map obtained from the commissioner of Loma Bonita, and interpreted by me on this satellite image from Google Maps.

[7] A milpa refers to the "system of shifting cultivation, in which forest is cleared to grow maize and beans in a labor-intensive, rain-fed system. In recent decades, the traditional milpa system has been intensified in most areas due to increased pressure on land, shifts from subsistence to commercial production and widespread application of fertilizers" (Castillo-Santiago et al. 2007: 1216).

Figure 4. Geographic map of Loma Bonita. Written in yellow are the neighbouring communities.

To visualize the local reality of landscape dynamics and of land use practices, and to visualize the micro-processes that are invisible in the small-scale maps such as the ones in Figure 3, this thesis has made use of participatory mapping. The maps are constructed based on local knowledge rather than satellite images or aerial photographs. However, this does not reduce the academic value of this study, because this study adds to the research that has already been performed on land use change and which generally lack local knowledge (as argued in the previous chapter). Moreover, this study does not neglect the (quantitative) information, the macro-processes and the larger context in which this study case is located. Rather, it uses that information as backdrop for this study. Regardless of the fact that this study emphasises the value of local knowledge and individual logic, an understanding of macro-processes is needed for a researcher to be able to make sense out of micro-processes (Wortham 2012). Since currently the opposite is the case for land use change analyses in Marqués de Comillas (studies limit themselves mainly to macro-processes resulting in a determinism that does not take into account the logic underlying land use practices), this study adds to the knowledge on landscape dynamics using an ethnographic approach with participatory mapping methods to study the logic of peasants and the contingency of land use change.

3 The logics of peasants regarding their land use practices

Based on the conducted field research and on the literature on land use change in Marqués de Comillas, I have recognized several practices that are central to understanding the landscape dynamics and the landscape history of Loma Bonita. To understand these practices, the concept of logic is used to analyse why peasants have chosen or not chosen to perform certain practices. Meta-processes such as (inter)national migration and climate change and organisations that promote certain practices, have framed the playing field for landscape dynamics. However, it depends on the collective or individual choices peasants made that steered and continue to steer the landscape dynamics in a certain direction.

First of all, the practice of colonization or settlement is in the literature one of the main factors that has shaped the land use change in the region. Analysing the specific colonization history of the *ejido* Loma Bonita can add to the story of colonization in the literature, because rather than looking at this colonization as macro-process, it is analysed as a practice of individual peasants who have their own logic behind their choices for settlement. Secondly, the actual land use practices are identified and analysed. These practices are identified based on their relevance and presence in the literature (such as biofuel plantations which are not present in Loma Bonita) and on their relevance and presence in the field (such as cattle ranching and the cultivation of *milpa*).

3.1 The practice of colonization in Loma Bonita

The first person to arrive in the region now known as Loma Bonita was Rafael[8], he arrived in 1966 and is still living in the *ejido* to this day. At that time CILA (International Boundary and Water Commission between Mexico and Guatemala) was researching the possibilities of constructing hydrology dams in the region, and therefore alongside several rivers there were hydrology stations constructed where one or two families lived. During this time there was no need to cultivate the land, because CILA would provide the employees with food and other goods. CILA maintained five hydrology stations in the region, and aside from the people working in these stations there were very few people living in Marqués de Comillas. Rafael recalls that besides the people from the hydrology stations, the only settlements were a small indigenous village of Ch'ols somewhere in Benemérito de Las Americás which consisted of about 300 people; Palenque, which was a Mayan colony; and three big ranches and therefore labour workers scattered around the land. The owners of these ranches were only interested in the Mahogany and Cedar trees, which had been commercially logged since the early 20th century. Zamora Pica de Oro was at that time nothing but a storage place for the wood, from where it could be shipped out of the region by river. When I ask Rafael what the landscape looked like in that time, I can see a look of nostalgia on his face as he explains to me how big and dense the forest was, assisted by big arm gestures illustrating how the branches of the trees from opposite sides of the river would touch and form a roof over the river. The river he refers to is the Chajulio river, where the hydrology station where he used to work was located.

In the 1960s the Guatemalan civil war started, leading to many Guatemalan peasants retreating in the forest and fleeing to Mexican soil. Guatemalan soldiers would follow the refugees into Mexico.

[8] For privacy reasons the names are fictitious.

To prevent the Mexican-Guatemalan frontier zone from being an open, unclaimed terrain, the Mexican government started the colonization process of the Lacandon rainforest to protect its national territory in 1975. Before that, the only people who moved to the Lacandon rainforest were related to the employees working in the hydrology stations. Rafael tells me that around that time, CILA ended the program due to several groups protesting against the dams, such as indigenous communities (Mayas and Ch'ols), biologists and the Guatemalan government. Because the program ended, they received no longer payment from the government, nor did they receive food or other equipment anymore. Due to this end of the program, he build a ranch alongside the Chajulio river and started to cultivate the land to grow crops. From the moment the government decided to promote the colonization, everyone could hear about the possibility to move to this vast area of rainforest available to cultivate. One person reminisced how his father was sitting at home when he heard a broadcasting on the radio about the availability of free land in the south of Mexico. They lived at that time in Guerrero, where there was no land available anymore. His father travelled to the region to see what it looked like, where he met with the (former) employees of the hydrology stations and witnessed all the free available land and water. Immediately after that visit he went back to take his wife and kids with him to live in the region. He recalls that at that time, there were very few people living in the region; about three families in Loma Bonita, and three families in Boca de Chajul. They would arrive in Ixcan by plane, since that was the nearest airstrip. From there on they would either walk alongside the river or go by boat to where they lived, since there were no roads constructed yet. The amount of deforestation in this time was low, because there was only a small amount of people living there, and most did not have any equipment such as chainsaws. At this time the terrain was not parcelled out, rather, the region was considered 'tierra libre' (free land). Commercial logging did not take place, because the valuable trees, mahogany and cedar, had all been cut already. The people would only clear forest to cultivate new *milpa*s for their own consumption each year.

In 1975/1976 Rafael went to the government with a couple of other people who lived there at the time to formally establish an *ejido*. In that way the area would be divided in parcels and no other people could claim it. As more people had entered the region, slowly the village 'Loma Bonita' came into existence. Until this time, the few people living there lived by themselves on their own ranch. When the population increased, people from the same province or family went to live close together. In this period there were small groups of houses scattered around the region, but no central village. The first time people started to create a village, they did so on a hill, hence the name 'Loma Bonita' (beautiful hill), near the corner between the Lacantun river and the Chajulio river. However, because the land was uneven, it was difficult to construct roads there, and therefore the village did not grow large. In search of a location with even land and a good water source, they moved to what is now known as the ranch Puerto Rico. The river there had its source quite far into Guatemala, and thus many people used the water. Due to this, the water became contaminated and they could not drink it anymore. In the meantime, other people who had entered the region had settled down in the current location of the *ejido*, because all the land near the Chajulio river had already been inhabited (people still lived in their ranches there as well), and because there were two good water sources there. Slowly this *ejido* became the centre, especially when a church and a kindergarten school were constructed. The name they initially gave to this *ejido* village was 'Paraiso', but because people from other *ejidos* had gotten used to the name Loma Bonita for that region, the name Paraiso never stuck.

In the early 1980s the civil war in Guatemala reached a new high, with many Guatemalan peasants fleeing to Mexico where they lived in refugee camps near the *ejidos*. In Boca de Chajul there were for example about 8000 Guatemalans living, in Puerto Rico 6000, and in Loma Bonita 1500. This meant a drastic increase in population, and despite the fact that the majority of the Guatemalans only stayed for one or two years (with some staying up to six years, especially in Boca de Chajul), therefore also an increase in environmental pressure. The Guatemalans were skilled peasants with knowledge of the region, and could therefore easily clear plots of forest to grow crops. There was no animosity against the Guatemalans from Mexican side. The people tell me that the refugees just needed to survive, and therefore they let them live on their terrain and let them grow crops. Whereas before people would cut one or two hectares a year by axe, or a bit more if they had chainsaws, the amount of forest being cut in this period in Boca de Chajul for example reached 20 ha of forest being cut a day at some time. Due to this rapid transformation of forest to pasture the Mexicans could more easily turn to cattle ranching, which provides a source of income in contrast to the production of crops such as corn and beans. When the Zapatistas started to organize in the early 1990s in Chiapas, the government created several programs which gave out subsidies to peasants. Purpose of these subsidies was to calm the tempers of the peasants, and thereby to prevent more peasants from joining forces with the Zapatistas. These subsidies were the first steady sources of income for the peasants, and further enhanced their possibility of engaging in more profitable practices such as cattle ranching.

Despite the fact that Loma Bonita had not entered PROCEDE yet, the land had been parcelled out between *ejidatarios* and there was already a sense of privatization. People already bought and accumulated land and held ownership titles recognized by the other *ejido* members, albeit informal and without official documents. This informal property rights system provoked some tensions between families, and caused several conflicts throughout the history of Loma Bonita. The commissioner of Boca de Chajul, who was one of the first to enter the region, tells that the population in Boca de Chajul is more than twice that of Loma Bonita because people preferred to live in Boca de Chajul in the past due to these tensions in Loma Bonita. Despite such property tensions not being present in Loma Bonita anymore, Boca de Chajul is still considered of having more favourable conditions than Loma Bonita institutionally and politically speaking. Despite Boca de Chajul and Loma Bonita being established around the same time, with quite similar histories, and positioned geographically close to each other, since the formal establishment of Marqués de Comillas from a political point of view they have become more distant from each other. Marqués de Comillas has been established in 1999, with Zamora Pica de Oro as home of the municipal government. Loma Bonita, however, did not get incorporated in this municipality but remained part of the municipality of Ocosingo. The interaction and communication with the government is for Boca de Chajul therefore easier than for Loma Bonita, since Zamora Pica de Oro is located much closer. Despite the construction of the road from Comitán de Domínguez to Palenque in 2000 (which connects the *ejidos* in this region with each other and with the larger cities), traveling to the government in Ocosingo still takes a lot longer for the people in Loma Bonita than traveling to the government in Zamora Pica de Oro for the people in Boca de Chajul. This has its consequences in the availability and amount of governmental support and presence of government programs in the *ejido*.

Around 2005 Loma Bonita entered PROCEDE to formally privatize the land. Reason for this was to obtain legal documents, which would make it easier to enter certain government programs.

Regarding *ejido* politics not much changed, as the land was already considered as private property by the *ejidatarios*. People decided to enter PROCEDE because the programme was in its final years according to some peasants, and therefore there was a sense of 'now or never' to obtain formal ownership certificates. There are differences between *ejidos* whether to enter PROCEDE or not, and to what extend an *ejido* decides to privatize the land. In Loma Bonita, as good as all the land has been privatized, with the exception of small strips of land at the side of the road and river. This privatization process did not go without conflict, as Loma Bonita was characterized by the aforementioned tensions regarding property rights. Even after entering PROCEDE, informal deals between families and individuals were frequently made, causing the property rights system in the *ejido* to be quite opaque. However, according to the residents in Loma Bonita, these conflicts and tensions have largely ended over the course of the last years, in large part due to the departure of several families and individuals.

The construction of the road and the privatization of the land has made it easier for the government to start programs in the region and for peasants to enter such programs. Through the increased accessibility the region has also become more susceptible to macro-processes such as market forces. The following section discusses the logic of peasants regarding the specific land use practices. It will be shown that when a practice is analysed in itself, the logic of peasants regarding that practice extends beyond the mere influence of organisations and macro-processes.

3.2 The logic of peasants regarding their land use practices

The first section will analyse the logics behind the practice of cattle ranching since that is the predominant practice in Loma Bonita and regarded as one of the main causes of deforestation in the literature. The second section focuses on the cultivation of biofuels such as palm oil and rubber, which receives considerate attention in the academic literature but is remarkably absent in the land belonging to Loma Bonita. The third section focuses on the practice of cultivating *milpa* and the logic of peasants regarding their choice for crops, and management of their crops. The final section focuses on the practices and logic of peasants that result in the conservation and maintenance of forested areas.

3.2.1 The practice of cattle ranching

The rapid deforestation of forest in Marqués de Comillas that has been discussed in the literature can be witnessed on a local level in the maps in Annex I (specifically the series of maps in the Figures 10, 11, and 12), where between the years 1990 and 2000 the large-scale conversion of forest into pasture led to most of the forest being cut down by the year 2005. This rapid transformation is a result of the actions of the Mexican peasants after the Guatemalan refugees entered the region. The hospitality of the Mexicans towards the Guatemalans and the freedom they gave the Guatemalans to cut forest and grow their crops was not an act of pure altruism, but rather part of the window of opportunity they saw arising to enter the economic system more quickly. The Guatemalan refugees were allowed to cut forest and grow their crops, but were only allowed to grow their crops in that part for one year. The next year the Mexicans would turn the field into pasture, and the Guatemalans would have to cut a new part to grow their crops. The Mexicans did this because at the time the entire region was almost purely rainforest, and without large equipment it was very labour intensive to cut the forest. Despite this opportunity kick-starting the practice of cattle ranching, and therefore

creating the opportunity of moving from production purely for self-consumption towards profit-making forms of production, not all people are proud of this history. Some did not choose to follow this course of action in the past, because they regard it as exploitation of people who are in need. This is exemplified by the following excerpt of an interview with one of the earlier colonizers in Loma Bonita:

Yes, the Guatemalans cut most of the trees, but the deforestation is not their fault. They just needed to eat, and because they were peasants they knew how to produce this. They asked the people to give them some land to grow food, but then the people used that to exploit them. I never did this, I let them live on my land for free and shared all that I had with them. If there would break out a war in Mexico and I flee to Guatemala, I would also want their unconditional help. Others used them to do the heavy work, the Guatemalans fled to here from a horrible war and from dangerous conditions when they were living in the rainforest for a long time, and they [the Mexicans] *exploited them. My father is 80 years old and still healthy, while other people died much younger or are sick, that is because they did these bad things in the past. I had a store at the time, and would give them the rice and other food out my store for free.*

Regardless of the moral or ethical aspects of this history, it illustrates how the Mexican peasants were always pursuing economic progress, rather than that this was initiated when the government decided to stimulate this with the 1993 reforms to the constitution. This pursuit is found more often when interacting with the people living in the region. Even in the early stages of colonization before the road was constructed there was some level of trade. The mentality to improve their (economic) livelihood has always been present, it is just that the peasants lacked the means and opportunities to make significant and noticeable changes in the short-term, that on first sight one only witnesses a mentality of self-sufficiency. An example of this mentality is the cultivation of chilli in the late 1980s. Despite the cultivation of chilli requiring much care, and that the price was not that high, the peasants still travelled to Zamora Pica de Oro to sell this in order to make some money. This was part of their pursuit to obtain enough money to buy cows to start the practice of cattle ranching. Nowadays chilli has nearly vanished from the fields, because there are alternatives now for peasants to obtain money for the purchase of cattle. This shows that the cultivation and selling of chilli never was an end in itself, and therefore the current dominant practices might just be another stepping stone towards a next level or phase of economic activity in the region. The Guatemalan civil war and the Zapatista uprising were two phenomena that changed the social environment in such a way that it caused a turning point in the visibility of this economic mentality, because it enabled peasants to put this mentality into practice much faster. With the land cleared after the Guatemalan refugees living in the region, the peasants only lacked the funds to really start practicing cattle ranching. When the government then started to hand out subsidies in the early 1990s to prevent peasants from joining the Zapatistas, this provided them with the necessary funds, jump-starting cattle ranching in Loma Bonita.

The practice of cattle ranching seems to be linked to notions of social status in Loma Bonita. The possession of livestock (especially cows), equates to wealth, smart investment, and economic growth. Whereas many people skip over the existence of *milpa* in their parcel, no one fails to mention it when they possess livestock. When asking a peasant what types of land use he has in his parcel, or what he does on his land, often the only answer is that they have pasture for cattle

ranching. When I then ask them if they could draw their parcel for me, then suddenly a patch of forest and/or *milpa* emerges on the map. Inquiring more into these patches, people generally are not motivated or excited to discuss these types of land use more, as they are just for their own use and not for profit. A striking example of the value attached to livestock is when a peasant told me that his land is purely pasture. When he draws a map of his parcel I realise his land is located in a location with rich soil and enough water, and therefore also very suitable to grow crops. He proudly answers that this is true, but that he only has one hectare of *milpa*, and that the rest is pasture for all his cows. Cultivating *milpa* is thus a necessary practice for peasants, which they only perform to the extent that is needed for subsistence needs. This is the reason that one can see that in Figure 8 in Annex I the amount of land that is *milpa* is kept at a minimum, even in places alongside the river pasture is preferred over *milpa* when *milpa* is not a necessity. The possession of livestock is the indication of not being solely self-sufficient, but actually having income. This role of livestock is further illustrated by the answer a peasant gives me when I ask him about his land, and he answered: *I don't have land, but I have livestock. Some people have no livestock but have land, I don't have land but I do have livestock.*

Some people have shown interest in extending their livestock with sheep, rather than purely cows. Most people oppose sheep, claiming that keeping sheep is troublesome because they are small enough to pass through the barbed wired fences. Also, several peasants tell me they do not like to keep sheep because they ruin your pasture. The argument goes that the mouth of the sheep is so hot that it burns the grass and soil when they are grazing, resulting in your grass being completely killed after four years of letting sheep graze on it. When it comes to profits, cows are also generally preferred because sheep do not generate as much income. They do reproduce much faster, but the weight of a sheep is much less, and combined with the price per kilo of sheep also being less of that of cows, the preference for cows seems obvious for many peasants. Finally, people that have or had sheep complain that they get stolen from time to time. Since they are small they can easily be caught, and transported in a truck or by boat. The marking of the sheep does not prevent this, because the sheep are immediately killed and processed to sell the meat in other *ejidos.* Despite the negative aspects of keeping sheep, many people do like to eat the meat, which results in some peasants showing a (renewed) interest in extending their livestock with sheep, such as the peasant in following example:

I'm going to start breeding sheep. Sheep reproduce fast, so in a few years I will have a hundred. Currently almost nobody has sheep, but people like to eat sheep, so if in a few years people are going to want to eat or have more sheep, then I will have enough sheep to sell some here and there and make a lot of money.

The choice of a peasant for maintaining livestock, and the choice for which animal, seems to depend partially on a peasant's 'hunch' regarding what will be economically beneficial for him or her in the future according to the current situation. Another example is that peasants try their luck with other species of cows. Only few peasants currently milk their cows, because the predominant species in the region do not produce much milk. Therefore, some have attempted to introduce *pintas* or *holandesas* (with which they most likely refer to Holstein-Friesians), because this species is famous for producing much milk. Despite the fact that the few attempts to introduce this species resulted in

the cows dying (which the peasants tell me is because it is too warm in this region for these cows), still peasants express interest in attempting to introduce some cows of this species.

Choices regarding economic growth are not made on purely economic grounds, since peasants also take their autonomy into consideration. The governmental program PROGAN is one of the most beneficial programs for peasants that possess cows in Loma Bonita as it pays a peasant around 300 pesos per cow. However, not many people participate in this program due to the historical distrust of peasants towards the government. Participation in this program requires a peasant to provide the organization with much information, such as the amount of land you possess, a map of your parcel, the amount of livestock you have, etc. Several peasants are hesitant to give out this information because they do not trust the government and think the information will be used against them in some way. Despite the fact that Marqués de Comillas has never been part of the Zapatista territory, the mistrust towards the government is very real.

In Chiapas, the government has a history of building hydrological dams, and have had plans to build such dams in the Lacandon rainforest as well in the past. The peasants are very aware of the consequences of such dams, not in the least because some peasants have witnessed these consequences first hand when their lands got flooded in other regions in Chiapas as the result of the construction of a hydrological dam. Currently, the government is planning on building a dam in 'Boca del Cerdo', which is near Palenque. Even though the consequences of such a dam will not affect the people in Loma Bonita, for the people this proves once again that the government does not care for the peasants in Chiapas. Also, it increases the fear for a dam in Marqués de Comillas, and therefore the people oppose the construction of the dam. Many people in Loma Bonita have signed a petition urging the government to stop the construction, and many have made it clear to me that if the government continues to construct the dam, or if it plans on also constructing a dam in Marqués de Comillas, the times of peace may be over. The fact that the area has never been officially part of Zapatista territory, does not seem to imply that the anti-government mentality is absent, or that people are not willing to fight for their autonomy and their livelihood when these are threatened.

Another example of the mistrust is the persistent and commonly-shared rumour that the government is planning on selling Chiapas and does not care about the people living in this state. The debt that Mexico has to the USA is the main reason according to peasants for the government to sell Chiapas (and Baja California) to the USA, just like the southern states of Mexico have been sold to the USA in the past by the government. It is also believed that the government has introduced the fish species known as 'Diablo negro', or in English 'black devil'. This fish has historically never existed in this region according to the peasants, but approximately three years ago it suddenly appeared and is now one of the predominant species. The fish eats all the small other fish in the river, preventing other fish species from reaching maturity and therefore preventing them from regenerating. The fish is inedible for other fish due to its skin being like that of a toad, and also for people because it is quite small and full with tiny bones. It is believed that the government has introduced this species in the lacantun river to decrease the interest of the people in the river. Currently people oppose the building of hydrological dams because this will likely cause a decrease in the amount of fish, but when there is no fish for the people in the river anyway, the peasants will not oppose the constructions of dams anymore. Regardless of the existence of any basis of truth for these rumours,

the fact these rumours exist already says a lot about the relationship between the government and the peasants, and thus also about the participation of peasants in government programs.

Interestingly, the programs of Corredor Biológico (a semi-governmental organisation), did have much influence regarding the practice of cattle ranching. The organisation entered the region eight years ago, and in its first years many peasants participated in its programs. This, however, has slimmed down to only a handful of peasants currently participating. Reason for this is that the organisation is first of all very strict. When peasants break the conditions of a program, they are expelled from the program and are not allowed to enter any of its programs anymore. There are two sides to this story of non-compliance. People that are involved in the organisation claim peasants misused the program just to obtain money, while peasants that are 'blacklisted' claim they either did not understand some of the requirements, did not agree to some of the requirements, or that the organisation did not take their personal case into consideration. An example is a peasant who complained about the obligation to build a drinking trough with a certain minimal size. This peasant shares his area and livestock with his neighbour/relative. 'They' complied to the building of such a drinking trough for their livestock. However, as the contract a peasant has with the organisation is on individual basis, and the drinking trough was built on his neighbour's terrain, he did not comply according to the organisation to the requirement of building such a trough. Another reason for a decline in participation is the amount of time a peasant has to invest in the program. Peasants complain that the organisation requires one to attend reunions almost every week. Finally, on some topics peasants are unwilling to stop certain practices that Corredor Biológico prohibits, the most prevalent example being that of slash-and-burn techniques. Related to the practice of cattle ranching, this practice is performed because it is believed to enrich the soil, but also because it is a fast and effective way to get rid of natural litter (heaps of leaves for example) and to turn *acahual* into pasture. This is important for peasants, because *acahual* and such natural litter are places where venomous snakes dwell. These snakes are an economic threat to peasants, since a cow that dies of a snake bite is a big monetary loss.

Despite the decline in participation, their programs have shaped the practice of cattle ranching in the *ejido*, and have made much impact in the landscape according to many peasants. The reason Corredor Biológico has been so influential is because they aim to combine economic growth with environmentally friendly practices. This objective resonates well with the people in the *ejido* because they witness and experience the effects of environmental degradation first hand. Another reason the organisation has had much influence is because their office is located in Boca de Chajul, and therefore the interaction with the peasants is much stronger than institutions that have their office in Zamora Pica de Oro for example. The biggest influences Corredor Biológico has had in the region are the intensification and the greening of agriculture and cattle ranching. Whereas before people would let their cows graze freely over the entire area of their parcel, Corredor Biológico initiated the construction of divisions and rotation. Nowadays every peasant has divided his pasture in divisions, where he lets his cows graze in one part to let the rest regenerate. The purpose of this dividing up of pasture is to increase the productivity so that peasants need less pasture per cow, and therefore do not need to keep cutting more forest to let their cattle graze. To further increase the productivity in cattle ranching they have promoted the introduction of 'Pasto de Corte', this is a type of grass which is rich in nutrients and will therefore fatten the cows much faster than most of the current types of grasses people have in their pasture. The idea is to have a small plot of this grass, and to construct shelters with feeding troughs where the cows can feed on this grass. Again the idea is thus to use less

land to accommodate to one's livestock. The impact of Corredor Biológico remains significant in the *ejido* despite limited numbers of current participation, because peasants continue to manage their land based on the ideas of the organisation.

3.2.2 The practice of biofuel plantations

The conversion of land to the creation of a biofuel plantation (the main types of biofuel plantations in the region being palm oil and rubber) is often seen as one of the most destructive land use changes for the environment, both in academic literature as in the conducted interviews in my research. In academic literature this relatively new type of land use gains much attention, and in relation to Marqués de Comillas is regarded as a result of institutional promotion. s. It is striking therefore how in Loma Bonita not one person is positive about palm oil plantations, despite government organizations promoting this in the past in the Loma Bonita as well. The people say that in other *ejidos*, such as La Union and Veracruz, palm oil and rubber trees are the predominant land use types. The reason the practice of cultivating palm oil and rubber is picked up so enthusiastically in these *ejidos*, while in Loma Bonita this is not the case, is because the soil in some *ejidos* is too poor for agriculture or pasture. The choice for palm or rubber is then more easily made, especially if one considers the subsidies granted by the government. In an interview with the commissioner of Boca de Chajul, where some people have changed their land use to palm oil or rubber plantations, he explains some of the logic behind the choice for biofuel:

> The propaganda around palm oil and rubber is all false, people are told that it will generate much income but this is not true. By the time people realise this, they have already made the switch towards palm or rubber, and are then too proud to admit they lose money on it. The market in Mexico for rubber is nearly inexistent, resulting in only Guatemalans buying it. Since there is no competition they can pay very low prices, so only the subsidy is what generates a bit of income. Some people changed their cows for palm because their cows wouldn't grow fat due to too limited nutrients in the soil. However, it is smarter to change your cows for calves, these need less nutrients, generate more money, and are less destructive for the soil. But some people do not like to keep cows or calves, they are a lot of work while the plantations just grow by themselves. The subsidy for palm oil and for rubber is so high and easy to obtain, that some people choose for this land use, or to change part of their land into a plantation to obtain extra money. SAGARPA pays around 11.000 pesos per hectare of palm oil or rubber, and only needs a photo as proof to give you the subsidy. This results in some people changing 10 hectare into palm oil, receiving 110.000 pesos, and then these persons do nothing at all with the plantation. They do not maintain it, they do not harvest it, they just get the subsidy. But in the end it is not a smart thing to do, cattle ranching produces more money and has more potential for growth. After palm or rubber trees, you cannot do anything anymore, you keep needing chemicals to fertilize. For palm oil, people find it an easy type of work, but after a few years the trees grow so high that it becomes more and more labour intensive to harvest.

If one compares the subsidy for palm oil and rubber to for instance PES, which pays 1000 pesos per hectare, it is understandable that some are tempted by the subsidies to change to that type of land use. Opponents of palm oil argue that palm trees produce much root in the soil, drain the soil of

nutrients and therefore continuously need fertilizer. After a cultivating palm oil or rubber, the land is basically useless and will either need much time or much fertilizer to be able to create *milpa* or pasture again. They also argue that there are only a few years when palm oil is an easy type of practice to generate money. The first years there is no harvest, then there are a couple years where one can harvest quick and easy, but then the years after that the trees grow so high (this is only the case for palm oil trees, not for rubber) that it becomes more and more troublesome to harvest. Despite these arguments, in Loma Bonita several people tell me that ultimately, they do not hold any grudge against palm oil or rubber, and that they would consider changing to that type of land use if it would be more profitable than cows. Another recognized problem in Loma Bonita is the fact that palm oil is only profitable when one has a substantial area of land to create large plantations. In Loma Bonita, not many people have such large amounts of (connected) land in the first place to create large plantations. A second problem is that it is not possible to give palm oil a try as the amount of spare land people have is too little to even start a sort of pilot plantation. When inquiring why some people who would have enough land (mainly in Boca de Chajul, where people more often have up to 80 hectares of land) do not choose practice, the answer is that some people just 'do not like that'. They prefer to keep livestock, as this is a more dynamic type of living, whereas a palm oil plantation is described as boring work (and consequently peasants with palm oil plantations are mocked as lazy people that do not like to work). In Puerto Rico, a ranch neighbouring Loma Bonita, there are hundreds hectares of palm oil plantation. Reason for this is that this area is all private property, owned by one rich person or family, and therefore the practice of maintaining a palm oil plantation is profitable and a relatively easy type of managing the area, despite the fact that the soil is rich enough for other types of land use.

According to the logics of the peasants, palm oil is thus only interesting when one has either very poor land that there are not many alternatives left; when one is not planning on doing anything with their land and therefore create a palm oil plantation to receive 'easy money' through government subsidy; or when one has such a large quantity of land that palm oil cultivation becomes a viable economic option.

3.2.3 The practice of cultivating *milpa*

Almost every peasant has some area of land that he or she uses for *milpa*. Even peasants that do not possess land are sometimes given a small piece of land (0.5 ha for example) so that they can grow corn and beans. Peasants that possess land more distant from the river have often bought or rent some land in parcels alongside the lacantun river. This can also be seen in Figure 8 in Annex I, where there is one parcel which is completely divided up in small plots for peasants to grow crops, and where it can be seen that along the river there is a strip of *milpa* throughout many parcels. Furthermore, the small plots of *milpa* around the *ejido* indicate small areas that are located on a lower altitude and therefore the soil contains (just) sufficient water for agriculture (sometimes these plots only receive sufficient water in the rain season).

The two most common crops that peasants produce in their *milpa* are corn and beans. Corn is sown twice a year by most peasants, while for beans this is mostly possible only once a year due to the rain season. Corn is a product many peasants do like, and several produce some for their own consumption, but it is not cultivated as much as corn and beans. The reason for this is that the

peeling of corn is very labour intensive. Machines to do so are very expensive, and no program subsidises these at the moment. Some peasants go to the nearest Guatemalan village to peel their rice, because in Guatemala many villages do have such machines. However, the cost to use the machine and the effort it takes to go to the village results in most peasants that have rice choosing to peel them using more simple tools that is more labour intensive. Besides these three products, many peasants grow several other products in their *milpa*, such as calabashes, mango, tomato, cacao, etc. This mixed agriculture is partly a result of the programs of Corredor Biológico.

Nowadays many peasants grow calabashes amidst their corn and beans in their *milpa* is because Corredor Biológico has promoted especially this crop to be planted in the ground amidst the other crops. The reason for promoting calabashes is to end the use of chemicals peasants use to kill undergrowth. When peasants grow calabashes for their own consumption in the ground, they will stop (or decrease) the use of chemicals since these will enter the soil and therefore also the calabashes. As an alternative to chemicals they give out grants so peasants can buy equipment to cut undergrowth and clear land. Finally, the use of coffee as natural fertilizer also stems from Corredor Biológico, and is a practice that is commonly used nowadays. Remarkable is that very few people participate in their programs to obtain loans and subsidies, while their impact has been considerate. Reasons for this are the high demands when one participates in a program; there are meetings almost every week and when someone does not comply with all the requirements, he or she is banned from all the programs of Corredor Biológico. Nevertheless many people have taken up their ideas, and this is mainly because the help of Corredor Biológico is not necessarily needed for many of the practices. Since using coffee as a natural fertilizer is cheaper than buying chemical fertilizer, people have an economic incentive to take up this practice. When I inquired about the widespread use of coffee and the apparent consensus on certain practices, one person laughs as he answers my question if there are people who work their land completely different. *If people manage their land differently? No, everybody does the same. People look at what others do and just copy that, so everybody just does the same.* The influence of a programme on the practices of peasants may thus extend well beyond its number of participants.

Following that statement it thus seems as if the practices that seem the most productive also become the dominant ones. Despite this being true in some of the given examples, there are other cases where peasants divert from the most a practice which has proven to be productive, but follow a different course. Examples of this are when peasants experiment with species that are new to the region and therefore have not proven to be productive yet, and when a peasant diverts from the rest of the *ejido* in how he manages his *milpa* (e.g. using a tractor where this is not optimal for the soil according to others, or using chemicals that will ruin the soil and therefore be less productive on the long term). When asking peasants how long it takes before the soil is drained of its nutrients and harvest decreases, I also receive different answers. Peasants who have enough land to rotate, generally sow corn twice a year in a specific part and then let that part rest for one year. Peasants who have less land, or less fertile land (which are mostly the scattered plots of *milpa* located further away from the river in Figure 8 in Annex I), generally choose one of the following courses of action: They sow corn once a year so that the land has enough time to regenerate; or they continue to sow it twice a year, with the consequence that the harvest is on the low side or that they will need to use agro-chemicals.

There are other examples where opinions divert on what would be the best practice. The most striking example of this is the slash-and-burn technique. There are only a few exceptions of persons that do not perform this, and these peasants tend to mimic the condescending attitude of environmental organizations such as Corredor Biológico towards those that do perform this technique (not rarely, these peasants are, or were in the past, related to the organization). The two opinions on whether to use this technique or not are directly opposed to each other, and this illustrates how peasants draw on different logics in the process of maximizing their harvest. Another example links back to the practice of cattle ranching. The rather limited use of Pasto de Corte in comparison to other initiatives of Corredor Biológico illustrates how peasants sometimes use a different type of logic than the organization would expect. Despite the fact that all peasants agree that Pasto de Corte is more rich in nutrients and increases the productivity of cattle ranching, and that without Corredor Biológico someone can still continue this practice (much like the use of coffee as natural fertilizer), many have seized to continue this practice. Especially peasants who own more hectares of pasture argue that they do not need this as they have enough pasture to feed their cows, and that Pasto de Corte is more important for those who have less land. It seems to be regarded as an unnecessary use of energy to maintain such small plots of Pasto de Corte, since a person has to cut it, shred it and construct a feeding trough, as opposed to letting your cows graze freely. The idea of selecting nutrient rich grasses, however, has been taken up. This has led to people experimenting with grass species they have obtained or purchased, and on peasants selectively growing certain grass species in different divisions of their pasture.

While the general tendency in land use change is the conversion of *milpa* into pasture for cattle ranching (and in other *ejidos* a subsequent conversion of pasture into palm oil or rubber plantations), this might not be the case for the future. Whereas cows as livestock is one of the most steady types of income at the moment, and therefore is linked to ideas of wealth and status, there are some indications that this will become more diverse. Currently, corn is not being produced commercially because the prices are too low for this to be profitable. Also, in the past there was no road to Comitán, resulting in traveling to the city to sell corn and beans being so labour intensive that it did not weigh out to the profits of selling these products. Therefore the focus has always been on livestock as the way to increase one's livelihood. However, in an interview with a peasant he hinted that this might change in the near future:

> *People do not grow corn and beans to sell in Comitán because the price is only 2 pesos per kilo. In the past we used to sell a little bit for extra money because the price was higher. Now the prices are rising again, and it is already at 5 pesos per kilo. Therefore people are thinking about producing more corn and beans again to sell this in Comitán. I am thinking about buying a tractor, then I can work my terrain, which is dry and hard now, and harvest much more corn. If I then buy a truck, or rent one, I can go to Comitán to sell it.*

Apparently peasants concern themselves with economic changes in markets, and are continuously exploring ways to achieve more economic growth. In other places (some even close-by and having the same climate and environmental characteristics), peasants have for instance chosen for large pineapple plantations. In Loma Bonita there are only a couple people who grow pineapples, and they do this mainly for their own consumption. Almost everyone grows some fruits and vegetables for their own consumption, and some people choose to grow a bit more of a certain product (for

instance chilli) to sell this in the *ejido.* But this in Loma Bonita this is not done to the same extend of cultivating corn and beans or of maintaining livestock; it is always a secondary practice rather than a peasant's main activity and primary source of income. After inquiring why no peasant in the *ejido* chooses to create plantations of fruits such as watermelon or pineapple, I am told that for certain crops the price is very low and that it therefore cannot compete with practices like cattle ranching. Regarding pineapples, there are large plantations of this in the *ejidos* Ixcan and in Nueva San Juan Chamula, who sell the pineapples throughout the region, including Loma Bonita. Peasants tell me that the pineapples from these plantations look very good and are large, while in Loma Bonita the pineapples remain very small. The differences regarding this cultivation is striking, especially considering Ixcan and Loma Bonita are very near each other and have similar socio-environmental histories.

Besides economic incentives, environmental factors also influence what products are cultivated, and how they are cultivated. For example, the cultivation of chilli has almost completely vanished through time in Loma Bonita due to the crop being labour intensive, and due to the much mentioned plagues that ruin the harvest. Cacao is another product some people tried their luck with in the past, but despite several academic articles referring to this practice in Marqués de Comillas, in Loma Bonita the commercial cultivation of cacao was given a very short-lived life due to disappointing harvests and plagues as well. Cacao trees can still be found in the area, this is however mostly not for harvesting cacao but because the trees provide shadow for other species. Plagues have become more and more common through time, and are seen as a result of the environmental changes the people have caused in the region. Climate change and environmental degradation are therefore phenomena everyone acknowledges, and they are experienced by the people in a very direct way. When asking how climate change is experienced, everyone describes alike effects and situations. An example of a peasant's description of climate change is the following excerpt of an interview:

> *I live in Loma Bonita for about 18 years now. It used to be a lot better here, nowadays the soil is deprived and the harvest is less. The heat is stronger, there is less rain, more wind, and there are more birds.*

Figure 5. A basket with harvested corn a peasant showed me to illustrate the results of climate change.

He shows me a basket of corn (Figure 5), where he picks up several cobs and explains that nowadays the birds eat the corn a lot more than they used to do in the past. Other peasants confirm these experiences, stating that in the past it was not necessary to sow corn with toxic, but that nowadays the birds otherwise eat the seeds. All, however, put the blame on themselves, when sowing corn with Carlos he tells me:

Look at all this toxic [pointing at the basket with agro-chemicals]*, and we eat this. But it is our own fault, we cut the forest so now the birds and mice have no food anymore and need to eat this. That is why my brother loves the forest and does not want us to cut any trees in his parcel. We used to sow corn by placing two seeds in every hole, now we use five or six so that they do not all get eaten.*

His brother possesses part of the land Carlos works on, since Carlos himself does not own land, and does not allow the use of any agro-chemicals or of slash-and-burn practices. Also, half of his brother's parcel is forest, and here his brother does not allow his family to cut any trees. When walking around the forest Carlos jokingly says that that if he would cut a small, young tree aside the path in the forest and his brother sees this when he walks there next time, his brother will get very mad at him; and that if he cuts a large tree that his brother will probably kill him. Despite the jokes, this does show considerate differences between the values ascribed to the environment by peasants, even within the same *ejido* or the same family.

3.2.4 The practice of maintaining or conserving forests

When it comes to forest (primary or secondary), Loma Bonita is characterized by many little plots of forest scattered around individual parcels in the *ejido* as can be seen in the maps in Annex I. Many people preserve patches of forest to maintain a water source, to have a reserve of wood to build or repair their house, and to have shadow for their cows. These patches are often only between a half hectare and a hectare big. There are a few peasants who maintain larger areas of forest, mostly in the range of five to ten hectares, which is considerate taking into consideration that the average size of a parcel is 20 hectares. Peasants give me two main reasons for maintaining these larger plots of forest. The first is that they have not cut it because they like the forest; they have witnessed the effects of deforestation and therefore want to preserve that bit which is left in their parcel. The other main reason is that they do not need the land (yet); cutting forest is labour intensive, and therefore people will only start to cut it when they have a good reason to do so. Forest is then cut, for example, when peasants expand their pastoral area, or when they give part of their land to their children who will then cultivate it. This means that the remaining large plots of forest do not per se indicate a conservationist mentality, and that when the economic interest in the area is large enough this can quickly be converted in pasture. An example of this is the plot in the lower-right corner in the maps in Annex I, where forest was preserved for a long time in almost the entire parcel. However, after ownership changed this got completely converted in pasture in a little over 10 years.

Some parcels are owned by people who no longer live in the *ejido*. In these cases either another person is working the land for them, or no one maintains the land resulting in the regeneration of forest. The people that own land but do not live in the *ejido* do maintain to care about their land and how it is managed by whoever they left in charge. It is necessary to leave someone in charge over your land, because when you possess land in the *ejido* but do not attend the *ejido* gatherings, then

you need to pay a fine of several hundred pesos to the *ejido* for every gathering missed. An example of when maintaining forest is an explicit environmental choice, is when a woman who owns a parcel moved to the city and left her nephew in charge to represent her at *ejido* gatherings. This woman had cut part of her parcel in the past for pasture, but several hectares were spared and remained primary forest. In her absence most of the pasture had grown into *acahual*[9] because she ordered no one to maintain the land. Her nephew gave permission to another *ejido* member to cut the forest, in order for that person to create *milpa* for a year and use the wood for his house. However, when the woman came back to check on her land, she was furious that her forest was cut, because she liked it and wished to preserve it. Now the land is unused once again, and completely covered by *acahual* and regenerating forest.

The example shows that the conservation of forest is a result of the preservation mentality that lives in some people. Whether this is the result of first-hand witnessing the effects of deforestation or of governmental programs promoting environmental awareness is not always clear. In some cases the language of peasants is very similar to that of environmental institutions, such as when one person stated that: *This region here is very important in the world, it is like the Great Barrier Reef, like the Amazon forest.* It seems highly unlikely that these comparisons and this environmental language is not linked to the presence of environmental programs in the region through time. The environmental value that is given to the forest by some peasants can also be witnessed in the pride of peasants who still have mahogany trees in their parcel. Despite the high monetary value of this tree, peasants that have this species do not cut it because of the educational value it has for their children. Note that the peasants tell me that the felling of this tree is forbidden by law, although these peasants also argue that it is only illegal when you travel over the big road with mahogany wood, and that the felling and processing of mahogany for ejidal use is not forbidden. The reason for preserving this species is thus mainly environmental, as they want their children to be able to still see this species.

The *ejido* does not participate in the PES program. The reasons peasants do not want to participate and the opinion some peasants have regarding this program is remarkable. When asking peasants about the past existence of PES in the *ejido*, or the past experiences of peasants with this program there exist some confusion. Since many programs have passed the scene throughout the *ejido*'s history, peasants do not remember exactly which program did what. Many people were very negative about the PES program, stating it had been in Loma Bonita several years ago, but that they never want to participate in this program again. There is anger towards the program due to false promises of payment, claiming that they never got paid in money, but in objects such as seeds for peasants grow fruit trees, and in animals such as chickens and turkeys. After further inquiring these statements about PES, which seemed odd to me as the PES program normally does not pay peasants in objects, it turned out that the program they referred to was PESA (Special Program for Food Security). The PES program has actually never been present in the *ejido*, and the answers of the peasants regarding this program thus did not correspond to any real history the people have had with PES. The confusion exists because the Spanish abbreviation for PES is PSA (Pago por Servicios Ambientales), resulting in the pronunciation resembling that of PESA.

[9] *Acahual* is low secondary forest. The term refers to the stage of regeneration on fallow pasture when the vegetation is two to five meters tall, and consists mainly of shrubs and early woody vegetation of five to seven years old (Diemont et al. 2006; Greenberg et al. 1995).

Another reason some peasants reject the program is because they claim PES does not work well in an *ejido* where the land is privately owned, which is why in Boca de Chajul and in Trece de Septiembre PES does work. In these *ejidos* the land is, respectively, partially or completely communal. Finally, the limited area of remaining forest is too small, as they tell me that PES requires a minimum of 200 ha of (contiguous) forest. After talking to the commissioner of Boca de Chajul about PES, he tells me that the people are misinformed, and that it is even possible to receive payment for your forest if you only possess a couple of hectares. Whoever is right, the assumptions made about the PES program and the opinions people hold on it results in peasants in Loma Bonita not (further) investigating the possibilities with PES. The fact that several peasants still conserve patches of forests thus struck me as it seemed to hold no monetary benefit. However, it turned out that despite PES not being present in the region, there are other monetary incentives to maintain patches of forest for peasants. Since UNAM performs many biological studies in this region, I am told that people have an arrangement with and *ejido* member who works for UNAM as field assistant to students and researchers. This arrangement is that they receive some payment if they do not cut specific parts of their forest, so that biologists can continue to do research there.

Ecotourism is another economic incentive that is starting to change land use practices and can be a reason for environmental conservation. In Loma Bonita there is currently only one person who is going in the direction of ecotourism, as he plans on building cabins. These are mainly directed at the researchers and students from UNAM, so they can rent these when they are in Loma Bonita. However, in other *ejidos* the process of ecotourism has already made more impact on the practices and land use of peasants. In El Piru, an *ejido* smaller than Loma Bonita, they have begun constructing a 'tree top path' the previous year, and are currently in the process of building restrooms and cabins in the forest. This is an interesting process, since at first sight one would not expect that such ecotourism projects would start in El Piru. The *ejido* is not near any specific environmental feature that would attract tourism, such as a cascade or lake; it is not located next to the main road, so tourists that do enter Marqués de Comillas are very unlikely to have accidently or spontaneously entered it; and it seems that there has been no history of tourism in the *ejido*. Despite this, the *ejido* is very environmentally conscious as there are signs at the entrance of the *ejido* and at the entrance of the forest prohibiting practices such as slash-and-burn techniques in the communal areas. It seems that the peasants in this *ejido* attempt to combine the environmental mentality with economic ends.

4 Analysing the contingencies in the logics of peasants

The previous chapter covered the logics of peasants regarding the colonization and settlement processes, and regarding their land use practices. Through a focus on the logics of peasants rather than on a predefined framework that places macro-organisations and programs at the centre of study, I have found that the land use changes are contingent on how individual peasants go enhancing their livelihoods within a certain structure or context. Between Loma Bonita and neighbouring *ejidos* the land use changes have followed a different trajectory, and also between peasants in Loma Bonita there are differences in land use practices. This reinforces the importance of logic to understand how peasants deploy agency within structure regarding their land use practices. In the following section the logics of peasants regarding the practices covered in the previous chapter are analysed in order to show how these practices have been contingent, and to identify certain patterns of contingencies.

4.1 Analysing the logics of peasants regarding their practices

This section analyses the logics used by peasants for choosing (or rejecting) certain practices, and for choosing how they go about regarding their practices. It is a succinct wrapping up of the main and recurrent types of logics that can be recognized in the reasons given by the peasants, which have been covered in the previous chapter.

4.1.1 Colonization and settlement

Regarding the colonization and settlement of peasants in the region, in the literature in Chapter 3 this has been labelled as part of a controlled program by the government. The colonization of the region now known as Loma Bonita and the establishment of the *ejido* has, according to the logics of the peasants, very much been a spontaneous and contingent practice. According to the colonizers themselves, initially the location of colonization in the 1970s was dependent on the presence of people working at the hydrology station. Following this first phase of colonization, the exact location of where the *ejido* was established was largely contingent on the environmental aspects of the region. It mainly depended on the availability of a good and clean water source, and on the area being plain enough to build houses and infrastructure. Furthermore, the current location of the *ejido* was chosen because this area had not been claimed yet by other colonists living on a ranch. The government may thus have controlled colonization and through that structured it to a certain extend by allowing or forbidding it, but the exact practice of establishing an *ejido* has mostly been contingent.

Besides the privatization of the land in the *ejido*, peasant have been pursuing economic growth and autonomy since early stages of colonization. Well before entering the privatization program PROCEDE, there was already an informal private property system enabling peasants to accumulate and sell land. The choice to formally privatize their land through PROCEDE was for legal security and because it facilitated participation in several subsidy programs. It has therefore not been the program PROCEDE or the macro-process of neoliberalism that started a mentality of privatization, but it was rather the mentality of peasants to pursuit economic growth that caused them to participate in PROCEDE. In some cases the activities of the government do affect the settlement practices of peasants, an example is the *ejido* Trece de Septiembre where the people have moved

the location of the *ejido* after the road that connect Comitán de Domínguez with Palenque had been constructed. However, the fact that Loma Bonita did not take that action shows how settlement is contingent on what factors a peasant or community find most important. Simply put, in the case of Loma Bonita the distance to the river was deemed more important than the distance to the road, and in Trece the Septiembre vice versa.

4.1.2 Cattle ranching and livestock

The reason that the most common practice in the *ejido* is cattle ranching, is because peasants regard this as the practice that best increases one's livelihood economically. Since the early days of colonization, peasants have oriented their practices towards cattle ranching. The possibility to do so has largely been contingent on the Guatemalan civil war. This war led many Guatemalans to seek refuge in the region, and these refugees had considerable knowledge efficiently clearing the forest, which led to a jumpstart in the practice of cattle ranching.

The ownership of livestock is also related to social status and notions of wealth, even when one is not in possession of land. Besides the economic aspects of cattle ranching, some peasants also express their interest in this practice by stressing that cattle ranching is a certain type of life that they like. Cattle ranching is a practice that enables a peasant to remain relatively autonomous from the government (especially compared to practices such as biofuel plantations and participation in conservation programs like PES), making this practice appealing to peasants due to their strive for autonomy. Economic growth and a strive for autonomy are two issues that often underlie the logics of peasants when it comes to cattle ranching, and are in conflict at times. For example, despite the program PROGAN providing subsidies for cattle ranchers, not every peasant with livestock chooses to participate in this program. The distrust towards the government prevents several peasants to take advantage of the monetary benefit of that program. The (desired) quantity of a peasant's livestock is thus partially contingent on whether or not a peasant participates in such a subsidy program, since peasants that do participate have a monetary incentive to expand their livestock (since PROGAN pays per cow).

Corredor Biológico is an organisation on the other hand that does influence the practice of cattle ranching a lot. This is because their programs combine ideas of economic growth and environmental sustainability, which resonates well with the peasants. The pursuit of peasants to achieve more economic growth also leads peasants to experiment with different species, some peasants for instance express interest to expand their livestock with other species. Even though several other peasants have had negative experiences with certain species, the possible economic advantages are apparently big enough for some peasants to change their practice and try their luck with these species. Finally, the knowledge of peasants on the environment steers the way peasants manage their pasture; techniques such as slash-and-burn are used to enrich the soil and prevent snakes from living in the pasture, and peasants actively choose what grass species they want to grow in their parcel.

4.1.3 Biofuel plantations

Currently, not one peasant in Loma Bonita is cultivating palm oil or rubber, and most peasants only mention negative aspects of this practice. Yet they do not outright reject the possibility of ever

starting this practice. If the price is higher than that of cows, and if they have enough land to make a palm oil or rubber plantation a viable option, they say that they then might go for the option of starting a biofuel plantation. Despite all the negative environmental aspects of this practice that they mentioned, there apparently is a certain threshold when the economic pursuit of a peasant outweighs the negative environmental consequences of a practice.

Besides economic or environmental ideas, when it comes to the biofuel plantations (especially palm oil plantations), the choice of this practice also appears to be contingent on personal preference. Several peasants made it clear they simply do not like the type of work related to a biofuel plantation. They see cattle ranching as more 'real' peasant labour, while the maintenance of a palm oil plantation is regarded as a more lazy type of work to quickly obtain easy-money. Opponents of biofuel plantations also accuse peasants who perform that practice as lacking a long-term vision, both from an economic and environmental point of view. This is especially the case for peasants who choose for biofuel plantations while the soil is good enough to maintain cows or calves. The two main reasons peasants give for changing to a biofuel plantation are the amount of land one possesses (because such plantations are most profitable and efficient when one possesses much land), and the fertility of one's soil. Still, despite the fact that these are the two main reasons given by peasants, it is in no way true that this will deterministically lead a peasant to maintain a biofuel plantation. In Boca de Chajul several peasants possess large quantities of land, but did not choose for a biofuel plantation, even when the land was not as fertile as in other parts.

4.1.4 Cultivation of *milpa* and other agricultural products

Generally, there is not much difference in which agricultural crops and fruits a peasant cultivates in his or her *milpa*. The main function of *milpa* is for self-subsistence causes, meaning that peasants generally do not earn money from these products. A product such as rice, which either requires much labour or money to process, is therefore not as common as beans and corn. Other products that peasants grow in their *milpa* seem to be contingent on an individual's preference, but it has also been influenced by Corredor Biológico. Especially coffee (which is not consumed but used as natural fertilizer) and calabashes are two products that have been introduced by Corredor Biológico, which are now present in the *milpa*s of many peasants and part of how they practice agriculture.

Regarding the way a peasant maintains his or her *milpa* is also contingent on the environmental consciousness of the peasant, leading some to use slash-and-burn techniques or agro-chemicals while others reject the use of such techniques or products. Furthermore, the practice depends on the economic interests of a peasant regarding *milpa*. Some peasants have expressed interest in making *milpa* more economically profitable and consequently desire tools such as a tractor to work the land faster and more efficient. Price signals influence this pursuit of economic growth, but there are more factors that play a role in whether a peasant will eventually choose to act on this interest, such as the availability of transport in order to sell the products in the city, the existence of competition, and the price signals of other products. In Loma Bonita no peasant produces products such as pineapple or watermelon on a large, commercial scale. Reason for this is that these products are produced commercially in other *ejidos*, and that they are of high quality (higher than those that produce them in Loma Bonita). Another reason peasants give is that cattle ranching is still more profitable than products such as pineapple. This is interesting, because in *ejidos* close to Loma Bonita peasants do

grow these products commercially, while the available markets are the same and the environmental conditions are alike as well.

4.1.5 Maintaining and conserving forest

In the stories of peasants regarding their forested area in Chapter 5, the reasons to maintain these forests are mostly economic or environmental by nature. Economic reasons are that the area is being preserved for future use (by themselves or by their children), that there is no economic benefit in clearing the forest at the moment, or that there are economic benefits related to the forest in the form of ecotourism, PES, or other projects. Environmental reasons have two dimensions to it. The first relates to more practical causes such as the conservation of patches of forest to maintain water sources and rivers, to provide shadow to their livestock, and to have a reserve of wood for (re)building their house. The second relates to the values peasants ascribe to the environment (such as the aesthetic value), and to the environmental consciousness of peasants regarding the sustainability of their land (this also can be seen in the choice of peasants whether to use agro-chemicals or not).

The success of the programs of Corredor Biológico does underline that these two mentalities (economic and environmental) are present in the logics of most peasants, and that therefore practices that combine these two mentalities have been picked up by the majority of peasants. This combining of the two mentalities can be applied to the conservation of forests. The ecotourism project in the *ejido* El Piru is a striking example. However, the extent to which different peasants in an *ejido* conserve forest differs, and the reasons for this conservation of forest as well. Between different *ejidos* this conservation differs even more, with the neighbouring *ejido* Boca de Chajul participating in PES due to their large area of forest. How environmental or economic causes are balanced out against each other, or how peasants combine these two, has thus resulted in very diverse practices. In the same *ejido* one can see that one peasant has turned the entire parcel into pasture, while another preserves the forest without it having any economic benefits, and again others who attempt to combine the two mentalities.

The previous sections have briefly summed up the most important or prevalent logics of peasants regarding their choices for certain practices. In the following section key issues are identified to which most of these logics apply. It thus on these key issues that the land use changes have been largely contingent in Loma Bonita.

4.2 Identifying key issues on which the landscape dynamics are contingent

The previous chapter showed that the land use changes and choices for certain practices has been largely contingent on what an individual peasant deems most important or what he or she prioritizes. In the analysis of the logics of peasants that showed how the practices are contingent, some similarities in this logic can be witnessed between the different practices. There is a recurrent balancing of certain ideas or interests, and a recurrent type of argumentation. Based on the analysis in the previous chapter, several recurrent types of logic can be seen according to which I identify three key issues to the contingency of the landscape dynamics. These three key issuers are 1) politico-economic concerns, 2) environmental consciousness, and 3) external events. In the following sections these three key issues and the logics that relate to them are further explained. Furthermore,

the sections discuss how these key issues relate to the role of macro-processes and organizations to show how land use change in Marqués de Comillas is contingent on the agency of peasants.

4.2.1 Politico-economic concerns

Politico-economic concerns are a key issue to which several of the recurrent logics can be ascribed. This issue refers to pursuit of peasants for autonomy and for economic growth; sometimes practices are a result of these two pursuits being in harmony, while in other instances there is a conflict between them which results in ostensible irrational behaviour. The strive for autonomy of peasants and their pursuit of economic growth leads most peasants to practice cattle ranching, since this practice generates income and does not make them dependant on the government. Social status is another important aspect of this issue to which many logics apply, and is also related to economic growth. The ownership of cattle means a person has possession and income, rather than that person merely practicing agriculture for self-subsistence causes. However, the strive for economic growth is also restrained by these other aspects, resulting in peasants following a certain course of action that is economically not the most rational choice. De Jong et al. (2000b: 324) assume that the choices of peasants for land use practices "will be made in a an economically rational way to price signals". This is not always the case due to governmental distrust, a strive for autonomy, and also due to concerns of peasants regarding their social status. Despite several programs providing peasants with benefits, many decide not to participate due to their distrust towards the government and because they feel participation reduces their autonomy. Regarding peasant's concern with social status, this can be linked to the choice of peasants to cultivate a biofuel plantation. Despite peasants stating the lack of such plantations is absent in Loma Bonita for environmental and practical reasons, they also ascribe a negative social image to people that do choose to perform that practice, hinting that concerns regarding their social status are also related to this practice (even when these concerns might not be decisive).

When it comes to organisations, the influence these have on land use practices is largely dependent on politico-economic concerns (e.g. the political pursuit of autonomy which is often linked to sentiments of governmental distrust), but also on whether the organisation corresponds to the environmental consciousness of a peasant. For example, the way peasants practice cattle ranching has been largely influenced by Corredor Biológico. However, rather than understanding the change in practice as cause-and-effect result of the presence of such an organisation, I would argue that the influence of an organisation is contingent on whether or not peasants choose to participate and co-operate. The (initially) high level of participation of peasants in Corredor Biológico was because this organisation enabled peasants to more efficiently manage their land, and through that combined environmental and economic goals. Increasing the productivity of pastures through the introduction of certain techniques went hand in hand with ideas of environmental sustainability, without inhibiting the autonomy of peasants. It was only when the requirements to participate in the program became more strict that the level of peasant participation dropped, but by this time the ideas that the organization promoted had mostly been picked up and continued.

The example of Corredor Biológico shows well that the influence of organizations is contingent rather than deterministic, because even though the ideas and programs of this organization were received well by the peasants, the influence of the organization is still in no way unidirectional and

deterministic. For every aspect of the programs of Corredor Biológico, each individual peasant weighs certain factors when deciding whether to comply or participate. An example is the slash-and-burn technique, which peasants need to stop performing if they wish to continue to participate in the programs of Corredor Biológico. Most peasants are unwilling to terminate this practice because the slash-and-burn technique is believed to enhance productivity and because it has practical benefits. Despite Corredor Biológico refuting that the believed benefits of slash-and-burn are true, it continues to be a common practice. Apparently the negative environmental aspects of this practice that the organization stresses are either not shared by the peasants, or not deemed important enough to outweigh its (assumed) economic benefit. Furthermore, it seems the practical benefits that peasants ascribe to this technique outweigh the economic benefits that they receive when terminating the practice to continue participating in the organization. Finally, peasants object the fact that the organizations attempts to restrict them in their freedom regarding what they are and what they are not allowed to do.

4.2.2 Environmental consciousness

As partially discussed in the previous section, environmental consciousness is one of the key issues for understanding the logics and practices of peasants. With this key issue is referred to two aspects regarding the interaction between the environment and peasants. First of all it refers to the knowledge a peasant holds over the environment (e.g. what practice is best to perform on a certain soil type, and what the long term environmental consequences are of certain practices). Whether this knowledge is 'correct' or not from a scientific point of view is irrelevant since it influences a peasant's practices either way. The second aspect refers to the value given to the environment by a peasant (e.g. the aesthetic beauty of a forest), as such values can sometimes account for economically irrational behaviour.

Regarding the first aspect, the environmental consciousness of peasants leads to a diversity in practices, with peasants not always fitting the economically rational profile. The use of agro-chemicals and slash-and-burn techniques is first of all contingent on whether a peasant believes these to be environmentally damaging. Very few peasants oppose the slash-and-burn-techniques arguing that this techniques is environmentally damaging. However, in Loma Bonita these peasants are linked to Corredor Biológico, which means this choice might also be linked to the issues of politico-economic concerns. Secondly, the choice whether to use agro-chemicals is greatly contingent on whether the negative environmental aspect outweigh the economic benefits for a peasant. The fact such chemicals are environmentally damaging has not been contested by peasants in any interview, yet the practical relevance of these chemicals have been stressed several times. The choice for such chemicals seems to be dependent on how environmentally sustainable a peasant ought this practice is. When linked to biofuel plantations, many peasants state the use of such chemicals is a necessity as biofuel plantations are themselves not sustainable, and because mostly the soil where such plantations are located are poor in nutrients. When linked to agriculture, the output of *milpa* will decrease over time when such chemicals are used, but using solely a machete to manage the *milpa* will result in a peasant being able to only maintain a smaller area which also decreases a peasant's agricultural output. Finally, using slash-and-burn techniques is a fast way to turn large areas in *milpa* or in pasture, enables a peasant to quickly dispose him or herself of natural litter, and is a safe and effective way to get rid of snakes. The way peasants thus manage their land is

highly contingent on how each peasant balances these issues and what logics he or she uses or prioritizes.

It is interesting to see how the environmental consciousness of peasants leads to different practices within the *ejido* and between *ejidos*. The cultivation of cacao, chilli, and pineapple are largely absent in Loma Bonita. Reasons for this is the existence of plagues and difficulties in cultivating these species. However, this environmental knowledge is not an absolute truth that is shared by all peasants and also does not per se rule out the cultivation of these species. Economic benefits may be deemed large enough by some to cultivate such species despite negative environmental circumstances (for example because almost no one cultivates chilli there exists an available economic niche), or the species may be cultivated for aesthetic (the beauty of a patch of forest with large cacao trees) or practical reasons (the cacao trees provide shadow for other species to grow in). Furthermore, as stated the environmental knowledge is not an absolute truth, as can be witnessed in the fact that pineapples and watermelon is regarded as not an ideal practice for this region (also from an economic point of view), while in other *ejidos* with alike circumstances large plantations of these species do exist and therefore one can assume that the peasants there disagree with the logic of peasants in Loma Bonita.

One of the practices criticized both by scholars and by the peasants in this study for its negative environmental consequences is the cultivation of biofuel plantations. In his study on biofuel cultivation in Marqués de Comillas, Castellanos-Navarrete (2015: 142) describes the agency and logic of peasants very well when he states that peasants "know what they do, they frequently know why they do what they do, and often know, though not always, what what they do does." Analysing the practice of biofuel plantations solely in relation to organizations and macro-processes misses the contingency of individual logic. In certain *ejidos* biofuel plantations are by far the most dominant land use practices, while in others this practice is completely absent. Looking at the presence of organizations and analysing macro-processes does not explain such local differences, as all *ejidos* are subject to the same macro-processes and interact with the same organizations. It rather depends on the knowledge peasants hold on their environment that leads some peasants (or some *ejidos*) to start this practice and others to decline or oppose it. With different organizations promoting different practices, and with peasants having their own opinion regarding land use practices, the choice for biofuel plantations is very much contingent on what practice a peasant believes to be most economically efficient in a certain area, which is largely based on his or her knowledge on the environment.

Regarding the second aspect, that of the values ascribed to nature, this is most clearly linked to the choice of certain peasants to conserve (patches of) forest. Since the PES program is not present in Loma Bonita, there is very little to no economic benefit of conserving forest. For the conservation of smaller plots of forest there are often practical reasons given by peasants, such as the maintaining of water sources or to provide cattle with shadow. However, when peasants conserve large parts of forest this is often linked to the aesthetic and emotional value of forest to these peasants. Such values relate to what McAffee (2012) discusses regarding participation in the PES program of peasants. She describes well how the emphasis on rational economic choice in the literature does not and cannot explain why PES is a success in some communities and in others not. "Whether rational or not, (...) peasants often have their own reasons for practising conservation when they are

able to" (McAffee 2012: 118). This does not mean that there do not exist certain factors that influence an individual's or community's choice for participating in such a program. Kosoy et al. (2008) provide a list of key factors they identified regarding this choice, which can be seen in Table 2. The risk of such listings of key factors is that it implies that the participation in a program is the deterministic result of these factors, and that therefore it would be possible to analyse and explain

Table 2. Key factors for PES participation (Kosoy et al. 2008).

	Key factors
Procedural and management levels	– Simple rules – Procedural flexibility – Information outreach levels – Social participation in rules-framing – Effective communication between resource managers, intermediaries and government
Community	– Forest management rules – Collective conservationist values – Consensus around the use of PES income and the allocation of responsibilities – Small community size
Farmer	– Contribution to household income – Consolidate and diversify productive activities – Grant access to research and development projects

why the program will be picked up by a community or not. Such an assumptions is tempting for policy-makers and organizations, because it renders a population measurable and controllable. However, when it comes to understanding the social processes related to the choice of peasants to participate in such programs or not, a study that only focuses on these factors will be indecisive. Analysing the logics of peasants concerning the environment and the PES program adds to our understanding of the social processes leading to rejection of, or participation in the PES program. For example, 'collective conservationist values' is a recognized key factor Table 2. It can be assumed that if these values are completely absent the chance of a community participating in PES will be low, even when other factors in the table are favourable. Conversely, in the case of low monetary benefits (or even in the case of an absence of monetary benefits) a community might still choose to participate based on the presence of such environmental values, resulting in economically irrational behaviour that can only be understood by taking their logic into account.

Participation in a program such as PES, and the practice of conserving forest in itself for that matter, is thus contingent on the environmental consciousness of peasants, but is not limited to only this. A peasant might not have economic interest in cutting the forest at the moment, or it might be economically beneficial to save the forest for future use of the land. The environmental consciousness of peasants is thus one of the key issues regarding the logics of peasants when they choose certain land use practices. The logic of peasants regarding their environmental consciousness can go hand in hand with economic concerns when it leads to a peasant choosing optimal practices, such as maintain their pasture or *milpa* in a way that is environmentally sustainable and therefore leads for a certain extend to economic stability. It can also counter economically rational behaviour when the values ascribed to the environment prevents a peasant from performing certain practices that increases productivity, such as the use of environmentally friendly but labour intensive management techniques.

4.2.3 External events

The reasons of peasants for performing certain practices, or for how they perform a practice, are contingent on external events since these shape the context in which peasants choose their land use practices. One of the most profound events that has influenced the land use change history was the Guatemalan civil war, as this event accelerated the rise of cattle ranching as predominant activity in the *ejido*. However, external events do not deterministically lead to certain practices or affect the logics of all peasants alike. As could be seen in the case of the Guatemalan civil war, other factors such as a peasant's ethical or moral standpoints can lead to him or her dealing with such events differently. Rather than macro-processes like trade liberalization or the presence of organizations supporting the practice of cattle ranching, this practice has mostly been contingent on the Guatemalan civil war that created a context in which peasants saw the opportunity to quickly enable economic growth.

Macro-processes and organizations are regarded as main factors driving land use change in the literature, but when analysing the logics of peasants for their land use practices these too are in fact external events to peasants. The constant flux of organizations entering and leaving the area affects the context in which peasants choose certain practices, as it causes opportunities for peasants to pop up and disappear which they decide to act on or not. Furthermore, the rhetoric of some peasants resembles that of environmental organizations, especially when it concerns the values ascribed to the environment and to the forest. However, this does not mean these organizations have a unilateral effect on the mentality of peasants, if only for the fact that this environmental rhetoric is not equal for all peasants. Much like the Guatemalan civil war, organizations are also an external events with which different individual peasants deal differently. The same argument goes for macro-processes. Whereas De Jong et al. (2000b) understand price signals as part of economic macro-processes that determine the practices of peasants, for peasants themselves such price signals are much like the organizations external events that causes opportunities to come and go. Whether a peasant then decides to act on such price signals is contingent on, for example, whether he or she thinks this outweighs the economic benefits of other practices and is worth it to change his or her current practices.

Another main external event that changes the land use practices of peasants is climate change. The changing environmental circumstances causes peasants to adapt their practices in a way that fits the new circumstances best. This is therefore linked to the environmental knowledge of peasants, as it depends on their knowledge how they react to the increase in heat and decrease in rainfall. It is also linked to the value they ascribe to nature, as many peasants blame themselves for the changing environmental circumstances, such as the increase in wind and in animals that feed on their crops. However, the chaning climate also remains an external event to peasants, as they can do little to the changes in heat and in rainfall, and even can do little now about the decreased fertility of the soil that the deforestation caused. Harvest of corn is already decreasing, and in other *ejido* peasants have made the change from cattle ranching to biofuel plantations due to their cows not fattening enough for cattle ranching to be profitable. If the climate thus continues to change and leads to agriculture and cattle ranching becoming less and less economically viable options, there is a realistic chance the amount of biofuel plantations will increase. Peasants have already stated that they are principally not against this practice if it is economically and environmentally the best option.

Combined with the other two key issues, practices are contingent on whether peasants decide to participate in organizations (such as has been the case with Corredor Biológico) or not (as in the case of organizations promoting biofuel plantations and PES), and on how and if organizations have changed the logics of peasants regarding what practices they believe are best to perform. The example of the confusion surrounding the PES program in this study illustrates well how the choice to participate in a program can be completely contingent on an imagined history, and that such an imagined history can end up being very real in the consequences it has on land use changes. The list of key factors that determine PES participation in Table 1 then shows very well how such a deterministic conceptualization of social change and practices misses the contingency and unpredictability that often underlie the choices and logics of peasants.

The fact I have identified three key issues does not mean that solely studying practices in relation to these three key issues can explain how land use changes are caused. Peasants may draw in their choice for a certain practice on logics that do not belong to one of the key issues (e.g. when their logic relates to personal preference or cultural values). Furthermore, these key issues are not objective indicators that, when the logics of peasants regarding these key issues are studied and understood, can determine causes for land use change. The importance or priority of each key issue in the logic of a peasant affects what practices will be performed. Land use changes are thus contingent on the logic of peasants, and this logic may very well not be regarded as logical for outsiders or even for other peasants. Studying the land use practices of peasants based on an a priori defined framework that seeks to explain land use changes through certain rigid factors, leads to a conceptualization of practices as deterministic actions and consequently does not, and cannot, acknowledge how the choices of peasants for certain practices is contingent on their logic. However, this does not mean that macro-processes and organisations are not influential factors, since they clearly are, but it rather means that they should not be taken as centre of study, nor should they be overvalued as main drivers for land use change.

5 Conclusion and discussion

This thesis has studied the micro-processes in the *ejido* Loma Bonita through a combination of ethnography and cartography methods, and through applying the concept of logic in analysing the land use practices. In doing so, this thesis has shown that cause-and-effect relations between government policies and programs, and the practices of peasants is much more nuanced in reality. In the following section, the conclusion, the research questions will be answered and the main findings of this thesis will be discussed. The discussion focuses on the contribution of this thesis to the academic knowledge on land use change and to the larger academic debate related to contingency.

5.1 Conclusion

In analysing land use change in Marqués de Comillas much of the literature focuses on general trends and on macro-processes and organizations as the two main drivers for land use change. Practices are consequently regarded as deterministic courses of action by peasants, resulting in land use change being studied according to a predefined framework. The large land use change trends are identified in cartographic maps with a small scale in order for the map to cover the entire region, and with a limited categorization so that deforestation and land conversion trends can be clearly visualized. When land use change is analysed on a large scale and through a predefined framework the local dynamics are missed, while these provide much information on the intricacies of social drivers for land use change (Lambin et al. 2001; Reenberg 2006). As argued in this thesis, such analyses do not provide information on how and why peasants choose to perform certain practices, and why it has not been otherwise. The micro-processes of land use change, and the logics and agency of peasants are largely overlooked, which limits our understanding on how socio-environmental processes affect land use change. This thesis aimed to contribute to the knowledge on landscape dynamics in agro-forest frontier areas. It did so through studying the micro-processes and the logics of peasants in a single *ejido* through a combination of ethnography and cartography. In pursuit of the objective of this thesis, the following research questions were posed and answered:

1. What are the logics of peasants in choosing certain land use practices?
2. How do these logics add to our current understanding of land use change in Marqués de Comillas?

Regarding the first research question, the analysis of the logics of peasants has led to the identification of three key issues to which the main recurrent logics apply, which are listed in Table 3. Most of the logics of peasants regarding their choices for certain practices deal with the following three key issues: 1) politico-economic concerns, 2) environmental consciousness, and 3) external events. The choices for land use practices and thus the landscape dynamics are largely contingent on how peasants deal with these three key issues: how they balance the issues out against each other and what their logics are regarding each issue. For instance, regarding the first key issue in Table 2 a peasant might prioritize his or her strive for autonomy over a pursuit for economic growth, leading to a practice that is economically irrational. Also, the choice of a peasant to not convert parts of the forest into pasture, for example, can be the result of prioritizing logics related to environmental consciousness over logics related to politico-economic concerns. When it comes to choosing (how to perform) a certain land use practice, this is thus contingent on what logics a peasant deems more important regarding each key issue, and on how much weight a peasant places on each key issue.

Furthermore, placing logics at the centre of study also enables the recognition of what practices are (or have been) important in the historical landscape dynamics. Whereas colonization is regarded a macro-process in the literature, based on the logics of peasants this thesis has found that it has been a practice which peasants performed.

The list of logics ascribed to each key issue is in no means exhaustive or global applicable. As stated before, practices are situational and thus the landscape dynamics as well. However, the key issues themselves might be applied to other regions when studying landscape dynamics. They correspond to the 'events' Lambin et al. (2003) identify in their narrative approach as main events that influence land use changes. In the following section I will elaborate on that approach, and on the added value of the identification of key issues in this thesis to that approach for understanding the socio-environmental causes of landscape dynamics.

Table 3. Key issues on which landscape dynamics in Loma Bonita are contingent, and the logics that relate to each key issue.

Key issues	Logics
Politico-economic concerns	- Strive for autonomy - Economic growth - Governmental distrust - Social status
Environmental consciousness	*Knowledge on nature* - Best practice for that area - Environmentally sustainable management *Values ascribed to nature* - Aesthetic value of nature - Environmental value of nature
External events	- Guatemalan civil war - Price changes - Continuous flux of organizations - Climate change

Regarding the second research question, the main contribution of studying the logics of peasants is that it shows that land use change is not a deterministic process or phenomena. Rather, it is contingent on the agency of individual peasants, and on how this agency articulates with the structures present in a specific area and moment in time. Analysing the logic of individual peasants shows that the practices of peasants are not part of rigid strategies aimed at clear end-goals, but that they rather are a continuous process of readjusting to the changing context, based on a sort of 'feel for the game'. Land use change is thus much more contingent on the logics of individual peasants than a deterministic and predictable result of certain key drivers. Also, through performing ethnographic research that places practices and the logics of peasants at the centre of study enables a different understanding of the role or nature of certain macro-processes and of organizations. Firstly, the colonization of the region is in the literature regarded as a macro-process that has caused a change in the landscape, while from the point of view of local peasants colonization has been a practice with a certain logic in itself. The history of the landscape dynamics then turns out to be locally contingent on how individual peasants went about in colonizing and creating a settlement in the region. Secondly, from a local perspective organizations are not unidirectional factors that

influence peasants and change practices, but are part of the context for peasants in which they form their logic to perform certain practices.

Through analysing the logics of peasants regarding their land use practices and identifying three key issues on which landscape dynamics are contingent, this thesis has contributed to two objectives of the international academic research program FOREFRONT (Nature's benefits in agro-forest frontiers: linking actor strategies, functional biodiversity and ecosystem services), namely 1) to identify and understand the ecological and social drivers that shape agro-forest frontier landscapes and their ecosystem services; and 2) to explain temporal changes in the social-ecological system and their consequences for landscape configurations. While this thesis analysed the same land use changes that are covered in the academic literature on the same region, it resulted in a different understanding of what the socio-environmental causes are for land use change and how these have influenced the practices of peasants. It thus shows how we can obtain a more comprehensive image of landscape dynamics when these are studied on different scales, with different focus, and based on different sources. Furthermore, through analysing the logics of peasants regarding their practices, this thesis found that the role of agency is very important to understand how socio-environmental processes steer landscape dynamics. These points are discussed more in-depth in the following section.

5.2 Discussion

5.2.1 Adding logics and contingency to Land Change Science

This thesis contributes to the international academic research project of Land Use and Land Cover Change (LULC) and to the more recent interdisciplinary effort of Land Change Science (LCS). One of the objectives of LCS is to study how human-environmental processes cause land use changes (Turner et al. 2007). The academic knowledge on land use changes depends on the scale and focus of study, and on the source on which a study is based. Large scale studies can identify land use trends well and analyse the larger context and processes that influences locales. However, this study has shown that in and between locales there exist considerable differences in practices, and these local dynamics are missed when locally located studies are not performed. Land use maps that cover a large area visualize the simplifications that are often inherent in large-scale studies, as these maps tend to have a limited categorization of land use and land cover types. A larger scale therefore inclines studies to only focus on general trends, and to analyse phenomena according to a limited set of factors. The focus of a study thus defines how land use change is conceptualized and understood. When land use changes and practices are analysed according to a predefined framework that focuses on certain specific factors, the analysis leaves a whole range of possible relevant factors outside its scope. Simplifying reality through delimiting a study by analysing certain factors is not per se a flaw, as reality is often too complex to be studied holistically. The pitfall of analysing practices according to a predefined framework (such as is the case with the focus on macro-processes and organizations as key driving factors), is that causal relationships are then sought or created between land use change and these factors (Sertel 1982; Mayntz 2004).

By placing practices and the logics of peasants at the centre of study, this thesis prevented the a priori framing or delineation of land use change. Rather, it analysed the logics of peasants in their stories on why they perform certain practices, and based on these logics it identified three key issues

on which the landscape dynamics are largely contingent. This way, this thesis regarded the peasants as a primary source of information for understanding land use change. In doing so, it showed that the source of information on which a study is based leads to a different understanding of landscape dynamics. The imagined history regarding the PES program in Loma Bonita has shaped the opinions of peasants on this program and formed their logic on why they do not participate. This can only be known when the knowledge of peasants is regarded as source of information, and therefore given considerate attention through for example the use of ethnographic methods. When this is not the case, it might result in researchers obtaining 'wrong' information when studying peasant's opinions on PES, since peasants mix up their experiences with several programs. To fully understand how and why peasants make certain choices regarding their land use, the peasants themselves should be regarded as primary source and their logics not be restricted according to preconceived ideas. Furthermore, when studies draw in their analysis mainly on data from organizations one should keep in mind that this data does not per se correspond to the reality of land use change in locales. The distrust of peasants towards the government leads to peasants that possess knowledge on land use changes and practices to not share this knowledge, or even hide this, from governmental organizations.

This thesis thus underlined the importance of studying landscape dynamics on different scales, with different focus, and based on different sources in order for LCS to more holistically understand landscape phenomena. Lambin et al. (2003) recognize three main perspectives through which land use changes are historically analysed, these three being an agent based perspective, a systems perspective, and a narrative perspective. This thesis adds to the third approach, the narrative approach, by confirming the academic validity of that approach and by suggesting how that approach can embrace a less deterministic stance in order to study the contingencies in landscape dynamics.

From the logics of peasants three key issues have been identified in this thesis that account for much of the land use changes: politico-economic concerns, environmental consciousness, and external events. Interestingly, these three key issues closely resemble the three events Lambin et al. (2003: 230) mention that often significantly affect land use change according to the narrative perspective, which are "changing political economies, environmental feedback on land use, and external shocks." The fact that both the narrative perspective and this thesis identify the same three main events/key issues that can account for most land use changes, underlines the academic validity of the narrative perspective and also of conceptualizing land use change and practices through the use of logics. Furthermore, it confirms the importance of the three events/key issues for understanding land use change. What this thesis adds to the narrative perspective relates to the difference in wording between 'key issues' and 'events'. With 'key issue', the exact nature of the logics of peasants that leads to certain practices is left open to allow for the peasant itself to define it. Purposely it was not termed 'factor', because that term inclines the idea that the three key issues are clearly distinct from one another, and that the relationship between the practice of a peasant and the key issue is unilateral and deterministic. The logics of peasants explain why they do what they do, and these logics often relate to the three key issues. This does not infer a causal relationship, but rather underlines the contingent nature of land use change as each individual peasant has its own logic in relation to the three key issues (let alone logics related to preference or culture, which are not included in the three key issues). Searching for 'events' to explain land use changes, as is the case in the narrative approach, leads to a focus on empirical or 'real' phenomena to understand land use

change. However, this first of all infers that events precede thoughts or action, and secondly it seems to overvalue singular events or 'shocks'. The values ascribed to forest by several peasants in this thesis partially stems from their experience and life in the region before it was colonized and cultivated. Neither their life in the region before colonization nor the colonization itself is an 'event'; there is no clear begin or end of either one. Also imagined histories have proven to affect the logics of peasants, and consequently affect the local landscape dynamics. Using a term such as 'key issue' enables a less deterministic and causal analysis of practices, and in doing so allows for an analysis on why peasants perform certain practices and thus on the contingencies that have led the landscape dynamics to have taken a certain form.

5.2.2 The contingency versus determinism debate

The problem identified in this thesis is that land use practices are often conceptualized as the result of deterministic cause-and-effect relations with specific factors. Following this logic, studying these factors leads to an understanding of land use change. Such analyses take an approach that fit the models of rationalism and institutionalism (Arts et al. 2014), which assume that actions of peasants are preceded and determined by a given structure (formed by organizations and macro-processes), thereby dismissing the agency of the peasants themselves. This thesis has used the information of these studies to understand the context in which the land use changes take place. While using the information regarding the social structure or context in the region, the focus of this thesis was on the role of agency of peasants. In doing so, it created a type of 'counter narrative' to explaining landscape dynamics, which shows that a conceptualization of practices and change through determinism does not and cannot explain why practices and changes have followed a certain trajectory.

While macro-processes and organizations do partially set the context that influences the land use changes, to conceptualize the practices of peasants as deterministic result of such factors is an oversimplification of the complexities that are involved in understanding the landscape dynamics. The agency of peasants is absent in much of the literature or given very limited consideration. However, it has become clear from the case study in this thesis that peasants take various factors into account, and that each person gives a different meaning to, or places different weight on every factor. Every individual person has its own logic regarding issues such as nature conservation and autonomy which consequently leads to different outcomes in the choices for land use practices. Structure thus does influence decision-making processes of peasants and their logic regarding their practices. It is, however, in the relationship between structure on the one hand, and peasants and their practices on the other hand where I disagree with the determinist accounts of land use change. The deterministic literature sees structure as preceding the practices of peasants, resulting in a unilateral cause-and-effect analysis in which land use changes are linked to key factors of the existing structure. In this literature peasants tend to resist the present structure (e.g. through illegal logging), but this resistance is still regarded as a reaction on, or a result of, the existing structure. By looking at practices through such a lens, it is believed that action can be studied in terms of cause-and-effect relations with specific aspects of the existing structure. Consequently, this leads to the structure being adapted to reach a desired outcome (read, desired practices). Peasants then maintain to be ascribed an identity of being a controllable subject, and consequently phenomena such as land use change as something that is deterministic and predictable.

To show that structure is not all-encompassing, I have focused primarily on researching the agency of peasants. Whereas the deterministic literature is mainly based on remote sensing data and historical institutional analysis (with a focus on organizations and macro-processes), this research is based on the narratives and stories of the peasants themselves. Analyzing the logics of peasants in their stories, organizations and macro-processes turn out to not be key factors but rather one of several factors that peasants take into account. Furthermore, the relationship between these factors and the choices of peasants for certain practices is not unilateral. Peasants actively pursuit certain goals or dreams (Scott 1998), and in that pursuit make use of the means available to them in a way they seem fit according to their logics. In the case of programs, this results in peasants declining certain programs, complying, and in them selectively using certain aspects of a program or participating for only a limited time to make progress regarding whatever end they are pursuing at the time. Studying this agency of peasants, the entire process of colonization and the land use transition from forest to pasture turns out to be far less determined by structure than one would expect from the contemporary literature. The macro-processes that allowed colonization and the governmental organizations in the region did influence the land use changes, but the exact shape of the landscape dynamics has largely been the result of individual action based on peasant logic. This underlines the importance of the scale-specificity of studies; the literature that takes a more deterministic approach tends to be large-scale which results in a focus on macro-structure dominating over micro-agency.

While I have focused on the role and importance of studying individual agency to understand the causes of landscape dynamics, I do not wish to argue that structure is of no influence or that structure and agency are mutually exclusive. Bourdieu argues that practices are the result of an interplay between structure and agency; there exists a given structure that sets certain boundaries, but within that space people can deploy their agency in following different courses of action. Lambin et al. (2001) argue that for a more comprehensive understanding of the socio-environmental causes of land use change it is necessary to study both the micro-agency of peasants and the macro-processes that frame the larger context. Through studying the micro-agency of peasants in a certain locale in relation to the studies that analyzed the macro-processes in the same region, this thesis already visualized some of the discrepancies that result from a different focus regarding how land use change is explained. It showed that the landscape dynamics in a specific locale are the contingent result of the micro-agency of individual peasants within the larger macro-structure. To further understand how the socio-environmental processes that drive land use changes are contingent rather than deterministic, I briefly discuss three possible approaches for future research in the following sections.

5.2.2.1 Comparative case studies

If more studies on micro-agency in specific locales are performed, then the importance of acknowledging the interplay between agency and structure can be stressed. This can be done in two ways. Firstly, comparative case studies can be performed between locales that are subjected to the same macro-structures. In the research conducted for this thesis peasants already hinted at considerate differences between locales, while this was not always due to a clear difference in context. For example, the difference in biofuel plantations between *ejidos* was explained as the result of environmental differences, while for the difference in pineapple plantations the reasons remained unclear. Studying the logics and agency of peasants regarding their practices in different

locales can thus show how practices are not the deterministic results of a given structure, but rather the contingent result of micro-agency within a macro-structure. This relates to the analogy given by Arts et al. (2014) between practices and performances (such as theater plays). Even when the scripts of the performance is the same for each play, and when the attributes etc. are the same, every play will be unique due to the reshaping of the script through human improvisation and (re)interpretation. Thus, comparative case studies of locales to which the same structures apply can stress the unpredictability in social change due to the role of micro-agency. Secondly, comparative case studies can also be performed between locales that are not part of the same structure to stress the role of human improvisation in very different contexts, and to add to the identification of global patterns in social change and in land use change.

Using participatory mapping (or community mapping) methods, the specific land use practices and the micro-processes in local landscapes can be visualized. While in large-scale maps the differences in land use between specific locales are often limited or absent due to the limited land use and land cover classification in such maps, in such local maps these differences can be visualized and studied accordingly. Based on these maps, it is possible to identify differences in land use trends and consequently to study the logics of peasants that underlie these differences. Using participatory mapping methods furthermore provides information regarding aspects such as status (what practices are deemed important enough in each locale to be included in the map), distrust (what knowledge is shared on the map), and strategies or trajectories (how and why did peasants go from land use type A to land use type B). In the research conducted for this thesis it turned out to be impossible to create a map with a future scenario based on the plans of peasants. The main reason was because most peasants did not have clear ideas what their plans were, and when they did have an idea the time-scale in which they would act on their plans remained vague. Another reason was related to the time constraints of my research. Future research therefore may be able to create and compare such future scenarios, which can produce interesting results regarding the priorities or objectives of peasants and the way they use the existing structure in their pursuit of these objectives.

5.2.2.2 Bourdieu's concept of *habitus*

While I mentioned the concept of habitus in the conceptual framework to stress the role of micro-agency within a macro-structure, this thesis has not operationalized the concept itself. Operationalizing habitus means to study and redefine structure itself, and explain practices as an interplay ff this structure with agency. I focused in this thesis only on agency; more specifically, this thesis focused on the way logics of peasants relate to the existing structure in a specific locale. Comparative case studies can show the linkage between agency and structure as argued in the previous section, but there it is again only focused on studying the agency of peasants while adopting the structures outlined by literature such as in Section 1.2. It can provide interesting information if practices are studied trough a focus on the interplay between agency and structure in the same locale. Bourdieu provides a tool for such an analysis through the concept of habitus. While external structures shape an individual's habitus, it does not steer practices according to a mechanical determinism. Habitus is formed and restricted by an objective structure, but also by the subjective presence of past experiences and anticipation. In this way the concept of habitus goes beyond thinking in dichotomies of structure/agency and determinism/free choice. Instead, it enables a more comprehensive understanding of the role of contingency in practices as it acknowledges the myriad

outcomes of an individual's subjective experience and observation of reality in relation to (past) structures that restrict or steer action. The relation between agency and structure in the concept of habitus is not one in which they affect each other; the boundaries between the two become fluid or transparent as they co-produce each other, resulting in habitus being an amalgamation of agency and structure.

Studying how the past experiences, the embodied histories of peasants, the ambitions of peasants, and the current external structures relate to each other and result in specific land use practices, shows how landscape dynamics are the result of complex and local socio-environmental processes. A study of the external observable structures, such as organizations and macro-processes, overvalues an objective determinism that it actively creates itself, and therefore misses the subjective agency of individuals. The example in this thesis of the imagined history of peasants with the PES program shows perfectly how structure can be a subjective construction of past experiences, a structure that can never be witnessed through an scientifically objective study of the 'real' structures present in the region. Consequently, practices will not be studied according to this past experience as this was deemed unthinkable since the experience never existed from an outside perspective. To quote Bourdieu (1990a: 55): "Nothing is more misleading than the illusion created by hindsight in which all the traces of a life [...] appear as the realization of an essence that seems to pre-exist them." This means that studying the current and past land use practices through a historic lens of programs and macro-processes will inevitably lead to the illusion of a mechanic type of determinism that can account for all landscape dynamics. In correspondence with the goal of LCS to enhance our understanding of landscape dynamics through studying how macro-structures and micro-agency steer land use change, I would suggest that habitus is a concept with interesting potential in land use change sciences because it combines the two and centres the study on the process of practices itself.

5.2.2.3 Scott's concept of *mētis*

The concept of mētis that James Scott discusses in the book *Seeing Like a State* relates to issues of determinacy and simplification. The concept is used by Scott as a tool to analyse the practical skills of people, the know-how or common sense regarding a certain topic that a person obtains through practical experience. These practical skills and practical knowledge are acquired through interaction with an ever-changing context, and in turn helps a person to adapt to the changes in the social and environmental environment. Scott relates it to the Greek mythology from where the term originates, where the term refers to the skill of Odysseus to adapt to new situations and to understand and outwit his opponents. In this sense the concept can be related the land use practices of peasants and to how one analyses the relation between structure and agency. As organizations come and go in the region and the social and political structures continuously changes, peasants grow used to changes in context. Consequently they use the programs in a way that is to their advantage (without giving up values such as their autonomy), and in a sense thus outwit these programs, which corresponds to the concept of mētis.

Scott relates mētis mostly to physical practices; it focuses on the skills a person regarding a practice that cannot be taught or technically explained but only understood as a kind of 'feel' a person develops through performing that practice. Practical knowledge is thus always locally situated knowledge. Following this logic, attempts to understand changes in land use practices through a

focus on certain rigid factors is a simplification which misses the particularity of such situated knowledge while this is essential to understanding a practice. Focussing merely on general trends in land use change without a consideration of the particularities of every single case of land use change - much like the necessity that McCarthy & Prudham (2004) stress regarding the need to acknowledge and study the particularities of each case of neoliberalization, rather than studying neoliberalization as grand process in itself - will therefore likely lead to "practical failure, social disillusionment, or most likely both" (Scott 1998: 318).

Using mētis to analyse land use changes furthermore enables an interesting new angle in studying such phenomena. The concept firstly implies that the holder of certain practical knowledge is an expert regarding that practice, and secondly that the phenomena related to land use change are so complex and uncertain that it is necessary to trust on the experienced intuition of peasants. What this means is that instead of understanding land use change as the result of certain structures which we can study, that these changes are the result of practices that peasants choose based on a practical knowledge which is located "in that large space between the realm of genius, to which no formula can apply, and the realm of codified knowledge, which can be learned by rote" (Scott 1998: 316). Alike using the concept of habitus, it means a focus on individual agency within a certain structure and the necessity to acknowledge the particularities of a specific case for understanding the complexities driving landscape dynamics.

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Annex I – Local land use maps

This Annex contains the local land use maps created through participatory mapping. Figure 6 shows the blank map, with information regarding the compass rose and some explanations of the map to guide the reader. In Figure 7 the legend is provided for the maps in Figure 8 until Figure 14. Only in Figure 8 the small rivers and creeks are included, making this the most accurate map of the series. Also for this map the land use on the island is illustrated. Reason that in the other maps this has not been illustrated was due to time constraints of my research.

When in the map certain colours are illustrated in a striped pattern (aside from the striped black and white pattern which represents cacao trees), this means two things. Firstly, it indicates that it is not known exactly where certain types of land uses are located, but that the concerned land use types are present in that area. The thickness of the stripe of each colour indicates how these land uses relate to each other in terms of size. Secondly, it also indicates change. Most maps cover not a single moment in time (unlike maps based on aerial photographs and satellite images), but rather a certain timeframe. In these timeframes peasants have changed practice, or in their land use practice have changed the land cover (e.g. expansion of pasture through deforestation). The thickness of each coloured line indicates how prevalent this land use or land cover has been in that timeframe. For instance, in Figures 10 and 11 it can be seen that generally the line corresponding to pasture is much wider than the lines corresponding with *milpa* and forest. This is because in these timeframes forest got cut down after which *milpa* was only cultivated for generally 1 year. After this it was turned into pasture which it remained to be. Thus, over the full course of this timeframe pasture has been a much more present land use type than forest and *milpa*. The timeframes cover either 5 or 10 years; this has been dependant on the information given by the peasants. In certain periods the landscape has undergone a much more rapid change than in other periods of time. For example, Figure13 cover the period of time of 1975 until 1980. Despite this map not showing any change, this is interesting since it shows that the landscape only started to really change after 1980. Also, peasants do not remember exactly when what happened, but they do remember the state of affairs concerning the landscape for certain years (e.g. because they returned from to the region after having lived somewhere else for a few years, or because of other events in their lives). Based on such information timeframes are chosen that best capture the stories and knowledge of the peasants.

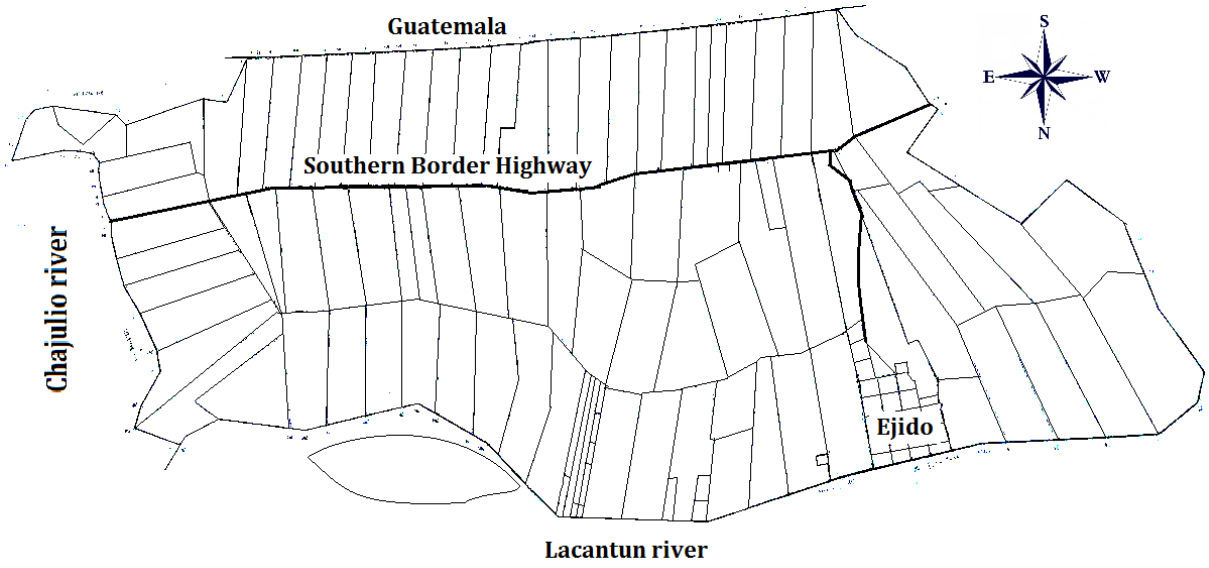

Figure 6. Outline of the *ejido* map with information regarding the compass rose and the surroundings.

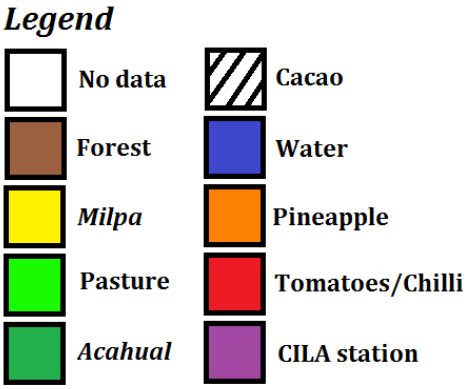

Figure 7. Legend explaining the colours used in the local land use maps.

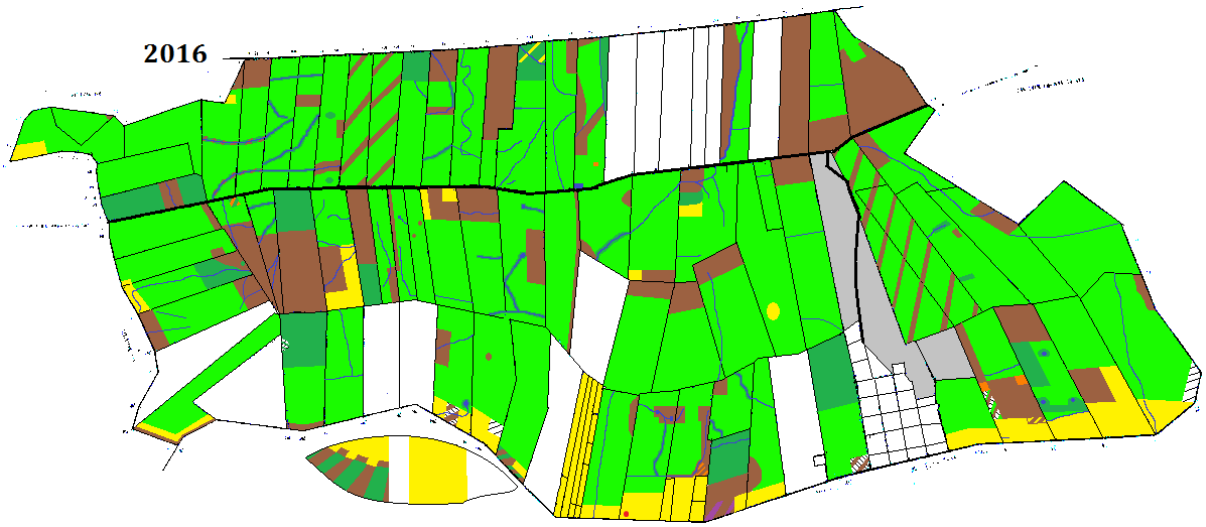

Figure 8. Local land use map of the current state of affairs in the year 2016.

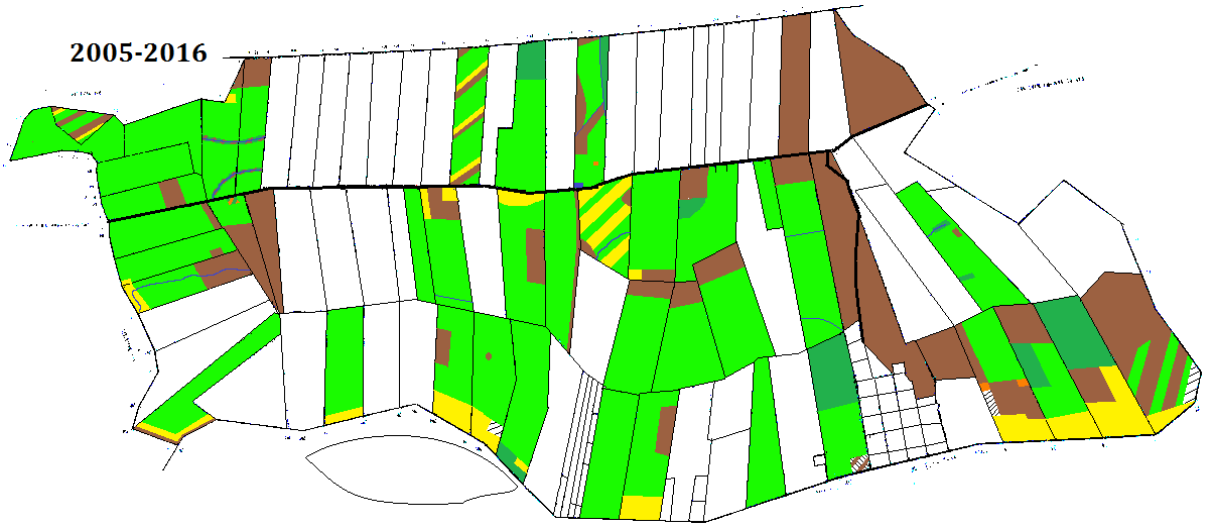

Figure 9. Land use map covering the period of the year 2005 until 2016.

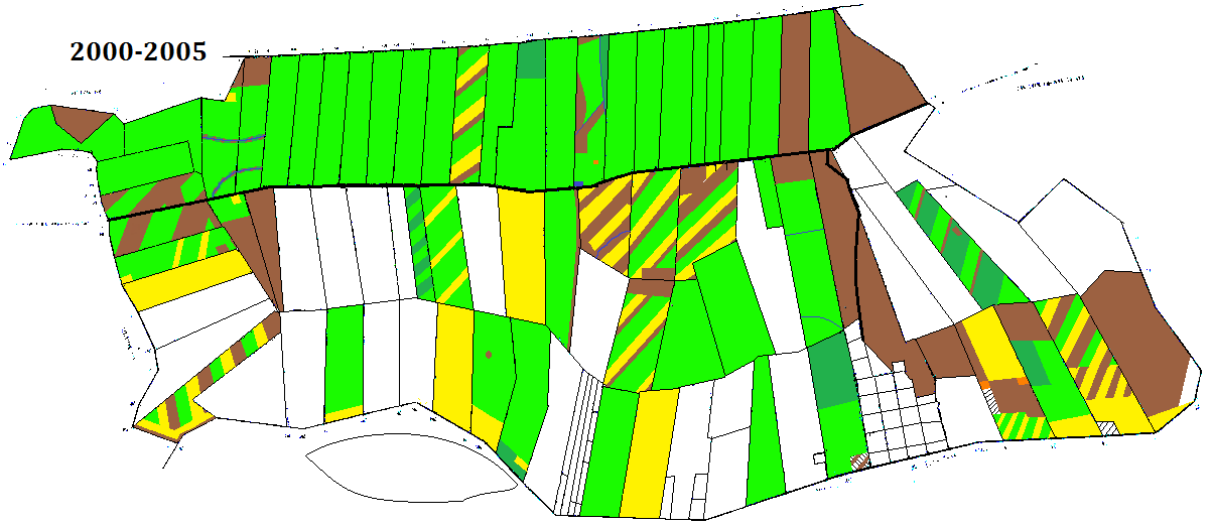

Figure 10. Land use map covering the period of the year 2000 until 2005.

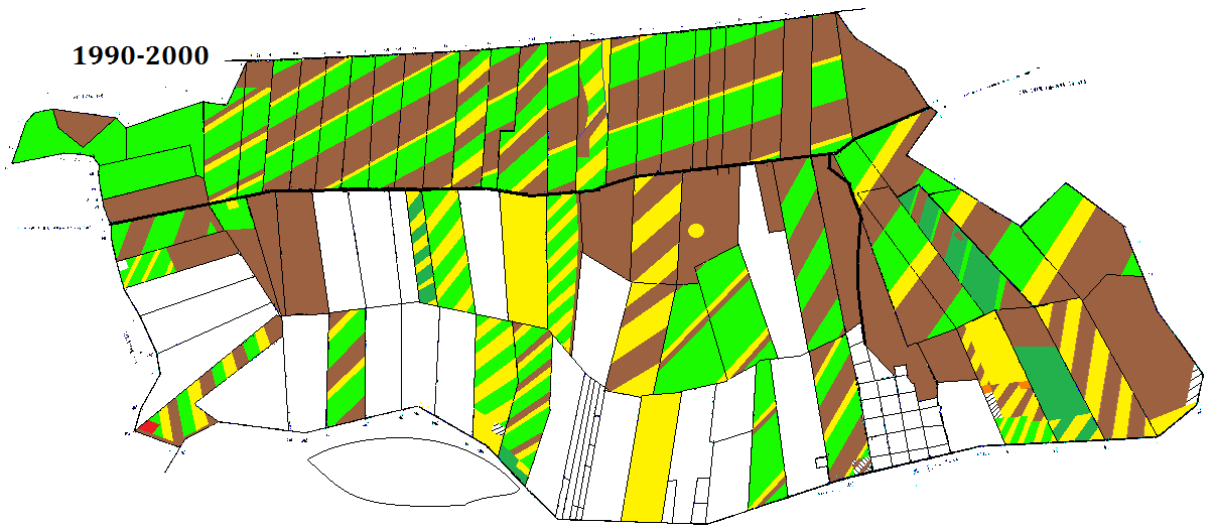

Figure 11. Land use map covering the period of the year 1990 until 2000.

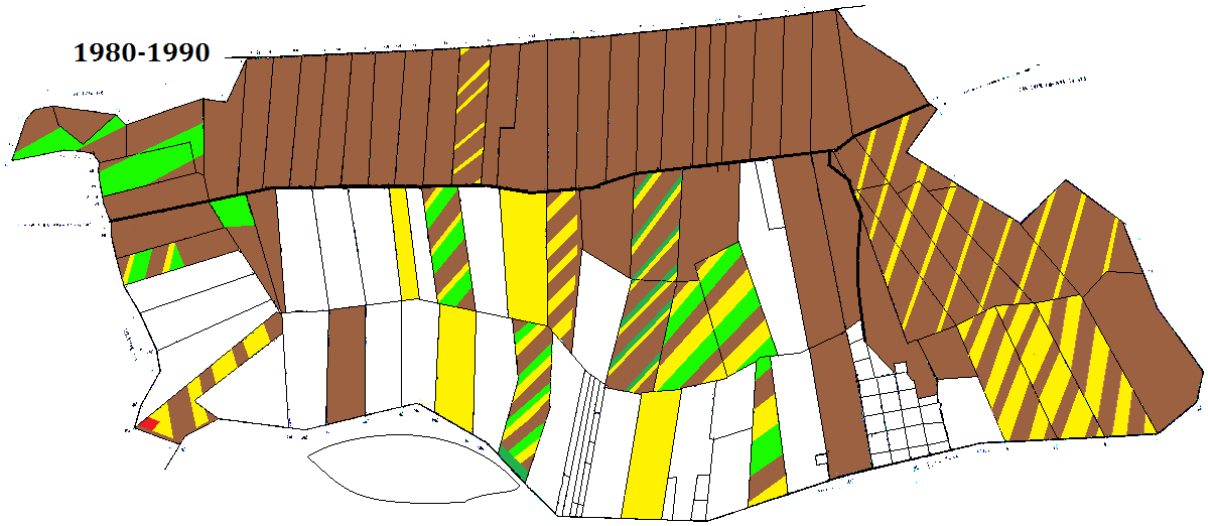

Figure 12. Land use map covering the period of the year 1980 until 1990.

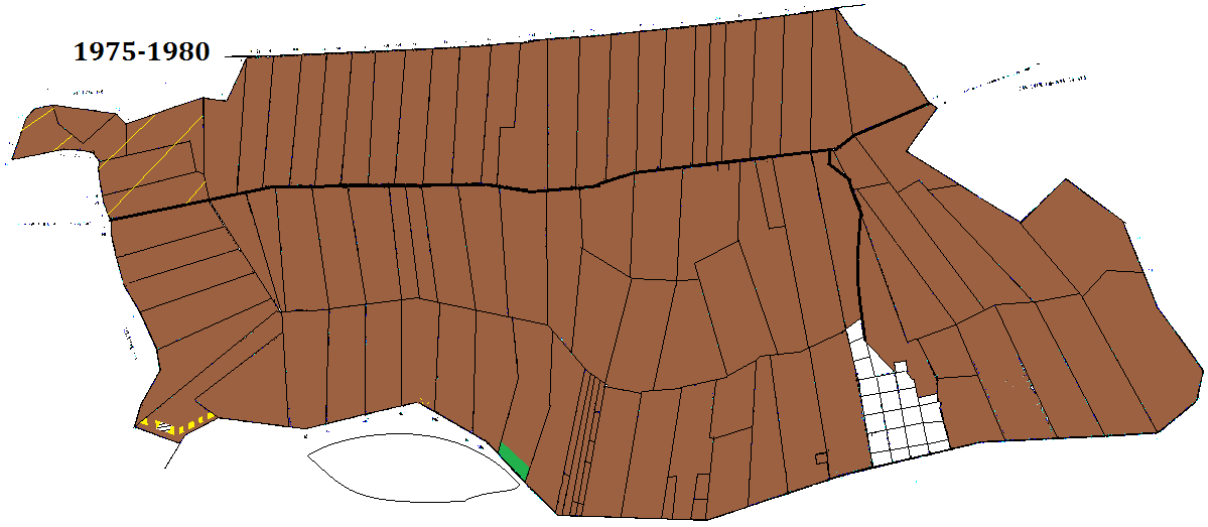

Figure 13. Land use map covering the period of the year 1975 until 1980.

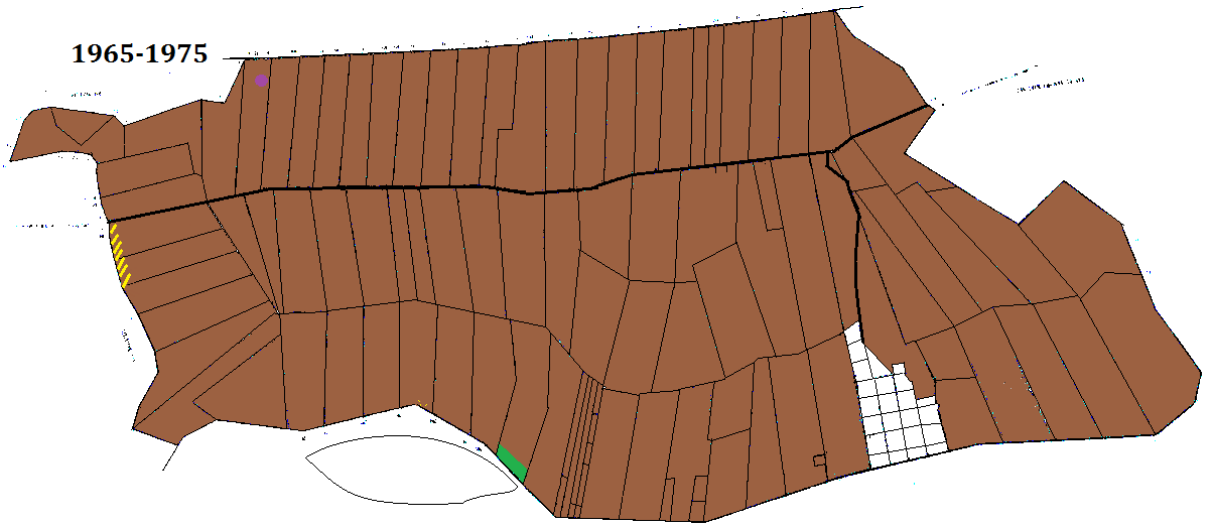

Figure 14. Land use map covering the period of the year 1965 until 1975.