THE EFFECTS OF MONOCULTURE TREE PLANTATIONS ON SMALL FARMERS’ LIVELIHOODS IN THE MEDITERRANEAN REGION OF CHILE

By

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To my parents; Cecilia and Agustin
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THE EFFECTS OF MONOCULTURE TREE PLANTATIONS ON SMALL FARMERS’ LIVELIHOODS IN THE MEDITERRANEAN REGION OF CHILE

By
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The following study focuses on small farmers living in the Mediterranean region of Central Chile, specifically in the so-called Secano Interior of the Biobio administrative region. This region has been proclaimed as one of the most successful cases of forest plantation expansion, a model characterized by high revenues and diverse associated benefits (Lara and Veblen, 1993; Miller, 2014; FAO, 2010) where the establishment of forest companies and their respective plantations has been encouraged, especially around small towns and rural communities with high levels of socioeconomic vulnerability (Contreras, 1988).

However, local actors, including individuals, families, NGOs, neighborhood councils, among others, argue that the socio-cultural, economic and environmental implications of plantations’ expansion go far beyond the macro-economic figures provided by the Chilean Timber Corporation (CORMA) and other institutional reports. These issues include land grabbing, social and territorial isolation, loss of biodiversity, changes in the landscape, increase in wildfires, water scarcity, rural-urban migration growth, and traditional agriculture loss.
Using landscape perception test, social network analysis and semi-structured interviews this research examines factors and implications associated with the social dimension and subjectivities affected in these rural households. It also focuses on a wide sample of rural configurations in the Mediterranean region of Chile, encompassing the diversity of socioeconomic and ecological realities found in the region. The objective behind this is to compare socio-environmental scenarios with diverse levels of plantation dispersion and magnitude, although sharing same macro ecological, cultural and economic characteristics. At its core, this research assesses the sociocultural dimension of monoculture plantations’ expansion, focusing on livelihood elements such as social structures, knowledge, adaptation strategies and landscape perceptions of small farmers’ households inhabiting the region.

The results show a transversal agreement about which landscapes are considered more and less ideal for local producers having industrial forest plantations as the most rejected choice and production diversity as the most approved. Also, social networks shows how the level of encroachment due to forest plantations is associated with certain trends in networks metrics and attributes. Finally, ethnographic narratives show how respondent’s socioeconomic and environmental vulnerabilities are linked to the establishment and expansion of local monoculture forest plantations.
CHAPTER 1
INTRODUCTION

During the last 40 years, tree plantations have become more expansive around the world, both in number and in size (Gerber, 2011). At the same time they have progressively become an important debate topic not only at the institutional and academic context, but also for the general public. This escalation in the international environmental and socioeconomic agenda is sustained not only in particular local conflicts, but rather in the explosive process of global expansion itself (FAO, 2010; Gerber, 2010; Rudel, 2009; Schirmer, 2006).

Plantation expansion has had diverse socio-environmental implications that are being studied around the world by scientists from multiple disciplines. In the current context of global environmental uncertainty, socio-political movements and economic dynamism, any process of that magnitude requires this level of attention, especially from a discipline like anthropology, with a holistic approach and constantly integrating diversified knowledge and questions.

For example, these 'new ecologies', as presented by political ecologists, have raised questions about inequalities to resource access and its implications on the sustainability of the particular livelihoods that surround these plantations (Robbins, 2004). This is especially relevant in the context of developing countries, where interactions between the State and the private sector are often embedded in economic, politic and social tensions (Peet et al. 2011). This growth in, not only planted surface, but also in their regional economic role, has positioned forest plantations in a complex spot. The debate has evolved from issues such as decline and scarcity, to questions
such as: what kinds of ecologies are being produced, by whom, and to whose benefit and/or detriment?

The present research focuses on these processes from an anthropological approach, it seeks to link the multiple factors that are at stake at the local level but strongly influenced by larger-scale events. In order to accomplish this, this study is rooted in several theoretical and methodological perspectives that transcend different disciplines with the objective of providing a broad context and exploring the daily implications of forest plantations and their expansion in the life of people in a real world scenario.

Research on the socioecological, economic and cultural impacts of monoculture plantations on small farmer’s communities is not new (Rudel, 2009; Bull et al., 2006), it has been mainly focused on Europe and Oceania (Slee, 2006 and Fairweather & Swaffield, 2003), especially the case of Australia (Barlow & Cocklin, 2003; Leys & Vanclay, 2010; Schirmer, 2007; Tonts & Black, 2003). Australia was one of the first regions to confront high levels of land degradation, massive monoculture plantations, and small/medium farmers. Most of the research focused on the same local problems; changes in land use, land grabbing and dispossession, water scarcity, wildfires, loss of agriculture and social cohesion. In the last decades these same issues have been progressively recognized in Africa and Latin America, which is consistent to the development and consolidation of the industry in the region.

The Chilean case shares most of this issues observed in other regions with similar socioeconomic and environmental characteristics (Contreras, 1989), although it attaches particular historical, political and economic factors that constructs a very
interesting case where power plays an essential role. Hegemonic power relations and inequalities rule the dynamics between people and natural resources at multiple scales. The monoculture forest expansion in Chile, mainly controlled by an elite group, is one of the best examples of this, and it represents an essential source of socio-environmental scientific knowledge, aimed to understand causes and effects, but also, generate strategies and actions.
CHAPTER 2
FOREST PLANTATIONS, GLOBAL AND LOCAL

What Is a Forest?

Before presenting figures about the expansion and the state of the art of plantations around the world, it is fundamental to go over some definitions: What is a forest plantation? Should we call it forest? Are there alternatives to this concept? This is a fundamental step in order to comprehend the basis sustaining the discussion about the implications associated with forest plantations.

One of the most commonly used definitions for forest and forest plantations comes from the Food and Agriculture Organization (FAO). This organization has struggled with these definitions through time, especially since 1980 when the Global Forest Resources Assessment (FRA) program began to collect statistical information on the classes of ‘natural forests’ and ‘plantations’ (FAO, 2006). Since then, the program has constantly introduced and eliminated concepts, acknowledging the enormous range of forest conditions, especially in the context of human intervention. In FRA (2000) “forests plantations” are defined as:

Those forest stands established by planting or/and seeding in the process of afforestation or reforestation. They are either of introduced or indigenous species which meet a minimum area requirement of 0.5 ha; tree crown cover of at least 10 percent of the land cover; and total height of adult trees above 5 m (p. 23-24).

Beyond the technicalities, it is important to highlight the human factor and the distinction between introduced and indigenous species. In relation to the first point, “human made forests” or “artificial forests” were considered synonyms for forest plantations as defined in FRA 2000 (FAO, 2002). Also, in FRA (2010) the ‘plantation’ concept used in previous global assessments was also revised, the argument was that
‘planted forests’ is broader than forest plantations in the sense that it captures all planted forests and: “is in line with the recommendations of the Global Planted Forests Thematic Study 2005 (FAO, 2006) and recent efforts to develop guidelines and best practices for the establishment and management of planted forests” (FAO, 2010: 90).

However, during this ‘definition transition’ the concept of ‘forest’ by itself has never been questioned, which is an essential part of the ongoing conceptual debate. Diverse social and environmental movements, NGOs and other groups (World Rainforest Movement, Via Campesina, GRAIN, etc.) criticize the use of the concept ‘forest’ by FAO in the context of plantations, they argue that this definition: “reduces a forest to any area covered by trees, discarding the structural, functional and biological diversity of non-tree elements that make up a forest, as well as the cultural importance of the interaction between forests and communities” (WRM, 2014).

This discordance has also been portrayed in research, especially by those approaching socioeconomic aspects and implications related to plantations. In the literature it is possible to find multiple concepts referring to plantation forestry; industrial tree plantations (ITPs), monoculture plantations, intensively managed plantations (IMPs), fast-wood plantations, forest farms, etc. In order to be accurate in presenting the most representative data produced and managed by FAO, during this dissertation the concept of ‘forest plantation’ will be used, especially in relation to the context of this research, where planted forest of introduced species are the most representative (FAO, 2010).

**From Global to Local**

Continuing with the characterization of forest plantations and their expansion at the global scale, the FRA 2010 reported a global area of 264 million hectares,
corresponding to 6.6 -7 percent of the forest area of the reporting countries (FAO, 2010). An important point at the global level is that the forest area has steadily increased since 1990 by an average of 4.3 million hectares per year, and 5 million between 2000 and 2010. With this trend, FAO anticipates a further rise in the planted forest area up to 300 million hectares by 2020 (Ibid.).

The reasons behind forest plantation expansion process are diverse. Even the pressure to reduce logging of natural forests is considered among them (Kanowski, 2005 in Schirmer, 2007). However, most of the forces behind forest plantation growth and expansion are attributed to the economic dynamic of high demand and consumption of wood. As explained by Victor (2005, in Charnley, 2005): “Forest plantations currently provide approximately one-quarter of the world’s industrial wood supply” (p. 37). According to Heaton (2006) the current global consumption of industrial wood for lumber and pulp is approximately 1.5 to 1.6 billion cubic meters per year: “By 2050, global industrial wood consumption is expected to rise by 50-75% to approximately 2.4 to 2.8 billion cubic meters per year” (Sedjo, 2001 in Heaton, 2006). This can be observed in multiple studies suggesting that wood is “increasingly used as an energy source at the global level, not only in developing countries but also in developed economies” (d’Annunzio et al. 2015).

At the global level five countries (China, United States, Russia, Japan and India) account for more than half (53 %) of the plantations worldwide. Although with a smaller area, the afforestation processes conducted in Latin America and the Caribbean are very interesting from different point of views. With 13.1 million hectares the planted forest of this region represents a small percentage of the total planted forests of the
world (9.4%) (FAO, 2006). However, the expansion process has been peculiar in terms of speed and concentration. Almost 88% of all the planted forests in Latin America and the Caribbean located mainly in four South American countries (Brazil, Chile, Argentina and Uruguay) (FRA, 2005 in FAO, 2006). In relation to the rate of growth, in 1980 the region possessed around 6.5 million hectares, which means that in about 20 years the growth exceeded 101.5% (FAO, 2006).

Payn (et al. 2015) explains another contingent fact regarding total forest area and planted forests' expansion:

While total forest area decreased from 4.28 billion hectares to 3.99 billion hectares from 1990 to 2015, with percent global forest cover dropping from 31.85% to 30.85%, the area of planted forests increased from 167.5 to 277.9 million hectares or 4.06% to 6.95% of total forest area (p. 57).

In short, plantations are expanding, even in a global scenario of decreasing total forest area. According to FAO (2006), the biophysical potential for the expansion of plantations in the region is estimated to be 70 million hectares: “Most of these new forests will be private property… There will be less available land in Brazil and Chile to settle plantations with large dimensions; this will increase the importance of small and medium units” (p. 114).

In relation to South America, there are some significant disparities regarding plantation surface. Brazil and Chile have the largest planted surface in the region, this is remarkable, especially for the case of Chile, as it is one of the smallest countries in South America and has the second largest forest plantation in the region, even doubling Argentina planted surface, which total area is almost 4 times larger than Chile. Figure 2-1 shows this phenomenon presenting both total surface and annual growth rate:
Figure 2-1. Total surface of planted forest and annual rate of plantation increase in South America (FRA, 2005).

Only looking at the surface data the Chilean case becomes very interesting, especially approaching it from different scales. One of the last reports presented by the National Forest Corporation (CONAF) shows that the total area covered with plantations is 2.8 million hectares (2011). The evidence indicates that Chile does not only have the second largest plantation area in South America (as shown above) but also, the sixth largest planted area in the world. Comparing the planted surface to those countries above in the ranking may give the impression that Chile has an average amount of plantations; however, if we look into the total country surface we can see how Chile is also the smallest country in the top six, surpassing a ten times larger country as Australia. If we compare the cases of Chile with United States, which has the largest planted area in the world, we see that in relation to the total country area, United States has 1 million ha of plantations for each 77 million ha of its total area. On the other hand, Chile has 1 million ha of plantations for each 27 million ha of its total area. This means
that Chile has almost three times more plantations than United States in relation to their total country areas.

![Plantation area in Top 10 countries, 2012 (Forest Stewardship Council, 2012).](image)

Figure 2-2. Plantation area in Top 10 countries, 2012 (Forest Stewardship Council, 2012).

In order to understand this phenomenon where a country as small as Chile, exhibits such as big surface of planted forest, a series of socioeconomic, historical and political factors must be explored. This discussion will be presented in the next chapters. For now it is important to introduce some dimension and perspective to the proposed debate, which as explained before, does not belong to a particular country or region but on the complete global scale.

Being a global phenomenon, it is expected that the implications related to plantations’ expansion will be manifested in diverse ways according to the regional environmental and socioeconomic settings. However, literature shows that there are also multiple shared phenomena associated with the forest industry, especially for monoculture plantations. The huge spectrum of positive and negative implications related to the introduction and expansion of forest plantations will be expanded later on,
however it is important to introduce some of the most representative global claims that have placed monoculture plantations in, not only the public debate, but also in the scientific spotlight, and therefore are an essential part in the present research’s problem.

Implications associated with forest plantations and its expansion can be classified into two big groups; environmental and socioeconomic (Heaton, 2006). Although, there are so many factors involved in each of these classifications that the scientific debate has sometimes become incoherent for the public, as explained by Cossalter and Pye-Smiths (2003 in Schirmer, 2006: 2):"Some claim plantations will destroy the environment and displace small farmers. Others say they will help protect natural forests and provide economic growth. Most of the public does not know what to believe”.

The literature suggests much greater agreement regarding the environmental implications of forest plantations (both pros and cons) than the socioeconomic implications. From a general point of view, authors agree that the most representative benefits associated with plantations are the ability to rehabilitate degraded agricultural lands (Charnley, 2005; Hartwing, 1991 in Reyes and Nelson, 2014), carbon sequestration (Winjum and Schroeder, 1997) and the associated relief of harvest pressure on existing natural forests, leading to their protection (Charnley, 2005; Tonts and Black, 2003). On the other hand, the main environmental arguments against forest plantations are the loss of biodiversity (Cannell, 1999; Lugo, 1997), wildfire risks (Cordero, 2011), destabilization of water cycles (FSC, 2004; Cossalter and Pye-Smith, 2003), associated deforestation of native forests (Heaton, 2006) and effects on soil
conditions (such as salinization) depending on the species, management and environmental conditions (Liao et al. 2012).

In relation to the socioeconomic implications, the debate seems to be much more diversified and less conclusive. Although there are some important patterns in the literature, there is also a recurrent clash in terms of the conclusions, mainly sustained in the different approaches (theoretical and methodological) to a particular topic. An example of these discrepancies is the employment factor, having agencies such as the World Bank attributing 54.2 million jobs to the forest sector globally (13.2 million formally and 41 million informally) (World Bank, 2016) and multiple research characterizing these type of employment as particularly seasonal (Tonts and Black, 2003) and with low working conditions standards (Carman et al. 2012).

In general, arguments supporting the plantation industry are sustained essentially in the generation of revenues and foreign exchange for national governments (Morrison and Bass, 2005), with higher levels of productivity, less labor requirements and the ability to produce biomass in harsh environmental conditions (high slope, sandy soils, etc.) (Rudel, 2008). In relation to this and the discussion above, there is also a sub-debate related to employment creation (Flaten, 2011), as in other related topics, the afforestation context (big or small scale) has much to do with the outcomes, which are variable and irregular (Schirmer, 2007).

This dissertation focuses on the key topics sustaining the socioeconomic debate associated with forest plantations. It is important to mention that there is a strong cultural background associated with these topics; therefore they can be addressed as sociocultural and economic arguments. Probably the most recurrent topic in this group
is rural population decline (Barlow and Cloklin, 2003; Schirmer and Tonts, 2003; Gerber, 2011; Leys and Vancly, 2010), this point is tightly related with the seasonality of jobs (Tonts and Black, 2003), issues of social isolation (Williams et al., 2003 in Charnley, 2005), levels of uncertainty and anxiety in the rural population (Barlow and Cocklin, 2003; Funtowicz and Ravetz, 1994 in Gerber, 2011) and the general lack of land available to poor rural people (Rudel, 2008). Associated with this we can find issues of land ownership and control, landscape and land-use change (Barlow and Cocklin, 2003) and the concentration of economic benefits outside the communities, especially in larger regional centers (Bull et al. 2006).

Each of the above subjects are very complex on their own, integrating historical, political, economic, environmental and sociocultural dimensions. This also makes them vary according the regional context where plantations can be found, the tree species, social group diversity, national economy, etc. Research focused on the compilation of cases and conflicts related to forest plantations (Gerber, 2011; FAO, 2006) show how plantation-related conflicts diverge, in some places they are sustained by a single dominant issue like water shortage (Kwazulu-Natal region in South Africa) or poor employment conditions for women (Chipko, India) (Gerber, 2011). There are also some particular configurations where we can find a huge spectrum of significant factors shaping the major general conflict (Aracruz, Brazil) (Ibid.).

One of these cases, where multiple environmental, economic and sociocultural conflicts are simultaneously developing and interacting, is the Chilean context. Ironically, at the same time the Chilean case is considered as a model of successful forest policy, especially due the expansion and management of forest plantations during
the 1970s and 1980s (Lara and Veblen, 1993). This incongruity along with the figures presented before provides a glimpse about the complexity and contingency of the plantation debate in Chile.

The Chilean plantation expansion is a reflection of the most rapid process of expansion at the global level. With an afforestation rate of 95000 ha per year between 1975 and 2009 (INFOR, 2010) the forest sector has become an essential part of the Chilean economy. The primary and secondary industry consumes 39 million cubic meters of round wood annually which has become the 3.6% of the Chilean GDP (Ibid.). This ongoing growth can help us understand in some way the figures that place Chile as one of the most important producers at the surface level, regardless of the available territory, and why it is considered highly successful.

![Graph showing plantation growth in Chile](image)

Figure 2-3. Plantations surface growth in Chile (1975 – 2011)(Reyes and Nelson, 2014).

Like the global context, Chile encompasses different conflicts related to monoculture forest plantations in different regions. Probably the most representative and well known of these is the “Mapuche conflict” (Miller, 2014). There is so much
historical background behind it and so many factors involved that any review here would never do justice to its tremendous complexity. However, is important to understand that besides the historical factors, the current pressures affecting the *Mapuche* people (most representative indigenous group in Chile) arising from the forest industry and the State are very similar to those affecting non-*Mapuche* communities (mostly *campesinos*) located near the plantations. However, regularly these pressures have different and much more drastic outcomes in this indigenous context where the territorial claims are embedded in other cultural meanings and a much more violent background.

Besides the sociocultural context it is also important to mention that there are also different types of plantations in the region in terms of proportions. Although most areas engaged in monoculture plantations are owned by big forest companies we can also find isolated plantations managed by medium and small owners (Lara and Veblen, 1993). Most times, in these smaller properties the conducted management practices are much more sustainable than those in large monoculture plantations. This has been highlighted by some authors as an important point to consider when we talk about plantations in general (Schirmer, 2007).

Nevertheless, especially in Chile, the difference in the total area between these two scenarios is enormous. This can be understood by noticing that 64% of plantations are owned by only three large companies (Reyes and Nelson, 2014). These three companies also own 100% of pulp mills, 81% of paper and cardboard plants, 75% of wood-panel factories, 37% of chip production, 26% of sawmills and 36% of nurseries (UDEC, 2009 in Reyes and Nelson, 2014). However, at the same time this criticized model of economic concentration has generated 120000 direct jobs (INFOR, 2010).
Taking into account the environmental and socioeconomic issues discussed before, it becomes extremely hard for researchers to approach a unified conclusion and recommendations encompassing the different scales, from the national aspect to the community. It is also especially complex when the certification factor is added to the equation. The Chilean Timber Corporation (CORMA) highlights how 70% of the national plantations are certified having many companies with international certification as FSC (Forest Stewardship Council) and PEFC (Programme for the Endorsement of Forest Certifications) ensuring environmental and socioeconomic production standards (CORMA, 2015).

A very straightforward and efficient approach to accomplish this task has consisted in the analysis of large amounts of data capturing different scales, moving down from the national level and passing through the different administrative division until the municipal level (probably the most important administrative unit in Chile in terms programs and census data). Most of the high impact institutional reports have used this type of methodology, like the CEPAL, OCDE, FAO and CONAF among others.

In this context, one of the most recent and relevant reports is entitled “Study Update of the Economic and Social Contribution Evaluation of the Forest Sector in Chile and Concatenation Analysis” (2014). This study was requested and disclosed by the Chilean Timber Corporation (CORMA). This association gathers about 150 stakeholders and the main companies in the Chilean forest sector covering the 85% of the forest-related exportations. The study was conducted by UNTEC a foundation created by the University of Chile with the mission of executing basic and applied research programs
and technical consultancy requested by diverse public and private institutions (UNTEC, 2015).

This study is significant not only because it is updated, but also because it was presented as a strong conclusion about forest plantations in a particular moment when the debate was reaching its highest point. It was also opportunistic in making a stand supported by a noteworthy amount of data in a very turbulent moment of rising conflicts and diverse stakeholders claiming concerns. CORMA portrayed it as ‘the definitive study’ and this tone can be perceived throughout the whole document. It was the final proof showing the public and private sector that plantations, and the forest industry in general, were not only a source of revenues, but also a platform for sustainable development.

Some of the most important concluding points of this study are: 1. The remarkable importance of the forest sector in the national economy and for some specific regions (mainly in the southern part of Chile). 2. The capacity of economic linkage and product multiplication associated with the forest industry. 3. The capacity of employment generation and poverty reduction. 4. All the above in the context of a sustainable approach (UNTEC, 2014). The executive summary concludes stating that: “the municipalities where the forest industry are located (plantations, factories, plants etc.) have significantly improved their socio-economic indicators (income, poverty) despite being located in the poorest regions of the country, confirming the contribution to the economic and social development of the country, regions and municipalities, using public and official data” (Ibid.: 8).
These conclusions were received with optimism by the government institutions and especially by the general public. The model was making sense and the forest sector had the arguments to position itself as a key player in the process of making Chile one of the most solid economies in Latin America (Reyes and Nelson, 2014). However, as expected, the conclusions presented in this study were not received with the same attitude by the diversity of organizations and individuals involved in the plantation problematic. Not long after the dissemination of this report a public statement signed by more than thirty organizations, social and environmental watchdog groups and movements, social assembles, among others, was disclosed (Mapuexpress, 2015).

Here the signatories claim that the study is highly misleading and biased. The argument is sustained by the fact that poverty levels in Chile have steadily decreased at the national level from a 38.6% in 1990 to a 14.4% in 2011 (CASEN 1990, 2011 in UNTEC, 2014). Therefore, by the presented methodology it is inadequate to attribute these figures to the forest sector activities. Also they criticize the study of being presented as a sustainability analysis when there is only methodology accounting for the evolution of socioeconomic and poverty indicators. Lacking, not only methodology to approach the concept of sustainability, but also the use of fundamental literature for the theoretical discussion. Finally, they make a public appeal to the civil society and academic community in order to establish and participate in a high ethical and scientific discussion about the Chilean forest model, which hopefully focuses on people and sustainability rather than corporate interests.

Inquiries have also emerged from academia, especially doubting the capacity of productive concatenation (Falabella and Gatica, 2014). Looking at the specific region of
South-central Chile, the authors explain how the State support of the forest sector, essentially integrated by big conglomerates; “deepened the disconnection among the local networks and generated negative externalities that hindered the development of alternative productive activities” (p. 213).

Finally, it is important to pay attention to this study in terms of the process of knowledge construction and the related hegemonies. During the first paragraph the report refers to the positive impact of the forest sector promoting development at different scales. Following, it confronts the controversies explaining that: “Many times this development generates criticism sustained in the different stakeholders’ perceptions and opinions, not in objective quantitative data, regarding the true economic, social and environmental impacts, not only at the national level, but also regional and local” (p. 11).

There are some very remarkable points from this paragraph that are worthy of analysis. First we can notice the hierarchization in the way knowledge is presented and constructed, portraying quantitative as objective and in a superior level. In contrast we find the stakeholders perceptions and opinions, which are subjective and therefore in an inferior level. Also, it is interesting how this quantitative data is portrayed as the ‘truth’ about the economic, social and environmental impacts. This analysis is important because it denotes a general trend in the high-end studies conducted in the context of relevant socioeconomic and environmental issues in Chile.

The decision to addressing this particular study and setting the discussion around it is not arbitrary. The debate derived from it can help us understand that the forest plantations related issues are not only important topics by themselves, but also, the way they have been addressed and studied are significant. The present research is
sustained in the conviction that if our objective is to understand a particular phenomenon in a way we can produce useful knowledge from it; our approach must be inclusive and holistic. This means that along with the analysis of ‘objective’ quantitative data we must also look into the subjectivities that are been unfolded in the social world.

This dissertation explores the complex interaction between broad socioeconomic and environmental phenomena at the household scale. It focuses on how historical events; political decisions, economic shifts and environmental transition affect the household as an essential social unit. It also examines a particular social group that has experienced one of the most drastic processes of change at the global and local level: the campesinos. There are multiple ongoing issues that encapsulate the above criteria, however the forest plantations and their expansion is not only a trending phenomenon but also is right in the middle linking socio-environmental processes at different scales. It is the pattern that connects all the above discussion with the particularities of the Mediterranean region of Chile.
CHAPTER 3
ENVIRONMENTAL ANTHROPOLOGY AND THE POLITICAL ECOLOGY OF FOREST PLANTATIONS

Why Anthropology and Environment?

The issues and phenomena addressed in this research are rooted in the relationship between humans and their environment. This relationship is embedded in the most essential questions for our species: Why people behave differently? How does the environment shape human life? How do humans transform the environment? The elemental magnitude of these questions made the classical philosophers the pioneers in analyzing this relationship between humans and their surroundings.

Hippocrates was perhaps the most important classical scholar in theorizing about the society-environment relationship. In his work he distinguishes the basic environments in the world arguing how the differences between them account for the major differences in cultural type (Dove and Carpenter, 2008). Besides the work of Aristotle and his thesis about the relationship between climate and political development, Thucydides presented one of the most sophisticated explanations of how environmental differences create social differences (Ibid.).

This debate has been present in anthropology since its beginning, introducing the environment as an essential factor in human life. Clearly some theoretical branches began to focus more and more on these factors shaping different approaches into what is known today as environmental anthropology. This ‘subfield’ started to focus on the nature-culture dichotomy, which underlies much conservation on sustainable development policy discussed nowadays.

As in most disciplines and sub-disciplines, the field of environmental anthropology has experimented an intense process of revision and maturation. The
work of Marcel Mauss and of course Julian Steward was pioneer in addressing this co-
relationship between environment and human activity, and at the same time, opposed
against the categorization of this relationship as deterministic. As explained by Moran
(1990 in Haenn and Wilk, 2006): “Steward proposed a research method that paid
careful attention to empirical details and that causally linked the cognized environment,
social organization, and the behavioral expressions of human resource use” (p. 15).

This is particularly important for the present research, as the linkage presented
above, many theoretical fundamental concepts from cultural ecology are essential to
understand the reciprocal interactions between the households and their surroundings.
For example, how does land cover transition to forest plantations affects social
structure?

Another essential characteristic that suits environmental anthropology into the
present research is the concern and attention to the peasant context. Here the work of
Robert Netting, among others, is essential to contextualize how the availability of natural
resources interacts with the strategies and decision-making processes in the context of
smallholders (Netting, 1993 in Dove and Carpenter, 2008).

The process of theoretical and methodological evolution behind the
anthropological preoccupation with the environment is an extensive and complex
discussion on its own. Although, it is important to take into account the process by
which it has become what we nowadays call; “the new ecological (or environmental)
anthropology” (Kottak, 1999 in Haenn and Wilk, 2006):

The new ecological, or environmental, anthropology blends theory with
political awareness and policy concerns. It attempts to understand and
devise culturally informed solutions to such problems/issues as
environmental degradation, environmental racism, and the role of the
media, NGOs, and environmental hazards in stimulating ecological awareness and action (Ibid. 40).

Along with this definition, Kottak (Ibid.) emphasizes some crucial points, also constituting a set of fundamental guidelines for the present research. First, although this field puts central attention on environmental factors, we must be “careful in not removing humans and their specific social and cultural forms from the analytical framework” (p. 40). Second, what differentiates the old and the new ecological anthropology is the way we apply it, our analytical units (shift from single communities to pervasive linkages ad concomitant flows of people), the importance of scale, the integration of new methods and the involvement of policy with a value orientation: “Studies relying on the norm of cultural relativism, generally aimed at being value-neutral. By contrast, the new ecological, or environmental, anthropology blends theory and analysis with political awareness and policy concerns” (Greenberg and Park, 1994 in Haenn and Wilk, 2006: 41).

Finally and directly related with the last point, the nature of the issues addressed in this research implies some strong trans-local political factors and therefore requires an approach that acknowledges and appropriates a standing point: “We cannot be neutral scientists studying cognized and operational models of the environment and the role of humans in regulating its use when local communities and ecosystems are increasingly endangered by external agents” (Kottak, 1999 in Haenn and Wilk, 2006: 42).

This premise positions the present research in a transdisciplinary place shared by anthropologist, sociologist, ecologist, and geographers, among others, called “political ecology”. Portrayed by Bryant (1999 in Robbins, 2004) as a series of
“disciplinary transgressions” the involvement of ecological anthropology implies the enrichment of the field but also infers anthropological influence in other fields (Orlove, 1980 in Haenn and Wilk, 2006). But, what is political ecology? How does it relate to cultural ecology? And more important, in what way is it incorporated in this research?

One of the earliest and also most used definitions for political ecology is the one presented by Blaikie and Brookfield in their high-impact book: *Land Degradation and Society* (1987). Here, they explain “The phrase ‘political ecology’ combines the concerns of ecology and a broadly defined political economy. Together this encompasses the constantly shifting dialectic between society and land-based resources, and also within classes and groups within society itself” (p. 17). In this book, through the context and issues related to land degradation the authors set some of the basis for a field derived by the concept coined by Frank Thone in 1935 and later enhanced by Eric Wolf in 1972.

Blaikie and Brookfield talk about the need for an approach able to “encompass interactive effects, the contribution of different geographical scales and hierarchies of socioeconomic organization (e.g., person, household, village, region, state, planet) and the contradictions between social and environmental changes through time” (Ibid.). In terms of the socioeconomic organization they emphasize the role of the State, which responds directly to a key issue presented in this research concerning the Chilean case:

The state commonly tends to lend its power to dominant groups and classes, and thus may reinforce the tendency for accumulation by these dominant groups and marginalization of the losers, through such actions as taxation, food policy, land tenure policy and the allocation of resources (p. 17).

As it will be covered later on, the subsidies and tax benefits handed by the state (not only in Chile) to large forest companies constitutes one of the most significant
events in terms of the socioeconomic and environmental implications associated with this industry, especially concerning the magnitude and speed of its expansion (Bull et al. 2006; Reyes and Nelson, 2014).

So, from this first outline it is possible to understand that humans’ impact on the environment is mediated by political, economic and cultural forces (or power). However, as explained by Borgerhoff and Coppolillo (2005) these forces cannot be simply added or multiplied if they are to be properly understood: “Critically important are the social relations within and between populations that, because of the institutional history of Latin America, guarantee inequitable access to resources” (p. 163). This paragraph introduces the essential points that will be addressed further on; access to resources and social relations.

Because political ecology is one of the main theoretical frameworks for the present research it is fundamental to introduce and go over some of the main points that associate its theoretical basis with the particular topics addressed as research questions and stated problems. The objective behind this is to incorporate the research context into the big theoretical frame, which will also help to define the general approach, but also the units of analysis, and therefore, sustain the research design and its methodologies.

First, it is fundamental to understand political ecology as a trans-scale critical approach, as presented by Robbins (2004), political ecology is: “a field of critical research predicated on the assumption that any tug on the strands of the global web of human-environment linkages reverberates throughout the system as a whole” (p. 5). The concept of linkages is essential not only in the explicit relation between humans
and the environment, but also in terms of the contextualization of the particular socio-
ecological problematic in the whole web of political, economic and environmental
processes.

Second, some definitions of political ecology stress the ‘political economy’ aspect
of the field; this is because it plays a fundamental role in the nature of the proposed
analysis, especially in terms of “forms of access and control over resources and their
implications for environmental health and sustainable livelihoods” (Watts, 2000 in
Robbins, 2004). A major factor related to the implications associated with access and
control over resources is inequality. The big-picture phenomena addressed in the
present research are strongly influenced by the economic and political inequalities that
are represented in asymmetrical power relations. Bryant and Bailey (1997 in Robbins,
2004) explain how political ecology copes with these dynamics introducing the
environmental change factor:

Political ecologists accept the idea that costs and benefits associated with
environmental change are for the most part distributed among actors
unequally…[which inevitably] reinforces or reduces existing social and
economic inequalities…[which holds] political implications in terms of the
altered power of actors in relation to other actors (p. 11).

As we will see during multiple sections in the present research, power relations
play a crucial role in the theoretical foundations of the research problem, but also in the
everyday situations observed in situ. One of the most important representations of these
power relations is classified in the, mentioned before, state-private sector interactions.
As described by Peet et al. (2011): “Power in environmental management is most
crudely and commonly understood as the capacity of a polity or state to control the
actions of people (or organizations or firms) within its jurisdiction, what theorist Michel
Foucault referred to as ‘sovereign’ power” (p. 31-32).
Very close to the power concerns presented above, a third remarkable point that integrates the research problem into the theoretical bases of political ecology are the concepts of vulnerability and hazards. These concepts can be observed in diverse human realities, in multiple contexts around the world. However for this particular case and for political ecology in general, it is worth analyzing how they are associated with the access and control over natural resources. As explained by Robbins (2004), in many cases the questions to be asked are not whether land use or management has altered productivity, or usefulness: “but instead whether it has led to an increasing vulnerability of an area to destruction (fire, erosion, mass slumping) or created new risks or hazards for local residents” (p. 96).

Finally, along with looking into the big picture, the present research puts special attention onto the local socio-environmental dynamics. Here is where we can observe the intersection between political ecology and cultural ecology, especially while focusing on variables such as knowledge transition, landscape perceptions, environmental practices or adaptation strategies: “The cultural ecological approach is most notable for its serious attention to the logic of local people taken on its own terms, particularly their ecological knowledge and the relationships between that knowledge and environmental practices and the production of landscape” (Ibid.: 33).

Using the above approaches and incorporating them into chains of explanation researchers involved in political ecology are seeking to document the way individuals are coping with change, households’ organization and adaptation for survival and groups uniting for collective action. In relation to these there are two main dimensions from where we can approach a socio-environmental issue: “Research, therefore, is
commonly predicted upon determining either the material condition of the environment (e.g., soil conditions, land cover types, or groundwater levels) or its imaginary status (e.g., perceptions, ideas, or concerns about the state of nature), or both” (Ibid.: 83). The present research, will aim to use both of these approaches in order to understand the sociocultural implication of forest plantations on peasant households.

The phenomenon of forest plantation introduction and expansion by its own is a platform where we can observe how the material condition and the socio-ecological imaginaries meet. According to Taylor (2004 in Stephenson, 2010: 2) social imaginaries: “incorporate a sense of the normal expectations we have of each other, the kind of common understanding that enables us to carry out the collective practices that make up our social life”. New social imaginaries about ecological change (as monoculture plantations introduction and expansion) are part of what construct new ecologies.

These are always proliferating, however, the political ecological/economic drivers and implications associated with them demand careful attention (Peet et al. 2011): “The third area of political ecological interrogation is into the political and economic implications of such new ecologies, environments and species. In this regard, political ecology takes as its core understanding of the environment that nature is produced” (p. 29).

We should give special attention to these new ecologies, especially when they are produced in contexts of highly asymmetric power relations, principally those founded on economical inequalities. According to Smith (2007 in Peet et al. 2011), in the production of nature we can see how nature itself becomes a strategy of
accumulation: “These new natures frequently have capitalist goals and logics bounded up within them” (p. 29).

All the above arguments constitute the foundations of the high demand for anthropological research on these topics. The particular characteristics of the forest plantations in the Mediterranean region of Chile makes it a case study completely embedded in the big picture processes, which are being questioned in terms of expansion, denomination and control. As clearly summarized by Robbins (2004):

The amount of newly created forest has nearly doubled, suggesting that the new political ecology of forestry is not so much about decline and scarcity, but more about what kinds of ecologies are being produced, by whom, and to whose benefit. Who defines what a forest is and who controls its location, expansion, and growth? (p. 83).

**Sociocultural Implications and the Household**

Using the propositions that social phenomena “are not the immediate result of the nature of individual human beings, but are the result of the social structure by which they are united” (Radcliffe-Brown, 1940: 3) this study embraces social structure (Crona & Bodin, 2006) and social capital (Bourdieu, 1986 in Richardson, 1986; Portes, 1998) theory as key tools to understand the effects of plantations and environmental change in the context of Mediterranean campesinos (small farmers).

One approach to understand the importance of social structure and capital in the context of political ecology is through the social dimension of natural resource governance (Bodin & Prell, 2011), especially in complex social ecological systems as described before: “Reduced diversity tends to create more sensitive systems, both ecological and social (Levin, 1999) and examples of this today are the highly controlled systems of conventional agriculture and forestry” (Crona et al., 2011:44).
These ecological and socially sensitive systems are an essential part of what has become “the new rurality”. Changes in productive systems, social dynamics and structure, technology, connectivity and massive information access in the context of globalization have impacted “traditional” socioeconomic and cultural configurations, echoing in the collective imaginaries (González, 2010). For many authors all these processes, especially in Latin America, have constituted the need for a new framework in order to approach this new scenario; this is the new rurality (González, 2010; Rodriguez & Salas, 2010). For Canales (2006) “movement” is one of key concepts behind this new rurality, the shift from something that seems to be really stable to something much more convulsive, as explained by Ruiz & Delgado (2008):

It describes the ways of organization and the change in the traditional “non-urban” spaces functions: population mobility increase, goods, economic activities delocalization, new specialized uses (machinery, residency, tourism, parks and development areas), change in social networks and the diversification of roles (Arias, 2002: 371-377; Linck, 2001: 94 in Ruiz y Delgado, 2008: 2).

As described by Arias and Linck (Ibid.) this movement is a crucial factor in the reshaping of social relations in the rural context, which are the foundations of the cooperation and social capital, and according to Rodriguez and Salas (2010): “The conception of the peasant as a subject and a stakeholder imposes a basic presupposition: their traditional practice themselves constitutes a means of social capital, or communitarian social capital that define them” (p. 49). For these authors, the existence and exercise of social capital and cooperation is the main characteristic of being peasant and most importantly; it defines and attributes an identity (Ibid.).

As discussed in previous research, it seems that for the Mediterranean region of Chile, and most of the southern part of the country, one of the most representative
materializations of the link between social capital, peasant identity and agriculture are
the production ceremonies. These ceremonies are part of a complex cultural and
economic system, where in order to “make a living” small farmers and peasant families
engage in different strategies to meet their needs and sustain the production cycle for
next year. As explained by Pretty & Smith (2003): “for as long as people have managed
natural resources they have engaged in forms of collective action” (p. 632), this is
because “labor organization provides the crucial link between systems of production
and social groups” (Wilk, 1997: 85).

However, as Eric Wolf (1966) would say: “But social relations of any kind are
never completely utilitarian and instrumental” (p. 7). This reciprocity does not play a
purely economic role and is not only rooted in a conscious need, it also meets symbolic
functions that are highly embedded in the community trust dynamics. This cooperation
system can be understood through observing the interdependence between families
(hosts and guests).

It is at this point that the concept of household becomes extremely valuable, as
explained by Wilk (1997: 31): “Household is the logical level of analysis for human
ecological studies” including the present research. Households are the crucial link
between the micro- and macro scales of human systems, although each one is unique
in the way they cope with every internal and external challenge, they are the core of
social life in terms of structural transformations and the most basic indicator of
economic and socio environmental change from a cross-cultural perspective.

One of the most crucial points about households is that we should look at them in
terms of time; the historical perspective is essential for any study that seeks to
comprehend adaptation strategies. As explained by Wilk, “how can we understand how households responded if we do not know in detail what they are responding to?” (Ibid.). And not only the ‘big picture’, households being a dynamic and fluid group of changing individuals, mix of events, struggle, negotiation, and decision implies that their particular history can reveal to us key local socio-ecological processes. As explained by the author, while all societies have households, the household is always embedded in wider social and economic network, to greater or lesser degrees.

Another essential theoretical concept used by Wilk in the context of households and borrowed from biological ecology and applied to cultural anthropology is “the niche”. However the niche is much more than just the environmental settings, it is also a temporal perspective that implies movement, change and adaptation: “the concept of niche helps us preserve our knowledge that adaptation is an active and dialectical process whereby people change their environment, even as they change themselves and their social arrangements” (Ibid.: 33).

But as explained by Wilk, a niche is not a place, a resource or a mode of production, it is a combination of different resources and techniques for production and consumption with which members survive and reproduce. That is why niches are also dynamic and the transformation of the landscape is only one of the many factors involved in the way households solve their survival. However, we don't have to approach them as evolutionary stage development; these transformations are constructed from multiple small adaptations: “concerned to deal with very local circumstances, with problems and issues of a relative immediate time spam” (p. 30).
An essential representation of the mentioned adaptation strategies is migration, which is especially relevant in the context of rural population. Rural-urban migration has changed the morphology of rural households, having generally the younger generation moving to the cities. One of the main implications of this type of migration is the discontinuance of labor availability that has multiple effects on the economic system.

However there are also indirect “costs” of migration that can be also be associated with the environment, as explained by Requier-Desjardins (2008) this can be classified in two groups: the cost assumed by the adopting environment and by the abandoned environment, this last one clearly the most important for the present research. The arrival of more people into an environment entails an impact, as the urban expansion, the increase of production and services (transportation), pollution, etc. But also the abandonment of an area implies the “loss of maintenance of the natural environment, worsening of erosion, disintegration of the society, loss of often qualified human resources” (Ibid: 576). This, as it will be discussed next, is tightly related to the monoculture forest expansion process.

**The Big Picture and the Chilean Case**

Figures about the introduction and expansion of forest plantation were presented in the introduction, these figures were approached from different scales, looking at the global level, then focusing on the South American region, and of course finally expanding the Chilean case. Also, from a general overview some of the most representative forest plantation-related conflicts were introduced. This part of the discussion will focus on linking these conflicts to the global scenario presented before, going a little deeper into their particular dynamics, trying to understand what forces (political, economic, environmental, social) are behind them, what are the shared
characteristics, and especially, how do they relate to the specific issues found in the Mediterranean region of Chile.

Putting aside for the moment the more purely environmental issues (such as water scarcity, soil acidification, loss in biodiversity, etc.), socio-cultural and economic issues stand out while reading the literature related to the expansion of forest plantations. Although there are multiple scenarios where we can find people planting trees, it is the industrial context where the more representative and complex conflicts arise, especially in terms of the duality of local people compared to foreign companies. These disputes and concerns about afforestation have caught the attention of diverse researchers, and have been documented in more than 35 countries: “covering most, if not all, regions in which commercial afforestation has occurred on a large scale in recent decades” (Schirmer, 2007: 437).

In relation to the above, many authors agree that, the essence of this type of conflict is sustained in the principle that in order to be economically viable, industrial afforestation must be big. Most of these companies: “operate according to economies of scale due to the cost of initial establishment, and planting, managing, and harvesting trees” (Charnley, 2005: 37-38). They function in the logic of efficiency, which is necessary in terms of energy use, production of revenues and even natural resource management. However, this philosophy clashes with local ideas about benefits sharing, community, traditional activities, diversified income and rural landscape. From another point of view, according to Schirmer (2007) and Charnley (2005), the key that distinguishes small-scale and large-scale forestry from the local perspective is ownership and control. From the Australian case, they explain that small scale-
afforestation is almost always identified as an activity undertaken by farmers, family-owned or other individual landholders. On the other hand large-scale is generally identified as being undertaken by big companies with absent owners:

Accompanying the process of land ownership concentration is the consolidation of power in the hands of those who own or control the means of production in the forestry industry. This process alters the dynamics of rural social relationships and changes social constructs of rural identity (Barlow and Cocklin, 2003 in Charnley, 2005: 41).

For Williams (2014) this implies that plantations owned and managed by larger corporations may be less acceptable than plantations owned by individual landholders:

“Smaller and more integrated plantations may also be more acceptable than whole of property plantations (Carroll et al., 2011), perhaps because the visual impact on landscape and the social impact on ownership is less striking” (p. 349). From this we can understand that the extension of these plantations plays a fundamental role in terms of the local perception and associated conflicts. However, Gerber (2011) argues that this phenomenon is just one of the implications associated with deep impacts that “arise because of inequalities in power, property and income among human groups” (Martinez-Alier, 2002 in Gerber 2011: 165). Even, some critics see forest plantations as: “vehicles through which 19th century colonial officers (Peluso, 1992; Guha, 2000); and more recently corporate officials (Potter and Lee, 1998; Rohter, 2004) have deprived poor rural peoples of access to lands and livelihoods” (Rudel, 2008: 545).

Going back to the plantations extension and the implications on local perceptions (which is a fundamental part of the present research) it is important to mention that there are several studies focused on how different groups and individuals perceive and view plantations (Schirmer, 2006): “These studies do provide answers to questions about how land use change to plantations influence’s people’s connections with their
community and landscape, questions that are inherently related to people’s perceptions and interpretations of land use change” (Ibid.: 5).

This analysis lies in the fundamental process by which humans experience and interpret their surroundings or landscapes. As explained by Magnoni (et al. 2008): “Through the process of living and dwelling, people continually create, transform, experience, and imbue their surroundings with meaning” (p. 193). So, how does the introduction and expansion of forest plantations impacts this construction and the meanings associated with the landscape? The main consensus is that the repercussion of land-use change (especially from agriculture to plantation) goes beyond the loss of visual amenity (Leys & Vanclay, 2010; Tonts & Black, 2003).

Exploring the case of Western Victoria, Barlow & Cocklin (2003 in William, 2014) found that plantation forestry “disturbs the basic norms and values by which rural communities have operated, transgressing traditional forms of ownership and control of land, and resulting in changes to valued attributes of rural landscape, for example by increasing the sense of enclosure” (p. 349). Various authors mention these senses associated with plantations, where local farmers have expressed uncertainty, suffering grieving and anxiety due to the introduction and expansion of plantations (Rolley & Humpreys, 1993; Tonts & Black, 2003; Anderson et al. 2013). The process of landscape enclosure due to forest expansion has been documented to have other interesting effects that will be discussed later on. However, at the moment it is important to talk a little more about the transformation of what is considered ‘rural’.

Smith (1981 in Barlow & Cloklin, 2003) also suggest that the main reason behind the negativity associated with forest plantations is because it subverts the basic values
and norms by which communities operate, the way in which communities view and define themselves, opinions about appropriate use of land; the way rurality is conceived: “community opposition to plantation forestry extends, in some measure, from the unease created by changes in the production landscape associated with land-use change, because this disrupts extant social constructions of rurality” (p. 513). This point is very important because it introduces the concept of ‘social construction’, which denotes the interaction between people as a key dynamic in the construction of rurality.

The above also explains why effects on population change have been cataloged as one of the main implications associated with plantations (Ibid.). This change implies not only population loss, “but the loss of certain people” (Ibid.: 511). Farmers and their families, workers, people who have been in the region for generations, but also provided services for the community through reciprocity networks. In relation to this, the industrial characteristics of the forest companies contrast with the traditional farming enterprises: “that generally involve open countryside and which are typically family owned and run, requiring the daily involvement of one or more farmers” (Ibid.: 506-507). The process of depopulation is a shared characteristic along multiple cases where plantations have been introduced, however it is important to understand that rural depopulation is a global trend where multiple factors are involved: “For at least four decades, rural areas have experienced population decreases, economic decline, and contracting social networks” (Charnley, 2005: 40).

Because the depopulation of rural areas is a global process influenced by multiple political, socioeconomic and environmental factors it is fundamental to understand the particular dynamics that promote demographic change in regions where
forest plantations have been introduced or are expanding. According to multiple authors the way forest plantations impact depopulation is through the displacement of local people, especially in developing countries (Heaton, 2006; Gerber, 2011). This displacement also works in different ways, like the alteration of the material infrastructure around which a community coheres (Barlow & Cocklin, 2003), the impact on their “livelihoods and resources such as food, medicinal plants, and water” (Heaton, 2006: 64) and in general by bringing a new stakeholder into rural communities: “prospectively changing power relations and creating a sense of powerlessness among existing community members” (Barlow & Cocklin, 2003: 513).

However, the most explicit way is of course, buying the land. Forestry companies buy public and private land that sometimes ends in families being displaced (Gerber, 2011). There are different situations that can sustain this outcome: “In some cases, large landowners sold their land that was previously worked by tenant farmers who then got evicted by companies. In other cases, large landowners kept their land and replaced tenant farmers with trees” (Ibid.: 171). Although this is unfortunate for this part of the population, these outcomes are within the ‘rules of the market’. However, some authors describe what they call ‘coercive tactics’ performed by forestry corporations in different regions, as we will see later on, many of these tactics have been conducted in rural Chile. Clapp (1998 in Charnley, 2005) exhibits some of these coercive tactics:

These included eliminating informal common property rights to areas the corporations had already acquired, making it hard for farmers to obtain the resources needed to subsist; exposing livestock, crops, and people to pesticides applied by aerial spraying; encircling and isolating communities with plantations; fencing plantation land and forbidding people to trespass; and, cutting off access to previously-used travel corridors located on plantation lands. As people were displaced and their relationships to the
land dissolved, they moved to rural shantytowns or resorted to urban migration (p. 39).

Many of these tactics have been cataloged as key determinants in the demographic transition of forested rural communities towards an aging and unemployed (or close to retirement) population (Leys & Vanclay, 2010), which is also the population that has become more susceptible to selling their farms (Charnley, 2005). In most cases the literature describes a progressive process where people are forced or encouraged to migrate, then local networks become weaker, services are diminished, which promotes more migration. This also implies a land ownership concentration, involving greater socioeconomic and power inequalities that fuels socio-environmental conflicts (Gerber, 2011). As complemented by Tonts & Black (2003): “If large-scale tree plantations do contribute to depopulation and economic decline, then there is likely to be a concomitant impact on local and regional social institutions and networks” (p. 186).

This brings us to a key factor for the present research, which is also strongly embedded in this vicious cycle; the process of isolation due to the expansion of forest plantations and the repercussions on local social networks. The procedures involved in this type of social isolation can be very drastic as the fencing or cutting off access to travel corridors mentioned before, however, as explained by Williams et al. (2003 in Charnley, 2005) plantations by themselves constitute a socio-environmental barrier that: “visually transform the landscape and surround farms, making people feel more socially isolated” (p. 40). This type of sociocultural and economic impact in the form of networks and social capital has not been considered in most of the reports and studies focusing on the local socioeconomic effects of forest plantations in the Mediterranean region of
Chile. Here the main arguments have been constructed from census data concerning aspects like economic income, material assets, level of education, literacy, etc. However, in other regions researchers have looked into these other factors and have agreed on the fundamental role social interaction plays in the communities’ resilience:

The loss of community organisations, institutions and linkages can contribute to a reduction in opportunities for social interaction, especially for older residents, can undermine networks of local social support, and can contribute to a sense of improvishemente for the remaining residents” (Tonts & Black, 2003: 186)

Research also shows that an essential factor involved in the outcome of these issues is employment: “Unless alternative employment can be generated, these communities risk depopulation, contracting local economies, the erosion of social services, and declining levels of socio-cultural interaction” (Tonts 2000 in Tonts & Black, 2003: 179). Employment is a complex matter in the context of forest plantations, this is because forest companies do create a significant amount of jobs, however in most cases these jobs have some characteristics that constrast with the traditional work dynamics associated with agriculture. First, jobs associated with forest plantations are very seasonal, even more than agriculture, especially the most accesible jobs in this context commonly generates casual employees (do not have regular or systematic hours of work or an expectation of coninuing work). Second, and also related to the first one, most times forestry jobs are not suited for the educational level and expertise of local people, which not only implies that they get minimum wage (or lower) jobs, but also poor working conditions (Carman et al. 2012).

This disjuncture between the two realities (forest plantations and traditional agriculture) many times make it easy for companies to look for workers from other regions: “There is also evidence to suggest that tree companies tend to purchase goods
and services from outside local communities” (Kelly & Lymon 2000: 179 in Tonts et al. 2001). This is one of the scenarios that support the idea proposed by multiple authors who argue that although plantations have an enormous potential to deliver significant economic benefits (especilly through the injection of capital into local ares) most of their administrative offices are allocated in the larger urban regional centers, rather than the smaller communities around which the trees are established (James et al. 1995, Tonts & Black, 2003; Barlow & Cocklin, 2003). Even more, industries located in these larger urban centers depend on these forest resouces, as explained by Freunbenburg and Gramling (1994): “it has been argued that the economic benefits associated with farm plantation forestry accumulate not in those areas growing trees, but in industrialised 'core' regions that use timber as an input into existing industrial processes” (p. 179).

Finally, for this part it is important to emphasize that although these processes are shared by multiple regions and observed in different cases around the world, every context has particular characteristics concerning land tenure systems, industrial procedures, population composition, environmental features, among others. The Chilean context also shares many of the described phenomena, however the level of development in terms of planted surface, technologies implemented, logistics, policies and even science involved delivers a particular case that has the potential to foreshadow some of the possible forest plantation dynamics for the South American region. In the next part we will look into some of the background that sustains this degree of development and some of the associated implications.

**The Chilean Transition**

If we look into the Chilean forest transition from a general economic point of view, we notice that both supporters and critics agree that the introduction and growth of this
industry can be considered as a successful model (Lara and Veblen, 1993; Miller, 2014). Only looking at the speed of the expansion through the figures presented in the introduction is it possible to understand how plantations not only are a great business and one of the most important export sectors for Chile, but also they have reversed the trend of deforestation in the past three centuries (FAO, 2010 in Reyes and Nelson, 2014). The factors involved in this success are multiple; authors highlight the interaction between the environmental features of the region and the particular characteristics of the introduced tree species, having pine and eucalyptus reaching their fastest growth rates globally in South Central Chile (Camus, 2006: 250). However, an important part of the literature focused on this success phenomenon attributes it mostly to the introduction of neoliberalism (privatization, fiscal austerity, deregulation) and free-market policies, this process is also denominated by many as the “Chilean miracle” (Winn, 2004).

Although, if we look earlier in history it is possible to find some records linked to the contemporaneous global and local processes of plantations expansion. According to Miller (2014) the modern forestry practices, and more importantly, forest laws began in Europe, from here they spread to its colonies and other parts of the world with the expansion of the capitalist market:

Chile’s history of forestry development belongs to a transnational history shaped by the circulation of forestry science and foresters trained in Europe and North America and the influence of international organizations such as the US Forest Service, the United Nations Food and Agriculture Organization, the International Monetary Fund (IMF), the World Bank, and the International Bank for Reconstruction and Development (IBRD), all of which participated in projects to promote forestry industrialization in Chile in response to growing global demand for paper pulp after the Second World War (p. 8).
However, before the Second World War we can’t forget that these kinds of processes also belong to certain individuals and their work. An example for that in the context of Chile is Federico Albert, a German natural scientist hired by the State of Chile in 1898. Albert is an important figure in the history of Chile, not only because he is considered the father of natural resources conservation in the country, but also because he was one of the first and most important forest and afforestation advocates (Camus, 2006). He saw the afforestation of the highly degraded coastal range of Chile, as a great opportunity to stop the outrageous erosion and as a way to provide wood to the region. This tremendous soil degradation found in South Central Chile is the product of decades of native forest exploitation and relentless cereal production since the Spanish arrived. It was through historical events such as the growth of the colonial Hacienda system (Gay, 1862) the independence war and the gold rush (Montaldo, 2004) that wheat production was expanded to lands not suited for intensive cereal production ending up with significant soil erosion (Mellado, 2007). Having this as a main concern, Federico Albert promoted the establishment of tree nurseries and was a key player in the approval of the law N° 3091 in 1916, which granted the first tax exemptions and benefits intended for forest plantations by the private sector (Camus, 2006).

State policies for internal production and industrialization were enhanced during the 1930’s global economic crisis, aiming for the substitution of imports and an economic ‘inward development’. Here the nascent forest sector was given an important economic role, but also to promote the colonization of the southern part of Chile. The historical background related to the forest of the southernmost part of Chile will not be developed at this moment because it requires a lot more discussion on the clear-cutting
by settlers of an important percent of the native forest. Although, it is important to mention that by 1931 the level of overexploitation was so large that a new law (N° 4363) was implemented to protect the native forest and boost large-scale monoculture plantations, especially *Pinus radiata* (Ibid.).

By the end of the 1930’s Chile had its first 5000 hectares of planted forest and given the bigger role this industry was earning the more concern was given to the foreign markets’ instability and fluctuation. In response, the State enforced the protection of the national industry, fostered the forest activity, banned the entry of competitive products, gave bonuses for the acquisition of forest machinery and prohibited the exportation of raw forest materials. All these measures had a huge impact on the forest industry for the time; an example of this is that by 1955 Chile had its first national cellulose plant. The point of this argument is to show that although the introduction of neoliberalism during the 1970’s had an essential impact on the forest sector we cannot forget the associated historical process that happened before: “neoliberal economic ‘shock therapy’ exacerbated, rather than initiated, the social dislocations produced by several generations of government forestry policy in Chile” (Miller, 2014: 4).

So, how did the 1973 *coup d’état* and the 17 yearlong dictatorship exacerbate these socioeconomic dislocations? Since the first years a series of political and economic measures were undertaken; companies and public assets were privatized, trade liberalization occurred, and the regulatory role of the State was weakened (Monckeberg, 2001; Stiglitz, 2002, in Reyes and Nelson, 2014). Explained by Camus:

> The development model implemented by the military government from 1975 implied a radical change in the economic policies of the previous
period based on a strong State intervention in all spheres related to the economic and productive national affairs. The free market, private enterprise and fiscal austerity became the great pillars of the new development model (p. 249: 2006).

These changes can be summarized in the transition from fixed prices to free market, protectionism to tariff reduction, the return of expropriated companies and the privatization of public business, therefore the complete economic restructuring carrying the ecological triumph of exotic species of trees. These reforms were sustained in two interconnected strategies; the elaboration and establishment of new policies and the implementation of subsidies and tax benefits. Probably the most relevant reform during these years that still operates is the ‘Order of Council N°701’, this policy had the objective of enhancing forestation through tax breaks and subsidies (which covered sometimes between 75% and 90% of the costs) (Reyes and Nelson, 2014; Camus, 2006). The properties covered under OC 701 couldn’t be expropriated and the freedom of trade was declared for all the forest products. The problem with this is that these royalties were mostly used by big privates companies and conglomerates: “Between 1974 and 1997, 6% of the subsidies were paid to small landowners and 94% went to other landowners, particularly forest companies that benefited the most from this policy due to their size and capacity to capture the funds” (Reyes and Nelson, 2014: 381). 1977 was the first time in history that more forest were planted by privates than the State, by 1979 the State had already financed 75% of the 68.71% of the total private plantations: “If the subsidized surface is valued at 1980’s cost, i.e. US $ 151.5 per hectare, we could establish that the State had transferred to the private sector by this system the total amount 25 million dollars by 1979 (Camus, 2006: 254).
This resulted in the major forest private industry taking over not only the market, but also, an important area of Chile, “by the early 1980’s a few major financial groups controlled 80% of pine plantations and 100% of the cellulose and paper-pulp industry” (Casanova et al. 2013: 20). Where also: “three large companies own 64% of plantations, 100% of pulp mills, 81% of paper and cardboard plants, 75% of wood-panel factories, 37% chip production, 26% of sawmills, and 36% of nurseries (UDEC, 2009 in Reyes and Nelson, 2014: 382). Multiple authors agree that this phenomenon along with similar ones, are the basis of the construction of the deep socioeconomic inequalities found in Chile and other developing countries, which can be seen repeatedly materialized in sociocultural, economic and environmental implications, especially for the people that lives surrounded by these plantations.

In the context of the violent repression unleashed by Pinochet and the radical socioeconomic inequalities produced by his dictatorship’s free-market policies, pine came to represent an alien commodity that was responsible for campesinos’ loss of land and livelihood … The brief moment when Monterey pine and forestry held the promise of equitable development vanished, along with peasants’ small plots, engulfed by a swelling sea of tree plantations held by the most powerful financial groups in Chile (Miller, 2014: 23-24).

As explained before, the lack of capital, credit and technical assistance: “virtually excluded small owners and significantly limited medium-sized owners from benefiting from the afforestation grants established in 1974” (Lara and Veblen, 1993: 129). The misbalanced economic power enabled the accumulation of land, especially the purchase of land from small, medium-sized and large land owners in rural areas by the timber companies for the establishment of plantations has meant the expulsion of large amount of rural population (Rivera and Cruz 1983; Cavieres et al. 1986; Otero 1989 in Lara and Veblen, 1993): “Most medium-sized (100-1000 ha) or large (>1000 ha) estates
sold to establish forest plantations were inhabited by *campesinos* (peasants) on the basis of customary rights with no legal tenure of the land (Ibid.: 129). It is important to mention that at this point the debate becomes much more economic than political, before trade liberalization initiated in the mid-seventies has been reinforced since democracy was recovered. The *Concertacion* (left wing political conglomerate) governments have created a model based on natural resource exports and reinforced policies like OC 701 (Leight, 2008; Sáez and Valdés 1999 in Reyes and Nelson, 2014). As summarized by Miller (2014): “while Chilean governments from across the political spectrum have seen in pine an engine of economic development for the frontier, one of the major consequences of pine’s expansion across the southern Chilean countryside has been *campesinos* dispossession” (p. 7).

**Capital and the Roots of Dispossession**

The mentioned socioeconomic and political processes associated with the historical growth of the forest industry in Chile can be understood by looking into the inner dynamics and contradictions of the late capitalist system, and are strongly represented in a process coined by David Harvey as ‘accumulation by dispossession’ in his book ‘The Enigma of Capital’ (2010).

As mentioned before, a first key factor behind this process was the elaboration and establishment of new policies like OC 701, which implemented subsidies and tax benefits for the forest industry. This interaction in the form of tax breaks for particular groups qualifies in what Harvey (2010) calls the ‘State-finances nexus’ or also referred as the ‘central nervous system for capital accumulation’ (p. 54). This late-capitalist model seeks to surpass and weaken the State power in order to accomplish or approach a ‘frictionless movement’ of capital and commodities (less tax, intervention,
fixed prices, etc.), however at the same time, this system occasionally relies on force and authority or ‘structures of governance’ in the implementation of laws and policies to achieve these goals: “This confounds the analytic tendency to see state and capital as clearly separable from each other” (Harvey, 2010: 48).

Secondly, the disparities in participation between the big forest company and the small owners (both economic and territorial) becomes progressively larger in time due to the production process, which is sustained by mechanization and scale. The bigger the plantation is, the more efficient and profitable the activity becomes, and this is why most of these companies operate according to ‘economies of scale’ models. Along with size, the speed is an essential factor. Harvey (2010) explains that “those who can move faster through the various phases of capital circulation accrue higher profits than their competitors” (p.41). The fact that more speed equals more profits takes a completely new meaning in the ecological context of forest plantations in Chile. The Insigne pine’s rotation in Chile fluctuates between 20 and 25 years, half of what it takes in Canada, a third of what takes in Sweden and below the observed in New Zealand and United States (Camus, 2006: 250). This explains why even plantations critics cannot deny how successful the forestry model in Chile has been in terms of economic growth.

The next essential factor is the relationship between the capital forces, the local natural resources and the environmental global crisis. According to Harvey (2010) capital needs to ensure ‘the free gifts of nature’ or the availability of raw materials in a sustained way for the future. Without them there is no growth and expansion, two crucial necessities for capital. During the last century this friction has increased and has become a global trend raising the question of sustainability and adaptation colliding with
the framework of endless capital accumulation. Forest plantations are playing a complex role in this ‘new’ scenario, on one hand, especially monoculture tree plantations are criticized for their environmental effects (water overconsumption, soil acidification, biodiversity loss). On the other hand, they have been presented as a great strategy to control land degradation and carbon sequestration. This new carbon sequestration market and the international environmental agreements have created a new global dynamic where production and the capital flow does not have to stop while companies or countries are able to ‘plant more trees’ or alternatively pay for carbon emission credits. According to Gerber (2011), these regulations associated with the ‘climate-change age’ have encouraged the expansion of tree plantations. However, most of them are being administrated by developing countries and organized to supply external markets as the carbon market.

The fourth factor is the capital-labor relation. For Harvey (2010) the main problem lies in the fact that capital are too powerful and labor too weak, rather than the other way around. The arrival of the forest industry into the communities materializes this power dislocation and by transforming the economic dynamics generates conflict, which are even more severe when highly mechanized and automated technology is introduced, implying less employment opportunities. After doing research in Chile, Miller (2014) explains how pine, like many commercial crops before it has served as the wedge that separates rural people from their land and the natural resources essential to their subsistence, but at the same time creating a scenario where their economic choices are progressively decreasing: “turning them into population of deracinated, landless laborers and inexpensive labor reserve that often is employed by the forestry
companies” (p. 7). As we can see, labor related issues are strongly associated with land dispossession dynamics, especially in the context of forest plantations. Confirming the mentioned above Harvey (2010) explains that “the dispossession of the mass of the population from direct access to the means of production (land in particular) releases labour power as a commodity into the market place” (p. 58). For multiple authors forest plantations became the vehicle through which 19th century colonial officers, and more recently corporate official have deprived poor rural people of access to lands and livelihoods (Peluso, 1992; Guha, 2000, Rohter, 2004 in Rudel, 2008). Forests constituted forces leading to proletarianization or their transformation into a landless labor force. Pine came to represent an alien commodity that was responsible for their loss of land livehood (Miller, 2004).

The fifth and conclusive factor is capital accumulation, this factor has dialectic relationship with each of the factors mentioned above. It seems that in terms of capital, accumulation is the natural response to dispossession in a progressive feedback relationship using labor, natural resources, politics and the state. As explained by Blaikie and Brookfield (1987) the state commonly tends to lend its power to dominant groups and classes: “thus may reinforce the tendency for accumulation by these dominant groups and marginalization of the losers” (p. 17). Many have identified that the development of the Chilean forest industry has been a successful pursuit with few winners and many losers (Miller, 2004). Finally, we should pay attention to the platform that sustains this system of ‘accumulation by dispossession’ that is rooted in unequal power relations. For Gerber (2011) the implications associated with the expansion of forest plantations “arise because of inequalities in power, property and income among

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human groups” (p. 165). To look into these kinds of processes from an economical point of view is always fruitful in terms of research, but it is important to regularly incorporate the political and of course the ‘power’ factor. Is that interconnection what explains capital in a stronger way. Forest plantations are the materialization of these “new landscapes and geographies created within which capital circulates in ways that are frequently haunted by deep contradictions” (Harvey, 2010: 88).
CHAPTER 4
RESEARCH SETTINGS

The geography of Chile tells the history of a series of dramatic geological, ecological and socioeconomic processes. Just looking at the country’s strange shape on any map it is possible to understand that Chile is a “land of extremes”. Located in the southwestern corner of South America, it is the southernmost country in the world. It stretches over 4,300 km (2,670 mi) north to south, but only 350 km (217 mi) at its widest point (east to west). This implies the presence of a huge variety of climates and landscapes, the Mediterranean being one of them. The region that encapsulates this climate, and therefore adopts a series of ecological characteristics shared by Mediterranean-type ecosystems (MTEs), is located from 33°-38°S from the Pacific coast to the Andean foothills (Ovalle et al. 1990).

This region is characterized by cold and humid winters and dry/warm summers, with an average yearly precipitation of 548 mm and the average yearly temperature of 15.4 °C (Ovalle et al. 1990). In general, Mediterranean ecosystems are a special type of dry lands, representing less than 5% of the Earth’s surface (Hernandez et al. 2015). However, “they hold 20% of the plant species of the world, many of them endemic” (Cowling et al. 1996 in Hernandez et al. 2015: 199). This type of climatic and ecological characteristic only can be found in some very specific regions of the world, these are the western and south regions of Australia, the Cape of South Africa, the Napa Valley in Coastal California, Central Chile and of course the Mediterranean Basin, comprising southern Europe and northern Africa. The map shown in Figure 4-4 highlights these particular locations:
These ecosystems are also amongst the most threatened on the Earth: More than 41% of these ecosystems have been converted from farmland to urban use. Only 5% of their natural area is protected worldwide (De La Fuente and Mühlhauser, 2014: 261). In the case of South Central Chile, it is possible to observe the large alteration of the landscape and the resultant deterioration of the natural resources. As explained by Aronson (et al. 1993): Five hundred years ago, the Central Depression of Chile was covered by dense, *sclerophyllous matorral* vegetation, typical of Mediterranean-climate regions” (p. 15).

Livestock farming/agriculture overexploitation, constant land use changes and high endemism have classified the Mediterranean region of Chile as an endangered biological hotspot (Hernandez et al. 2015). Therefore, this region and the few around the world are highly important in terms of conservation (Dallman, 1998). More about the historical environmental transformations and issues will be discussed in the next
chapters, at the moment it is important to introduce the sociocultural diversity that inhabits this region of Chile.

The Mediterranean region of Chile, or also called, Chilean Matorral (Ibid.), concentrates different realities and particular ways of living at the rural level. Here we can find diverse cultural and socioeconomic configurations attached to the territory and constantly interacting. For example, in one extreme we can find the wine industry, consisting mainly of big producers, owners of the best land, with a good access to water sources and exporting most of their production. They also provide jobs, mainly seasonal, for another part of the population, most of them rural people but also some workers from small towns in the region.

On the other end, we can find the small farmers, campesinos living in the cheapest and degraded land, continuously struggling for water, with high socio-economic vulnerability and facing an alarming process of depopulation in the last decades. The present dissertation will focus on this last group, exploring their interaction with the landscape in the context of the strong forest plantation expansion. Although the Mediterranean region is presented as the ecological context for this dissertation, the research will focus in a specific administrative division within the Matorral, this is the Biobio region.

As shown in Figure 4-2, the population in this region is concentrated in the coastal area, having the city of Concepcion as the largest urban conurbations of Chile with more than a million inhabitants. The regions’ economy is mainly sustained by the manufacturing, fishing, agriculture and forest industries (INE, 2008).
According to the 2002 census, the Biobio region with 1,861,562 inhabitants is the second most populated region of Chile (INE, 2002). Another important characteristic related to this research is the high level of urbanization. The high urban expansion along with lack of land, labor and educational opportunities (especially for the younger population) have been addressed as the main reasons for the rural-urban exodus during the last 40 years (INE, 2008).

For this region, in the 1992 census the urban population reached 77.4% in contrast to 22.6% for the rural population. Associating these data to the 2002 census it is possible to observe how the urban population has grown 13.8% while the rural population has decreased 14.8% as shown in Figure 4-3. Although there is not official data for the last census (2012), the National Statistics Institute (INE) projects the perpetuation of this population distribution trend, having a progressively urban population in the future.
As we will see in the following chapters, this phenomenon is not only influenced by national factors as those mentioned before, but also by territorial and socioeconomic issues related to the expansion of forest plantations in the region. In relation to this, another factor to pay attention to is the household categories distribution. For the case of the Biobio region, which has been traditionally portrayed as a rural region, the current figures of urbanization evidences the significance of the rural-urban migration process, having more than 70% of the population living in cities.
The demographic characterization of the Biobio region is important because this research will not be focused on a particular community or a specific municipality, but rather it will analyze different households within the Biobio region. The goal behind this design is to diversify the sample from an environmental and socioeconomic point of view, in order to encapsulate the different realities found in the Mediterranean region for this particular administration.

Beyond the environmental and sociocultural regularities found in the rural context of the Biobio region, it is important to approach certain distinctive elements directly related to the variables considered in the present research. Factors like rural isolation, different forest companies with different operations and methodologies, different levels of soil erosion and water scarcity, etc. Therefore, this research is conducted in a delimited portion of an ecological region passing through different local administrations and communities. Finally, in order to connect the research problem with the described settings, the dimension and location of both plantations and native forest are also presented in the next figure:

Figure 4-5. Biobio region: Plantations and native forest location and extension (CORMA, 2016)
CHAPTER 5
OBJECTIVES, HYPOTHESES AND METHODS

Research Objectives

The overall objective of this research is to understand the sociocultural implications of monoculture plantations in the context of small farmers of the Mediterranean region of Chile. Specific objectives will inform the overall research goal:

1. Construct personal networks and measure structural characteristics along with the geographical dispersion of alters.
2. Reveal collective ideas about socioeconomic and environmental uncertainty and the adaptation and change in knowledge and behavior.
3. Assess landscape perception in terms of risk, functionality and aesthetic appeal.

Research Hypotheses

The research objectives are based upon, and contribute to, existing theoretical foundations, providing both quantitative and qualitative data to better understand the sociocultural implications of monoculture plantations on small farmers’ social structure, traditional environmental knowledge and practices (behavior), along with their landscape perception. To explore these theories, the following research objectives and hypotheses are proposed:

Objective 1: Construct personal networks and measure structural characteristics along with the geographical dispersion of the alters.

Based on social structure (Putman, 1993; Bodin et al. 2006) and social capital theories (Portes, 1998) associated with natural resources (Bodin & Prell, 2011) the interaction of households and their landscape affects their networks, especially in the case of plantations (Tonts et al. 2001) and where farmers who are surrounded by plantations suffer from reduced social interaction and increased isolation (Schirmer, 2006; Tonts and Black, 2003). Therefore, my hypotheses are:
H1: Farmers with higher levels of plantation encroachment surrounding their properties will have less dense personal networks compared to those households with lower levels of encroachment due to surrounding plantations.

H2: Farmers with higher levels of plantation encroachment will present a broader geographical dispersion of their network due rural-urban migration compared to those households with lower levels of encroachment.

Objective 2: Reveal collective ideas about socioeconomic and environmental uncertainty and the adaptation and change in knowledge and behavior.

According to Sjölander-Lindqvist (2004) and Rolley & Humphreys (1993) socioeconomic and environmental processes associated with the change of the landscape can result in anxiety and uncertainty in the population that inhabit these regions. Also, Tonts & Black (2003) and Schimer (2007) explain that the introduction of plantations have shown change in behavior and traditional knowledge in farmers forcing them into a process of adaptation. In relation to this, my hypotheses are:

H3: Farmers with higher levels of encroachment due to nearby forest plantations will express higher levels of uncertainty and anxiety in relation to the future concerning socioeconomic and environmental topics.

H4: Farmers with higher levels of encroachment due to nearby forest plantations will experience more change and adaptation in terms of traditional knowledge and practices.

Objective 3: Assess landscape perception in terms of risk, functionality and aesthetic appeal.
According to place theory and social representation theory (Selby & Petajisto, 2000; Devine-Wright, 2009) landscape perceptions can tell us how people feel about changes in their surroundings, like different process of land degradation or the introduction of plantations (Anderson et al. 2013). Based on this my hypothesis is that:

H5: Depending on their proximity to plantations and level of encroachment, farmers will have different perceptions between samples of landscapes in terms of how risky, functional and appealing they are. For example, farmers living closer to plantations will perceive a higher risk of forest (due fire hazards) than a cleared and eroded field, compared with farmers living in deforested areas with high soil degradation.

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Dependent Variables</th>
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<tr>
<td></td>
<td>Social Structure</td>
</tr>
<tr>
<td></td>
<td>Social network strength and Social Capital</td>
</tr>
<tr>
<td>Encroachment due to plantation proximity</td>
<td>Higher Encroachment due to plantations</td>
</tr>
<tr>
<td></td>
<td>Lower (or none) Encroachment due to plantations</td>
</tr>
</tbody>
</table>

Figure 5-1. Research variables and hypothesized relationships.
Methods

This is a comparative design comprising three main classifications or levels of encroachment due to forest plantations. Analyzing their proximity and level encroachment related to forest plantations a sample of 50 households was classified into these groups using their geographic location and GIS analysis.

In order to do this the geographical location of each of these households was identified using ArcGIS 10 software, specifically the ArcMap tool. Having the geographical location (supported by in situ GPS readings) a Land Cover (LC) analysis was conducted using ArcMap. According to the results, the households were classified in three different groups: 1. High levels of encroachment (plantation encapsulation) 2. Medium level of encroachment 3. Low or no encroachment. There are many studies that use land use and land cover analysis (LULC) in order to understand socioeconomic related changes in the environment (Ramirez, 2002). However, for this particular study the Land Cover analysis was used only to fulfill the need of household categorization.

As explained in the previous objectives table, after the sample was organized and categorized the actual data collection focused on three main variables:

Landscape Perception

Along with the social structure factor, knowledge and behavioral effects, the proposed research will also aim to assess the factor of landscape perception, place meaning and social representation (Moscovici, 1981). The study of landscapes as perceived by cultural groups has spread from geography into anthropology in recent years (Sutton & Anderson, 2014). Landscape perceptions, meaning and representation are tightly associated with social characteristics such as structure, that although they are individual, have a social origin, acquired from the social group and mediated by the
individuals’ belonging to a collective that shares similar views and experiences (Augoustinos et al., 2006 in Anderson, et al., 2013: 122). It is important to add that these perceptions are a product and a process, they are dynamic, constantly forming, reforming and re-negotiated within the group (Howarth, 2006). That is why it is so interesting to test them in the context of severe landscape change, many times associated with a process of social isolation.

In order to assess landscape perception a Q-sort test was conducted with each respondent, this method is designed to “study subjectivity in an organized manner” (Barry & Proops, 1999: 389). In this study it was used to understand meaning attributed to the rural landscape and the role of plantations within the rural landscape in the study area. Q-methodology identifies individuals sharing similar mental images or ways of thinking about the rural landscape, these symbolically ‘summarizes’ the complexity of meaning ascribed to place (Anderson, 2013). In order to do this, photographs of rural landscapes (23) were provided to the respondents, who were asked to sort them. These photographs represented the range of rural land uses and landscape types typically found in the Mediterranean region. In order to stimulate this task, the question: “What do rural landscape in this region mean to you?” was asked. “The sorting matrix requires two photos to be placed in each of the two extreme categories (“most like/least like my idea of a rural landscape”) with the number of photos in each category increasing towards the middle of the scale” (Stainton Rogers, 1995 in Anderson, 2013: 126). This was recorded and associated with the household and its geographical location. After that, a statistical analysis looked inter-correlations between the individual and shared configurations among the household categories (level of isolation due to plantations)
and among the whole sample, the PQMethod software (Schmolck, 2002) was used for this objective.

Finally the respondents were asked to select a single picture that best represents a risky landscape, one that best represents a functional (in terms of production) landscape and one that best represents an aesthetical appealing landscape. The results of this part were associated with the plantation encroachment category and with the general landscape contributing with quantitative and qualitative data.

**Semi-Structured Interviews and Participant Observation**

Interviews were conducted with the head of the household who was approached at his/her home. These interviews contributed with qualitative data specifically aimed at the knowledge and behavior variables, in relation to this, the semi-structured interview focused on the following data: what is the household’s general experience with the plantations, do they have/manage forest, how does the plantation introduction and expansion makes them feel (H4), which benefits and problems can they identify for the household in relation to the forest sector and the near plantations (H5), what changes (if any) have resulted from the household due to the plantations introduction and expansion (H5), how is their relation to the near forest companies (H4), what is the situation in relation to jobs and migration for their household and the region (H3), what activities have been incorporated and lost in the last years (H5), do they feel vulnerable or isolated (H4). The ethnographic narratives were recorded with a digital voice recorder and transcribed, in order to do the text analysis by content analysis (Bernard, 2011).

Along with the actual interviews, the multiple sessions conducted with each of the respondents allowed time to share with the household, observe, and even, participate in some of their productive activities. As explained by Bernard (2011) this type of fieldwork
can be categorized as rapid ethnographic assessment (p. 264), where the ethnographic method stands alone “but it is also increasingly part (or platform) of a mixed method strategy” (Ibid: 288). In this context of “short” fieldwork the gathering of qualitative and quantitative data was accomplished, this combination allowed me to produce more insight than either of the approaches alone (Ibid.).

**Personal Social Network Analysis**

For Schweizer (1997) the development and use of new tools in anthropology, and in social sciences in general, is directly related to the demanding increase of complexity in the social world. This is not only the continuous transition from local to global but also all the “economic linkages, demographic processes, social interaction, political control, and flows of information” (p. 740) that are continuously drawing people into multiple circuits. The overlapping of these systems, the different types of ties and the resulting networks can be investigated with the help of social network analysis (Ibid.).

For the present research the way to approach these systems is the ego-centered network analysis. As explained by Trotter and Schensul (in Bernard, 1998) this methodology is based “on an individual's definition of the individuals connected to him or her by specified social relationships” (p. 712). In other words these personal networks “consist of the set of family, friends, and acquaintances surrounding a focal person” (McCarty et al. 2007: 145).

The personal network interviews occurred during the second meeting with respondents. All personal network data was elicited and collected verbally but will be entered directly into Egonet software using a laptop computer as the informant responds to minimize potential researcher error. As explained by McCarty (et al. 2007:
148) this software is designed as a “questionnaire authoring language that allows researchers to tailor the interview to their specific research interests” and consist of four modules: 1. Personal questions about the respondent (also previously described as general socioeconomic survey). 2. Questions used to generate the names of network alters (n=30). 3. Questions asked of the respondent about those alters. 4. Questions asked of the respondent about the existence of relations between alters. The Egonet software is an essential tool not only for the collection of network data, but also for the analysis of this data. Let’s remember that the number of ties grows geometrically as alters are added, in the case of the present research of 30 alters, there were 435 alter pair evaluations \( \frac{n(n-1)}{2} \).

Going back to the hypotheses table, the analysis of this section is aimed to answer objectives related to social structure (H2) and alters geographical dispersion (H3). As explained by Trotter et al. (1995 in Bernard, 1998): “Attributes of the content of ego-centered networks (size, gender and ethnic composition, etc.), and characteristics of those networks themselves (density, intensity, etc.) can be incorporated into "typical" network profiles, which can then be associated with other psychosocial variables” (p. 712). This explains the complementary role that social network analysis has for the different variables and the research in general.

**Sample Profile**

As mentioned before, 50 householders were selected to participate in the study. The respondents were contacted through multiple local agencies as NGOs (CET Biobio), research institutions (INIA) and rural development programs (PRODESAL) from several municipalities (Ranquil, Hualqui, Chillan, Portezuelo). These agencies became
the bridges to recruit five key informants that also were the seeds for the used Snowball sampling technique (Goodman, 1961).

The final sample is comprised by 30 females and 20 males, with an average age of 57.26 years and a gender/age distribution shown in Figure 5-2:

![Figure 5-2. Sample age/gender distribution.](image)

Also it can be added that most of the respondents are married (68%) and with an average fertility rate of 2.7 (the average rate for the whole administrative region is 1.8). Being a sample mostly composed mostly by middle aged and older respondents, there is also an important percentage of widows and widowers (16%) followed by single respondents (12%). This can be visualized in Figure 5-3:

![Figure 5-3. Respondent’s marital status.](image)
The sample households’ are inhabited with an average of 2.8 people, however this is not directly related with the number of offspring in each household, as it is shown in Figure 5-3:

![Figure 5-3: Respondent’s offspring size and household inhabitants.](image)

Finally in terms of economic characteristics it is important to mention that 62% of the sample has agriculture related activities as their main income source followed by 16% of the sample economically dependent of their pensions:

![Figure 5-5: Respondent’s main income source.](image)
In relation to land, the sample is mostly characterized by householders that own their property, where most of these (72%) can be classified as small (less than 10 ha). This is shown in Figure 5-6:

Figure 5-6. Respondent’s land tenure and size.

From a general point of view, most of the sample can be classified as small producers, dependent on rainfed agriculture living in poor soils with low levels of organic matter (as described in the study settings). Most of them don’t own agriculture machinery and have reduced the production surface over the years, shifting from cereal production to more particular crops, greenhouse horticulture and more diversified activities. They have also been progressively surrounded by exotic forest plantations, in some cases they have designated parts of their properties for this same activity, managing most of this small production for internal use (fire wood).

However, this study also considers a small group of producers with some different characteristics. A small part of the sample consists of bigger producers with
larger properties away from forest plantations, better soils, use of agriculture machinery and complex irrigation systems. This allows me to consider the diversity of realities that coexist in the region and a reference point in terms of the proposed study variables.

**Household Ecology Context**

In Klubock (2014) introduction to “La Frontera” a book about the forest socio-ecological conflicts in Chile, he describes arriving to the region by air, and being surprised by the magnificent view of all these pine plantations covering the hills of the coastal cordillera of South Central Chile running down to the very edge of the Pacific Ocean. Others, especially locals, have called it “a green ocean” and even “a green desert”. However, being a local myself, living in the region for most part of my life, you are used to see plantations everywhere, especially while traveling from the central valley to the coast.

The flat road sides become a repetitive line of pines, one tree after another that seems infinite into the horizon. However, most people traveling in these freeways are not able, or do not care to see what is behind those first front lines of trees, not even locals like me. It is only when you dare to exit the freeway and enter some of the dusty dirt roads when you start to notice the magnitude of this plantation operation. This is particularly shocking when after traveling some miles you find out that there is actually people living in these monotonous territories, and these are not only isolated houses inhabited by hermits, but small communities and villages behind those extensive plantations. There is a general perception in our imaginary that farmers only live in farm lands, where we see vast agricultural lands, however, when you immerse yourself in these small roads within the plantations it is possible to see a whole different reality, small properties completely surrounded by mostly pines and some eucalyptus. It is hard
to see vegetation other than monoculture tree plantations, some bushes and weed are spotted in the road side, but looking into these dense forests there is almost impossible to see something below those dense tree shadows. Sporadically you see wood and wire gates closing even smaller roads leading to small houses. The land is not as flat as the freeway anymore, now it is possible to notice that you are moving between hills with sometimes strong slopes. After arriving to one of the respondents’ properties you usually see three main structures: A small wooden or adobe house, a wooden shed and sometimes a greenhouse with old plastic shelving. These small properties are a result of a land tenure system in which land has been divided several times during the decades between the inheritors. In regards to animals, most respondents have pointed out how during the last decades it has become progressively harder to sustain cattle, sheep and even chickens. This is easily noticeable by looking at their properties, although most of them breed chickens in some level, it is rare to see pigs, sheep, and especially cattle.

The household configuration is also something that has changed drastically in the last decades. Most of these houses were built to provide shelter to nuclear families, occasionally with numerous offspring. Although every family member was in charge of particular production task, the main productive activities, as the cereal production (especially wheat and legumes) was administrated by the father, the head of the household. Nowadays the most common scenario is to find a middle age or elderly couple living by themselves, having most of their offspring migrated to urban areas. For this same reason they have adapted to a more diversified and small scale production, having greenhouses and gardens as an important source of vegetables not only to sell
and trade, but also for consumption and women leading most of these operations. Simultaneously, they have progressively become involved in development programs where they have adopted multiple economic activities, not only concerning vegetable production, but also handicrafts, gourmet products as jams, preserves, honey sub products and even sparkling wine. This has a lot to do with their location within the Biobío administrative region. Although households share similar socioeconomic and ecological characteristics their particular location in the region have certain implications. For example, households located in the southern part of the region, especially those in the Arauco province have as an essential economic activity the traditional production of strawberries. This region was characterized for certain varieties of strawberries that cannot be found in other regions in Chile. The local identity is totally influenced by this product, and the story of how they used to fill trains with local strawberry decades ago is told by everybody. According to the respondents, the particular local climate, with very cold temperatures in the coastal cordillera altitudes is essential for the strawberry production cycle that is why the temperature increase associate to climate change has affected this product. But along that, respondents point out plantations as a key responsible in the loss of bee hives due to the lack of pollination offered by these monoculture forests. These issues will be addressed in more depth during the discussion chapter, however, is important to describe some of the most relevant socio-ecological characteristics of the region and the households inhabiting it.

Moving to the north of the region several households in the Ñuble province were approached. With higher temperatures and lower altitude than the Nahuelbuta cordillera found in the Arauco province, the coastal range of the Ñuble is characterized by
traditional wine production. As with strawberry in the south, wine production played an essential role in local identity and the transformation of the landscape. Vineyards have been grown for hundreds of years since the arrival Spanish arrival. However, in the last decades, changes to new varieties of grape have made the traditional wine production obsolete for the current markets. Along with this, climate change and the expansion of plantations have had important implications regarding water availability, which has become an important factor in the decline of traditional wine production.

In the central part of the region we found the Biobio province where several respondents were approached. This province is characterized for its long history of cereal production, especially wheat. However, this production history involves the long term overexploitation of the natural resources, especially soil, which has led to significant land degradation issues. This, along the expansion of monoculture plantations into arable land, have progressively become a key factors in the decline of traditional cereal agriculture. Although all three of these regions have been presented separately, the small farmers living in these provinces share most of their cultural practices and identity. This can be observed in how they interact with their landscape, but especially, how they interact with the rest of the community. Traditionally, these rural communities have sustained not only their production, but their livelihoods in the social interaction between households. The production of strawberries, wine and cereals, among others, are a result of a complex system of cooperation and reciprocity within the community. This is particularly relevant for households that cannot afford the means associated with a mechanized production system. They rely on their neighbors, family and friends in order to produce food, not just to sell and exchange, but also for the
household consumption. This complex system of social capital have implications beyond economic production, cooperation is embedded in most practices intended to overcome socioeconomic and environmental vulnerabilities, even concerning health problems, caregiving needs and security issues. Although this type of support is not exclusive for rural communities, there are particular strategies that are accentuated in these settings that are worth to mention. An example of this is the *Compadrazgo* relationship (coparenthood) (Mintz & Wolf, 1950). This is the social institution of reciprocal relationship between godparent or godparents and the godchild and its parents (Mendoza, 2010) which can be found in many region of South America and in the Spanish-speaking world. This type of social support is vastly found in rural areas, where Christianity is also predominant. However, one of the most representative social support strategies found in this region are production ceremonies (Infante, 2017), which were also addressed in Chapter 3. The “*mingaco*” (crop production) and the “*vendimia*” (wine production) are gatherings where different families, neighbors and friends meet for a meal, or even a full day of sharing and eating. The goal of these meals is not only the necessity to summon the guests, but also to nourish those who work in the planting, harvesting, weeding, mooring or any activity involved in production. These ceremonies are summoned by one of the families in the community; this household subgroup offers a feast to the guests in return of labor. One of the main features of these ceremonies is that it determines a social network that integrates and excludes cooperation depending on participation. To illustrate this, lets imagine that the “A” family calls for a “*vendimia*” or “*mingaco*” but the “B” family does not attend, it is very likely that in the future if the “B” family is the convener the “A” family will not participate, by this dynamic, families are
implicitly ‘obligated’ to collaborate so that in the future the rest of the community will cooperate. Thus, ceremonies, especially productive ones, work reciprocally, relating hosts and guests *vice versa* in a network of labor interchange.

As it will be discussed in the final chapters, these ceremonies have been disappearing in the last decades due to multiple factors, but having rural-urban migration as a key element. This process of depopulation is one of the most significant concerns for the local respondents. Their narratives about this issue signifies a general sense abandonment of and hopelessness for the future. Not only regarding the banishment of their communities and the transformation of the landscape, but the loss of their traditions, practices, and especially, knowledge.

Probably this is also one of the reasons why respondents are so welcoming, they are eager to talk, to answer questions, to invite you to eat and stay longer. Even if the visit was arranged days ago they are always expecting you. Although, they are also always working on something. If they are not watering the vegetables or pulling out weeds in their gardens, they are sorting seeds, working in the kitchen, talking on their cellphones or baking bread. Although most respondents invite you inside their houses to conduct the interview, some of them prefer to pull some chairs outside. I could perceive that sometimes they feel ashamed about the precariousness of their houses. Even though I am a local sharing multiple communalities with my respondents, there is still a sociocultural, age and economic gap constantly separating the researcher and the respondent. Many of their houses made of adobe were severely affected by the multiple earthquakes that have stroke the region in the last years. Some of them are living in temporary housing solutions or *mediaguas* (prefabricated houses constructed of wood
panels). On the other hand, they are always extremely proud of their production infrastructure; gardens, greenhouses, crops, sheds, fruit trees and animals. It is easy to identify how connected they feel to all those things, to the land, and especially to the work involved. Even in cases when they have a job or other type of occupation outside their properties, they always are producing something and taking care of their animals. Is what they know how to do best, and they have done it during their whole life. This is the same reason why their narratives portray a traditional rural world that is vanishing in front of their eyes, but at the same time, they point out new challenges in the context of the new rurality. The irruption of forest plantations in this scenario and its implications in the respondents’ livelihoods will be addressed in the following chapters.
CHAPTER 6
RESULTS

Land Cover Proximity Analysis

In order to understand the results in the context of the proposed hypothesis it is necessary to associate each household unit to their geographic context. Specifically, as mentioned in the previous chapter, for each household unit a geographic land cover analysis was needed in order to categorize this household with a particular level of encroachment due to near plantations. Table 5-1 in the previous chapter shows the hypothesized relationship between this independent variable and the rest of dependent variables addressed in this study.

Using ArcGIS 10.2.1 software, a 2 km ‘buffer’ (zone of equidistance around a geographic feature, in this case a circular perimeter with a 2 km radius) was created for each household geographic location. For this type of analysis the literature shows that it is common to use a 1 km radius, this is especially popular in wildlife studies (Tuanmu and Jetz, 2014) although several studies involving human activity several authors have applied values around one mile (1.6 km) and more, especially for rural settings (Boucek and Moran, 2004).

After this procedure each buffer was overlapped or ‘intersected’ with the land cover polygons provided by the Chilean Ministry of National Assets (IDE, 2015). The resulting intersection polygons contain the surface data with the amount of square meters of forest plantations inside the above mentioned perimeter. As shown in Figure 6-1, although households can be located relative close between each other, they can also have very different amount of plantations within their close perimeter (orange polygons):
Figure 6-1. Example of three respondent’s household land cover analysis with different amounts of forest plantations surrounding their 2 km radius perimeter.

This surface numeric data was extracted for each household and transformed into percentage of forest plantation area in relation to the total perimeter area. With these percentages the data was organized and a frequency table was constructed. This table allowed to generate intervals and to categorize the sample in three percentile groups:

1. Low encroachment due to forest plantations (0%-5%),
2. Medium encroachment due to forest plantations (6%-30%)
3. High encroachment due to forest plantations (31%-100%)

This frequency categorization also divided the sample in three sufficiently even groups of 16, 17 and 17 respondents each respectively. Figure 6-2 shows this distribution:
Along with individual case analysis this classification will address the following results with an extra point of view, allowing to interpret the socio-economic and cultural dynamics taking into account an essential variable as the household’s landscape context, which is portrayed in this study as a crucial piece in the puzzling socio-environmental dynamics in which these households are embedded.

**Landscape Perception**

The following section is focused on Objective 3 and the corresponding hypothesis (H5) regarding landscape perception. Although, topics related to landscape perception were also addressed with semi-structured interviews, the main method intended to assess this variable was a Q-sort test. After explaining how the test worked, especially how each space in the matrix assigns points to each photograph, the respondents were asked to: “Please arrange the following photographs according to your opinion about the most and least ideal landscapes for the local rural settings”. This test was completed by each respondent generally during the first visit. Most of the respondents had a very positive and enthusiastic reaction to the test although some were a little intimidated. Figure 6-3 shows the final matrix used to facilitate the sorting process by the respondents:
Respondents used different approaches to sort the images; some tried to visualize the whole deck of photographs before placing any in the matrix, others went through the deck placing each photograph one by one. Some respondents focused on identifying the most striking images for both extreme columns (-3 and +3) and from there build their way to the middle column (0). In most cases, respondents rearranged their final sorting, even several times, until they were totally satisfied with the result.

The sorting process was audio recorded, so any comments, questions or narratives related to the process were also considered and transcribed, this allowed a thorough analysis and understanding regarding the sort results. Also, the observation of the actual process allowed to identify which pictures were sorted more easily and which were more difficult to locate, which pictures had a stronger reaction from the respondent, which were more conflicting, etc. All this qualitative data was also recorded as field notes.

The resulting configurations have multiple analytic functions. First, there is a visual result where the sorting curve can be qualitatively observed and analyzed as a whole. Here it is possible to identify visual patterns of certain types of landscape in the curve, and even the distribution of colors associated with the content of each picture (plantations, clear land, crops, etc.). Secondly, the resulting configuration constituted a
strong stimuli to talk about the topics addressed in this study. The respondents were asked about their decisions in creating the sorting curve; why they chose those particular images for those particular values? What is their opinion about the resulting sorting? Was it a good experience? Why not?

This also allowed me to go deeper into the content of particular pictures from the respondent perspective, especially for the most extreme pictures (+3 and -3). What were the reasons behind locating that picture in that value? What does that picture represent for you? This aftermath interview process not only took more time than the sort itself, but also, set the perfect scenario for the semi-structured interview. The respondents incorporated the main topics and objectives addressed by the study.

Thirdly, the resulting distribution of photographs grants each picture a numeric value which can be quantitatively analyzed using PQMethod software. By associating the results within the rest of the sample and within each of the encroachment classifications (Low, Medium, High) it is possible to assess a final score for each landscape. Along with this, UCINET software was used to assess the cultural competence of the respondents in order to identify key respondents and outsiders. These competence scores were also statistically analyzed using SPSS in order to understand how cohesive the general landscape perception was for each classification.

**General Landscape Perception Trends**

Figure 6-4 shows the final z-scores for each of the 23 photographs for the whole sample of 50 respondents. It is important to understand that z-score is the number of standard deviations from the mean. This test creates a mean of 0 by forcing a normal distribution (-3,-2,-1,0,+1,+2,+3). Having this in mind, the minimal possible z-score for a photograph is -3, this would indicate that every respondent located that particular
picture in a -3 segment, suggesting a unanimous and total rejection. At the same time, the maximum possible z-score for a photograph is +3, this would indicate that every respondent located that particular picture in a +3 segment, suggesting a unanimous and total approval.

Figure 6-4. Whole sample landscape perception Q-sort results.

The above figure shows the resulting distribution, also highlighting three photographs with the highest rejection (11, 1 and 5) and approval (16, 8 and 9) index. These photographs represent the landscapes indicated by all the respondents as the most and least ideal for the local rural settings. Also, it is easy to identify one photograph as a predominant choice for both extremes (11 and 16), these two images will become recurrent as the chapter proceeds. Table 6-1 shows these most representative photographs along with their respective z-scores.
Table 6-1. Whole sample most and least ideal landscapes.

<table>
<thead>
<tr>
<th>Most Ideal Landscapes</th>
<th>Least Ideal Landscapes</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /> P16: 1.83</td>
<td><img src="image2.png" alt="Image" /> P11: -1.85</td>
</tr>
<tr>
<td><img src="image3.png" alt="Image" /> P8: 1.30</td>
<td><img src="image4.png" alt="Image" /> P1: -1.51</td>
</tr>
<tr>
<td><img src="image5.png" alt="Image" /> P9: 1.25</td>
<td><img src="image6.png" alt="Image" /> P5: -1.48</td>
</tr>
</tbody>
</table>

The left column shows three landscapes identified as the most ideal for the local rural settings from the available sample of pictures. From a general point of view, respondents argued that these three landscapes were associated with some kind of agricultural activity, especially subsistence/traditional agriculture. Also, many pointed out that, although there is some amount of introduced tree species, these are a minor part of the visible landscape, where other features as agricultural production are highlighted.

Beginning with photograph 9 (P9: 1.25), there are two main components that were pointed out as positive by the respondents. First there is vegetable garden in the low part of the property where most of the water and arable soil is found. Secondly,
respondents identified a mixture of native trees and shrubs with some introduced species located in the hills. This is considered as a good interaction between the ability of producing food and protecting the hills for erosion, along with the availability of firewood for the household needs.

P8 (1.30) is a completely different case from the previous photograph. Here the main component is traditional wheat production in a hilly area. This production system has been progressively declining in the region. This is due to many factors as low prices in an unfavorable grain market, high labor dependence and especially labor scarcity due to rural depopulation. Most respondents identified this image as “the way things used to be” in a very nostalgic tone. Especially highlighting the ongoing harvest process as an opportunity to share and interact with the community. The traditional production aspect from the image is the main component that called the attention of respondents.

Finally P16 (1.83) is the landscape with the higher approval for the whole sample. There are two main concepts associated to this image by the respondents; “diversity” and “community”. Regarding the first concept, most of the respondents argued that the image encapsulates many of the multiple production activities small producers have to conduct in order to survive for a whole year. It is possible to identify gardens, greenhouse, vineyard, animals and even some trees. One of the main strategies carried out by small producers to cope with socio-economic and environmental vulnerability is the diversification of their income and production. This allows them to withstand not only environmental events associated with climate change as drought, unforeseen frost or new pests, but also, economic variables as market fluctuations and availability. However, this production diversity has also become
essential in this new scenario of rural depopulation and labor scarcity, shifting from 
more extensive grain production to smaller and more diversified products.

Regarding the concept of "community", respondents argue that social interaction 
is a key component in rural life, especially being a small producer. Respondents 
highlighted the sense of community and connectedness shown in the image, having 
three different households sharing the landscape. This is also a key narrative about one 
of the main issues associated with forest plantations. Although this will be discussed 
thoroughly at the end of the chapter, at this point is important to mention in terms of 
landscape perception how plantations are seen as a division, a place of discontinuity, a 
barrier between households and communities.

The right column shows three photographs with the lowest z-score, and 
therefore, identified as the least ideal landscapes for the respondents. These images 
also represent two of the main environmental concerns narrated by the respondents; 
forest plantations and land degradation.

P5 (-1.48) represents a landscape of not only high land degradation due to 
erosion but also abandonment. Many respondents had opinions about this particular 
landscape, pointing out how severe and irreparable this scenario was, also adding that 
the only thing left to do in a case like this is to plant trees. They also highlighted the 
solitude represented by the small house in the middle with no crops, animals or any sign 
of human activity.

According to respondents’ comments, P6 (-1.58) score is mainly attributed to the 
monoculture forest plantation component, although, it also continues the above 
discussed issue of abandonment. Respondents identified the vineyards at the bottom as
abandoned arguing that the lack of maintenance is noticeable. Although, some respondents acknowledged it is a good decision to plant trees in the hilly area leaving the arable land for other activities, as wine production in this case.

Finally, P11 (-1.85) is not only the most rejected landscape in the sort, but also, it has the biggest score range from the mean, even bigger than the most approved images (P16: 1.83). This also implied that respondents had very strong feelings about this image, not only regarding the score, but also, in their narratives. Respondents pointed out that this photograph represented one of the main issues in the region; huge plantations located in flat agricultural soils. They also highlighted how this plantation had company standards, this is: every tree uniformly arranged, with similar sizes, similar ages, and therefore, the same harvest date. Most respondents also associated this type of production as very vulnerable to fast wildfires and as a space or territory that only fulfills the plantation purpose. Therefore there are no other trees, bushes or plants species found, there are not trails to travel and generally these plantations are very extensive in size.

In order to have a better understanding of these results it is also important to look into the “cultural competence” scores for each of the analyses. In this case, the whole sample holds competence scores ranging from 0.891 to -0.843. This means that, although there are respondents whose responses are very representative of the group, there are also outliers whose negative scores (5 cases) point out some completely different opinions. The statistical analysis of these competence scores shows a positive mean with a small standard deviation and variance in spite of a high range as presented in Table 6-2:
Table 6-2. Whole sample competence score analysis.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.508</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.384</td>
</tr>
<tr>
<td>Variance</td>
<td>0.148</td>
</tr>
<tr>
<td>Range</td>
<td>1.734</td>
</tr>
</tbody>
</table>

These general landscape perception results for the whole sample are important because they show certain trends including the whole spectrum of rural inhabitants, even those located far away from plantations (0%-5%). They are also useful to compare with each groups’ results revealing and assessing any possible variations. Before moving to each of the group’s results it is also important to highlight that 5 of the top 6 most rejected landscapes had some tree plantation component.

**Perception by Group Classification**

The following section will introduce the Q-sort results for each of the three classifications introduced at the beginning of the. As for the whole sample, the same analysis was conducted to each of the groups, also resulting in a z-score for each landscape. Starting with the Low encroachment group (0%-5% monoculture plantation surface cover in a 2km radius) composed by 16 respondents, shown in Figure 6-4:

![Figure 6-5 Low encroachment group (0%-5%) landscape perception Q-sort results.](image)
As shown in the above figure, there is a very continuous progression of positive scores finishing with P16 standing out in terms of approval score (1.80). This result is shared with the whole sample analysis, although, the predominance of P16 is not as big as the whole sample, followed close by P19, P7 and P9.

In terms of rejected landscapes there are two images (P11 and P5) sharing the top for least ideal landscapes with equal scores (-1.63). As shown in Figure 6-4, P11 remains in the bottom of the graph, however in this analysis P5 has obtained a lower score, moving from a third place for the whole sample to matching the top for most rejected landscape in the Low encroachment classification. The landscape elements in P5, and the rest of top scores can be seen in Table 6-3:

Table 6-3. Low encroachment group most and least ideal landscapes.

<table>
<thead>
<tr>
<th>Most Ideal Landscapes</th>
<th>Least Ideal Landscapes</th>
</tr>
</thead>
<tbody>
<tr>
<td>P16: 1.80</td>
<td>P11: -1.63</td>
</tr>
<tr>
<td></td>
<td>P5: -1.63</td>
</tr>
</tbody>
</table>

For this group with a low number of plantations surrounding their households P16 (1.80) has some predominance in terms of the z-scores. As discussed above, production diversity and community seems to be the key element behind this landscape, that as it will be shown through all q-sort results, it has a unanimous acceptance
regardless of classifications. The most interesting alteration regarding scores, between this Low encroachment group and the whole sample, is in the least ideal landscape results. Here, although the top three also share the lowest scores for the whole sample, as pointed out before, there has been an interesting rearrangement. P5 received a lower score matching P11 (-1.63) and leaving P1 in a third place for the most rejected landscapes. Interestingly P5 does not show any signs of forest plantations as part of the landscape, but rather, has land degradation due to erosion as the main element. The low score for this image is predictable for a group of respondents with more extensive agriculture the as main income source, and therefore having land degradation as one of the main threats. This change is also reasonable for a subsample with many properties away from plantations and its associated issues.

In terms of cultural competence, the Low encroachment group shows scores ranging from 0.925 to -0.226 with 3 respondents having negative values. This along with the analysis presented in Table 6-4 suggests that, although the Low group has a smaller range, its average cultural competence is very similar to the whole sample, especially in terms of variance.

Table 6-4. Low group competence score analysis.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.504</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.403</td>
</tr>
<tr>
<td>Variance</td>
<td>0.163</td>
</tr>
<tr>
<td>Range</td>
<td>1.151</td>
</tr>
</tbody>
</table>

The Medium encroachment group (6%-30% monoculture plantation surface cover in a 2km radius) composed by 17 respondents also shows some interesting
results. As can be seen from Figure 6-6, there are two landscapes that evidently stand out on both sides of the score spectrum, especially for the most rejected images:

Figure 6-6. Medium encroachment group (6%-30%) landscape perception Q-sort results.

These results show no variability in terms of the landscapes with highest and lowest scores, especially compared with the whole sample (11 and 16). However, the level of predominance of these two landscapes, especially for the least ideal, is what stands out the most for this subgroup’s results. P11 (-2.11) is the lowest score for any landscape in any analysis and the only surpassing the -2 index. This means that most respondents in this group had very strong feelings and opinions about this particular photograph. Along with this, P16 (1.97) has the highest score for any landscape, in every group. These scores reveal two choices with significantly different results; however, they are also showing the representation of two completely opposed landscape realities. On one hand there is diversity, on the other hand there is monoculture:
Table 6-5. Medium encroachment group most and least ideal landscapes.

<table>
<thead>
<tr>
<th>Most Ideal Landscapes</th>
<th>Least Ideal Landscapes</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
<tr>
<td>P16: 1.96</td>
<td>P11: -2.10</td>
</tr>
</tbody>
</table>

The resulting distribution along with the highly representative scores for both ‘most’ and ‘least’ ideal landscape choices are concordant with the group’s competence scores. The Medium encroachment group has the highest competence average along with no negative values among its respondents. This group has also the lowest standard deviation, variance and range, as showed in Table 6-6. It is safe to say that the Medium encroachment group is the most cohesive in terms of landscape perception compared both with the whole sample and the other two groups (low and high).

Table 6-6. Medium encroachment group competence score analysis.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.590</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.175</td>
</tr>
<tr>
<td>Variance</td>
<td>0.031</td>
</tr>
<tr>
<td>Range</td>
<td>0.528</td>
</tr>
</tbody>
</table>

Finally, the High encroachment group (31%-100%) maintains the same tendency as previous analysis. In this case there are two main photographs with prevailing scores for both sides of the score spectrum. The results also show that, for this particular group, P16 (1.63) does not take the top position as the most approved landscape. This is the only group where another choice (P8) has received the highest score (1.72). This can be seen in Figure 6-7:
As discussed before, this is the only classification where P16 (1.63) is not scored as the most ideal landscape. P8 (1.72) takes the first preference with a very different landscape compared to P16. Rather than presenting production diversity as the main element, it shows the traditional process of wheat production. Respondents recognized the image as the harvest stage of a crop that is progressively disappearing from the region. Traditional wheat production, especially in hilly areas, has become completely unsustainable for small producers due to multiple factors associated with loss of labor and production ceremonies, low prices and high production costs, among others. However, this used to be one of the most common views decades ago; hills full of wheat, sown and harvested by hand. According to comments and respondents answers, this image has a strong nostalgic value for them, it shows things as they used to be, it was their main activity, and something they rely on for the whole year. Although diversity is not the main element, most respondents associated this landscape with the
concept of community. This activity depended entirely on the community, specifically, in the traditional cooperative labor networks. This landscape, along with the other top scores can be seen in Table 6-7:

Table 6-7. High encroachment group most and least ideal landscapes.

<table>
<thead>
<tr>
<th>Most Ideal Landscapes</th>
<th>Least Ideal Landscapes</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Image" /></td>
<td><img src="image2" alt="Image" /></td>
</tr>
<tr>
<td>P8: 1.72</td>
<td>P11: -1.71</td>
</tr>
<tr>
<td><img src="image3" alt="Image" /></td>
<td><img src="image4" alt="Image" /></td>
</tr>
<tr>
<td>P16: 1.63</td>
<td>P1: -1.57</td>
</tr>
</tbody>
</table>

In relation to cultural competence, this group also stands out for having the lowest average (0.438) with two very low negative scores. Although the score’s range is not as high as the whole sample, both standard deviation and variance are the highest compared with the other two groups and the whole sample. The cohesiveness in terms of landscape perception for this group seems to suffer from the two lowest competence scores in the whole sample of 50 respondents (-0.843 and -0.824).

Table 6-8. High group competence score analysis.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.438</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.521</td>
</tr>
<tr>
<td>Variance</td>
<td>0.272</td>
</tr>
<tr>
<td>Range</td>
<td>1.677</td>
</tr>
</tbody>
</table>
A final group comparison for cultural competence statistics can be visualized in Figure 6-8. Here the mean values represent the average competence scores of each group, therefore a high number indicates more cultural competence. This is in contrast to the standard deviation, variance and range. Here a higher number presumes a lower competence:

![Bar chart showing cultural competence statistics for different groups.]

Figure 6-8. Whole sample and other group cultural competence statistics.

As can be noticed from the above figure and previous discussion, the Medium encroachment group has the biggest mean and the lowest standard deviation, variance and range, making it the group with the highest cultural competence. The Low encroachment group, although with a lower range, is very similar to the whole sample in terms of cultural competence. Finally, the High encroachment group seems to have the lowest competence, both from its low mean and high standard deviation, variance and range.

**Risk, Productivity and Aesthetic:**

Within the landscape perception analysis, this study is also concerned in how respondents are stimulated by certain landscape elements. These elements can impact how households interact with the territory and how inhabitants respond to changes in
their surroundings. In the present and previous studies conducted in the region, local respondents referred to three main landscape characteristics as key features defining their preferences and livelihoods: productivity, risk and aesthetics. Besides their perception about how ideal landscapes are for the local rural area, it is also necessary to go deeper into what makes a landscape risky, productive or aesthetical attractive.

After conducting the q-sort test, respondents were asked to select three photographs from the 23 original samples. Specifically the respondents were asked to select one picture that, according to their opinion, represented the most risky landscape, one picture that represented the most productivity potential and a third picture that represented the most attractive landscape in purely aesthetic terms, without necessarily considering its productive features.

As in the previous section, their answers were analyzed for both the whole sample and the classifications according to their level of encroachment due to forest plantations. Figure 6-9 shows the preferences for the most risky, productive and aesthetic landscapes for the whole sample of 50 respondents:

![Figure 6-9. Whole sample risk, productivity and aesthetic perception results.](image-url)
In terms of risk the results show a clear inclination for two photographs; P11 with 36% of the preferences (18 votes) and P5 with 32% (16 votes). These two landscapes can be recognized for the previous Q-sort analysis section repeatedly identified with the lowest scores. Therefore, the reoccurrence of these images in this more specific analysis is useful to understand some of the reasons behind the previous low scores.

As shown in Table 6-9, P11 is the strongest representation of monoculture tree plantation in the whole sample of photographs. According to the respondents, this type of production arrangement is extremely risky, not only for the households living close to the plantation, but also for a whole region. Respondents argue the risk is mainly in the threat of wildfires and their immense destructive power. Many narrate how fires do not only burn houses down, but also take their crops, animals, greenhouses, native forests, and any small production infrastructure. P5 (32%) represents probably the most recognized environmental issue for the region; land degradation due to soil erosion. This issue has become the target of innumerable conservation and amelioration programs from both the public and private sector. Soil erosion, as explicitly portrayed in P11, threatens both small traditional agricultural and extensive industrial agriculture, but also, the formation of gullies and the quick movement of water and soil in the form of alluviums can be an extremely dangerous phenomenon for households, especially those in hilly areas.

Moving to productivity, there are two very interesting choices with the highest preferences for the whole sample. P12 shows a more extensive monoculture production system with pivot irrigation in a very flat terrain, very representative of much bigger and expensive properties, with better soils, managed with high inputs and producing large
revenues and volumes. On the other hand, P16 as described in previous analyses, portrays a very different scenario of small properties with higher production diversity but much less volume.

Finally in terms of aesthetics, it is interesting to see that P16 (26%), besides its production potential, is also considered as a very appealing landscape regarding its aesthetic properties. The second place is taken by P3 (12%) presenting a largely characteristic landscape found in the region, a pseudo-savanna called “espinal”, whose name is derived from the hardwood shrubs called “espinos” (*Acacia caven*). These shrubs and trees, shown as main landscape element in the photograph, are very representative of the Mediterranean basin at this latitude (~36° south). An important percentage of this type of autochthonous landscape have been transformed into agricultural land and pasture terrain. Table 6-9 shows the top preferences for each of the categories taking into account the whole sample of respondents:

<table>
<thead>
<tr>
<th></th>
<th>Risk</th>
<th>Productivity</th>
<th>Aesthetic</th>
</tr>
</thead>
<tbody>
<tr>
<td>P11</td>
<td>36%</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>P12</td>
<td>24%</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>P16</td>
<td>26%</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>P5</td>
<td>32%</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>P16</td>
<td>22%</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>P3</td>
<td>12%</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>
The Low encroachment group (16 respondents) shows some interesting shifts in terms of preferences. As shown in Figure 6-10, the risk value has P5 (44%) as the most voted photograph for all the variables, putting behind P11 (19%) as a second choice for most risky landscape.

One of the most interesting results for this subgroup is from the productivity variable. Here P11 (25%) that has been constantly highlighted as a rejected landscape with high disapproval scores shares the top choice of most productive along with P12 (25%). This means that for the Low encroachment group, forest plantations and industrial agriculture are tied as the most productive images from the entire sample of landscapes. There is also another tie for the aesthetic variable, both P3 and P16 share the 38% of the preferences equally. These two landscapes also received the top places in the whole sample analysis with P16 doubling P3’s percentage. The results for the Low encroachment group can be seen in Figure 6-10:

![Figure 6-10](image)

**Figure 6-10.** Low encroachment group risk, productivity and aesthetic perception results.

For the Low encroachment group (0%-5%) land degradation seems to be the most concerning risk from the landscape available in the sample. It is the only group where forest plantation (P11) does not have the top choice. This can be understood by
looking at the profile of most respondents in this group. They are not only distant from dense plantation locations, but also most of their households and production are found in properties with very good soils. Therefore, a soil erosion situation of the magnitude presented in P5 (44%) seems to be a rational main concern. P11 (19%) is in second place with almost half of P5’s votes, pointing out that, although most respondents from this group do not experience this reality first hand, there is some kind of concern about how safe plantations are for people surrounding them.

As discussed before, the productivity results for the Low encroachment group are extremely interesting, having P11 (25%) and P12 (25%) tie for the first preference. P12 results match the arguments discussed for the whole sample analysis; extensive agricultural systems with high volume and revenues. However, P11 moved from being a highly rejected landscape in most analysis to a top position in this Low encroachment group. It is clear that the displayed tree plantation production system also implies extensive surfaces with high volumes and revenues. Although, as will be shown later, this is the only group that has considered as a popular or valid option.

In terms of aesthetic appeal, the results show a much more distributed set of preferences with two landscapes sharing the top with only 19% each (P3 and P16). These two choices are the same showed for the whole sample analysis, with the only difference that, in this Low encroachment group, P3 and its native vegetation elements is sharing the top choice. This particular image also stimulated many comments with a conservation concern and discourse. For many respondents, from every subgroup, these type of landscapes and vegetation must be protected, also acknowledging how
they have been progressively disappearing from the region. This landscape and the rest of the top choices for each variable can be seen in Table 6-10:

Table 6-10. Low encroachment group risk, productivity and aesthetic top choices and percentages.

<table>
<thead>
<tr>
<th>Risk</th>
<th>Productivity</th>
<th>Aesthetic</th>
</tr>
</thead>
<tbody>
<tr>
<td>P5: 44% (7)</td>
<td>P11: 25% (4)</td>
<td>P3: 19% (3)</td>
</tr>
<tr>
<td>P11: 19% (4)</td>
<td>P12: 25% (4)</td>
<td>P16: 19% (3)</td>
</tr>
</tbody>
</table>

As in the Low encroachment group, the risk variable shows the biggest distinction in terms of preferences for the Medium encroachment group. Here P11 (35%) reclaims the top choice as the most risky landscape also followed by P5 (24%) as in the whole sample analysis. Productivity and aesthetic preferences are much more evenly distributed with four landscapes with 18% of the choices and no landscape standing out. For the productivity variable Figure 6-11 shows the tie between the same two top choices from the whole sample analysis (P16 and P12).

Regarding the aesthetic variable an unprecedented P10 (18%) landscape shares the top choice with the very recurrent P16 (18%). The results for the Medium encroachment group can be seen in the following Figure:
Figure 6-11. Medium encroachment group risk, productivity and aesthetic perception results.

The above results reinforce the tendency of respondents being much more cohesive in their choices regarding the risk variable. P11 (35%) with its strong monoculture plantation element stands out as the most risky landscape for this group with 6% to 30% of plantations surrounding the respondents' households. Narratives about how respondents interact with wildfires risk will be covered in more depth in the later sections focused on the semi-structured interview data. However, it is important to point out that along with fires as the main concern, there are also less alarming but not least important risks associated with plantations such as: falling trees, proliferation of certain predator species and security issues associated to decreased line of sight.

Regarding productivity, the Medium encroachment group has evenly distributed results without a clear prevalence of any landscape. However the top two choices (P16 and P12) are consistent with the two production models discussed during the chapter: subsistence diversity and industrial monoculture. Along with this, the respondents in this group have two main reasons for choosing these landscapes; there is a necessity of diversity but there is also a desire for a much extensive production.
Similar to the productivity variable, aesthetic results show some distributed votes with P10 and P16 sharing the top with 18% of the preferences. These two images show production diversity in a very different way. P16 as discussed before, shows the interaction of multiple activities and households. On the other hand there are pines and cattle. Interestingly, respondents identified this plantation as different from the industrial plantation standards. Many recognized this landscape as an agro-pastoral system without separations or fences between livestock and trees, less dense tree distribution and open spaces next to the plantations. That seems to be the reason behind the high approval for a landscape with tree plantations as one of the main components. The contrast between P11 (industrial plantation) and P10 (domestic plantation) can be seen in Table 6-11, along with the top group results:

Table 6-11. Medium encroachment group risk, productivity and aesthetic top choices and percentages.

<table>
<thead>
<tr>
<th>Risk</th>
<th>Productivity</th>
<th>Aesthetic</th>
</tr>
</thead>
<tbody>
<tr>
<td>P11 35% (6)</td>
<td>P16 18% (3)</td>
<td>P10 18% (3)</td>
</tr>
<tr>
<td>P5 24% (4)</td>
<td>P12 18% (3)</td>
<td>P16 18% (3)</td>
</tr>
</tbody>
</table>

Finally the High encroachment group shows two variables; risk and aesthetic, with particularly distinctive top choices and a tie in the productivity variable. As seen throughout this entire analysis section the risk results are very consistent, having P11
as the main choice for the whole group and every classification other than the Low encroachment group. However, for this last group the level of predominance obtained by P11 (53%) is the highest shown by any landscape in any of the above group analyzes.

The same regularity argument can be used for the productivity variable, having P16 (29%) and P12 (29%) taking most of the top choices both in the whole sample analysis and every group other than the Low encroachment group. For the High encroachment group the results regarding the aesthetic variable show a high predominance of P16 (47%) and with a big margin from any other landscape. These final results for the High encroachment group can be seen in Figure 6-12:

![Figure 6-12. High encroachment group risk, productivity and aesthetic perception results.](image)

Probably the most interesting result from the High encroachment group is the high percentage obtained by P11 (53%) as the most risky landscape, followed by P5 (29%) these two top choices add up to 82% of the votes that is very categorical. Looking again at P11 as a risk predominant choice, it seems coherent to have such as high percentage in a group that is densely surrounded by plantations according to the GIS data. This is also reaffirmed with respondents’ comments and narratives, making
this High encroachment group, the most condemnatory in terms of opinions about this industrial forest system.

For the productivity variable there is not so much variation from previous groups, having P16 (29%) and P12 (29%) tie as the most voted choices. However, respondents argued their choices always pointing out the critical situation facing agriculture in the region, especially for small producers. Finally, P16 (47%) stands alone for the aesthetic variable with the second highest percentage of all analyses, only behind P11 (53%) as the most risky landscape in the High encroachment group as showed in Table 6-12:

Table 6-12. High encroachment group risk, productivity and aesthetic top choices and percentages.

<table>
<thead>
<tr>
<th>Risk</th>
<th>Productivity</th>
<th>Aesthetic</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
<tr>
<td>P11: 53% (9)</td>
<td>P16: 29% (5)</td>
<td>P16: 47% (8)</td>
</tr>
<tr>
<td><img src="image4.png" alt="Image" /></td>
<td><img src="image5.png" alt="Image" /></td>
<td><img src="image6.png" alt="Image" /></td>
</tr>
<tr>
<td>P5: 29% (5)</td>
<td>P12: 29% (5)</td>
<td></td>
</tr>
</tbody>
</table>

**Personal Social Networks**

The following section focuses on Objective 1 and its corresponding hypotheses (H1 and H2) regarding the construction and analysis of personal social networks. The present study highlights social structure as an important factor regarding the interaction of human groups and their surroundings. However, these networks do not only reveal data concerning the network structure characteristics, like its density, shape or
connectivity. But also, it generates and reveals an important amount of data about the people in their networks and their attributes.

The following analysis section will look into these networks structural measures, but also will put especial attention on dissecting the resulting networks in order to understand their composition and behavior both in terms of the whole research sample and each of the group classifications.

**Network Structural Metrics**

Structural metrics provide important information about the networks as a whole, describing and summarizing various aspects of it (Kadushin, 2012). This is particularly useful when grouping networks in relation to particular variables, or in this case, according to the level of encroachment due to forest plantations.

Among these structural metrics, network density is a fundamental graph-based measure because it represents “the percent of ties that exist in a network out of all possible ties” (McCarty, 2002: 4), with 1 denoting networks where everyone is connected and 0 a network where nobody is connected. Along with density, measures related to centrality are essential to understand structure in personal networks (Marsden, 1990; Costenbader and Valente, 2003). Here the emphasis is set on three main measures; the first one is degree centrality, this is the number of alters that any given alter is directly connected to. The second one is closeness centrality, this is the inverse of the sum of the distances from that alter to all other alters. Finally betweenness centrality is equal to the number of shortest paths (or geodesics) from all vertices to all others that pass through that node. Also, the average number of cliques were considered, these are the maximally completed subgraphs in each network. Table
6-13 shows the average results for each of the above mentioned metrics, including both the whole sample and each of the encroachment groups.

Table 6-13. Relationship between network structural measures and level of encroachment due to forest plantations.

<table>
<thead>
<tr>
<th>Group classification</th>
<th>Average Density</th>
<th>Average Degree Centrality</th>
<th>Average Closeness Centrality</th>
<th>Average Betweenness Centrality</th>
<th>Average Cliques</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Encroachment</td>
<td>0.63</td>
<td>18.59</td>
<td>75.96</td>
<td>5.54</td>
<td>18.88</td>
</tr>
<tr>
<td>Medium Encroachment</td>
<td>0.82</td>
<td>23.37</td>
<td>84.75</td>
<td>2.62</td>
<td>21.53</td>
</tr>
<tr>
<td>High Encroachment</td>
<td>0.62</td>
<td>17.87</td>
<td>73.24</td>
<td>5.98</td>
<td>15.88</td>
</tr>
<tr>
<td>Whole Sample</td>
<td>0.68</td>
<td>20.06</td>
<td>77.98</td>
<td>4.71</td>
<td>18.76</td>
</tr>
</tbody>
</table>

There is a evident pattern from the above table. The Medium encroachment group stands out in each of the structural measures. In all density, degree centrality, closeness centrality and cliques’ average, the Medium encroachment group exhibits a higher index, having the Low and the High encroachment group with lower results. Only for the average betweenness centrality column does it show an inverse result with the Medium encroachment group with a lower average and the Low and High groups with higher. This is consistent with the other results, with higher density, degree and closeness centrality there are less alters working as bridges between other alters.

As will be seen next, this distinctive pattern for the Medium encroachment group is expressed in multiple data sets, not only in the current social networks analysis but also from the semi-structured interviews and ethnographic observation. This consistency will be approached and discussed in the last two chapters.

Although the level of encroachment data shows a non-normal distribution and was unable to be normalized by multiple methods, a Pearson correlation analysis (Agresti and Finlay, 2009) was conducted for each network structural measure and for each respondent. This means that for this analysis the whole data set was used (not the
average showed in the above table). The first result shows a -0.119 correlation between level of encroachment due to forest plantations and network density, which is not significant at all. The remaining correlation analysis results can be seen in Table 6-14:

Table 6-14. Pearson correlation between network structural measures and level of encroachment due to forest plantations.

<table>
<thead>
<tr>
<th></th>
<th>Density</th>
<th>Degree Centrality</th>
<th>Closeness Centrality</th>
<th>Betweenness Centrality</th>
<th>Cliques</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of encroachment</td>
<td>-0.119</td>
<td>-0.128</td>
<td>-0.130</td>
<td>0.175</td>
<td>-0.137</td>
</tr>
</tbody>
</table>

This analysis shows no significant correlation (neither positive nor negative) for any of the network structural measures and the level of encroachment due to forest plantations (% of plantations surface in a 2km radius).

**Network Attributes**

Gender is the first network attribute to take into consideration. Although, the final sample was composed of 50 respondents with 30 females and 20 males, the respondents’ network composition shows an interesting prevalence of males, this is in an administrative region with 102.8 females for each 100 males (INE, 2010). As mentioned before, each respondent was asked to provide 30 alters, this means that the total of alters for the whole sample is 1500 alters. From this total, 656 (44%) are female and 844 (56%) are male. Looking only at women’s networks, the results show 48% female alters versus 52% of male alters.

Another way to look at this phenomena is through sex ratio, this shows the ratio of males to females in the sample \( \frac{\text{Males}}{\text{Females}} \). The average sex ratio for all the networks in the sample is 1.5, interestingly the average sex ratio for only the females’ networks in the sample is 1.65, which is higher than the males’ networks with 1.35.
Regarding the relationship between the independent variable (plantation encroachment level) and each network sex ratio, a Pearson statistical correlation analysis was conducted. The analysis showed a negative correlation of 0.04 which is far from being significant.

Another way to look at these sex ratios in relationship with the level of encroachment due to forest plantations is shown in Figure 6-13. This figure shows the average sex ratio for the whole sample and each of the groups according their level of encroachment. The Medium encroachment group has the largest sex ratio with 1.65 followed by the Low encroachment group with 1.58 and the High encroachment group with the lowest ratio of 1.37:

![Figure 6-13. Average network sex ratio for the whole sample and encroachment groups.](image)

Following gender, age is also an essential variable to take into consideration for the resulting networks. As presented in the previous chapter the average age of the whole 50 respondents sample is 57.26 years. However, their networks show a slightly younger population with an average age of 49.46 years. Female respondents seem to be a key factor in this with not only lower age average than males (55.7 vs. 59.6), but
also with younger networks. Female respondents’ networks show an average of 47.8 years in comparison to male networks with an average of 52 years.

As for previous variables, a Pearson correlation analysis was conducted for the age variable and the level of encroachment due to plantations. The results show a correlation of 0.006, which is clearly not significant. However, looking at the average by encroachment group there are some interesting results. The Medium encroachment group show some younger networks with an average of 46.1 years, especially in comparison with the Low encroachment group with 52.5 years. The High encroachment group with an average of 50 years is the closest to the whole sample average of 49.5 years as shown in Figure 6-14:

![Figure 6-14. Average network age for the whole sample and encroachment groups.](image)

Besides gender and age, there are other attributes worthy of exploring, especially in terms of how the network satisfies socio-economic needs mainly associated with agricultural labor. This is particularly important in the context of subsistence traditional agriculture, where most activities rely on human labor and cooperation ties.

This type of social capital relies on trust dynamics, which, in most cases, are built over extensive periods of time. This is why it’s important to understand how old the ties are in building each of the networks. For each alter the respondents were asked how
long do they know him or her. The results show 31.6 as the average years the respondents know their network alters which is certainly high, but consistent with the sample average age (57.26 years).

As in previous analysis, there is no correlation found between this variable and the level of encroachment due to forest plantations (-0.036). However, as expected, there is a significant correlation between network alters’ age and the years the respondent knew them (0.668).

Looking at the average results from the encroachment group approach, it is apparent that the Low encroachment group has the most long-standing ties in comparison to the other groups. Especially the Medium encroachment group, which has an average of 29.41 years.

![Average years knowing network alters for the whole sample and encroachment groups.](image)

Figure 6-15. Average years knowing network alters for the whole sample and encroachment groups.

Although, the time respondents have known their alters is an important variable regarding the network strength, frequency is also essential. Respondents were also asked about how frequently they had contact with their alters. This is also particularly relevant in terms of trust dynamics and production strategies for the more vulnerable population.
Six categories were used for this question, respondents were asked to choose one of the following options that best represent how often they had contact with each of the alters: daily, weekly, monthly, biannually, annually and more than a year.

The whole sample analysis showed that the most common frequency is “monthly” with 34% of the cases, followed by weekly with 25%. Looking at the results for each of the encroachment group it is possible to notice that these two categories are also the most representative.

However, there is some interesting variability between the groups worth pointing out. The Medium encroachment group has the biggest percentage of “daily contact” among the groups, also holding the biggest percentage of “weekly contact”. This means that the Medium encroachment group dominates in the more frequent network contact classifications. Also, it is important to highlight in Figure 6-16, the High encroachment group with the biggest percentage of “monthly contact” and the Low encroachment group with the biggest percentages in the three lowest frequency contact classifications (Biannually, annually and more than a year) compared with the other two groups.

Figure 6-16. Average percentage of network contact frequency for the encroachment groups.
Another variable that is directly related with how often people make contact is location. Like in the previous analysis, respondents were asked about the location of each alter in their network. In this case, eight categories were used, respondents were asked to choose one of the following options that best represent where their alters live regarding their own location: Same house, same property, neighborhood, locality, municipality, region (administrative), other region (administrative), and other country.

The whole sample analysis showed that the most common location for the network alters was the municipality level with 26% of the results, followed by neighborhood with 20%. These top results are partially shared for all the encroachment groups, however there are some interesting points to highlight.

The biggest percentage of any classification in this analysis was the municipality location for the High encroachment group with 31% of the answers in the group. This particular result has the most significance difference with the other two groups. Another result with a significant variance is the neighborhood classification for the Medium encroachment group with almost 28%. This neighborhood classification is very important in terms of production in non-industrialized agricultural systems because most of the labor comes from people living close by. Also in the Medium encroachment group, locality shows the biggest percentage by only a fraction (20.7%) however, these two very representative choices make up almost 50% of the medium group.

The Low encroachment group stands out for more evenly distributed results, with four categories close to the 20%. It also has the biggest percentage of alters living in other regions within the country. All the above results can be seen in Figure 6-17:
Finally, and probably one of the most relevant variables associated with the above discussion is the level of closeness between the respondents and their alters. Respondents were asked how close they feel to each of the respondents in their network. For this question five categories were used, the respondents were asked to choose one of the following options that best represent how close they feel to each of the alters: Not very close, a little close, somewhat close, close and very close.

The whole sample analysis showed that most the most common level of closeness to the network alters is ‘very close’ with 43% of the results, followed by ‘close’ with 28%. This means that for all the networks created, more than 70% of the alters are in some level of high closeness with the ego (respondent).

The encroachment group analysis shows how the ‘very close’ choice has an important predominance for all the three groups. However, within this trend, the Medium encroachment groups stands out for having the biggest percentage of ‘very close’ alters in the respondents networks with 52%. This is an important margin compared to the

Figure 6-17. Average percentage of network location for the encroachment groups.

Low  Medium  High

- House
- Property
- Neighborhood
- Locality
- Municipality
- Region
- Other Region
- Other Country
High encroachment group with 42% for very close alters, and especially, compared to the Low encroachment group with 35%.

The High encroachment group stands out with two very large percentages for both ‘close’ and ‘very close’ classifications adding to more than 80% of the answers. On the other hand, and as in previous analysis, the Low encroachment group shows much more evenly distributed results, although having the ‘very close’ classification as the most representative choice. Also interestingly, the Low encroachment group has the biggest percentage of ‘not very close’ alters in their networks. The group results can be seen in Figure 6-18:

![Figure 6-18](image)

*Figure 6-18. Average percentage of network contact closeness for the encroachment groups.*

For this last variable a Pearson correlation analysis was also conducted. In order to do this, a value of 1 through 5 was assigned to each possible alternative going from less to more closeness. As shown in Table 6-15, a 5 value implies a “very close” relationship between the ego and the alter, while a 1 value implies a “not very close” relationship:
Table 6-15. Closeness attribute analysis response assigned value.

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Assigned Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not very close</td>
<td>1</td>
</tr>
<tr>
<td>A little close</td>
<td>2</td>
</tr>
<tr>
<td>Somewhat close</td>
<td>3</td>
</tr>
<tr>
<td>Close</td>
<td>4</td>
</tr>
<tr>
<td>Very close</td>
<td>5</td>
</tr>
</tbody>
</table>

The results show a moderate correlation of 0.369 between the level of encroachment due to forest plantations and the level of closeness attributed by the respondents to each of the alters in their networks. This is consistent with previous personal network research conducted in the region, having subsistence agriculture producers (higher level of encroachment) with stronger ties in their networks compared to extensive/industrial agriculture producers (lower level of encroachment). Similar analysis for other network attributes mentioned before did not show any moderate nor significant correlations.

**Semi-Structured Interviews**

This last section will look into the data obtained through semi-structured interviews. Although this method was mainly considered for Objective 2 and its corresponding hypotheses (H3 and H4) related to collective ideas and behaviors about adaptation strategies and socio-environmental uncertainties, it will also address issues related to social structure and landscape perception as discussed above. Additionally in this chapter, interviews will be analyzed mainly in terms of quantitative data, leaving the actual narratives and its qualitative properties for the discussion chapter.

As mentioned in the methods chapter, semi-structured interviews constituted an essential and protagonist role in this research. These interviews were conducted with each of the respondents considered in previous sections, taking most of the
ethnographic experience in the field and, in most cases, more than one session to complete. The length of these interviews range from 90 to 120 minutes, which were entirely transcribed.

For this first part, interviews went through content analysis and the results were assembled into a text-by-theme matrix (Bernard, 2011). Using statistical software (SPSS and Infostat) contingency tables were generated from the matrices along with multiple correspondence analysis (MCA). For analysis and organization purposes, the topics or categories of analysis have been sorted in four main groups: 1. Socio-environmental, 2. Socio-economic, 3. Demographic and Power and 4. Socio-cultural and Risk. Although, as will be seen below, many of these issues transcend the group boundaries. These interactions, and their explanation will be explored with more depth in the following chapter.

**Socio-Environmental Issues**

Water can be easily described as the main environmental concern in the region, and that concern is strongly represented in the sample. Water related issues is the only category of analysis that all the respondents (100%), regardless of level of encroachment, pointed out as a serious environmental issue strongly associated with monoculture tree plantations and its expansion. Most respondents talked about scarcity issues, however, some living close to pulp plants also highlighted issues related to water quality and pollution.

Also, it is important to add that, many respondents recognize macro environmental processes such as climate change as an important factor in water scarcity. However, every respondent in the sample associates plantations with water issues, highlighting eucalyptus plantations as particularly harmful for groundwater.
Along with water, one of the most representative concerns for the respondents is soil. As it has been mentioned before, this region carries an historical emergency regarding land degradation due to soil erosion. This particular category exemplifies how certain issues affect and are perceived differently according the level of encroachment due to forest plantations. Fifty eight percent of the sample mentioned issues relating to plantations and soil degradation, however, 77% of the High encroachment group considered this a reality. On the other hand, only 43% of the Low encroachment group referred to this issue. This supports the ethnographic observation of these two very different realities. Something similar can be appreciated regarding the issue of agriculture land loss due to forest plantation expansion. Sixty five percent of the whole sample manifested this process as a concern, compared to 76% in the High and 56% for the Low encroachment group respectively.

Other categories where the High encroachment group obtained a greater representation than the whole sample are: Pesticide/Herbicide use issues, Wildfire issues, Yield loss, Climate change and Pollination decline. Most of these issues are very representative for the High encroachment group, where the close proximity to huge extensions of plantations are materialized in multiple socio-environmental effects.

Regarding the Medium encroachment group, issues related to activities as agriculture and cattle are highlighted in their interviews with the highest percentages in relation to the other groups and the whole sample. Also interestingly, visual pollution associated with plantations seems to be more recognized by the Medium group rather than the High encroachment group.
Finally, the Low encroachment group seems to have higher concerns in categories related to the speed of plantations expansion, native vegetation loss and pulp plants pollution issues. This last point is very interesting due to the fact that most pulp plants and other industrial settlements associated with the forest sector are not located necessarily within the plantations, but rather, in locations accessible to services as water, electricity and public transportation.

The most representative results from the frequency tables were visualized in Figure 6-19. The categories are arranged from higher to lower representativeness regarding the whole sample results, starting with the water issues category with 100% of the respondents mentioning some kind of water related issue associated to monoculture tree plantations.

![Figure 6-19](image-url)  
**Figure 6-19.** Most representative socio-environmental issues from semi-structured interviews for encroachment groups and whole sample.

Another way to visualize these data is through a multiple correspondence analysis, here the resulting contingency tables are used to represent data as points in a
Euclidean space (Balzarini et al. 2011). The closer the categories are to each encroachment group (High, Medium and Low) in the plane, the more representative they are in each of those groups. Categories in the middle of the three groups are equally representative. The visualization in Figure 6-20 does not consider the displayed issues regarding the whole sample representativeness, but rather, it only shows how certain issues are more inclined to a particular group instead of another.

Figure 6-20. Socio-environmental issues multiple correspondence analysis for the encroachment groups.

The above figure shows in the middle of the Cartesian plane issues related to water availability, yield loss, wildfires and agriculture loss pointing out how transversal they are to the whole sample. With some inclination to the Medium encroachment group it is possible to see issues related to cattle raising, along with the above discussed visual pollution factor, with more incidence in the Medium group, even surpassing the High encroachment group.

Regarding this last group, it is important to highlight three issue categories with higher proximity in the Cartesian plane: agriculture land loss to plantations, soil
degradation and climate change. These two last points are interesting because, as it has been discussed in previous chapters, they transcend the effects of local monoculture plantations, being soil degradation an historical environmental issue and climate change a global phenomenon. However, as it will be explained in the following chapter, local respondents recognize certain socio-environmental dynamics where these type of issues are exacerbated through the expansion of forest plantations.

**Socio-Economic Issues**

As in the socio-environmental issues section, there is one particular category that stands out with a high frequency in the contingency tables from the semi-structured interviews, this is the loss of the traditional agriculture production systems. Although, with a lower percentage for the High encroachment group (with more extensive agriculture systems), 84% of the sample mentioned this issue, linking forest plantation expansion as one of the main factors behind it.

Following this issue, there are two categories with high percentage of recurrence that are also tightly connected with the local forest industry, these are the lack of job opportunities associated with forest plantations and the process of land grabbing by local forest companies. Other categories where the Low encroachment group stands out are strongly related to market issues like high production costs and low product prices. Many respondents in this group also mentioned how forestry related jobs are very inaccessible for the local population and how the use of agricultural machinery has strongly increased in the region.

In the Medium encroachment group, issues related to lack of labor possibilities, both hiring and communal cooperation, stands out as some of the biggest concerns. Also in this group, respondents are especially concerned about decrease in economic
activities related to livestock, especially cattle. This is different from the previous section where respondents blame the effects of plantations on the cattle production. Finally, there is an emphasis on the economic necessity of activities diversification along with new markets for this Medium encroachment group.

Regarding the High encroachment group, there are three categories with outstanding percentages in relation to the rest of the sample. The first one is the loss in wine production, one of the most affected traditional activities in the region during the last decades. The other two are interconnected, on one hand, respondents point how poverty is an essential reason behind migration. As a response to this, most respondents in this group participate in some kind of development program (Government or NGO). These results can be seen in Figure 6-21:

![Figure 6-21](image)

Figure 6-21. Most representative socio-economic issues from semi-structured interviews for encroachment groups and whole sample.

The distribution of these results according the encroachment groups can also be appreciated in Figure 6-22. Here, the multiple correspondence analysis shows how certain categories are closer or farther from each of the encroachment groups.
As in the previous multiple correspondence analysis visualization most of the categories are grouped in the middle, meaning that most of these categories are similarly shared for the whole sample. Although, there are some issues closer to certain groups, suggesting to be more representative to those groups. An example of this is the 'lack of market', more associated to the Medium encroachment group. This is also easily noticed for the two categories close to the High encroachment group. Being the most socioeconomically vulnerable, most respondents in this group participate in development and NCRE (Non-conventional renewable energy) programs. Finally, there are a couple of categories shared mainly by two groups, as the increase of productive diversification and the relation between poverty and migration. These two variables are located in a midway point between the Medium and High group, but far away from the Low encroachment group.
Demographic and Power Issues

Rural-urban migration appears as the top demographic issue for the whole sample (90%), with a slightly higher percentage for the Medium encroachment group (94%). As in previous categories, it is important to point out that rural-urban migration is not only a national, but also a global phenomenon. However, in most narratives, respondents argued how forest plantations’ expansions are playing an important role in the current process of rural depopulation, as it will be examined in the next chapter.

Population aging is the second most representative concern for the whole sample (58%), having the Low encroachment group with a considerable bigger percentage of respondents mentioning this issue (69%). With a similar percentage for the whole sample, 54% of the respondents accused power abuse practices from the local forest companies. These were mainly composed of representatives ignoring community requests, extractive activities leaving waste behind and clogged irrigation canals, the denial of water and air pollution over allowed standards, aggressive property-acquisition strategies, threats, among others.

For the Medium encroachment group, there are two particular categories with distinctive percentages in comparison to the other groups. Along with the recognition of social movements, the issue of high socioeconomic inequality is worth of pointing out. This is another phenomenon that transcends the local scale and it is very representative of the national reality. However, respondents also link forest plantations, and especially the current expansion model as a strong factor behind local socioeconomic inequality.

In the Low encroachment group it is important to point out the predominance in categories such as population aging, issues in government development programs and
urban-rural migration. This, along with the previously mentioned, is showed in Figure 6-23:

![Figure 6-23](image)

Figure 6-23. Most representative demographic and power issues from semi-structured interviews for encroachment groups and whole sample.

Although, in the above bar graphic is not very noticeable, the multiple correspondence analysis (MCA) for this particular section shows how the Medium encroachment group is very intricate in many of the demographic and political issues considered in this section. Especially compare to the rest of the MCA, where the encroachment groups are generally located away from the center of the diagram.

The MCA graph displayed in Figure 6-24 shows two main configurations. First, is the above mentioned interaction of the Medium encroachment group with a significant number of categories considered in this analysis and very close to the center of the Euclidian plane. Secondly, on the right side of the graph it is possible to see how there are a series of categories located between the Low and High encroachment, having the later much further from the center of the figure:
Figure 6-24. Demographic and power issues multiple correspondence analysis for the encroachment groups.

Urban-rural migration, population aging and crime increase seems to be issues mainly associated with the Low and High encroachment group respondents’ narratives. On the other hand, categories such as high socioeconomic inequalities, power abuse by forest companies, use of political influences and the OC 701 effects are located very close to the Medium encroachment group, suggesting that these topics were more of a concern by this group’s respondents.

**Socio-Cultural and Risk Issues**

This last section comprises categories associated with socio-cultural changes in the region, especially those concerning production systems. It also takes into account concepts related to the perception of risks from near and expanding monoculture forest plantations. In relation to this it is important to point out that respondents were not asked if they feel a certain way. The results only show the presence of these concepts in their own narratives from the semi-structured interview, where the main goal was to
understand the different nuances involved in the relationships between respondents and their surroundings.

The category with the higher percentage from the contingency tables is the loss of production ceremonies (65%), where the Medium encroachment group stands out with 77% of the respondents mentioning this as an issue where plantation expansion have had some kind of effect. As in the previous discussion, the loss of production ceremonies is a very complex phenomenon where a series of sociocultural, economic and environmental factors interact.

The following two categories with the biggest percentage are both dominated by the High encroachment group with the highest percentages. The first one is the loss of traditional knowledge and production practices. This is also related to production ceremonies, however, it also accounts for the loss of particular occupations and products. The second category refers to the concept ‘uncertainty’, this category takes in consideration every respondent that mentioned to feel uncertain about their future or their family’s concerning the environmental and economic process conducted in the region, essentially forest plantation expansion and the decline of agriculture.

Other concepts that also reached a significant frequency from the interviews are ‘impotence’ and ‘fear’. For both concepts the High encroachment group has the bigger percentage of respondents pointing out that they feel, in some way, impotent or are afraid regarding the current situation of close plantations and their expansion. A similar phenomenon is the 47% of the High encroachment group respondents mentioning to feel isolated by the surrounding plantations.
Finally, one of the categories where a very even distribution among the groups can be observed is regarding the traditional to formal education shift, here every group had approximately 50% of its respondents mentioning this phenomenon. The results for this final section can be seen in Figure 6-25:

![Graph showing socio-cultural and risk issues from semi-structured interviews for encroachment groups and whole sample.](image)

**Figure 6-25.** Most representative socio-cultural and risk issues from semi-structured interviews for encroachment groups and whole sample.

The multiple component analysis shows ‘knowledge and practice loss’ and ‘production ceremonies loss’ in the middle of the graph. This points out how both of these categories are similarly representative for each of the three encroachment groups, also matching the high percentages shown in Figure 6-25. However, looking at the ‘uncertainty’ category in the MCA it is possible to notice a disparity compared to the graph bar. Figure 6-26 shows how ‘uncertainty’ is located slightly away from the Low encroachment group and more in between the High and Medium encroachment groups.

At the same time, both ‘anxiety’ and ‘fear’ categories are located between the Low encroachment group and the High encroachment group, and significantly more distant from the Medium encroachment group.
Figure 6-26. Demographic and political issues multiple correspondence analysis for the encroachment groups.

The main purpose of the present chapter was to display most of the quantitative data obtained through the q-sort test, personal social networks and semi-structured interviews. In the following discussion chapter, this data will be integrated with the actual respondent’s narratives. The objective behind this is to give sense and substance to an important amount of data that may seem abstract when is separated from the discourse that supports it and gives context to the issues and dynamics presented in this chapter.
This chapter will focus on integrating the previously presented quantitative results with some of the most representative narratives from the semi-structured interviews and \textit{in situ} ethnographic observations. The objective behind this is to create a comprehensive discussion that takes into consideration the particular socio-cultural, historical, economic and environmental characteristics found in this region. This approach is also aimed to highlight some of the background externalities surrounding the complex issues previously described, especially concerning processes of knowledge change and adaptive strategies.

As in previous chapters, it is important to emphasize how transversal these issues are, integrating in most cases the whole spectrum of rural life. Issues that seem purely environmental have significant historical background and sociocultural implications, while others that seem to be essentially local economic phenomenon are rooted on much extensive political events. Having this in mind, the following discussion will be divided in four main segments aimed on presenting qualitative ethnographic data primarily focused on the most representative local ideas, knowledge and behavior embedded in the previously presented issues, also unveiling some key adaptive strategies that are responding to these phenomena.

\textbf{Water, Fire and Land Use Change}

As mentioned in the previous chapter, water issues stand out as one of the most significant concerns in this study with all the respondents remarking on it. Water scarcity is a very complex phenomenon because it has multiple local and global factors involved. Climate change, deforestation and land degradation are some of the large
scale causes water scarcity that are also recognized by the local population. However, respondents concur on the significant effects of monoculture forest plantations on water availability decrease, especially concerning eucalyptus plantations.

This water crisis has also affected local producers’ livelihoods in multiple ways. Along with the evident effects on food production, respondents narrate how water availability is essential in sustaining rural communities’ livelihoods in general. Besides soil resources, water is indispensable for agriculture that is their main socioeconomic activity. The inability to maintain the production cycle is a significant element in the extensive process of migration and rural depopulation. Mr. Omar (Medium encroachment group) a 75 year old producer from Ranquil narrates this socio-environmental issue:

The hill had a spring where there was water at ground level, many tenants use to live there, they had their small properties with orchards, they feed themselves from what they produced there, but that is finished. Because even in the low areas you cannot find water anymore ... because the groundwater has dried up, the water that emerged to the surface it is gone, why? It doesn't reach the surface anymore, the forests absorb it.

According to respondents, the decline of water availability, although it has been a gradual process through the years, has become critical in the last decades that they associate with the explosive expansion of plantations. This sudden worsening can be seen in particular actions and adaptations that have become essential to survive. An example of this is how many communities are relaying on water sent by the local government and municipalities. Mrs. Patricia (Medium encroachment group), a 42 year old local producer explains how the close proximity of plantations to their houses have diminished their wells making them dependent to external water sources:

The most critical issue is water, plantations are too close to our houses, that is the biggest mistake because the eucalyptus have dried our wells,
there is no more water. The municipality water tankers are coming to deliver water during the whole summer, sometimes even during winter.

Although this seems as a radical measure, it has progressively expanded in the region. Also, this is only one of the many adaptation strategies adopted by locals to face this issue. They are building more diverse and deeper wells, even rain collectors at ground level and roofs. They are also dismissing certain high water demand crops and adopting others that can produce biomass with lower amounts of water like alfalfa (*Medicago sativa*), sorghum (*Sorghum bicolor*) and *tagasaste* (*Cytisus proliferus*). This has also implicated a significant amount of knowledge acquisition regarding the production systems of this new species, and at the same time, the abandonment of certain practices and knowledge associated with the dismissed species. Development and rural extension programs have played a key role in the introduction of both new technologies (for production and water collection) and crops in this type of setting.

Although, these programs do not reach and are not adopted by every household, they have a limited number of participants, an application process is included and sometimes there are particular requirements that are not met by everybody. When these excluded households are not able to cope with significant issues as water scarcity it is very likely they will abandon agriculture and other water-dependent activities, especially traditional wine production.

On the other hand, people that have planted introduced tree species close to their houses and are experiencing drastic water scarcity are cutting down and getting rid of these plantations replacing it with native vegetation. Multiple respondents commented on how natural springs commonly found around native vegetation disappeared after those locations were transformed into plantations. Mr. Eduardo (High encroachment
group), a 65 year old producer and retired teacher narrates how he personally experienced this:

We used to have some springs, one in the east, and another in the northeast and a third one in the west. Only one of those still works, the other two were closer to the plantations and stopped working. I attribute it to the pines, sometimes I would like to blame the earthquake, but it has coincided with the plantations.

This excerpt also illustrates one of the main concerns expressed by the respondents, not only in the semi-structured interviews but also in the landscape perception Q-sort test. This is the expansion of monoculture tree plantation into land that serves other essential environmental and economic purposes, especially agriculture.

Respondents acknowledge the big potential introduced tree species have, both economically and in terms of soils conservation. They are a tangible source of timber and firewood for the household and the production can also be sold to local sawmills and forest companies. At the same time, the low resource requirements (soil and water) and fast growing characteristics of these species make them very suitable to protect degraded soils, especially in this region.

However, as mentioned before, the conversion of native forest, and especially agriculture land, into monoculture plantations is highlighted as a key environmental and socioeconomic issue. Agriculture land loss due to forest plantation expansion was the second most representative socio-environmental issue mentioned by respondents after water scarcity and it has been pointed out as a significant threat to subsistence agriculture by the producers living closer to expanding plantations. Mr. Luis (Low encroachment group), a 54 year old producer from Colliguay a small locality established in the central valley comments on this issue:
I agree with planting forests, but in the lands that are not suited for agriculture. The problem is that nowadays nobody monitors where they are planting. Right here, all those hills are suitable for plantations, but at the same time, here in Colliguay there was a farm that was great to produce and they completely afforested. Years ago I rented 30 hectares there, what a great place, but now it’s gone, they planted it. It was perfect for wheat production, oats, lentils, vegetables, good and moist soils, gone forever. Plantations should not exist here, in degraded lands I totally agree on afforestation, but not in good lands, the weather here is spectacular, and it’s becoming filled with plantations.

As with water scarcity, plantation expansion into agricultural land has some significant social implications. This is especially materialized when households and whole communities are dismantled and forced out of the land. As discussed in previous chapters, there are multiple traditional land tenure systems in rural Chile, and especially in this region. A very common system that has been progressively disappearing is the “medieria” or sharecropping. Here a landowner would share or rent part of the property to one or more households so they can produce, and at the same time, they would pay back with either products or labor. Since the monoculture plantation boom many large properties and farms sustaining multiple households and communities have been sold to forest companies or afforested by their owners. Families that occupied these lands were forced to migrate, sometimes they were able to find other rural properties. However, many times they end up living in marginalized urban neighborhoods. Mr. Eduardo (High encroachment group) narrates a particular case where this phenomenon occurred:

Well, the biggest disaster I’ve seen regarding forest plantations is the neighboring property, the Choigue farm. For me, this was a disaster, a spectacular agricultural field of 400 hectares, with many workers doing lots of sharecropping. And then, a forest company comes in, buys it in an auction, and when they planted it, everything was lost for the people. I say this is the biggest disaster I’ve seen because that farm used to breed a ton of cattle, beautiful cattle. There were many families living there, producing in harmony, a real community, they helped each other in harvesting.
This narration also unveils how land use change practices of this nature not only diminishes local crops and livestock production, but also social cohesion. Having this last effect especially occurring in the High encroachment group. The dismantling of rural communities have also resulted from the appropriation of several smaller properties within a community, which implies the closure of roads, trails and common land. This will be approached with more depth in the last part of the chapter, although is important to highlight how certain territorial configurations such as native forest, or arable land play important social roles other than natural resources or production.

Following with the most recurrently mentioned socio-environmental issues regarding forest plantations it is necessary to point out wildfires. The closeness reached by plantations to the properties and houses of the local rural population has become alarming. When asked about risk in the landscape perception section most answers focused on the conditions associated with wildfires; plantations close to houses, extensive and dense areas of plantations without firebreaks, and residual biomass left after harvest. These factors were especially relevant for those respondents living closer or with high encroachment due to plantations.

Respondents’ experiences and narratives regarding wildfires range from having fire reaching their gardens to watching hopelessly how everything they owned becomes destroyed by fire. They also explain how a constant state of fear has been established in these communities, especially during the dry season. As described by locals, the fast expansion and the resulting encroachment of their households makes them feel trapped:

If a fire starts in this area we are right in the middle, there is no way out. We are always living with fear here, we are constantly intimidated by the forest
companies, because this has become a hotspots for wildfires, and we have become completely besieged and trapped (Ms. Amanda, (Medium encroachment group) 40 year old producer).

This is one of many narrations exposing indifference and intimidation from the local forest companies regarding their vulnerability to fire reaching their properties. This vulnerability and state of fear has also become a means of pressure and harassment from those looking to expand the forest production: “The fire has reached everywhere, right over here (30 meters from the house). People from the forest company have told us: ‘How are you not afraid?’ ‘Why don’t you sell?’ ‘You could buy somewhere else’ (Ms. Nancy (High encroachment group), 52 year old producer from Ranquil, a rural community located next to the largest pulp plant in the region). Another testimony regarding this belongs to Ms. Rosa (High encroachment group), a 59 year old producer living in Hualqui, a locality 70 km south from Ranquil: “And they have told us, ‘If you are afraid of the fire surrounding you it is better to sell to us and then you can go to another place’. So, our way of life has become more and more difficult”.

Wildfires reaching small properties could be a catastrophic event for the families living in the region. Unlike earthquakes, which are very common in Chile, fire does not only destroy houses and other infrastructure like barns, but also destroys the production, planted crops, greenhouses and harvested products. This is particularly harmful for the vulnerable subsistence agriculture conducted by most households living in the secano region. Ms. Filomena (Medium encroachment group), a 80 year old local explains how fire not only destroys the means of production but also vegetation (both native and introduced) commonly gathered as part of the economic diversification: “I had a vineyard but it got burned, now I don’t have that income anymore, all the rosa
mosqueta (*Rosa rubiginosa*, local bush with fruits that are sold to cosmetic companies) was also burned in the last fire.

The risk associated with wildfires have generated another indirect issue to local producers, new regulations and restrictions have been implemented by the authorities to reduce wildfires. One of the most significant restrictions is the banning of agriculture fires, commonly used to clear the organic residues left after the harvest. This process is essential in order to prepare the soil for the next production cycle. Although there are alternatives to fire, as the incorporation of the biomass into the soil, these practices are more labor intensive, which are hard to adopt by producers that are actually highlighting the progressive loss of rural labor. Gabriel (High encroachment group), a 31 year old producer explains how these regulations have stopped him from producing:

I have not been able to sow because I can’t burn the stover anymore with the plantations so close, they could put me in jail for many years! And for so little land, it is not worth it. Before all this you could burn without any problem. Nowadays you can’t do anything like that, you can only pile and stack which does not work. Those piles become rat burrows, and that is a big problem on a farm.

This new impediment to production has reinforced the idea that agriculture is not sustainable for local small producers anymore. Multiple narratives talk about how these restrictions intensify not only the loss of agriculture and food production, but also outmigration: “People were left with their work unfinished and in the end they said ‘we cannot live here anymore’ (Ms. Silvia (High encroachment group), 55 year old producer). This was a significant factor for multiple families to sell their properties. Some had the support from agencies and programs to adopt and move to other productive activities, but those keeping up with the traditional agricultural system were not able to produce. This combined with other important factors as labor scarcity, land degradation,
low prices and high costs. Mr. Sebastian (Medium encroachment group), a 65 year old producer explains how people living in the hills, which rely on traditional production practices (human labor and animal-powered tillage) were particularly affected by these regulations:

People feel harassed so they sell. If they catch you lighting a fire soon you will be surrounded by police, SAG (Agriculture and Livestock Service) and CONAF (National Forest Corporation)… Small producers began to sell because they couldn’t burn, so the people that lived on the hills couldn’t keep up doing agriculture.

So far multiple factors associated with forest plantations affecting rural livelihoods have been discussed, especially concerning those sustained in traditional agriculture practices. However, some of the most shocking testimonies gathered in the region with high encroachment due to forest plantation talk about another issue that not only affects their crops and its production systems, but also, their animals and household members’ health. The use of pesticides and herbicides in the monoculture forest industry has been regulated and restricted during the last years, especially due to certification requirements. However, many respondents, especially those living in areas of high encroachment, have experienced the impact of these substances at different levels in the last decades and even in the present day. Mrs. Elena (High encroachment group), a 50 year old wine producer illustrates this issue by narrating part of her personal experience:

…when I lived there, 5 years ago, they fumigated the pine trees, I lived surrounded by forest. One day I went out to work, when I arrived they had fumigated the surroundings, all my chickens, I had more than 40 hen and chickens, all dead. It was getting dark so I began to put everything inside the house, but then the pesticides began to affect me. I got sick, I was poisoned, I was living alone so I called my boss and she took me to the Ñipas’ hospital. They gave me an IV with something I don’t remember, they also told me I was poisoned, and I feeling well before I arrived to my house.
Besides more serious cases as the above, one of the main negative effects of these substances highlighted by the respondents is the death of bee hives. Local small producers develop a strong connection with their hives, bees not only produce honey and other by-products which they can use and sell, but also, they are essential for the pollination of their crops, plants and trees. Mr. Francisco (Medium encroachment group), a 50 year old Mapuche (main indigenous group in the region) producer, sadly narrates how his bees progressively died out:

When the forest company arrived at the region they arrived with bread for us, but also with hidden poison. When they began to fumigate all my bees started to die, one by one they died. I devoted all my efforts to save the last hive, I took care of it, day and night, but there was nothing I could do…

One of the most tangible impacts related to loss of bee hives and pollination was found in the further south area of the Biobio administrative region, in the *Nahuelbuta* mountain range (part of the coastal range). Here, native strawberries are one of the most traditional products and an essential part of any household productive activities. As wheat production in the northern part of the region, strawberry production has undergone a series of repercussions from the expansion of monoculture tree plantations. Locals identify climate change and forest plantations as the main factors behind water scarcity; however, many associate the expansion of plantations with the loss of bees and pollination. Figure 7-1 shows a strawberry field located in the *Nahuelbuta* mountain range, as seen in the photo, the irregular shape of the field denotes how farmers are forced to adapt to the few arable land available. This particular field is in a steep slope and surrounded mainly by eucalyptus in different stages of growth, this type of encroachment also affects the amount of light received by the strawberry plants:
Pines are the predominant species used by local forest companies. According to respondents, large extensions of this type of tree are detrimental for the bee population because they have to travel farther to find flowers and gather food. But also, as mentioned before, the use of pesticides by the forest industry impacted on the bees’ population, which, according to the local producers had repercussions on the strawberries:

For me the biggest impact was the fumigations, it destroyed the hive. I had an uncle that owned 70 rustic hives, huge bins, three times bigger than the modern apiculture. He had a 100% mortality, and I remember it pretty well, that the strawberry plant changed, there was not enough pollination, only between the closest plants, but not with further plants with the help of the bees, and the strawberry began to decline. (Ms. Nubia (High encroachment group), a 53 year old producer).

Currently there is interdisciplinary research conducted in the region focused on the mentioned strawberry decline. Along with pollination issues, climate change, and management strategies, monoculture tree plantations are been taking into consideration
as key factor in this issue. It is important to mention that, due to new regulations and certifications requirements, aerial pesticide spray has no longer been executed by forest companies. This is also acknowledged by local respondents, however, they also point out how the use of pesticides continues, having been replaced with ground level applications by workers with sprayers. Ms. Silvia (High encroachment group), a 55 year old local producer narrates this adjustment and some of its implications:

I think they have never stopped fumigating, they don’t do it by plane anymore, but they do it by hand, you can see the vans full of hand motor pumps going up and down the hill. They sprayed very close to strawberry fields and you can see the effects. It was something so strong they sprayed that even the trees got burned. Usually they used to spray it in the afternoon, before it got dark with 2 or 3 planes. The next day you found all your plants burned and all the bees dead.

The use of these substances in the forest industry and the expansion itself of plantations into non-degraded areas have also impacted the availability of native flora used both as medicinal plants and crafting raw materials. A specific case of this phenomenon, unveiled in the interviews, is the Ñocha (*Eryngium paniculatum*). This plant is commonly used by Mapuche craftswoman as a vegetable fiber that is knitted into multiple objects such as baskets, vases, bowls and decorations. However, it only grows in the native forest of the southern part of the region. With the decline of native forest and the expansion of plantations it has become progressively harder for locals to find this plant. Local craftsmen have adapted to this scarcity by building woven mesh tents similar to a greenhouse in order to replicate the environmental conditions found in the native forests, here these plants are cultivated and periodically harvested. Interestingly, most of these initiatives have been funded by the same local forest companies that control most of the land surrounding the communities. Figure 7-2 shows
both one of these tents and Mr. Francisco (Medium encroachment group), demonstrating the preparation process of the Ñocha:

Figure 7-2. Mr. Francisco handling the Ñocha and woven mesh tent used for its production (Photo courtesy of author).

There is a complex relationship between local communities and the neighboring forest companies. Respondents are rigorous critics regarding the forest companies’ *modus operandi*, not just their productive and expansive actions, but also their intimidation strategies. However, these companies also have several aid programs for adjacent communities, not only focused on productive issues as the above discussed Ñocha, but also regarding recreation spaces (gyms, soccer fields, parks, etc.) and even training (computer, cooking and baking courses).

These initiatives have created internal conflicts within the communities that are sometimes unified to face problematic issues generated by the companies, but at the same time, some community members are receiving important benefits from them. Other examples of this conflicts will be approached in the following sections in this chapter.
There are several other socio-environmental implications mentioned during the interviews that are very specific to particular regions, especially regarding the decline and scarcity of certain products only found in native forest such as edible fungus (*Changle* (*Ramaria flava*) and *Digueñes* (*Cyttaria espinosae*)) and medicinal plants (*Hierba de San Juan* (*Hypericum perforatum*) and *Yerba de la Plata* (*Equisetum bogotense*)).

Many of the narratives explaining these particular cases have been left aside in this discussion. As mentioned before, the main objective behind the present chapter is to discuss some of the most characteristic and representative issues unveiled in the conducted semi-structured interviews. This also implies the need to provide context and meaning to these phenomena and explore some of the externalities involved.

Although most of the issues discussed above have some kind of economic implication, there are some particular interactions between monoculture tree plantations and local small producers' livelihoods that are especially noteworthy in economic terms, especially in the rural household scale.

**Gathering, Agriculture and Labor**

In the previous section, *rosa mosqueta* (*Rosa rubiginosa*) was mentioned as a wild fruit significantly affected by wildfires. However, the main threat for this bush is the expansion of monoculture plantations itself, which have considerably reduced the ecosystem where this plant is commonly found. It is important to highlight this particular species in the “*Secano Interior*” context from other products because it not only plays a key economic complement role for small producers' households, it is also one of the few products that are gathered in groups.
This bush was originally brought from Europe by Spaniards colonists, the objective was to use it as living fences due to its spinose structure. Nowadays it is found sporadically between properties, especially in common areas as roads and trails. This is also why it is harvested in squads that wander long distances around and within properties. As explained by Ms. Amelia (Medium encroachment group), a 43 year old producer, the picking of *mosqueta* played an important social role, similar to agriculture:

Before the plantations arrived in the region we used to pick *mosqueta*, everyday we gather and went out, the whole community participated. Some were in charge of collecting in wagons what we picked, others were in charge of cleaning, packaging, etc. So we saw each other every day. Nowadays, unless there is an emergency or an especial event we don’t gather anymore, we don’t see each other. We say good morning and good afternoon, but beyond that we don’t talk that much as we used to.

It is interesting to notice how small implications and externalities that are not often considered when the effects associated to monoculture forest plantations are discussed become significant issues. If the loss of practices as the *mosqueta* picking have considerable social effects, the loss of agriculture practices are more than significant, especially for small producers conducting subsistence agriculture in vulnerable environmental situations.

Social capital and social cohesion are essential in sustaining these types of livelihoods, however, according to respondents, the expansion of monoculture tree plantations is making agriculture more challenging, and therefore, disintegrating social cohesion. As mentioned before, local traditional agriculture relies mostly on human labor, especially for those households located in hilly areas where animal-powered tillage is often the only option to produce cereals. Figure 7-3 shows the traditional sowing method. Also pine plantations in the back, and a bush of *rosa mosqueta* can be seen in the lower left corner:
As discussed previously, water scarcity and the use of agricultural soils are some of the main environmental issues associated with plantation expansion affecting traditional agriculture. However, respondents describe how the general process of land acquisition conducted especially by forest companies has indirectly affected agriculture by compromising labor exchange dynamics and cooperation networks. Although, intimidation strategies have been described by respondents, it is irresponsible to assert that this is always the case. The economic unsustainability of traditional agriculture due to several factors mentioned before (high costs, low prices, natural resource degradation, labor scarcity, etc.) have made land acquisition offers very appealing for many rural households, especially for the elderly population: “They continue to buy land, any property they can, and they are paying fantastic prices so they don’t get accused. Right there, in the side of the compound (pulp mill) they have bought properties at unbelievable prices” (Mr. Omar (High encroachment group), 75 year old producer).
However, as described by Ms. Silvia (High encroachment group), this has implications for the whole community. Having part of the adjacent territory transformed into plantation does not only have environmental consequences, but also socio-economic, the community by losing one of its members also loses a worker, a collaborator, they lose social capital:

People are selling and leaving. It makes me think that someday in the future we will have to leave as well, we feel the pressure. We had a neighbor, he had 60 hectares of land, when we arrived here we worked together, we harvest potatoes and he lend us part of his property. So, not long ago he sold and left to the city. We didn’t only lost our neighbor, but we also lost our work partner, and that hurt us so much because we don’t have neither the people nor the land to produce anymore. Last year he returned to buy his land back, he couldn’t, it was full of pines.

The establishment of trees does not involve the arrival or replacement of new community members, the property becomes merely an uninhabited productive space, and in most cases controlled by a large company. A fundamental concern related to this socioenvironmental transition, and frequently highlighted by respondents, is food security. The capacity to produce most of their own food, besides what they can sell, is a fundamental need for small farmers. This necessity also illustrates how afforestation programs and subsidies are inequitable regarding big forest companies and small producers. It is extremely hard for small producers to access the economic (extra income) and environmental (soil conservation) benefits of afforestation because the production of food is the priority. As explained by Mr. Alejandro (Low encroachment group), a 78 year old retired industrial producer:

The problem with small producers is that they cannot afforest because they have to produce food. Chickpeas, wheat, lentils, etc. If you afforest you are doomed for 10 years. So, the subsidy should be to plant pines and for food. Then, 10 years later they can pay and afforest again.
While small producers are progressively struggling to sustain their food production, forest companies are being benefited with subsidies that they use to expand their production, which in many cases is materialized in the acquisition of new land. This new land includes abandoned and highly degraded areas, but also properties that used to be productive or that belonged to medium and small producers that couldn’t struggle any more in sustaining traditional agriculture and saw an option in selling their land for afforestation. But as mentioned before, the community does not only lose a social unit (individual or household), but also land and productive potential.

The land use shift from agricultural to plantation and the resultant loss of a food production unit implies a significant reduction in the amount of food produced within the community that can be shared or exchanged. This process can be also extrapolated to a bigger geographical scale as the locality, region or even country. Mr. Eduardo (High encroachment group) points out how food security issues are also playing an important role in this vicious cycle enhancing rural depopulation:

So, there are no more cattle production, no more food production of any kind, beans, peas, lentils. People are forced to migrate, to the city or to a very small farm and the land becomes plantations. A place where kilos and kilos of food were produced, now we only get wood that will serve to a very small group of people.

Although wheat production is the most extensive example, monoculture tree plantations have taken over farms, fruit orchards, and even vineyards. An example of this is shown in Figure 7-4. In this photo, pine trees have been planted above what used to be a wine vineyard on the hill. In this case the landowner did not care to even remove the vines below the trees before planting. This exemplifies how certain products have been completely discarded and replaced with monoculture tree plantations:
Local communities have had to adapt to this progressive process of plantations replacing food producing spaces and activities. The main source of food acquisition has moved from their own and neighbor properties to local markets, mainly located in urban settings. This is not ideal for many respondents, they feel that the monetization of their basic needs, especially food, is particularly detrimental for rural households, especially those in a state of socioeconomic vulnerability. Ms. Silvia (High encroachment group) explains this transition:

Now you are forced to buy everything in other places... For example, time ago you could produce most of your food in your property. Nowadays we have to go to Chillan (local big city) to buy the wheat, all those things, you just have to buy them, and most of us don't have a salary.

It is important to highlight how these type of economic transition are not exclusive for this region, nor for Chile or Latin America only. These are global process framed in what is called “The new rurality”. However, for this particular study, it is important to inquire into the specific representation of this global processes in this region, especially
focusing on how the particular processes of monoculture forest plantation expansion generates specific effects and how households interact with these effects.

The enormous scale of the big forest sector operations and the high purchasing power concentrated in a few companies have also significant effects on labor and rural job dynamics. Although the effects on labor migration has been mentioned before, there are particular cases were the “economy of scale” or the constant need of expansion involved end up consuming the potential of other development, jobs and production opportunities:

There was an individual who wanted to buy something like 200 hectares to plant blueberries, which would create some jobs. However he didn’t have as much money as the forest company, so they bought it, and afforested it. This is what is destroying us, more and more trees. And who stops this? Nobody (Mr. Luis (Low encroachment group), 54 year old producer).

This testimony introduces the issues related to jobs in rural settings and the effects of the introduction of forest plantations. As it has been discussed previously, jobs associated with agriculture have been progressively diminished in the last decades. According to respondents, although there is a necessity of labor, small producers cannot satisfy the requirements asked by workers, much less compete with urban job standards.

That is why I don’t own cattle anymore, because there is no one to help you. If you find someone the first question always is: “how much are we talking about?” Can you imagine paying 8000 pesos (12 USD approx.) for moving the cattle between farms? What profit can I get? (Mr. Ramon (High encroachment group), 63 year old producer).

The growth of the forest sector seems to be an aid to this job issue, unlike most industrialization projects, plantations and all the industrial infrastructure supporting it, is located in rural areas. This productive sector also had the resources to provide the
standards and remuneration sought by local workers. It was portrayed not only as
source of revenues and jobs, but also sustainable development.

However, according to the respondents, especially those living near the “Nueva
Aldea” industrial complex (one of the biggest pulp mills in Chile and South America),
these plans did not materialize for the local communities. Although there are cases
where locals have been hired by these companies, it seems to be three main factors
preventing a significant job creation impact for local workers. The first one has to do
with the actual work needed to plant, maintain and harvest a plantation. Although the
production cycle in Chile is one of the fastest in the world (10-15 years) there is still very
little maintenance involved between the planting and the harvest. As described by Mr.
Omar (High encroachment group), forest jobs are very sporadic compared to
agriculture:

This thing is cyclical, depending on the species they use. So for the
harvest it is just a very short period of time they need people. Now, those
working on the forest brigades have a more stable job, but the others are
very sporadic. Especially compared with what it used to be the year-round
agricultural cycle, instead of the 10-15 year forest cycle.

The second is a technical factor. Most of the hard labor used in the current big
forest sector is done with machinery. Big “harvesters” that not only cut, but also limb,
buck and pile logs, these machines are operated by very few specialized workers. This
is also a very significant portion of the technical factor. Forest companies require
workers with a certain level of specialization, their work requirements are not suited for
the local population with a low average years of formal education. Most of their workers
have some kind of training that is not accessible for most of the local population. This
technical factor is explained by Mr. Gabriel C. (Low encroachment group), a 67 year old
local producer:
They have all their crews coming from outside the region, they are specialists. Do you understand? Specialized crews, they know how to do specific tasks, and how to do it quickly. Besides that, almost everything is done with machinery, they cut, peel, load, etc.

The final factor has much to do with the above narrative. With nationwide operations, even in other countries of South America, and the potential to move large amounts of machinery, resources and people, it is not practical for the biggest companies to hire people from the local communities. The big forest sector is an important job source for the country, but not necessarily for the particular regions where most of their operations are located. As described in previous chapters, the benefits associated with the forest are commonly not allocated in the communities that coexist with the actual plantations. This is exposed by two women community leaders from different localities (Hualqui and Chillan):

Forest companies are not interested in providing jobs to the communities, they bring everything from outside, modern machines that cut and clear everything… they don’t need many workers (Maria (High encroachment group), 51 year old).

There are not actual benefits, because nobody from this community works for the company, they have their own people, their own crews. They don’t need people from here, I don’t know anybody from here that works for the forest company (Amada (Medium encroachment group), 40 year old).

As mentioned before there is a complex situation where unemployed workers from the rural communities claim there are no enough jobs that force them to migrate. At the same time, local farmers are in need of labor in order to produce claiming that local workers are not interested in agriculture-related jobs due to the low salaries and drudgery work. This lack of labor makes small agriculture even less economically sustainable promoting afforestation, by the landowner or by forest companies after acquiring this agricultural land. Forest companies are also interested in that, even if they
do not own the land, trees are planted. This means that they can buy from the owners, however, the previously mentioned size and low competition, allows the companies to set the market price. As explained by Mr. Hernan (High encroachment group):

“Companies are companies, when are you going to be able to defeat a company? They are a monopoly. Forest companies gave us the trees they couldn’t use to, later on, buy those trees from us”.

The above discussion seems to frame and generalize small local producers in an intractable situation, condemned to fail and disappear. However, there are also cases that illustrate how households are adapting to this difficult situation where local and national factors interact negatively. From an economic approach, one of the strategies adopted by rural households that seem to alleviate the constant struggle to both produce food and also have a monetary income is production diversification. Producers have learned that they can no longer sustain themselves by only focusing on producing cereals and legumes, especially in overexploited soils that require significant fertilizer input. They have diversified by building greenhouses, investing in aviculture and even shifting to agroforest systems where they can use and sell timber without getting rid of agriculture. Ms. Balsamina (Medium encroachment group) explains part of this productive shift:

We rely on what we can produce that is why we have to “juggle” all year round. Last year we weren’t able to harvest lentils or wheat, nothing, because it was a very bad year. This year was a little better but I had to buy all the wheat for the chickens. So, we don’t have a salary, but we try to sell all kind of products, however, always in small amounts. We sell firewood, eggs, chickens, a little of everything to subsist because the fields are not providing enough.

Households are also seeking development opportunities from both government institutions (PRODESAL) and local NGO’s. Many of the respondents have applied and
are participating in programs related to non-conventional renewable energy (NCRE), having solar panels installed both for the house needs and irrigation. This can be appreciated from the multiple component analysis where both development and NCRE programs are located adjacent to the High encroachment group.

Going deeper into this particular cases that seems to be successfully adapting to all these issues, there is a particular standpoint that is been repeated over and over along the whole research region; “do not sell your property”. Many respondents have not only observed, but also, lived the implications of selling their property and migrating to the cities. One of the most recurrent opinions made in the interviews is that vulnerability or being poor in the city, is not the same as being poor in the countryside. This seems to be especially relevant regarding food availability and quality of life in general. Mrs. Balsemina (Medium encroachment group), a 45 year old producer explains this in her own words:

The biggest mistake you can make is to sell your property, no matter how small it is, and leave to the city. You see people returning regretful because in the city… Here at least, if you want to eat a bunch of grapes you can just pick them, in the city you can’t. In the city everything costs money, an onion, fruit, etc. Here in the country side there is not much, but you always can find something. Lots of people that I know have left for the city and returned with nothing.

Respondents highlight how a household become much more vulnerable by selling their rural properties and migrating to urban areas. This is particularly relevant concerning food security. Although, households are able to access more, and sometimes, cheaper services in urban settings, food accessibility is a fundamental factor playing against poor families relocating in cities. Also, most of these vulnerable families are commonly relocated in marginalized urban areas, which in many cases implies a series of socioeconomic concerns as health, safety or education.
Depopulation, Aging and Power

Rural-urban migration has been a key element in this discussion, it has been pointed out by respondents as an essential factor in the complex socioeconomic and environmental dynamic carried out in the region during the last decades. As it has been presented before, migration and agriculture decline are commonly put together as the main corresponding forces behind the loss of social capital and cohesion. However, as it has also been discussed, the expansion of monoculture forest plantations have interacted in some very particular and significant ways on local households’ livelihoods and their interaction with the rest of the community. As mentioned in the previous section, the process of land acquisition by forest companies was not only aimed at big properties inhabited by multiple households and land tenure systems. According to respondents, companies also focused on smaller properties, which unleashed a progressive process of communal disintegration. Ms. Silvia (High encroachment group), a 55 year old producer narrates this process:

During the 1980’s plantations began to grow in every direction. MININCO (one of the biggest forest companies in the country) bought all the available small properties, so the households in the community got frustrated because they couldn’t work together anymore so they also sold their small properties and migrated to the city. They also suffered a lot in the city.

There are two main ways forest companies have acquired land from local households that can be identified from the narratives. The first one was discussed early in the chapter and was related to large agricultural properties with a single owner but multiple smaller producers sharecropping within the properties, which were evicted after the sale. The second way is as described in the above quote, forest companies buying multiple smaller properties within a community, also affecting those who remain.
Although it has been mentioned several times before, it is important to highlight that this type of migration boosted by forest plantation expansion and land acquisition is only one of the multiple factors embedded in a global process of rural-urban migration. Newly afforested farms and properties are not always those sold to forest companies, there are multiple landowners that decided to shift to forest production. At the same time, not all migrants sold their properties to the forest companies. They are occasionally sold to other community members, people moving from the cities, and also many times, they are just abandoned. Ms. Mercedes (Medium encroachment group), a 67 year old producer talks about this and some of the perceptions about people moving to the cities:

As I was telling you, in this region there were much more people but they sold their houses and they have migrated. The farms are sold to the forest companies or they become abandoned because of the isolation and the fear for wildfires during the summer. The water is also drying, especially the wells where there are close plantations. It is tricky because people that has moved to the city become really depressed, they don’t move anymore, they lock themselves in their homes, and they don’t talk with anybody. I believe that living in the country is much more drudgery but it’s better than the city.

But migration is not the only demographic process concerning local respondents, population aging is the second most mentioned issue in this regard. Unlike the younger population, the elderly are less prone to migrate to urban areas. This also explains why 40% of the respondents in the sample are senior citizens (60 year old and over), they are a very representative group in these rural regions where most of the younger generation have migrated: “There are very few people, only the elderly, the youth have completely migrated. The clearest example is that the local school has only three students. (Mr. Hector (Medium encroachment group), 68 year old). This demographic process has multiple implications, for the community, especially those related to
caregiving for older people. However, for respondents, the main issue related to population aging is again agriculture.

This concurs with previous research conducted in the region showing that agricultural work, especially in this older population, plays an essential role in their lives. Not only as a means of subsistence but from an identity point of view, before householders, before citizens they are farmers, they are producers, they are campesinos. The inability to work, to plow, to sow and plant, those are the main apprehensions for this population. This is why the lack of support from younger generations is probably the most mentioned concern, although most of them do not believe in retirement, they also expect and demand help from the younger community members.

We will become older and we will not be able to work the fields, we will not be able to take care of ourselves, and all these fields will be taken by the forest companies, perhaps everything will become forests and the children will leave (Mercedes S. (Medium encroachment group), 60 year old producer).

Although respondents manifest a lack of labor support and availability due to migration and population aging, many households have adapted to this by adopting less labor-intensive crops as greenhouse vegetables instead of extensive cereal production. Many, especially woman, have participated in workshops where they have learned new occupations (crafting, baking, fruit preservers, etc.).

Along with this, some households have managed to continue their traditional production by congregating with friends and family members on certain dates as weekends, vacations or holidays. In this way they are capable of bringing back community members that have migrated to near cities for a certain amount of time. After the harvest they would also receive part of the production, which can become a
fundamental aid to sustain a more expensive urban life, especially regarding food acquisition. These new cooperation systems and production ceremonies are also sustained by the growing communication technology, and especially, the arrival and availability of this technology to rural and very isolated areas. The construction of roads, the expansion of the electric network and cell phone towers are some of the most valued public development initiatives.

From a general perspective the interviews show mixed opinions about the government performance regarding rural areas, respondents acknowledge many of the initiatives related to public institutions. However, there are multiple criticisms regarding the interaction between the State and the private sector, especially forest companies.

One of the main concerns is regulation, respondents perceive that forest company activities and monoculture plantations expansion is not regulated enough by the authorities: “The State has a tremendous responsibility because they did not oversee the intervention of these new species, they didn’t take responsibility about the water issues and many other things” (Mrs. Nancy M. (Medium encroachment group) 53 year old producer). Nowadays most of the regulation comes from international certification agencies, forest companies are required to follow certain productive, environmental and social standards to get certified.

Is in this regard that local communities denounce activities and operations linked to big forest companies, respondents associate the infringement of these standards to high power concentration by forest companies, and especially, the significant unequal power relations between companies and small producers’ communities: “The problem is that we can’t do much against the big companies, they are lords and kings and they can
do whatever they want. Especially in their enormous properties, they can plant whatever they want” (Marta (Medium encroachment group), 45 year old producer). This is especially relevant when communities are more segregated having households apart or separated by plantations, roads or other landmarks. According to respondents, when households are closer it is easier for them to discuss issues and deliberate actions.

However, there is a general sense of impotence and frustration from the respondents regarding their agency as local producers, in a context where the economic and political power embedded in the forest sector surpasses their communal interests for the region. Having agriculture once again as a focal point in their concerns:

Pretty bad, that’s how I feel. Nowadays anybody can arrive here and plant whatever they want, they don’t care about the campesinos, they don’t care about agriculture. Now we are surrounded by plantations, if we have a fire we lose everything we own (Luis S. (Medium encroachment group), 66 year old producer).

They are too powerful, that’s what I think, and that concerns me. Because they have more money, there is nothing you can do about it. A lady that worked for them came here and she told us “whatever you do, we will continue to work” (Cristian (Medium encroachment group), 32 year old producer).

For respondents, these uneven power relations have promoted the overbearing stance adopted by many workers and companies representatives. During this chapter multiple intimidation strategies conducted by forest companies have been presented, however, these actions are supposed to be condemned by most of the certification agencies. Mrs. Amelia (Medium encroachment group), a 43 year old producer and craftswoman narrates her perception about how forest companies deal with the community:

My view of the issue is that it is illogical the way companies treat us, with the cunning they show, the people that work for them, to trick us, to
blindfold us, to make us believe that nothing happens so we do not complain.

One of the most recurrent issues from the interviews, and also one of the most tangible abuses carried out by big forest companies has to do with the traditional space configuration of the rural communities and their shared infrastructure, especially trails and roads used to interconnect multiple households that are commonly distant: “They destroy our roads, they don’t even respect our roads when we are using them, we made them. We don’t receive anything from this, only disrespect” (Ms. Amada (Medium encroachment group), 40 year old producer). As discussed previously in the chapter, the appropriation of the territory by the companies has multiple implications, and the effects on the local communities social interaction is a significant one. Not only the establishment of large, continued and fenced plantations makes interaction more difficult, but also the appropriation of roads is highlighted by respondents as a particular issue for the community. The acquisition of a large amount of land has also implied that companies are privileged with the public infrastructure located in those areas, however, according to the respondents, there have been cases where companies and large landowners have appropriated this infrastructure: “They (forest companies) take over our roads, without notice they have established gates. We have to ask for the padlocks’ keys. This road over here is vicinal, is national property, its public” (Nancy F. (High encroachment group) 52 year old producer).

The local population has attempted to adapt and respond to what they label as corporate abuses by multiple strategies. They have filed complaints with local government institutions, they have confronted forest companies’ workers and associates and they have tried to generate a unified movement. There has been very
dissimilar results from these strategies. It seems that communities with more and closer households have been able to coordinate efforts and in some cases achieved certain results and changes. There have been meetings where the community have presented their concerns to the forest companies’ representatives and resulted in agreements through the help of conflict management institutions and mediators.

Figure 7-5. House close to pulp mill in Nueva Aldea. Sign reads: “Arauco (Forest company) No more pollution” (Photo courtesy of author).

However, in cases where households are more dispersed and isolated, or their occupants are elderly or have any disability there is much less chance of positive results for these families. In this way, environmental and social isolation becomes an issue for social movement and conflict resolution.

Isolation, Invisibilization and Fear

But, do local householders feel isolated? The growth and expansion of communication technology and accessibility has been mentioned during the chapter.
This is also portrayed in the research sample, where every respondent had a cell phone. This allows them to have continuous communication with their families living in the cities and also with members of the community. However, it seems that this new type of connectivity does not satisfy all the socioeconomic needs that direct interaction use to have. Gabriel (High encroachment group) explains how the introduction of extensive forest plantations has affected interaction within the communities:

> You could look to that side or that other side and you could see crops, and the next farm also had crops and so on. And now, only trees… surrounding us. We are not connected between the households as we used to be. You could cross a property and find people, now everything is blocked, everything is privatized.

For respondents located in the more encroached areas, plantations have become more than a physical barrier. As it has been discussed previously, forest plantations have fragmented the rural landscape and the household geographical distribution. This also has social implications, essentially regarding the interaction dynamics between households within the same community: “There is not enough communication between families, houses are too far away, they have become separated by the plantations” (Ms. Filomena (Medium encroachment group), 80 year old producer).

This isolation is not necessarily associated with the amount of plantations surrounding each household, but rather, how the near plantations are distributed in relation to each household or property. Thus, a household could have large extensions of plantations close, but by having clear exits or open passages to the rest of the community it could imply a significant qualitative change regarding social interaction. However, in many cases plantations are so extensive that even looking at households, community and towns from larger scales the level of encapsulation is significant. In this
regard it is interesting to listen to how respondents conceptualize this type of isolation in their own words. Mr. Gabriel (High encroachment group) lives in Quinchamali, a small village located in a highly forested area in the Biobio administrative region:

*Quinchamali* is like an oasis, because is surrounded by plantations. Here we have plantations 200 meters around us, we keep a vineyard and it is surrounded by forest, we call it the island. Imagine our community as a cup (he shows a small cup next to him), we are living down in the middle, think of yourself inside a cup, and everywhere you look you see plantations.

There are some implications from this configuration regarding households, communities and plantations that are not as evident as some of the environmental and economic issues discussed before. One that is shared transversely by the respondents is visual pollution. The extensive establishment of monoculture plantations not only implies an undiversified and repetitive landscape, but also, if has affected the visual capacity of the population by blocking it with tall continuous trees. Ms. Amelia (Medium encroachment group) explains how the change from *espino* (*Vachellia caven*), a short native bush, to tall eucalyptus and pines have affected the visual of locals and their surroundings:

If you see, everything is planted with pines, years ago you could see your neighbor house because there was mainly *espino*, which is short. Now all the landscape is blocked by pine trees... we are like trapped from this side. Now if you have a wildfire coming in it could easily reach the house. Or also strangers prowling around and some looking to break in and rob, they now have places to hide and you can’t see them anymore.

This last quote exposes the relationships between the visual capacity of householders and safety issues. This also illustrates how landscapes are much more than just scenery, their composition and transformation are directly related to the population livelihoods, behaviors and concerns. This is especially relevant in situations where these transformations are extensive and immediate as monoculture plantations
resulting in scenarios of high encroachment: “There are people that are completely enclosed by forests and don’t have anything to grow, people with small properties and surrounded by plantations, hard soils, only hillside and everything planted with trees” (Mr. Ramon (High encroachment group, 63 year old producer).

This perception of confinement from “inside” is only part of the issue, respondents living isolated due to plantations are not only concerned about having access to the rest of the community or outward of it. They are also concerned about being perceived from the outside. Local respondents also see plantations as an element of invisibilization, which not only has economic implications as the inability to sell products or rural tourism, it also makes them feel hidden, forgotten and even worthless. This phenomenon is explained by Ms. Amelia (Medium encroachment group), a 43 year old producer and community leader from the Lollinco locality:

People doesn’t even know of our existence, they have heard the name Lollinco but they don’t know where it is. Because, if you are passing by car you only see plantations. I’ve heard people say ‘how can people live there?’ And yes, there are lots of people living here behind those trees, so we are very isolated from other communities. If you are passing close to those communities you can actually see houses. That does not happen with our community. We are very isolated, we are behind the plantations away from other neighborhoods.

This perception of confinement and invisibilization is important because it has implications on populations’ ideas, knowledge and behavior. This is especially relevant when the changes in the landscape are fast as plantations expand. Figure 7-6 is an aerial photograph of a respondent’s property showing the massive extension and the level of encroachment due to pine plantations. This particular respondent had 98% of the 2km radius buffer filled with monoculture plantation:
Figure 7-6. Ms. Marta's (High encroachment group) property surrounded by large extension of pine plantations, on the right, a recently abandoned house (Photo courtesy of author).

The above picture exemplifies the interaction between two of the main issues discussed through this and the previous chapter: high encroachment due to forest plantations and rural depopulation. Also as discussed before, both of these issues are closely connected with the loss of agricultural production. The isolation reported by the respondents is not only social, but rather, socioeconomic. An essential function of the community is production and, acknowledging the series of factors involved in the loss of agriculture, respondents highlight plantations expansion as a key reason behind the loss of production and the dismantling of rural communities:

We feel very lonely, enclosed by plantations, because there are no more people around, nobody to work with. You don't have anybody to invite to work, you have to do everything alone now or bring people from the city, mostly family. But everyone is on their own things, the system we had where you helped somebody and they helped you back is gone. (Ms. Maria H. (High encroachment group) a 62 year old producer from Unihue).
The word dismantling characterizes the rural community as a machine or engine that has been progressively taken apart household by household losing its social and economic self-sustaining properties. However, as pointed out by respondents, this dismantling is not only a result from rural-urban migration. Households living in the same communities have become progressively individualistic, being this new social dynamic a key factor behind the loss of social capital and cohesion.

Two neighbors, Ms. Amada and Ms. Rosa from a community near Hualqui explain: “When I was a child my parents used to regularly work with our neighbors, because you needed people in order to produce”… “It was beautiful. Now every family is apart, we used to be a big single family. They have created small groups with their own properties, people are divided”.

When asked about the causes of this frequently mentioned phenomenon, most respondents are not sure. They point out how, for decades, families within the communities have become distrustful, selfish and even greedy, but generally do not have an explanation for it. However, there are a few narratives that provide some keys to understand this social process.

The first explanation is embedded in the “Chilean land reform” conducted from 1962 to 1973. Although, it went through different administrations with different approaches, this was a process of land ownership restructuring focused in expropriating large properties, most of them originated in colonial times (*Hacienda*). The main targets were terrains not used for production, they were handed over to small producers and peasant families, mostly land-less.
Beyond the macro socioeconomic and political repercussions from this process, new local and social dynamics emerged in these rural areas. These are described by Mr. Omar (High encroachment group), a 75 year old producer from Ranquil that personally experienced these events:

There was a social change, which I supported, but the way they did it was inadequate, people were not prepared for it, tenants became landlords overnight, so that is how the inequalities and mistrusts started, forgive me the term I'll use, but they screwed each other… It was the law of the jungle! Going a little back, farmers used to help each other, people used to collaborate. But this new social class that emerged, a group of people with the only goal of taking advantage of others. They stole from each other, they fought each other, they even killed each other! So that is where the current distrust dynamics started.

These types of conflicts as described in the above narrative can also be observed nowadays associated with institutional and cooperative projects, production credits, subsidies and other types of private and public development programs. Being these limited opportunities, vulnerable households are constantly confronted competing for necessary and resources.

This is why institutional intervention in rural areas is complex, in most cases they are designed for individual households instead of communities. It is in this regard that the intervention of forest companies in nearby communities can also have implications in the internal social and trust dynamics that can develop into significant conflicts. This has happened in several of the regions approached in this study, however, there are particular cases where communities have completely fragmented due to this type of intervention. Ms. Amelia (Medium encroachment group), a 43 year old producer narrates her personal experience with the rest of the community:

I see my neighbor as an enemy now, because I know he is being paid by the forest company, he is living from the company and there is nothing to do about it. So, how can I come visit him if I know that he is being
protected by the big company? The company that is taking everything from us, everything I want to protect.

This is especially relevant when the community leaders are closely interacting with the forest companies and getting paid. Besides losing credibility, community members tend to align in opposing groups, not only perpetuating conflictive situations but also, losing strength in their particular social movement actions that in most cases are aimed to solve environmental and socioeconomic issues. This is the case of a Mapuche community in Calebu, in the Elicura Valley. Ms. Olga (Medium encroachment group), a 46 year old producer and craftswoman who talks about the effects of this type of interaction between leaders and forest companies, especially in the context of an ongoing conflict and vindication movement:

Forest companies bought us, they bought the Mapuche people. So, what happens now? We want to reclaim our land, but there is so much corruption. The community president works for the forest company, she is in charge of the craft class. So she doesn't want to look bad to the company, especially because they pay her salary, so she cares only about herself.

The following photograph shows some of the repercussions from the particular case presented above. After an internal conflict emerged due to one of the leaders receiving payments and other benefits (as production supplies) from the forest company, some community members decided to fence their properties separating their households from the rest of the community. Interestingly these fences were mainly symbolic, made with woven mesh and only one meter high, it did not played any security or protection function. They were essentially a message to the leader and the rest of the community, although they live practically in the same property, they were no longer part of it.
This loss in social cohesion and trust within the communities is a key factor in most of the environmental and socioeconomic issues discussed during this chapter. Households need the support from their neighbors, not only to produce as mentioned several times before, but also to sustain some of the most vulnerable livelihoods in the country. Trust, cooperation and social capital is one of the few fundamental assets sustaining rural communities in regions of high poverty, drought, land degradation, and constant environmental risks as earthquakes and especially wildfires. Community support is one of the few safety nets in a place and time of high environmental and economic uncertainty, especially where local populations perceive themselves completely powerless against corporations that historically have concentrated both the economic and political power.

All this constant state of uncertainty, restlessness, impotence and isolation have had significant implications on these households’ day-to-day life. People are afraid of
producing due to the significant risk of losing all the monetary and time investment because of drought, pests and especially fire: “Nowadays people are afraid to live here. They don’t want to produce, they just come in the summer, they have their houses for the summer, but don’t want to risk by producing food” (Mr. Victor (Medium encroachment group), 68 year old producer).

Most of the respondents living in areas of high encroachment due to plantations are constantly concerned about the expansive behavior of this productive sector within their territories and what this entails. The lack of regulation regarding land use for territories near rural communities have resulted in a high level of uncertainty for many respondents:

We have the constant fear of companies buying properties close to us and planting them. Not long ago somebody bought and planted a field that is very close to me, no more than 100 meters. So, I’m very worried of that happening again and again (Mrs. Rosa C. (High encroachment group), 59 year old producer).

The close proximity between plantations and houses is one of the main factors responsible for the levels of anxiety manifested by respondents. As mentioned early in the chapter, the risks associated with wildfires is clearly the most representative concern in the region, this also implies that local households have had to implement new strategies to face this type of risks. Many have incorporated the habit of creating firebreaks as an adaptive strategy that were not needed decades ago. However, these types of adaptations do not seem to relieve householders of their current and future situation:

They are isolating us, we are disappearing, I cannot see a good future for us. Imagine if we had a fire, I would be left barefoot, and my neighbor even worse. It is too risky with all these trees, it’s scary. I’m constantly making firebreaks because I’m nervous. At any moment something sparks and I don’t have anyone here to help me, just in 30 minutes everything is
gone, including me (Gabriel (High encroachment group), 31 year old producer).

To end this chapter, is important to highlight how all the previously mentioned issues have put local households in a position of constant pressure and insecurity about keeping the struggle to sustain their livelihoods. Many have not been able to succeed, and the few remaining are uncertain about overcoming the short-term implications of climate change. In a time where this global phenomenon is one of the main challenges for humanity, it is important to pay attention to these particular populations that carry more baggage than other more privileged groups. This is an historical baggage of socioeconomic inequalities rooted in power and manifested in the territory:

Is miserable for us that we have to consider leaving the region. Especially to think that we owned the place, the people, not the companies that have arrived. They are the ones that have to leave, they are the strangers, not us! This is our land, our heritage, not theirs. They have told us “well, if this place does not look good to live, then leave”… humans that know nothing about humanity, who profit with our dignity, it is very sad for us (Mrs. Amelia (Medium encroachment group), 43 year old producer and community leader).
CHAPTER 8
CONCLUSIONS

The inception of this research was different from any other previously conducted in the region. While working and doing research about land degradation, rural extension, traditional practices, production ceremonies, machinery use, and other agricultural related issues, respondents would always talk about ‘the forest’. At the moment this seemed very frustrating, influenced by classic rural anthropologists and looking to match cultural patterns of reciprocity, labor exchange and traditional agriculture, people would answer pines instead of seeds, and focus on eucalyptus before kinship. There was something going on, something that seemed hidden but it was actually so evident. There was a necessity, an urgency exposed by local communities about something that seemed camouflaged, but it was there, it was everywhere; monoculture tree plantations.

The graphic and sometimes shocking narratives contained in the previous chapter unveil this urgency. However, the historical background, the available literature and the whole range of results presented in earlier chapters also expose a disconnect between local communities’ vulnerabilities and the current development models for the rural regions. A model that, not only embraces the expansion of monoculture forest plantations and the inequality that entails, but also, portrays this activity as socioeconomically and environmentally sustainable. This is consistent with the New Rurality framework, where small farmers went from being a “central element of development policy as producers and political constituencies” (Hecht, 2010: 163) to a new class in need of adaptation to new markets and efficiency standards. They are now
the problematic inhabitants of a territory with huge economic potential if managed by the new market and technological standards of this globalized era.

This disconnect between the development programs and local vulnerabilities is unveiled by the landscape perception analysis. The results show, regardless of level of encroachment, a general disapproval for monoculture forest plantations, especially when these are established on fertile agricultural lands or arable areas with the potential to produce food. Landscapes with predominant indications of land degradation due to soil erosion are also highlighted as the least ideal possibilities for the rural regions. This is a first hint about the relevance of agriculture for local communities and how embedded this activity is in their sociocultural construction which is portrayed in every data set considered in this study. In this regard, the encroachment group analysis also shows how distinctive the productive strategies are for households located in different environmental and socioeconomic realities and how the surrounding landscape affects these strategies. This is also particularly evident through ethnographic observation, having some cases sustained in extensive monoculture to households relying on production diversification.

If monoculture forest plantations are strongly rejected as a main component in these rural landscapes, this reaction is clearly exacerbated when the concept of risk is additionally raised. Wildfire risk is significantly associated with forest plantation encroachment and expansion. The analyzed narratives and the participant observation data supports the suggestion that fire is a much bigger threat for those more vulnerable households than those considering soil erosion their main environmental concern. This is particularly evident by looking at the landscape productivity indicators (from the
landscape perception analysis) having forest plantations tied with extensive agriculture as 'most productive landscapes' by the low encroachment group. Participant observation became a key method in giving context to the landscape perception results, the possibility of entering and perceiving life from a property surrounded by plantations contrasting with visual openness experienced in other places became a valuable and qualitative scientific asset for this study.

Regarding personal social networks, although statistical analysis did not yield a significant correlation between level of encroachment and network structural metrics, there were some quantitative patterns that emerged from the data. The main finding in this regard is the higher density for the Medium encroachment group which is also supported by measures of centrality and cliques. This was particularly interesting in regards to the initial research hypotheses, which predicted a linear tendency of stronger networks for low levels of encroachment and weaker for high levels of encroachment due to the supposed social isolation.

Data shows that the High and Low encroachment groups are much more similar to each other when compared with the Medium group. This not only concerns network structure, but also most of the variables considered in the personal social network analysis (sex ratio, age, closeness, location, contact frequency). There are some new hypothesis derived from participant observation and especially semi-structured interviews that can help understand these network results.

The Medium encroachment group seems to cluster most of the households that continue to conduct traditional agriculture, although most of them are struggling, they still have some productive capacity sustained by the labor provided not only because of
more dense networks, but also closer and younger contacts living mostly in their neighborhoods or localities with higher encounter frequency. Along with this, although arable land has decreased in the last decades, most of these households have the minimal amount of land to produce traditional crops as cereals and legumes, this is especially relevant in comparison to the High encroachment group, where arable land availability is minimal. Most households in the medium group can be characterized as families that keep struggling to sustain their traditional livelihoods.

On the other hand, for the High encroachment group this type of agriculture is no longer a very tangible option, not only due to the scarcity of arable land and the proximity of plantations, but also their networks are composed of older people, living in further locations and contacted less frequently. This has promoted the incorporation of other less extensive and labor-dependent production strategies, especially those introduced by development and aid programs. This is clearly the most vulnerable group, not only environmentally, but also socioeconomically, which explains the broad participation in this type of programs.

Finally, as explored in previous research focused on personal social networks in the region, respondents dedicated to more extensive agriculture, and especially production sustained with machinery rather than manual labor, showed less dense networks with less centrality averages than producers focused on traditional agriculture fundamentally sustained on cooperative production and labor exchange practices. These more extensive producers’ profiles share multiple characteristics with most of the respondents from the Low encroachment group, not only as the previously mentioned
social network features and economic activities, but also, the greater access to arable land.

The semi-structured interviews and the resulting narratives were essential to assembling both the quantitative data obtained and the ethnographic observation. This is particularly relevant concerning respondents’ position towards plantations and the forest sector in general. According to the theme matrix analysis from the interviews there are general trends concerning the environmental and socioeconomic issues shared by most respondents regardless the level of encroachment. However, the narratives themselves are key to understand the magnitude of these issues for each level of encroachment and how they end up affecting different levels.

Water related issues are an excellent example of this phenomenon. Although every respondent in the sample pointed out some kind of water related problem, the narratives shows significant contrasts between respondents from different groups. While many respondents from the Low encroachment group have perceived decreases in irrigation canal flow or less rain that previous years, producers from the Medium, and especially, High encroachment groups have experienced wells gone dry, springs disappearing, and even losing water sources for personal consumption, all with increased dependence of water brought to the communities by local authorities.

These differences also exemplify the effects of vulnerability as a base line for certain populations, vulnerabilities that are strongly exacerbated when households face the effects of global environmental process such as climate change. In relation to this, another instance where these dissimilarities were highlighted was while discussing topics associated by respondents to fear, anxiety or impotence. Beyond uncertainties
related to production, climate change and even water scarcity, wildfires take the spotlight as the most critical source of these type of psychological responses, and having respondents from the high encroachment group with the most disastrous experiences. This is expected for households surrounded, and sometime, adjacent to vast extensions of monoculture plantations.

Finally in regards to the disparities unveiled by narratives, it is important to highlight issues sustained in power inequalities. According to the interviews, these are especially materialized in various abuses perpetrated by forest companies affecting rural communities. Respondents from the Low and Medium group declare themselves as powerless facing issues of monopolistic activities by forest companies along with issues pollution of water and air, especially perpetuated by local pulp mills. Communities located in high encroachment areas also denounce these activities, however, this is aggravated by intimidating and coercive attitudes from forest companies, especially regarding issues of isolation and potential risks as fire. There is a significant group of respondents that feel isolated, left behind and powerless.

These results are strongly connected to the fundamentals of political ecology (Bryant & Bailey, 1997), which brings us back to the core of the theoretical framework addressed in this dissertation. Firstly, the establishment and expansion of monoculture forest plantations is a clear example of how costs and benefits associated with environmental change are distributed unequally among the stakeholders. Having rural communities living next to and within these plantations struggling with the multiple socioeconomic and environmental implications of this enterprise, while production benefits are been mainly allocated outside these communities.
Secondly, this unequal distribution of costs and benefits among the stakeholders inevitably reinforces the pre-existing socioeconomic inequalities. The Chilean forest sector is an accurate representation of the country’s significant socioeconomic inequality (OECD, 2015) having big forest companies in charge of more than 73% of the reforestation at national level and controlling most of the productive infrastructure in the country (CORMA, 2015). This trend is especially exacerbated in the Biobio administrative region.

Thirdly, the unequal distribution of costs and benefits and the reinforcing of socioeconomic inequalities has political implications in terms of the resulting altered power relationships between the stakeholders. This is clearly reflected in the respondent’s narratives. Small farmers feel powerless against forest companies, both their actions and local presence. But at the same time, they recognize this local power inequality as the materialization of political lobbying conducted in the centralized urban settings, where the powerful decide the fate of rural areas.

Thus, these results also evidence the necessity for distinctive development models and programs appropriate to the different groups and their particular vulnerabilities with a decentralized approach. Although rural communities face similar issues associated with environmental change and socioeconomic instability, results show a process of vulnerability aggregation, where certain households are forced to carry a much heavier load composed of economic, social and environmental vulnerabilities, and are expected to face similar challenges.

Also, agriculture plays a tremendous role in every rural livelihood facet, anything affecting agriculture or food production in general will have significant socioeconomic
implications, but also psychological. This is why production diversification is becoming progressively essential for small farmers in this region. The expansion of forest plantations has important social repercussions because it displaces a social activity as food production and gathering, with an asocial activity such as industrial monoculture forestry. If forest activity could provide that social interaction it could become a significant contribution for medium and small rural producers and their eroded soils.

That is why a diversified agroforestry system could become a successful management and development model for the small farmers’ properties in the Secano Interior. However there are certain requirements that need to be addressed if institutions are really interested in preserving rural communities living in this highly forested regions. The first issue refers to deterritorialization. Institutions have to embrace people as entities of development and conservation. Rural communities are not the source of poverty and environmental degradation, they are the solution. Healthy, cohesive and protected communities take care of themselves and their surroundings. Secondly, structural changes are needed to face socioeconomic inequality, not only in this specific region, but also in the whole country. Vulnerable rural communities are some of the main groups affected by the growth in inequality, experiencing tangible issues such as land-grabbing or natural resources overexploitation. A substantial and specific way to confront this structural engine of inequality is by ending State subsidies benefiting the big forest sector, especially the OC 701 and the perpetuation of this first decree into multiple laws approved during dictatorship and democracy.

Finally it is important to point out that this study intended to compile most of the effects and implications monoculture forest plantations have on local communities.
However, probably each of these deserve a much more extended research program, especially the effects of fire. At the same time, there were also multiple less represented issues that were not mentioned due to their very regional-particular characteristics. Most of them show how monoculture forest plantations have different effects on communities by interacting differently on each crop or product characteristic of that region. While wheat in the northern area was mainly affected by the loss of arable land, strawberries were affected by loss of pollination in the southern region. Vineyards suffer from water scarcity in the wine production zone, while at the same time, particular fungi, medicinal and craft plants have become less available for communities to gather in particular areas.

It is for this same reason that more research focused in these issues is needed, not only qualitative with a particular deep case study approach, but also more extensive and with bigger samples. This is particularly true regarding social networks, a larger sample (both number of respondents and networks’ alters) could be tremendously beneficial to reduce the statistical effects of outliers, which was observed in the present research, and to emphasize variation in network structure and attributes networks’ sustained in different socioeconomic and environmental realities.

In addition, a quality of life approach could have a significant value for research focused in these topics. Methodologically the present study was both challenging and gratifying. Interviews focused on a very sensitive topic with strong opinions and shocking episodes of abuses and losses resulted in a very intense ethnographic experience. The monotony of personal social networks construction is rewarded with the final result and the respondent’s amazement after looking at their networks for the
first time. And finally the landscape perception test, which was originally intended as an icebreaker activity, ended as key data source and research component.

To finish this dissertation is essential to make a reflection from a larger scope, to look into this case study from a new and broader perspective. This is not only an important scientific and academic exercise in political ecology, but especially in anthropology. By stepping back and looking into this research as a whole process, connecting history, people and places, it is possible to notice some commonalities with other histories and people in distant places. Literature from around the world, and especially in South America, shows similar processes where rural communities are been surrounded, encroached and isolated by the industrialization of their territories. But this is a different type of industrialization process from the industrial revolution experienced in Europe during the mid-18th to early 19th century. In this “new” process, neoliberalism returned from the cities to the country side, exploring the productive potential of vast and smaller territories for fast consumption commodities. This is the example of soy production in the Argentinian Chaco (WWF, 2014) or the Brazilian Matto Grosso and Amazon region (Lima et al. 2011), an expansive agribusiness that has been label as Agro-neoliberalism (Ioris, 2017). As the establishment and expansion of forest plantations in Chile, this type of agro-neoliberal activity in Brazil, Argentina, Bolivia and Paraguay has been portrayed as a highly successful economic model. But at the same time, they are also being criticized and accused of land grabbing tactics, unequal power relationships, pollution and pesticide issues, hostilities and harassment in local small farmers’ communities.
The commonalities among these scenarios are also unveiling the potential for new ways to approach these socio-environmental dynamics of encroachment. Is in this regard that cultural anthropology has, not only the theoretical and methodological tools, but the disciplinary expertise to interrelate diverse local patterns into new holistic theories of human behavior, adaptation and resilience associated to these encroachment-driven vulnerabilities.
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BIOGRAPHICAL SKETCH

Felipe obtained his bachelor and professional degrees in anthropology at the Universidad de Concepcion in Chile during 2011. His undergraduate thesis focused on the socio-cultural factors related to land degradation in the Secano Interior of South Central Chile. This research was conducted through his internship in the National Institute of Agricultural Research (INIA) in the context of the DESIRE project (Desertification mitigation and remediation of land) funded by the European Union and conducted in different global hotspots, having INIA as one of the collaborators in charge of the Chilean study site.

During 2012 he obtained a Fulbright scholarship to prosecute graduate studies in the United States along with a CONICYT fellowship from the Government of Chile. In 2013 he was admitted in the anthropology graduate program at the University of Florida, specifically in the subfield of cultural anthropology. He received his master's degree in the spring of 2014 with his thesis about cooperation networks in traditional and mechanized agricultural systems in the Secano Interior. Finally, he obtained his doctoral degree in spring of 2017.