

Trees in the desert

A suitability assessment for a future community forestry and reforestation project in the department of La Libertad, Peru.



Tim Bos
Student Forestry and Nature Conservation,
Major Tropical Forestry
University of Applied Sciences Van Hall- Larenstein
Velp, the Netherlands

23rd of December, 2015

Supervisor:

Erika van Duijl
University of Applied Sciences Van Hall- Larenstein
Velp, The Netherlands

Commissioned and coached by:

Ramón Casana Araujo
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Preface

Through this thesis I hope to give an insight in the many interesting stories and persons that I have come across during the months I spent in Peru. Although the juiciest parts have not come through the editing, I hope to provide not only a technical, practical advice on community forestry possibilities and obstacles, but also an inside to the actual situation of La Libertad's forests. Off course, for a researcher, objective data, theories and knowledge are the things that count, but I have also seen that stories are sometimes just as important (or maybe even more important).

Generally speaking, the state of forest conservation and the possibilities for legally embedded forestry projects in La Libertad are deplorable and it is sometimes harsh to keep on sailing against the wind, but I was touched by many local initiatives of private persons and small groups of people that tried to save their beloved forest. I still remember many quotes and anecdotes that were told me during my short time in Peru.

I really wish that those people in Portada de la Sierra, Santonte, Conache, La Quinta, Tecapa, Puente Virú and all other places in Peru and the rest of the world, that are fighting for their environment, the wellbeing of their children and sometimes their own life, will succeed in their efforts.

I would like to thank my colleagues of A Rocha in Trujillo for their support – both professionally as personally. Furthermore my special thanks goes out to the professors Luis Pollack and Freddy Mejía of the Universidad Nacional de Trujillo, professor Segundo Leiva of the Museum of National History of the Universidad Privada Antenor Orrego, engineer Marco Rabanál of the Ministry of Agriculture – San Pedro de Lloc, Sr. Marco of the Ministry of Agriculture – Ascope and engineer Roberto Palomino of the Ministry of Agriculture in Trujillo.

Finally, I want to thank Professor Danny Roy Abanto for all his inside information.

Enjoy reading.

Tim Bos

Date: _____ of December, 2015

Summary

Community forestry is a way to combine forest conservation with economic development of forest depending communities. In the Pacific zone of northern Peru, the rural population heavily relies on the endemic dry forest ecosystem as a source of firewood, timber and as grazing area. Bad management, overuse and conversion of the forest into agriculture have made these dry Algarrobo (*Prosopis pallida*) forests one of the most endangered forest types in the world. They could be conserved and revived with the establishment of reforestation and forest conservation projects, based on the principles of community forestry. Community forestry is a way of forest management in which participation in management, decision making and benefitting from forest management of forest communities is actively promoted. Community forestry is seen as a way to improve social equity; alleviate poverty of forest users and improve ecosystem health. For this report, ten potential project sites in the coastal zone of La Libertad were identified and their suitability for a community based project of forest conservation and reforestation was assessed. The study was commissioned and supported by the NGO A Rocha Peru.

The investigated sites have been assessed on nine different criteria that are important for the establishment of a community forestry and reforestation project, including community organization, legal status of the area and willingness of local authorities to cooperate in such a project. For the assessment, different kinds of research methods were used, including literature study, semi-structured interviews with key-informants, transect walks and village meetings. Analysis of satellite images and spatial data was used to cross-check and visualize information about forest cover, deforestation and landownership.

Of the ten investigated sites, only the forest Tronco Prieto, near Santonte, in the province of Pacasmayo, was assessed as suitable for a community forestry project. Four investigated sites got a negative judgement (Bosque Pitura, La Quinta, Cañoncillo and Conache). About the five other investigated sites more information is needed for to conclude the assessment. The main restrictions for the establishment of a community based project of forest conservation and reforestation turned out to be a low interest of local government authorities and communities for a project of this kind, together with a poor relation between communities and local government authorities and unclear legal statuses of the forest areas. These restrictions are often interlinked and can be reduced into two main shortcomings which are an unsatisfactory functioning political and legal system and an absence of motivation for forest conservation at different levels in society.

Despite all negative aspects, this study also gives several positive examples of the will for forest conservation and reforestation of private persons, communities and governments.

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1. Introduction

Community forestry is a way to combine forest conservation with economic development of forest depending communities. In the Pacific zone of northern Peru, the rural population heavily relies on the endemic dry forest ecosystem as a source of firewood, timber and grazing area (Montacero et al., 2009). Bad management, overuse and conversion of the forest into agriculture has made the dry Algarrobo (*Prosopis pallida*)¹ forests of northern Peru one of the most endangered forest types in the world (Maass, 1995). These forests could be conserved and revived with the establishment of reforestation and forest conservation projects, based on the principles of community forestry. For this report, 10 potential project sites in the coastal zone of La Libertad were identified and their suitability for a community based project of forest conservation and reforestation was assessed, using social research methods and spatial analysis.

Community forestry was defined by Joan Carter (FORZA, 2010) as “*An approach to forest management that actively promotes the rights of the people living in & around the forest to both participate in forest management decisions and to benefit (financially and in kind) from the results of the management.*” Community forestry is seen as a way to improve social equity (McDermott & Schreckenber, 2009); alleviate poverty of forest users (Maryudi et al., 2011; Pokharel et al., 2007) and improve ecosystem health (Maryudi et al., 2011; Muñoz-Erickson et al., 2007). Important for the chance of success of community forestry projects are tenure rights; the existence of functioning and legally recognized communal institutions; a good relation between the community and (local) government institutions; and the possibility to make legally binding commitments with the communal institutions (FARM-Africa/SOS Sahel Ethiopia, 2007; Hlaing & Inoue, 2013). A case study from the Amazon in three different community forests points out that land ownership and organizational capital are considered as two of the biggest challenges for communal forest management (Hajjar et al., 2011). According to Taylor (2006), landownership and tenure rights in Peru are shaped by different policy regimes, of which the Agricultural Reform, the National Forest Law and policy on protected (natural) areas are the most important. These landownership policies are often overlapping and contradicting. Furthermore, Taylor states that communal organizations in Peru are quite weak.

Deforestation is a large problem in Peru, annual deforestation estimates for the period 2005-2010 vary from 150000 ha (FAO, 2010) to 261000 ha (WWF, 2015). Most of the dry forests in northern Peru have already disappeared and are still confronted with large scale devastation and degradation (Maass, 1995; Mejía et al., 2010). The deforestation is caused by conversion of forests into agricultural fields and pasture area and overexploitation of natural resources, leading to loss of biodiversity and genetic erosion (Mejía et al., 1991; Huamán et al., 2000). Natural forest regrowth is limited because of an annual precipitation of 25 millimetres (SENAMHI, 2010). Forest conservation and reforestation initiatives are therefore needed in order to enhance and increase forest cover in northern Peru.

The NGO A Rocha Peru is active in the assistance of communities in forest conservation and reforestation in the department of La Libertad, northern Peru. A Rocha wants to expand its activities in the region and is searching for locations and communities that have a reasonable chance for a successful establishment of a new project of community forestry and reforestation.

The current state of La Libertad’s forests and the intention of A Rocha have led to the objective to find sites that are suitable for the establishment of a community forestry and reforestation project. Suitable sites are here defined as forests that meet the main criteria for **reforestation**: 1) area available for reforestation and 2) water available; **community forestry**: 1) functioning organizations within the community; 2) interest of the community for forest conservation and reforestation; 3) good relation between the community and local government authorities; 4) interest of the local government for forest conservation and reforestation;

¹ Algarrobo (ES): a tree species (mainly *Prosopis pallida*, also used for other species of the *Prosopis* genus) of the Fabaceae family with a variety of uses, ranging from fodder, manure and natural medicine to firewood and timber. Its fruits are used to make ‘Algarrobina’ (a syrup-like constituent for honey or sugar) and its seeds for ‘café de Algarrobo’ (a local hot beverage). The Algarrobo was of high importance for the ancient civilizations of Peru’s coast and is often referred to with superlatives like ‘the magic tree’, ‘hero of the desert’, ‘blessing of heaven’ and ‘real wonder of nature’. The Algarrobo is a tree completely adapted to its dry habitat and is able to survive several years almost without any water. (Fernández & Rodríguez, 2007)

5) clear legal situation and tenure rights; 6) interest of forest's tenure rights holder for reforestation and forest conservation; and that have a large **conservational impact**, meaning are large in size.

The following research questions were addressed for each investigated site:

- How large is the area that is available for reforestation?
- Is water available and easily accessible?
- Which institutions exist within the community? Are these accepted as authority by the community, are they legally recognized, are they active in the field of forest management or forest conservation?
- Is the community active in forest conservation/reforestation, or is the community willing to cooperate in a reforestation/forest conservation project?
- Does the community have frequent contact with local government authorities (municipality, local representations of Ministries of Agriculture and Environment, government officials at village level) and do the villagers trust and rely on governmental institutions?
- Do local government authorities (municipality, local representations of Ministries of Agriculture and Environment, government officials at village level) support present or past reforestation/forest conservation initiatives, and are local government institutions interested in a new project?
- Are landownership and tenure rights clear, are there legal disputes about ownership or tenure rights, or are their governmental restrictions in the area that make the implementation of a project more difficult?
- Is the legal owner or tenure rights holder of the area active in forest conservation, or is he willing to cooperate in a forest conservation/reforestation project?
- What is the total size of the forest area?

This report was primarily written for the commissioning organization A Rocha Peru, but is also aimed to provide information about the possibilities and difficulties around community-based forest management projects in La Libertad to scientists, development workers, policy makers and other interested people. This research was based on a survey, executed by one researcher within four and a half months' time. The main topics of the survey were community organization; legal situation and interest of local authorities and communities for communal forest conservation and reforestation. The methodology is elaborated in chapter 2 and is followed by a further introduction to the local context of La Libertad in chapter 3. In the fourth chapter the obtained results are discussed, addressing each investigated site separately. Chapter 5 consists of the report conclusion and consecutive discussion and the last chapter points out the recommendations for A Rocha. Annexes and an overview of cited literature can be found at the back of the report.

2. Methodology

Different types of research were conducted in this study, in order to assess the suitability of the potential project sites for a new project of community forestry and reforestation. The used research methods include literature study, semi-structured interviews with key-informants, transect walks and village meetings. Analysis of satellite images and spatial data was used to check and visualize information about forest cover, deforestation and landownership. The use of different research methods is an important condition for triangulation² and makes it possible to cross-check obtained information and improve the validity of the research conclusions, especially for research with limited available time and resources. The research was executed between the 5th of March and the 17th of July 2015 in the department of La Libertad in Peru. In The Netherlands more data was gathered through e-mail contact with key-informants and literature study between the 23rd of July and the 26th of September 2015. All research and data analysis was executed by one student Tropical Forestry, who had on forehand no experience in the region. During the village meeting sessions, he was assisted by local experts that knew the area.

2.1. Study area

The area in which the study was conducted is limited by the political borders of the La Libertad region in the north and south and the geographical border of the contour line of 500 meters above sea level in the east. This contour line is the border between *Sierra*³ and *Costa*⁴, according to the Atlas of Peru of the National Geographical Institute (Peñaherrera, 1989). The area has a surface of 6444 km². The study was executed in areas with natural vegetation classed as dry forest. A total of ten sites was indicated and investigated for this thesis research (figure 1; table 1). Due to mobility restrictions, these sites were mainly selected on practical grounds (transport was available and contact with a local informant was made). During the first visit to a study site, company of a known local informant was always needed. Of the ten investigated sites, four have been researched most intensively, which are Tronco Prieto, Pitura, La Quinta and Cañoncillo. These locations were most easily accessible and local contacts were made early on. In the other areas, information could not always be triangulated, due to restrictions in time and logistics.

Table 1: For this report, ten different sites were investigated, located in different parts of the coast of La Libertad's.

Name	Size	Location	Nearest community
Tronco Prieto	45 hectares	District of San Pedro de Lloc, Province of Pacasmayo	Santonte
Bosque Pitura	36 hectares	District of San José, Province of Pacasmayo	Portada de la Sierra
La Quinta	1300 hectares	District of Casa Grande, Province of Ascope	La Quinta, La Arenita, Mocán
Cañoncillo	1515 hectares	Districts of San José and San Pedro de Lloc, Province of Pacasmayo	Santonte, Tecapa
Calipuy	62000 hectares	Chao district, Virú province	Tanguche, Vinzón, Suchimán
San Pedro de Lloc	40 hectares	San Pedro de Lloc district, Pacasmayo province	San Pedro de Lloc
Virú	One site of 6.3 hectares and one of 0.8 hectares	Virú district, Virú province	Huancaquito Alto

² Triangulation: Triangulation means that a problem is looked at from several points of view, using multiple tools and techniques. Triangulation is a way to cope with bias. Ideally, triangulation is applied at the research team (different researchers from different backgrounds); researched people/objects (different community members, representing the diversity of the community) and research methods (using different methods to look at the same issue) (Schoonmaker, 2008). Because of the limited resources available for this research, it was chosen to only apply triangulation on the research methods and investigated respondents.

³ Sierra (ES): the mountain range in central Peru, being part of the Andes. One of the three parts of Peru: Selva (rain forest), Costa (coast) and Sierra (mountains).

⁴ Costa (ES): Peru's Pacific coastal zone.

Chicama	Reforestation area of 50 hectares	Chicama district, Ascope province	Quemazón
Higuerón	Large forest area, part of Cordillera Occidental	Casa Grande district, Ascope province	Mocan
Conache	4.6 hectares	Laredo district, Trujillo province	Conache



The ten investigated sites considerably differ in area size (from a few hectares to several thousands of hectares), it was chosen to incorporate all these sites in this research because every site would have its own advantages and disadvantages, of which area size was only one aspect.

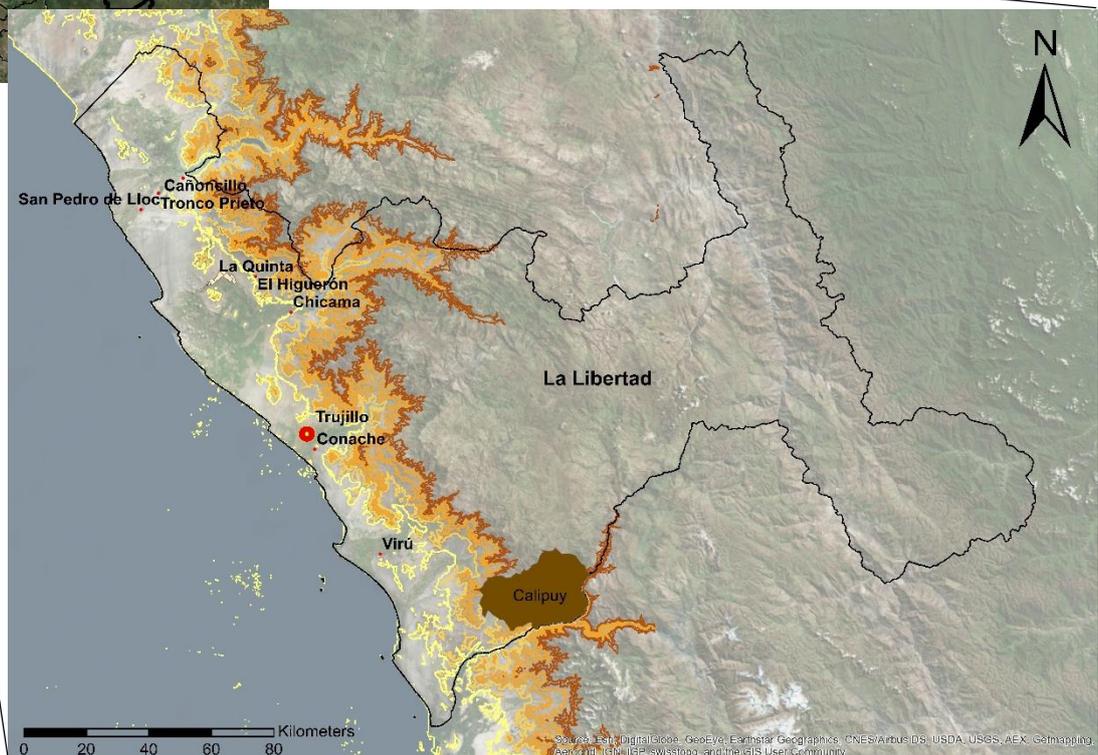


Figure 1: Location of study sites and La Libertad's capital city (Trujillo) in La Libertad, Peru (source: ESRI, 2013)

2.2. Research methods

This section describes the research methods used for this report. Semi-structured interviews, transect walks and spatial analysis formed the base of the research. An overview of the specific methods applied and the number of interviews executed per study site is given in Annex I.

2.2.1. Analysis of satellite images and spatial data

Initially, it was planned to analyse the area on forest distribution using Landsat satellite images. However, it was not possible to get a clear view on the forest distribution using spatial analysis only, due to the (relatively low) resolution of available images and the rather small size of most dry forests in the coast of La Libertad (generally a few hectares to a few dozens of hectares). A rough overview of existing forests in the area was made by visual study of Google Earth 2014 images (SIO et al., 2014) and ESRI 2010, 2011 and 2013 satellite images (DigitalGlobe 2010; 2010a; 2010b, 2010c, 2010d, 2011, 2011b; CNES/Airbus DS, 2013) of the region. For specific study sites forest cover loss was calculated using Google Earth and ESRI satellite images, visually comparing the forested areas at different moments in time. Information on land property was gathered from spatial data derived from the Ministry of Environment, the Ministry of Culture, the

Regional Government of La Libertad and municipalities. Data was delivered either digitally (georeferenced), or hard copy (printed maps with coordinates marked on them). The documents were scanned and georeferenced when necessary and the data was entered in ArcGIS. The information about land property was compared with forest margins and information gathered during interviews, in order to draw conclusions about the (legal) ownership of land.

2.2.2. Literature review

Literature review was conducted in order to get a first overview of important actors in the region, the local policy framework, economic situation and tenure rights. For the literature review, WUR library, Google Scholar and websites of several academic publishers have been used (e.g. Science Direct (Elsevier), JSTOR, Springer Verlag), together with information from the Peruvian government, ITTO, WWF, IUCN and FAO. Furthermore, a lot of information was derived from reports of the local universities 'Universidad Nacional de Trujillo' (UNT) and 'Universidad Privada de Antenor Orrego' (UPAO). In many cases it turned out to be necessary to review official documents, especially in the case of landownership. Documents of different governmental institutions (municipalities, PEJEZA, Ministry of Environment, Ministry of Culture, Regional Office of Administration and Registration of Terrain) had to be requested and analysed.

During the research, review of literature was repeated, in order to check outcomes from other research methods and to improve research methodology.

2.2.3. Interviews with key-informants

Interviews with key-informants were conducted in order to get familiar with the area, the problems of deforestation, potential project areas, important actors in the area and the compliance of the sites with the project criteria. Among these key-informants were government officials, village authorities, university professors, community members and people working in the field of forest conservation, rural development and reforestation. Furthermore, quite some information was derived from phone calls and e-mails, as it was not always possible to meet persons face-to-face.

Table 2: A total of 61 persons was interviewed. The topics addressed during the interviews were according to the respondents' expertise. Most of the mayors and leaders of communal organizations were also community members.

Function/Organization	Number of respondents	Main topics discussed
Representatives governmental organizations (Ministry of Agriculture, Ministry of Culture, SERNANP, PEJEZA, CHAVIMOCHIC, SENASA, GRAAT, government of La Libertad)	16	Tenure rights, rules and regulations, local context, potential areas
Leaders of non-governmental, communal organizations (Comunidades Campesinas, Agricultural Cooperatives)	8	Interest of organization, tenure rights, interest and organization of communities, interest of tenure rights holder, technical possibility, biodiversity
Local government: mayors	7	Interest of local government, interest and organization of communities, tenure rights
Local government: other representatives	4	Interest of local government, interest and organization of communities, tenure rights
Agriculturalists	9	Relation with local government, interest and organization of communities, technical possibility, biodiversity
Private companies and Entrepreneurs	7	Interest of tenure rights holder, tenure rights
Representatives of NGOs	4	Interest and organization of communities, local context
University professors	4	Potential areas, indicated problems, local context
Representatives of international governmental organizations (UNDP)	1	Interest and organization of communities and tenure rights holder
Journalists	1	Local context, local government

In total 72 interviews were executed with 61 different persons, of which two interviews were telephonic. Among the respondents were 51 males and 10 females, aged between 15 and 75. An overview of the functions of and organizations represented by these informants is given in table 2, together with the main topics discussed during the interviews. The interviews lasted between ten minutes and three hours, the majority (about 65%) lasted between thirty and forty minutes. Besides the interviews, data was gathered from nine informants that were only contacted by e-mail (eight male, one female), among them were three professors, two employees of GIZ⁵, and four employees of NGOs.

The interviews were conducted in a semi-structured way, using open questions based on the criteria for community forestry and reforestation. In semi-structured interviews, respondents can freely answer to the questions and can address topics that are important from their point of view (Eric, 1995). When during the interview specific topics come up, the interviewer can add questions in order to enlighten more in-depth details. Semi-structured interviews unfold in a conversational manner and allow respondents to express themselves in their own way. This way of interviewing is useful to get a first overview of ideas and meanings in a rather unknown environment (Longhurst, 2010). Since this thesis report is aimed at the analysis of study sites of which little was known in advance, semi-structured interviews were a fast way to get an overview of the main stakeholders, problems and issues in the study sites and whether these sites did comply with the main criteria for a community forestry project or not. Table 3 gives an overview of the topics that were addressed during the interviews.

Table 3: The topics addressed during the interviews were mainly based on the criteria for suitability of reforestation and community forestry.

Criteria	Interview topics
Area available for reforestation	Degraded areas; land use; land ownership
Water availability	Sub-terrain water; water bodies; water distribution; water use
Community organization	Community organizations; changes in population of the community; village gatherings; mutual interests; village authorities; relations within community; perceived problems and possible solutions regarding forest and nature conservation
Community's interest in conservation	Livelihood strategies of people in the community; forest use and forest management; changes in forest cover and perceived reasons; activity in forest conservation; perceived problems and possible solutions regarding forest and nature conservation; willingness to support reforestation and forest conservation; important stakeholders
Local government authorities' relation with community	Relations between stakeholders; importance of local authorities; visits and contact between authorities and community; mutual trust and respect
Local government authorities' interest in conservation	Activity in forest conservation; possibilities and interest for support of future initiatives
Legal status	Important stakeholders and local authorities; tenure rights and landownership; history of tenure rights land ownership; existing legal documents
Interest of legal owner/tenure rights holder in conservation	Important stakeholders and local authorities; changes in forest cover and perceived reasons; activity in forest conservation
Ecological importance (size)	Size of area; occurring plant and animal species; forest use and management

2.2.4. Transect walks

Transect walks were done in order to get familiar with a forest area, its characteristics and its features important for the local community. Transect walks were executed in all but two study sites (Higuerón and Chicama) and were always done accompanied by one or more village members, in order to get direct inside information about the area. During the transect walks, features important for a future project, like water bodies; bare areas; deforested and degraded parts of the forest; access roads; area and property boundaries and areas important for specific types of forest use (e.g. hunting, firewood collection) were noted down, described and marked with GPS. Transect walks helped to clarify the topography of features that people refer to during interviews. Furthermore, people tend to be more willing to discuss sensitive issues such as landownership patterns, when they are away from the village (Wilde, 2001). The transect

⁵ GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit) (DE): the German development agency, part of the Federal Ministry of Foreign Affairs.

walks were also a way to get more accepted by the village members, since interest in their forest and way of life was shown.

2.2.5. Village meetings

Village meetings were used to inform the village communities about the research project and interest of A Rocha; to check information obtained during interviews and to get a better understanding of the relations between village members and village groups. The village meetings were always done after a first round of interviews. It turned out to be difficult to bring village members together at a single moment, therefore this method was only used in the cases of Tronco Prieto and La Quinta.

For the village meetings as many persons from the community as possible were gathered at a specific moment, on a 'neutral' location in the village. The meetings opened with an introduction on the research project, the future project of A Rocha and A Rocha Peru itself. Questions were asked about the state of the forest, forest use and the organization of the village. During the meeting, the villagers became more and more involved into the meeting, which turned into an open discussion, showing the relations between different groups of villagers and their thoughts about the chance of success of a possible project.

2.3. Analysis of data

Table 4: Nine different criteria were used to assess the suitability of the study sites, which were all judged as positive, neutral or negative.

Criteria	Negative	Neutral	Positive
Area available for reforestation	0-5 hectares	5-20 hectares	20+ hectares
Water availability	No water available near reforestation area	Water available, but restricted (needs to be bought, permissions needed)	Water freely available and in abundance
Community organization	No generally accepted, legally recognized village organization(s) present	Legally recognized community organization(s) present, either not active in forest management/conservation, or not representing majority of the community members	Legally recognized organization(s) present, active in forest management/conservation and representing majority of the community members
Community's interest in conservation	Little or no interest in conservation, existence of forest is under threat by inhabitants of the community	Parts of community active in conservation, large part of community not interested in conservation	Community active in conservation, majority interested in conservation
Local government authorities' relation with community	Very little contact between authorities and community, authorities not trusted by community	Frequent contacts between community and authorities, some disputes	Relation between authorities and community regarded as good by community members and government representatives
Local government authorities' interest in conservation	No signs of interest in conservation	Authorities active in the past, or claim to be willing to assist in the near future	Active in conservation
Legal status	Ownership unclear and disputed, no documents present or contradicting titles on same area	Ownership clear, but legal issues could make project implementation difficult	Ownership clear and registered in Public Registers, no legal restrictions for reforestation projects
Interest of legal owner/tenure rights holder in conservation	No interest in conservation	Willing to cooperate in a conservation project, not active	Active in conservation
Ecological importance (size)	0-40 hectares	40-100 hectares	100+ hectares

Of each interview, characteristics of the respondents were noted, like sex, profession, age class and (social) status within the village. For the analysis all information obtained from the interviews, was divided into different parts, grouped by study site (some interviews covered more than one study site) and covering different themes and topics (e.g. livelihood strategy, forest management, landownership, etc.). The information per topic given by the respondents was summarized and compared with information obtained from other sources. Where information from different sources conflicted, all views were described.

All sites were assessed on 9 different criteria in order to judge their suitability for a project of community forestry in the near future. An overview of the criteria is shown in table 4. In order to assess the sites' suitability, the data obtained from each study site was compared with the classifications in this table. After granting a negative, neutral or positive judgement for the criteria, an overall judgement per study site was formed. In the case that the legal status criteria of a site got a negative classification (ownership is unclear and disputed), the site automatically got a negative overall judgement, since it is impossible for A Rocha to set up a project without signing an agreement with the legal owner of the area. In all other cases, two negative scores lead to a classification as unsuitable. Study sites with two positive scores were judged as suitable. When there was unavailable information for the judgement of one or more criteria, further research is necessary for an overall judgement of the suitability of the study site.

3. Local context

The coastal zone of La Libertad has a total surface of 6400 square kilometres and a population of 1.3 million people (INEI, 2009). This chapter gives a description of the native tropical dry forest and an overview of the most important laws and policies in the field of nature conservation and reforestation in the region.

3.1. The dry forests of the Peruvian coast

The dry forests of the northern coast of Peru are part of the Equatorial Pacific Ecoregion of South America (Peralvo, 2007). They are biologically important and are characterized by the presence of many endemic species and an important grade of local and regional diversity. According to Mittermeier (2005) and Sagastegui (1999) the northern region of Peru's flora consists for about 26% of endemic species. Besides its floristic importance, the region has high numbers of diversity and endemism for vertebrate species (Aguilar, 1993), like the endangered bat species *Tomopeas ravusen*, various bird species, the canine species Zorro Costeño (*Lycalopex sechurae*) and reptiles like Cañán (*Dicrodon guttulatum*). Peru's dry forests are mostly represented by 'Algarrobales' (dominated by *Prosopis pallida*), 'Zapotales' (dominated by *Colicondenron scabridum*) and 'Cactales' (dominated by *Cacti*) (Montacero et al., 2009). Dry forests have smaller tree dimensions and floristic diversity than their moist counterparts (Murphy, 1986).

An important aspect of the Peruvian dry forests is the occurrence of irregular rainfall events and their influence on forest establishment and expansion, known as the El Niño Southern Oscillation (ENSO). ENSO is an irregular occurring phenomenon, consisting of a wet part El Niño and a dry part, referred to as La Niña. The wet and dry events normally oscillate at a timescale of 3 to 6 years (Wang et al., 2012; Allan et al., 1996), meaning there is a particular wet and a particular dry year every 3 to 6 years. With a normal annual precipitation of around 25 mm, precipitation during ENSO events can increase up to 1640 mm (Holmgren et al., 2006), doubling germination, growth and survival rates of the forest's most important species *Prosopis pallida* (Holmgren et al., 2006). Dendrological data shows that growth during El Niño years is 2.8 times higher than in the dry years in between (Holmgren et al., 2006). In the case of La Libertad in Peru, roughly every ten years there is a very wet season, which is referred to as 'the El Niño'. The last time such a wet season occurred was during the (Peruvian) summer of 1997/1998, based on recent satellite images NASA predicts a new heavy El Niño in the end of 2015/beginning of 2016 (NASA, 2015).

The dry forests of Latin America were originally distributed from Mexico all the way south to Argentina, but are nowadays highly fragmented. In La Libertad's coastal zone most dry forests have already disappeared. The causes for this threat of Peru's dry forests are the overexploitation of natural resources, like logging (both for timber as for firewood) and hunting; conversion of forest into agriculture; urbanization and road construction (Maass, 1995). Another reason for the high pressure on dry forest relicts in the area is a lack of legal protection, as shown by the case of Nature Reserve El Moro in La Libertad's coastal zone.

In 1995, an area of approximately 320 ha was designated as protected Algarrobal. However, due to high population pressure and agricultural expansion, the area has lost almost all of its tree cover within 20 years' time (Mejía, 2015; Airbus Defence and Space, 2013).

Besides their ecological importance, the Peruvian dry forests have a high cultural and socio-economic importance (Bode & Renner, 2015), since they are home to many species important for local culture and livelihoods (for example Algarrobo and Cañán⁶). Dry forests are used by the local population for fodder, timber, firewood, shade and food (Fernández & Rodríguez, 2007). The majority of tree, shrub and herbal species are used by local people. Another important ecosystem service delivered by forests is the protection of villages and agricultural fields from invading sand. Furthermore the dry forests of the La Libertad region figure as resorts of patrimonial heritage, since many of them contain important archaeological sites dating back to pre-Columbian times. Of the ten study sites treated in this report, of six is known that they habit archaeological relics (Tronco Prieto, Bosque Pitura, La Quinta, Cañoncillo, Virú and Higuerón). Local communities are often willing to protect and conserve the forests for their own well-being and to protect the environment (Holmgren, 2015), but have to confront the economic and political power of large enterprises and wealthier and better organized communities from outside, as well as large-scale migration of people from other regions, predominantly The Andes, into the coastal zone.

3.2. Land property reforms in the past

In the last fifty years, Peru has gone through various major land property reforms. However, changes in landownership were not always well-documented, which has led to many ambiguities in property and tenure rights (for example, see the sites Bosque Pitura and Tronco Prieto). Four policy regimes in Peru's history –the system of the 'Haciendas', the Agricultural Reform of the Military Government, the privatization of communal land of the 1990s and the occupation of land by the government in this century– are described.

Haciendas

Historically, 56% of Peru's 3 million hectares of agricultural and 20 million hectares of pasture land (often including forests) was property of an oligarchic elite and was managed in the form of 'Haciendas'⁷. The other 44% percent of the land was owned by Comunidades Campesinas, Indigenous Communities and individual smallholders. The concentration of land had led to a concentration of economic and political power to a small group of wealthy landowners, which blocked all attempts for land reforms. (Mejía, 1982)

Agricultural Reform

In 1969, the military regime started the agricultural reform ("Law on the Agricultural Reform") (Piedra, 1969) which would heavily change Peru's countryside. Between 1969 and 1980, a total of 9 million hectares of land was transferred from the old Haciendas to 40362 peasants and former employees of these Haciendas (almost 70% of the total land possessed by the Haciendas). The land was managed and owned by so called Empresas Asociativas (Associate Companies), cooperatives of ex-employees. The newly obtained land was therefore cooperatively owned and not by the individual associates. The Comunidades Campesinas, Indigenous Communities and smallholders that already existed, were almost not affected by the reforms and almost no new land was allocated to them. The reform occurred in two phases: the first phase during the government of the Armed Forces (1968-1975), followed up by the second phase under the rule of General Morales Bermúdez (1976-1980), who slowed the process down and brought it to conclusion. (Mejía, 1982)

Registration and Privatization of land

After the agricultural reform, the government's attention was directed to the Comunidades Campesinas, especially those in the *Costa* region. The main policy was to register and title the communal lands in the so called 'Registros Públicos' (Public Registers) and afterwards individualize and commercialize land property. With the "Law on the Comunidades Campesinas, Boundaries and Registration of Communal Territories"

⁶ Cañán (*Dicrodon guttulatum*): a lizard, endemic to the dry forests of Northern Peru that feeds on Algarrobo. The Cañán is an important part of the local cuisine and is used in dishes like 'Cebiche de Cañán'. (Casa de la Cultura, 2013)

⁷ Hacienda (ES): farm. In the past, agriculture in Peru's coast was organized in the form of large Haciendas: large private owned areas of production land, often owned by foreign families.

from April 1987, the Comunidades Campesinas were obligated to register their lands (Vianueva et al., 1987). However, many Comunidades Campesinas did not comply with this law and have not until today. In July 1997 the “Law on the registration of land of the Comunidades Campesinas of the coast” (Way, 1997) came into practice. This law was aimed at the registration of communal land used by individual community members and made it, under certain conditions, possible for community members and third persons to register communal lands as private property. The law also foresees in the possibility to declare former communal land property of the state.

During the government of president Fujimori, the property of the former Empresas Asociativas was also privatized. The “Law on the Registry of Rural Properties” of September 1991 (Fujimori, 1991) made it possible for the Empresas Asociativas to divide their areas into parcels and register these parcels on the name of each individual associate. With the “Law on Economic Financial Health of the Agro-industrial Sugarcane Companies” of March 1996 many cooperative Empresas Asociativas were reformed into private companies (Casa Grande S.A.A., 2008). This made it possible for (international) private companies to invest in them and buy their lands.

Occupation of abandoned communal lands by the state

After the individualization of communal lands, the state directed its attention to ‘abandoned communal lands’, lands of the Comunidades Campesinas that were not officially registered and officially in use. The “Law that regulates the declaration of legal abandonment of the terrains of the Comunidades Campesinas of the coast, occupied by human settlements and other informal possessions” of March 2006 (Ayaipoma, 2006) states that terrains of the Comunidades Campesinas in the coastal region that were not registered in the Public Registers and were located within municipal areas, human settlements or state projects’ jurisdiction, were no longer considered to be property of the Comunidad Campesina and became registered as property of a governmental institution, in most cases one of the ‘Proyectos Especiales’. These large scale projects of irrigation and redistribution of land had been initiated in the whole coastal area, in order to increase the amount of agricultural land and privatize state property. Large quantities of land were sold in parcels of tens or hundreds of hectares, often to large (international) agro industrial companies. In La Libertad the projects CHAVIMOCHIC and PEJEZA were established for this purpose (Annex II). The areas lost by the Comunidades Campesinas have later on often been reclaimed in legal trials (e.g. the case of the Comunidad Campesina of San Pedro de Lloc in Tronco Prieto).

Legal problems

The many changes in land property policy of the last 50 years, which were often not passed through entirely and were often contradictory with former laws and policies, have caused many ambiguities about land property and led to disputes between different institutions. Especially in the coastal areas, claims of Comunidades Campesinas and governmental institutions are often contradictory. The lack of many Comunidades Campesinas to register their properties have also led to illegal trafficking of land and corruption (e.g. El Comunero, 2015). The uncertainty about legal ownership and tenure rights makes it often difficult to set-up community forestry projects. Special attention has therefore to be paid to checking of the validity of claims on land ownership.

3.3. Institutions

Peru is politically divided into departments (one of them is La Libertad), that comprise several provinces and districts. During the investigations, several institutions were encountered active in or affecting the process of forest conservation and reforestation, both governmental as communal. The governmental institutions are part of four different national ministries (Agriculture; Culture; Environment; Justice and Human Rights), and the regional government of La Libertad. The communal institutions are the Comunidades Campesinas and Village Rondas. An overview of the most important institutions active in the field of forest conservation and reforestation is given in Annex II.

3.4. Laws and policies

Peru has many laws that protect the forest resources of the country. According to articles 66, 67 and 68 of the Constitution, natural resources are national heritage, with the state as the supreme authority to decide

on how these resources can be used. The state is obligated to promote the conservation of biodiversity and natural protected areas (Oficialía Mayor del Congreso, 1993). This chapter gives an overview of the most important laws and policies on forest conservation in La Libertad, which in practise may not always be functioning.

Forest and Wildlife Law (2011)

The latest “Forest and Wildlife Law” came into practice in September 2014 (Gobierno Regional de Amazonas, 2014). The law describes that:

“Every person has the right of access to the use, benefit and advantage of the Nation’s forest heritage and wildlife, as long as it is in agreement with the national and regional authorities’ policies and the instruments of territorial planning and management; as well as to participate in its management. Every person must contribute to conservation of this heritage and its components with respect to the applicable legislation.”

And has the objective to:

“promote the conservation, protection, increase and sustainable use of the forest heritage and wildlife within the national territory” (Ugaz, 2011)

According to article 20 of this law, provinces and districts located in rural zones have to promote the sustainable use of forest and wildlife resources through the administration and usage of local forests (Ugaz, 2011). With this law, local governments are co-responsible for nature conservation and will have more power to fight against illegal logging and to promote reforestation. The Forest Law requires a forest management plan approved by the regional authority for forest and wildlife (the Agricultural Office of the Regional Government), for every forest within a province’s or district’s boundaries that is used by the inhabitants of this province or district.

According to article 38, the land use type of private areas covered by forests can be changed into agriculture, with authority of the regional authority of forests and wildlife, after a technical study on micro-zoning. One of the requirements for this change of land use type is that at least 30% of the original forest cover has to be maintained.

Regional Reforestation Plan

The Regional Administrations of Natural Resources & Environmental Administration and Agriculture La Libertad elaborated a Regional Reforestation Plan for the period 2011-2021, aimed at production, protection and conservation of forests, which states that:

“In the struggle against climate change, Social Forestry, aligned with protection of water streams for water provision and of traditional knowledge of native peoples, needs to be promoted.” (Región La Libertad, 2011)

In the coastal region, the projects need to be aimed at the repopulation of the dry forests with Algarrobo, a species in process of extinction, in areas located in the Comunidades Campesinas of Chepén, San Pedro de Lloc, Paiján and Ascope, as well as in the jurisdiction of the Proyectos Especiales CHAVIMOCHIC and PEJEZA. For the Regional Reforestation Plan a target for the number of hectares to be reforested before 2021 was made. The target for the five coastal provinces is 3217 hectares, of which, 78 hectares in Chepén, 86 hectares in Pacasmayo, 211 hectares in Ascope, 1488 hectares in Trujillo and 1354 hectares in Virú. The total reforestation potential of these provinces was estimated at 31841 hectares, on a total land surface of 9908 km². (Región La Libertad, 2011) Annex III gives an overview of the proposals for reforestation activities that are mentioned in the Reforestation Plan.

Laws on the protection of the dry forests of northern Peru

With Law, “[They] Prohibit the logging of trees in the forests of the Departments of La Libertad, Lambayeque, Piura and Tumbes” of December 1993, the logging of trees in the dry forests of the northern coastal departments was prohibited for 15 years, until 2008 (Fujimori, 1993). After the expiration of the law, the “Project Law that Declares the Fields and Forests of the Northern Coast National Heritage and Declares the Closed Season of the Algarrobo, Zapote, Palo Santo, Celbo, Hualtaco and Huarango” was submitted, requesting the prohibition of logging of the mentioned species for the coming ten years (until 2019). Up to now this law has not been approved however, which makes the logging of dry forest tree species legal as long as the regulations of sustainability mentioned in the Forest Law are applied.

Law on Protected Natural Areas

The “Law on Protected Natural Areas” regulates the way in which Protected Natural Areas are established, managed and protected.

Article 1 of this law states that:

“Protected Natural Areas are continental and/or marine areas of national territory, [...] in order to conserve biodiversity and associated values of cultural, scenic and scientific interest, as well as their contribution to sustainable development of the country; constituting National Heritage, so that their natural condition will be maintained in the long term.” (Prieto, 2001)

Article 22 of the Law on Natural Protected Areas states that:

“the National Reserves are areas designated to the conservation of biodiversity and the sustainable use of resources of wild flora and fauna, [...] in these areas the commercial harvest of natural resources according to the management plan is permitted, when it is approved, supervised and controlled by the national competent authority.” (Prieto, 2001)

The SERNANP (part of the Ministry of Environment) is the authority that has to approve, supervise and control the Plan Maestro (management plan) of each Natural Protected Area (ANP⁸). The Plan Maestro should be elaborated using participatory processes and revised every five years. (Gamboa, 2015)

Implications for research

Recent changes in forest policies lead to the devolution of responsibility and power for the conservation of forests to local governments (provinces and districts), a good relation with and support from these authorities therefore becomes ever more important. The Regional Reforestation Plan for La Libertad calls for the promotion of Social Forestry, forestry aimed at development of rural communities and stresses the need for the reforestation of the coast with Algarrobo, which should lead to more governmental support for projects with this purpose.

4. Investigated areas

This chapter describes the research results. Each investigated site is discussed separately alongside the criteria mentioned in chapter 1. About the sites Virú, Chicama, Higuierón and Conache only few data were gathered, these sites are therefore discussed briefly. The discussion of results is followed by an overall analysis of these results in chapter 4.11.

Where available, information on occurring (endangered) species is given. This information is derived from a variety of sources, differing per project site (interviews, reports made by the managing authorities and scientific studies using different methods). As an addition to the results discussed in this chapter, an overview of the identified stakeholders per study site is given in Annex IV. Large maps of most project sites are shown in Annex V.

4.1. Tronco Prieto

The forest area Tronco Prieto is located in the district of San Pedro de Lloc, province of Pacasmayo. The nearest community is the village Santonte, which is part of the district of San José. The forest was named after a single, old dark trunk (Tronco Prieto means dark coloured trunk), standing in the area. A map of the study site is shown in figure 2.

The Agricultural Association Muchick has a concession of 200 hectares, comprising the forest, a nearby pampa and sand dunes. Tronco Prieto is located next to Private Natural Reserve ‘Bosque el Cañoncillo’, only separated from it by a barrier of sand of 100 to 200 meters in width. The community of Santonte consists of around 600 inhabitants, of which most have their own agricultural fields. A large part of the community originates from the Andes, most of them are already settled in the community for many years, during the last three to four years again many migrants have come from the *Sierra* region.

⁸ ANP: Área Natural Protegida (ES): Natural Protected Area. An area part of the national Peruvian system of natural protected areas (SERNANP).

Area available for reforestation

The degraded part of the forest of 5.65 hectares can be reforested (figure 2). Potentially, an area of about 100 hectares in the pampa could become available for reforestation.

Water availability

Water for reforestation is available, although restricted.

Water is found at a depth of 4 meters in the forested area and at 5 meters deep in the pampa. The community has excavated two pools (one in each area), however without legal permission of any authorities. In the case of the pampa, this has resulted in a conflict with the Ministry of Culture, since this area is regarded as part of the archaeological heritage site 'El Cañoncillo'. Within the forest, there is probably enough water present to reforest the 5.65 hectares of degraded forest, looking at the size of the artificial pool in the forest and the vitality of the present trees. For reforestation of the rest of the concession water from outside would be needed. The subterranean water that is present in the pampa cannot be harvested, due to restrictions from the Ministry of Culture.

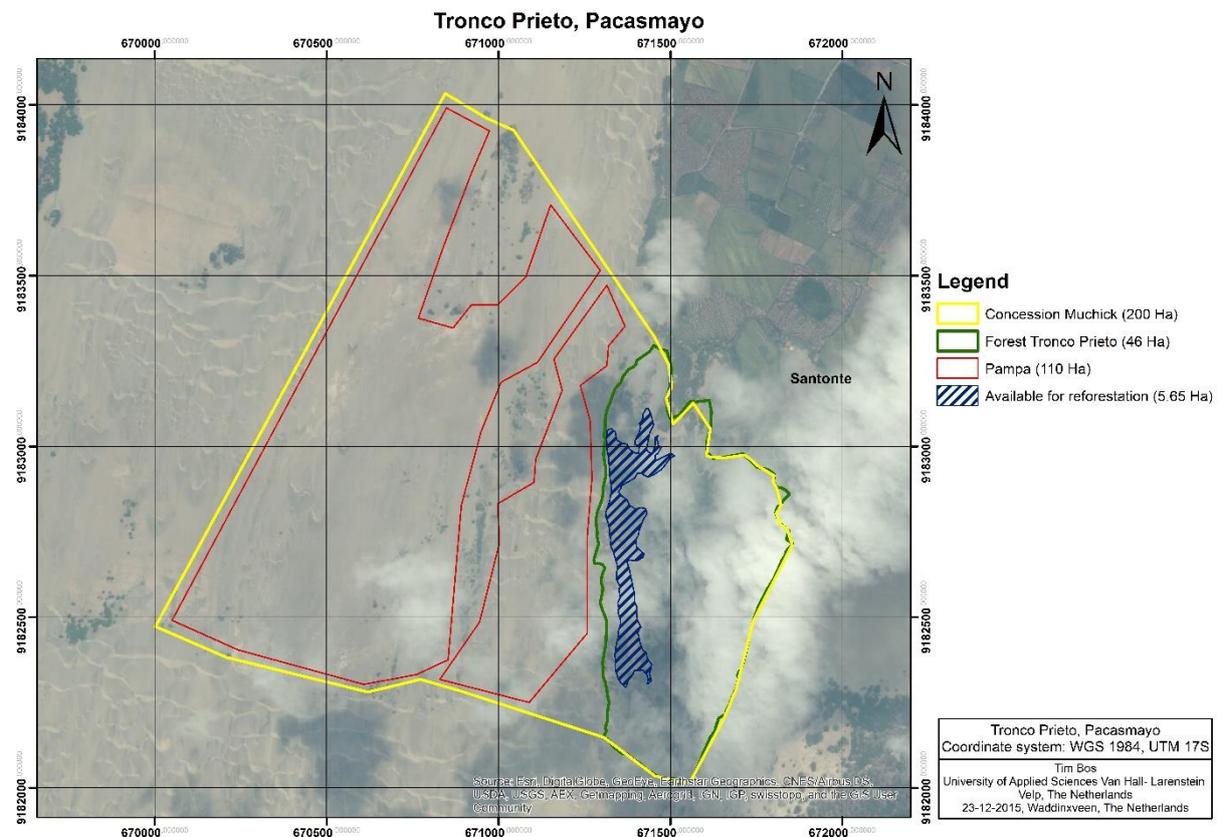


Figure 2: The concession of Muchick comprises the forest Tronco Prieto, a pampa and sand dunes. The forest is located in a triangular shaped depression, bordered in the south, east and west by sand dunes and in the north by Santonte's agricultural fields. The western part of the forest is available for reforestation. (Source: ESRI, 2013; T. Bos, 2015)

Community organization

Santonte's most important organization active in the field of environmental conservation is the Asociación Muchick, which was established with the purpose to 'conserve and protect the forest of Tronco Prieto'. The Asociación is however not trusted by all community members. Other village organizations in Santonte are the primary school, Vaso de Leche⁹, the administration board of drinking water and the village's Governance Council¹⁰. An organizational problem within the community of Santonte is the lack of communal leadership.

⁹ Vaso de Leche (ES): Glass of Milk, a Peruvian governmental food aid for vulnerable groups of society (primarily children and TBC patients). (Ministerio de Economía y Finanzas, 2015)

¹⁰ Comité Gestión (ES): Governance Council, a group of villagers responsible for public village activities. The Comité Gestión is supposed to be a link between the villagers and their (local) authorities and should communicate with those authorities, such as the district municipality.

The Asociación Muchick is a member of the Comunidad Campesina of San Pedro de Lloc, is recognized by the Ministry of Agriculture and registered in the Registros Públicos. The Asociación was established four years ago with the guidance of the NGO SEDEPAS Norte¹¹ and has 16 actual members. Muchick has a forest concession and manages Tronco Prieto. The main problem with the Asociación Muchick is that it is distrusted by parts of the community, referred to as ‘The Opposition’ (textbox 1). The discords between Muchick and The Opposition are mainly based on problems occurred in the past and bad communication during the SEDEPAS project, but nowadays lead to distrust: a part of the community claims that the Asociación does not prevent logging of the forest enough or even stimulates illegal harvest of trees and the its members are more interested in money than in conservation of the environment. Some village members say that the Asociación wants to be the owner of Tronco Prieto and exploit it for its own well-being, where it only has the right to manage it for communal benefits, as the forest in the end is communal property. The Asociación states that it only wants to conserve the forest for the people’s benefit and that possible income from its forest management activities is used for forest protection and conservation. Santonte’s Governance Council could be an intermediary between Muchick and ‘The Opposition’, the director of this council however lives in Trujillo and is often not available for the villagers. Santonte has no real leader, all authorities (mayor of the village, Teniente Gobernador¹², leader of the Governance Council, the Asociación Muchick) are distrusted by parts of the community.

Community’s interest for forest conservation

The community members of Santonte are interested in preservation of Tronco Prieto, both from a conservation as economic perspective. There are regulations in place on forest use and regular forest patrols reduce the intrusion by outsiders. However, the rules are not very specific and difficult to control.

Tronco Prieto is intensively patrolled by members of Asociación Muchick. Village members that want to let their cattle graze within the forest have to pay a fee (although collection of the fees sometimes is a problem). Only dry branches and dead trees are allowed to be harvested for timber and firewood, living branches are conserved. The community members depend on firewood and charcoal for cooking, which is harvested in Tronco Prieto. Furthermore the forest is used as hunting area (especialy Cañán), and serves as a natural protection against sand storms. The rules are generally followed by visitors and community members, although control and punishment are difficult and illegal logging is still taking place, predominantly done by people coming from other communities, like San Pedro de Lloc, Mazanca and Chocofán. Daily patrol of the forest is difficult, especially in the morning when the villagers have to work on their agricultural fields. The western part of the forest is most heavily degraded, due to intruders from other villages. There are no specific rules on the number of cattle that can graze or the total amount of firewood that is allowed to be harvested in the forest.

Textbox 1: ‘The Opposition’ (La Oposición)

Part of the community of Santonte disagrees with the way the Asociación Muchick works and claims that they are not doing a good job and are even a threat for the Tronco Prieto forest. ‘The Opposition’ is led by the village’s Teniente Gobernador, the head of the Comité Gestión (Governance Council) and a former head of the Committee of the Jequetepeque valley. They all have been active in the conservation of the nearby forest Cañoncillo, together with most members of the Asociación Muchick.

Relation between community and local government institutions

The relation between Santonte and local government authorities is rather good, although sometimes unsatisfying. The current transmission of Santonte from one municipality to another makes the political situation more complicated. Furthermore, the government representatives within the village are not communitywide accepted.

Santonte is frequently visited by local representatives of the Ministry of Agriculture and has contacts with the Municipalities of San José and San Pedro de Lloc. Individual inhabitants of Santonte complain that local authorities are difficult to contact and often promise one thing and do another. Muchick has some arguments with the Ministry of Culture about practices within its concession and complains about bad communication from the part of the Ministry (textbox 2). Santonte is part of the Municipality of San

¹¹ SEDEPAS Norte: a Peruvian NGO, active in rural development, looking at environmental, socio-economic and political issues. (SEDEPAS Norte, 2010)

¹² Teniente Gobernador (ES): A government representative who is responsible for local order at village level.

Pedro de Lloc, but the village is currently in a process to become part of San José, where the forest Tronco Prieto remains part of San Pedro de Lloc. Both municipalities still hold a stake in Santonte and try to maintain the village within their territories. The mayor of Santonte (authorized by the Municipality of San Pedro de Lloc) is perceived as under-qualified and her position as illegal –because of expiration of her elected term- by part of the community. The mayor is regarded as on the hand of Asociación Muchick. The Teniente Gobernador is criticized as well and is part of ‘The Opposition’.

Interest of local authorities for forest conservation

In the recent past the local authorities have assisted in reforestation and protection of Tronco Prieto with equipment and advice. Currently there is no assistance, but local authorities are interested in the protection of Tronco Prieto.

In the recent past the Municipalities of San José and San Pedro de Lloc delivered tubes and a diesel pump for the reforestation of Tronco Prieto with Tara¹³. Muchick gets frequent advice from the San Pedro de Lloc office of the Ministry of Agriculture on forest management and reforestation. The representative of the local office was changed last July however, so it is uncertain how support from the Ministry will be in the future. There is no current support coming from the Municipality of San Pedro de Lloc, but both the mayor as other representatives of the Municipality have spoken out their interest for a forest conservation project in Tronco Prieto in the near future. San Pedro de Lloc has a nursery which could be used to produce seedlings for reforestation of the area. The Office of Environment of La Libertad has spoken out its interest for reforestation of the area and has offered to give advice when needed.

Favourability of legal status of the forest area

The forest area Tronco Prieto is property of the Comunidad Campesina of San Pedro. A 200 hectare concession comprising the forest has been awarded to Asociación Muchick for an indefinite time. The Asociación Muchick is officially managing the area and can decide on how the forest is used and who can or cannot enter the forest. Disadvantages of the current legal situation are that both the Comunidad Campesina as the Asociación lay behind with the official registration of their territories and the fact that the area is located within an Archaeological Heritage Site, restricting the possibilities for reforestation.

In many official maps of the government, the project of PEJEZA is shown as owner of Tronco Prieto, based on land reforms in the past. According to a letter send in December 2009 by the Civil Court of the province of Pacasmayo to the Comunidad Campesina of San Pedro de Lloc, the Comunidad Campesina has won a legal dispute against PEJEZA and the possession of the lands it claimed was confirmed by the judges, based on old documents indicating the boundaries of the Comunidad Campesina. The legal transfer of the lands in the Public Registers from PEJEZA to the Comunidad Campesina is now in progress. The Asociación has an official document of the Comunidad Campesina on which is stated that an area of 200 hectares is given into concession to the Asociación, however without mentioning the exact location of this concession. Different representatives of the Ministries of Agriculture and Environment, the Municipality of San Pedro de Lloc and the Comunidad Campesina of San Pedro de Lloc do confirm that Asociación Muchick holds the concession rights over the area. To ensure the legal tenure rights of the Asociación over Tronco Prieto, the concession certificate should be updated. The problem is that the president of the Asociación distrusts the Comunidad Campesina of San Pedro de



Figure 3: Tronco Prieto is a rather young forest, most trees germinated during the last two big El Niño phenomena in 1987/1988 and 1997/1998. (Source: T. Bos, 2015)

¹³ Tara (*Caesalpinia spinose*, also known as Taya/Talla), is a tree species, native to the Peruvian Highlands. It was introduced to Peru's coastal zone as a cash crop, since its pods are a source of valuable tannin, the fruits are also used for various products in the food industry. The crop was planted as part of a CEDEPAS project, together with Alfalfa (*Medicago falcata*), an exotic crop which is mainly used as fodder.

Lloc, he is afraid to lose the document (and therefore the concession) when it is handed in for updating the actual boundaries of the area.

A second difficulty with the legal status of Tronco Prieto is that the entire concession is located within the Archaeological Complex “El Cañoncillo” (see Annex V). This implies heavy restrictions on the possibilities to use the land. Agriculture and other activities that could evoke disturbance of the soil or underground water flows are forbidden and reforestation is only possible after proving that it has no negative impact on the archaeological heritage. Before a project can be implemented, a valorisation of the archaeological rests has to be executed by a professional archaeologist, where after the reforestation plan has to be approved by both the Ministry of Environment as the Ministry of Culture.

Interest of legal owner/ tenure rights holder for forest conservation

The Asociación Muchick was established with the goal to ‘protect and conserve Tronco Prieto’ and claims to be protecting the forest up to date, although its intentions are distrusted by part of the community.

The Asociación has placed barriers at the entrances of the forest; sets out regular patrols, in order to reduce illegal logging of the forest and has made a start with rules on forest use. Muchick wants to reforest the degraded parts of Tronco Prieto and if possible, the surrounding pampa and sand dunes. ‘The Opposition’ has doubts about the intentions of the Asociación.

Ecological importance of the forest area

Tronco Prieto has a forested area of 45 hectares. Due to its proximity to Cañoncillo (the largest and most well-known dry forest of La Libertad), Tronco Prieto has a high biological potential. During interviews, transect walks and village meetings, the villagers mentioned 11 animal species that occur in the forest, a list of these species is shown in Annex VI.

Text box 2: History of Tronco Prieto and Asociación Muchick

Santonte and the forest of Tronco Prieto used to be the main entrance of the forest reserve Cañoncillo, the largest protected Algarrobal in La Libertad. Twenty years ago a group of forest guards was formed by villagers from communities surrounding Cañoncillo, among them were many inhabitants of Santonte. For six years the group of forest guards worked without external support, until a \$50000 fund of the UNDP was donated to them, in order to improve and institutionalize the conservation efforts. Cañoncillo however, was owned by the Cooperative of Tecapa and after the arrival of the UNDP money, the Cooperation wanted to lead the conservation project. This led to a clash between the forest guards and the Cooperation. Tronco Prieto was property of the Comunidad Campesina of San Pedro de Lloc and the inhabitants of Santonte continued with the management and conservation of Tronco Prieto.

In 2010 a group of village members of Santonte formed the Asociación Comunal Muchick, with the objective to ‘Conserve and Protect the Natural Forest Tronco Prieto’. The group originally started with 35 members, but many of them withdrew before the actual initiation of the Asociación, due to the disappointing economic revenues from the project. In October of the same year, the NGO SEDEPAS Norte incorporated the Asociación in a project aiming at the improved cultivation of Tara and Alfalfa¹². The assistance of SEDEPAS led to the reforestation of 2 hectares with Tara. However, due to site specific conditions (lack of water, sandy soil) the Tara has never become profitable and many plants died and the project ended in 2012. Despite the low results coming from the Tara plantation, the Asociación continued working on it and got financial support from the Municipalities of San José and San Pedro de Lloc. Results of the SEDEPAS project were often not clearly communicated to the other villagers, which led to speculations that members of Muchick were paid by the NGO or that the forest was divided among the members of Muchick to use it for their own consumption.

The Asociación also started to plant Alfalfa in the pampa area outside the forest, which evoked an intervention of the Ministry of Culture, leading to the paralysation of all activities in the pampa. According to a letter from the Ministry which was sent to Muchick, movement of the soil and establishment of an artificial pool had taken place within the Archaeological Complex “El Cañoncillo” and had a (possible) negative influence on nearby archaeological heritage. The treatment of the claim is now in process by the Prosecutor of San Pedro de Lloc, in the meantime Asociación Muchick is not allowed to execute any activity in the pampa. The Ministry of Culture was informed by the Teniente Gobernador of Santonte about the activities.

The Asociación has recently hired a forest engineer from Cajamarca to make a forest management plan. As part of this plan, a forest inventory has been conducted in which every single tree in the forest was marked and measured. The plan should have been finished by now, but the forest engineer demands a final payment before handing it over to the community.

Tronco Prieto is a rather young forest and mainly consists of small trees (diameter less than 30 centimetres, figure 3). Some Algarrobos suffer from a plague, but the majority seems to be healthy and produces seeds. Due to its relative juvenility, the forest has a very dense structure and high basal area. The western part of the forest is heavily degraded, due to illegal logging. In this area Muchick has planted Tara, of which the majority has died, due to water constraints. The majority of the concession (about 150 hectares) consists of a rather plain area, almost free of vegetation, called ‘the pampa’.

4.2. Bosque Pitura

Bosque Pitura is located in the district of San José, province of Pacasmayo, next to the village Portada de la Sierra. Close to the forest is a hill located with an elevation of 300 meters above sea level, almost free of vegetation, called Cerro¹⁴ Pitura. The area is part of a larger forest/shrubland area stretching out over the departments of La Libertad and Cajamarca. Pitura was originally a large forest area, but due to invasion of agriculture and cutting of trees by local inhabitants, most of the forest has been degraded to shrubland and agricultural plots. The ownership of the area is disputed by the Comunidad Campesina of San Pedro de Lloc and Trinidad, a Comunidad Campesina from Cajamarca. Both claim to be owner of the area, referring to historical documents. Figure 4 shows a map of Bosque Pitura.

Area available for reforestation

Forty hectares next to the existing forest are available for reforestation (figure 4).

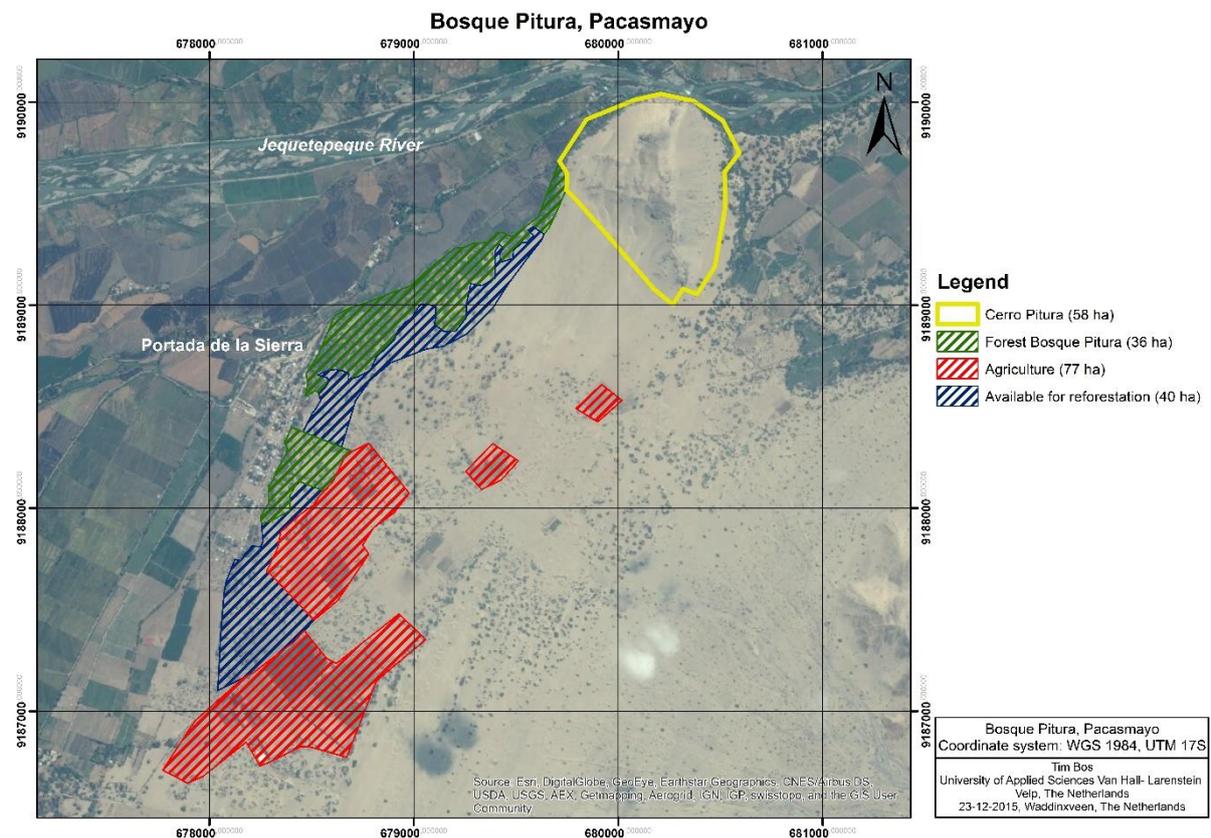


Figure 4: Bosque Pitura is located next to Portada de la Sierra and has a surface of 36 hectares. A strip of 40 hectares next to the forest is available for reforestation. (Source: ESRI, 2013; T. Bos, 2015)

Water availability

Pitura is a dry area, but with some efforts water can be obtained from sources nearby.

There is a (seasonal) stream of water next to the village forest and a bit further away, at 700 meters from the forest flows the river Jequetepeque. In Bosque Pitura are underground water streams at a depth of 15 metres, used by some agriculturalists to water their crops.

¹⁴ Cerro (ES): mountain, or hill.

Community organization

The community of Portada de la Sierra has little internal cohesion. Two organizations are active in the protection of the forest, they have little influence in the community however.

Almost fifty percent of the village's population consists of recent immigrants from the Sierra region. The villagers have little common interests, which makes it difficult to organize village reunions. The most important organizations active in La Portada de la Sierra are the Ronda¹⁵ and the local primary school. The Ronda is active in the fight against deforestation and is respected by most villagers, but has in practice little influence and needs more assistance from government authorities to actually do something against deforestation. The local school serves as a gathering location for the rare village meetings.

Community's interest for forest conservation

The inhabitants of Portada de la Sierra are generally not active in the conservation of Bosque Pitura, many of them contribute to deforestation. There exist some initiatives to protect the piece of forest directly next to the village.

The original inhabitants of Portada de la Sierra have always used the forest for the harvest of firewood and timber and for hunting. About four years ago, the village's population has grown dramatically due to immigration of people from the Sierra to a total of over 1000 inhabitants. The population increase has augmented the pressure on the forest and resulted in deforestation. The conservation and protection of the forest is only propagated by a small group of villagers, led by the Village Ronda. Members of the Community of Trinidad that practise agriculture in Bosque Pitura are not very interested in the conservation of the forest. The soil is cultivated with agricultural machines and the forest is destroyed deliberately. Trees are heavily 'pruned' (all branches are cut and made into charcoal) leading to the death of many Algarrobos. Trees are often cut with chainsaw, close to the village machete and axe are used, because the noise made by chainsaws alarms people from the village to intervene in the illegal logging. In the last six months only (January till June 2015), members of Trinidad cut 20 mature trees in the forest. The police was called by the Village Ronda, but no action was undertaken. A former professor of the village's primary school was active in the conservation of the forest and tried to create awareness about the natural environment among the village population.

Relation between community and local government institutions

The inhabitants of Portada de la Sierra feel often forgotten by the authorities and get little assistance from these authorities.

Portada de la Sierra is located at the topographical boundaries of the district, the province and the Department of La Libertad. The Village Ronda of Portada de la Sierra intervenes in deforestation activities when possible, but complains that it gets little assistance from the local mayor, Ministry of Agriculture, Teniente Gobernador and police. The mayor of the village also calls for more assistance from local and regional government in order to protect the forest.

Interest of local authorities for forest conservation

Local authorities are not active in the protection of Bosque Pitura.

Inhabitants of Portada de la Sierra claim that police, ministries and prosecutors are not active against deforestation and those same authorities react they do not have the power and resources to act upon and punish the destruction of Bosque Pitura. According to the mayor of Portada de la Sierra, more

Textbox 3: Head of Village Ronda about the consequences of deforestation

"In the past all village members had horses and let these forage in the forest. Nowadays there is not enough Algarrobo anymore, which means that there is not enough food for the animals. The forest used to be full of trees, now it looks like a bold man's head." [...] "The disappearance of the forest has led to a change in the local climate. There used to be a cool breeze in the afternoon, now the temperature does not cool down anymore. Many children get sick, because there is no fresh air."

¹⁵ Rondas (Campesinas) (ES): "Self-defence committees (Rondas) were set up to protect communities from the threat of terrorism in the 1980s and early 1990s, and have been retained despite the abating of the conflict. In rural areas, Rondas now consist of men who patrol the area around the village at night, primarily to deter animal rustlers. They also intervene in local disputes, and may administer punishments for petty thefts or other misdemeanours." (Silva et al., 2007) In Portada de la Sierra the Ronda is active against illegal logging.

assistance from District, Province and Region is needed in order to protect the forest. Three years ago an intervention of the police and the Ministry of Agriculture against illegal logging took place, which has not led to prosecution.

Favourability of legal status of the forest area

The ownership of Bosque Pitura is disputed by the Comunidades Campesinas of San Pedro de Lloc and Trinidad. Both have historical claims, information from government authorities on ownership is contradicting.

According to the original population, most authorities and the Comunidad Campesina of San Pedro de Lloc, the area in which Cerro Pitura and the Pitura forest are located is property of the Comunidad Campesina of San Pedro de Lloc, with Portada de la Sierra (as part of the Comunidad Campesina) having a historical stake in the forest adjacent to the village. However, Trinidad has given parts of the area in concession to its members, claiming that it is the legal owner of the area. Many immigrants have come to Portada de la Sierra and acquired a piece of land in the area from Trinidad, paying a yearly amount of money for the right to use it. The claim of San Pedro de Lloc is confirmed by a document in which the historical boundaries between San Pedro de Lloc and Trinidad are described. In this document the boundary between both Comunidades is placed north of Cerro Pitura. The Village Ronda of Portada de la Sierra also argues that Trinidad had never been active in the area, until a few years ago.

On the other hand has the Comunidad Campesina of San Pedro de Lloc never registered its terrains, despite its documents and historical claims, which allowed Trinidad to enter the area, divide the forest into agricultural lots and give it in concession to its members. Since the area was never registered in the Public Registers, the terrain has become state property, with the Project of PEJEZA as administrating institution. An engineer working at PEJEZA which has worked in the area declared that Trinidad probably possesses the historical rights on at least parts of the land, because it has older documents than the state and San Pedro de Lloc.

Interest of legal owner/ tenure rights holder for forest conservation

San Pedro de Lloc states that the forests in the area need to be conserved, but does not take any action. Members of Trinidad on the other hand are deliberately destroying parts of the forest.

Ecological importance of the forest area

The forest has a surface of 36 hectares, but is heavily degraded.

Most animals have disappeared due to population pressure and destruction of the forest. According to villagers, in the past it was hardly possible to pass the forest on horseback, because of the dense vegetation. Nowadays the forest is rather open (figure 5). At least Algarrobo (*Prosopis pallida*); Zapote (*Capparis spec.*); Cañán (*Dicrodon guttulatum*); Iguana (*Iguana iguana*) and Zorro costeño (*Pseudalopex sechurae*) can still be found in the forest.



Figure 5: Trees in Bosque Pitura are logged for firewood and charcoal. (Source: T. Bos, 2015)

Text box 4: Meeting Comunidades San Pedro de Lloc and Trinidad

According to the present secretary of the Comunidad Campesina of San Pedro de Lloc, a few years ago a meeting took place in order to determine the limits between San Pedro de Lloc and Trinidad. The person who had to mark the border did not want to go up the hill and took a point along the water stream. This wrongly marked point meant for San Pedro de Lloc a loss of parts of its territory near Cerro Pitura.

4.3. La Quinta

The forest of La Quinta is located in the district of Casa Grande, province of Ascope and has an acreage of 1300 hectares (figure 6). The nearest populated centres are La Quinta and Mocan. Other nearby communities are El Olivar, La Arenita, Monte Seco, La Mensajera and Río Seco. General consensus is that

the forest is property of the agro-industrial company Casa Grande, which is part of Grupo Gloria since 2006 (Grupo Gloria, 2015).

Area available for reforestation

There is almost no terrain available for reforestation within the forest. Possibly, an area of 200 hectares claimed by a family from Mocan could be reforested.

Water availability

Water is scarce in the La Quinta forest and needed by local farmers. To irrigate the reforestation area, water should be brought to the area from other places.

During the rainy season water is available from streams, this water is used by the farmers to irrigate their lands. Outside the rainy season water is very scarce, with subterranean water at 20 metres depth. CHAVIMOCHIC¹⁶ will possibly come to the area during the coming years, as part of the third and latest stage of the project (see Annex II). Water from the project could be used to irrigate the forest, but has to be bought.

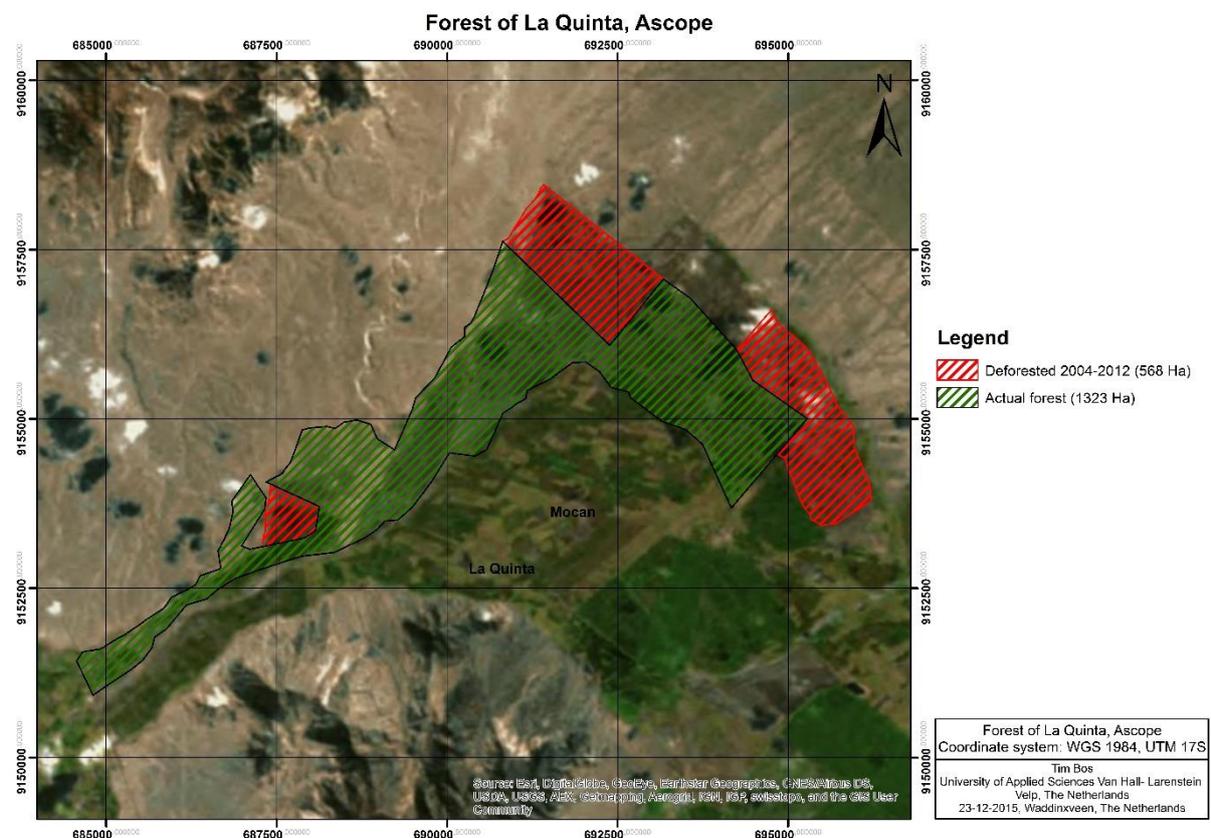


Figure 6: The forest of La Quinta is L-shaped and bordered by sand dunes in the north and northwest; an Olive plantation in the south-west and agriculture (mainly sugar cane) in the south and northeast. The forest has a surface of 1323 hectares, between 2004 and 2012, 568 hectares of forest have been lost and were converted into agricultural land. (Source: ESRI, 2004, 2011, 2012, 2013; T. Bos, 2015)

Community organization

The villages Mocan and La Quinta have little communal organization, all farmers operate individually and rarely come together to discuss village matters. The only village organization is the Water Distribution Committee.

It is very difficult to get the villagers together, because they have only few shared interests. On the community meeting in La Quinta it was said that the villagers only meet when there are presents to be given, when water is divided among the farmers and during the annual village fair. The majority of the inhabitant's descents from immigrants that originate from the *Sierra* region. These immigrants were often

¹⁶ Proyecto Especial CHAVIMOCHIC: a governmental irrigation project that administrates large parts of state-owned land in La Libertad.

brought to the area by Casa Grande and up to today, 10 percent of the villagers works for Casa Grande. Both villages have a Water Distribution Committee, which decides on how water is divided among the farmers, part of its revenues is used for communal goods.

Community's interest for forest conservation

Most people are not very concerned about conservation of the La Quinta forest. The inhabitants of communities in the area heavily rely on the forest for their survival. In Mocan there is an initiative of local farmers to reforest their land.

According to the villagers present at the village meeting in La Quinta, the low environmental interest is caused by a lack of culture and education, besides the economic necessity for the logging of trees. In Mocan many people are dedicated to livestock keeping, in La Quinta most of the villagers work on their own agricultural plots. The inhabitants of the nearby villages use the forest for grazing and collection of firewood and building materials. The farmers rely on natural water coming from nearby rivers. During the rainy season (December until end of May) there is sufficient water and therefore work. Outside the rainy season however, work is scarce and people have to look for alternative sources of income. During the dry season villagers start to cut trees and the firewood and charcoal is sold in nearby cities. This leads to high pressure on the forest, in very dry years even the roots and smallest branches are used to make charcoal. Few initiatives to protect the forest exist, in Mocan there is a family that wants to reforest its land, in order to use it as pasture area. The family disputes however with Casa Grande over the ownership of the terrain (textbox 6).

Relation between community and local government institutions

La Quinta and Mocan are small villages and are of little significance for local politics.

La Quinta is politically considered as a casería (settlement) under the jurisdiction of Mocan, which is a populated centre. Mocan on its account is located in the district Casa Grande. Both have a mayor elected by the people, who works on a voluntary base. There are no paid political authorities present in the villages. The villages get little support from authorities at district or provincial level.

Interest of local authorities for forest conservation

Government authorities are not active in the protection of forest La Quinta.

The local office of the Ministry of Agriculture (located in Ascope) is not active in the conservation of the forest and has very little influence on Grupo Gloria. The same holds for the district municipality (Casa Grande) and province (Ascope). The mayors of the villages do have the will to conserve the forest, but do not have enough influence and power to get things started. In the case of a reforestation project in La Quinta, they cannot guarantee that the community will cooperate. Village authorities of La Quinta state that it is even dangerous to patrol the forest on illegal logging, since there is no forest police.

Text box 5: Difficult to protect the forest

Mayor of La Quinta: "If we [the village authorities] go protect the forest, our heads will be smashed." Villager at village meeting in La Quinta about forest conservation: "You should educate the children and kill their parents, so that they will not have the same ideas. That is the only way to do it."

Favourability of legal status of the forest area

The forest of La Quinta is considered as property of the agro-industrial company Casa Grande S.A. Casa Grande has registered most of the terrain, some local farmers however dispute with Casa Grande about the legality of its territorial claims, basing their arguments on historical 'rights' and habits.

The forest used to be part of the Hacienda Casa Grande and was used as pasture area by the company's directors and employees. After the Agricultural Reforms (chapter 3.2) the land of the Hacienda became property of its former employees and the Cooperative of Casa Grande was formed. The forest area was abandoned for many years, giving the forest the chance to regrow. During the period of the Cooperative, inhabitants from adjacent communities could enter the forest and use it for their own consumption. In 1996, the Cooperative Casa Grande was reformed into a private company¹⁷ and Casa Grande started to cultivate its terrains more actively and converse parts of the forest into agricultural fields. The people living around the forest that had used the area for years, were now prohibited to enter the forest. Nowadays, the

¹⁷ Source: Casa Grande S.A.A., 2008

company has signs all over the area and transmits daily announcements over the radio, claiming its possession of the forest. Before the CHAVIMOCHIC project, large parts of the agricultural area outside the forest were considered terrain of the Comunidad Campesina of Paiján. Since the Comunidad Campesina of Paiján had not registered its terrains, large parts of the area that originally belonged to the Comunidad Campesina became state property and were sold by the CHAVIMOCHIC project to farmers and companies (Casa Grande/Grupo Gloria bought large pieces of land). Some local farmers dispute with the company Casa Grande about the ownership of terrain because they claim to have traditional rights to use the land (textbox 6). Farmers from Mocan frequently (violently) invade areas that are considered as property of Casa Grande, because of disputes about land use rights (e.g. Paredes, 2015). In some cases local farmers have won legal trials about land ownership.

Interest of legal owner/ tenure rights holder for forest conservation

Casa Grande has caused large scale deforestation in the area. The company is currently protecting the forest of La Quinta against illegal loggers, the company's management is however not interested in long-term conservation of the woodland area.

According to local people, the forest used to be more than 2800 hectares a few decades ago, against 1300 hectares now. They say Casa Grande has recently cut down 80 hectares of forest, in order to converse the terrain into agricultural fields. Satellite pictures confirm the large scale deforestation: between 2003 and 2014 over 500 hectares of the La Quinta forest have been lost (figure 6). This has been caused by both Casa Grande as inhabitants from adjacent communities.

Nowadays Grupo Gloria protects its possessions (and therefore the forest) against intruders. The long-term plan of the company is however to cut down the forest and convert the land into agriculture (probably sugar cane). The land is not regarded as a real forest, but as an abandoned pasture area and it is possible to apply for a certificate to cut down the trees and convert the area into agriculture (certificado de cambio de uso de suelo). According to the Peruvian law, 30 percent of the original, natural vegetation has to be designated to nature conservation. According to a representative of the Ministry of Agriculture, Casa Grande is in the process of application for such a certificate of land use change. Engineers working at Casa Grande confirm that the company sometimes lets areas covered with trees, but that the company's policy is to convert all areas into agriculture.

Ecological importance of the forest area

In size the dry forest of La Quinta is one of the largest of La Libertad (1300 hectares), the forest is heavily degraded however and is dominated by small trees (5-10 meters high). The dominant indigenous species in the forest is Espino.

There used to be a lot of Algarrobo and Zapote. Due to the natural resistance of Algarrobo and Zapote, sprouts can still be found all over the forest, almost all larger trees have been cut. Casa Grande has planted a few hectares of Eucalypt inside the forest. Most animal species have gone extinct. The animals still living in the area frequently enter agricultural fields in search for food, causing damage to cultivated crops. An overview of the animal and plant species that still can be found in the forest is given in Annex VII.

Text box 6: disputes over agricultural land

An example of disputed agricultural land is an area of 200 hectares, located next to the forest of La Quinta. Originally, the area was used by an agricultural family from Mocan. According to the family, they used the area for livestock keeping, until three years ago, when Casa Grande took over the terrain, cut down the trees and started to cultivate sugar cane. The family is now in legal dispute with Casa Grande about the ownership of the land.

4.4. Cañoncillo

Cañoncillo was the first Private Natural Reserve of La Libertad and was created in 2004. It is an area of 1515 hectares and is located in the districts of San José and San Pedro de Lloc, province of Pacasmayo. Of these 1515 hectares, 384 are cerros, 406 are intact forests of mainly Algarrobo, 119 degraded forests and 602 hectares are sand dunes and bare sand, these numbers are based on the limits determined by SERNANP¹⁸. According to the Management Plan of Cañoncillo of 2011¹⁹, the Natural Reserve consists of 1620 hectares,

¹⁸ Source: SERNANP, 2015

¹⁹ Source: Novoa, 2010

'based on measurements with new techniques'. In the forest area are 3 lakes located, called Gallinazo, Cañoncillo and Larga, with a total surface of 2.5 hectares.

Cañoncillo is often considered as the last Algarrobal of La Libertad. Although it is not the only Algarrobo forest, it is one of the largest and certainly the only one being a Natural Reserve¹⁸. Because of its importance for both the local population as regional ecology, many studies have been executed in the area. Within the forest archaeological relicts have been discovered, of the prehistoric cultures Cupisnique, Gallinazo, Mochica, Chimú and Inca²⁰.

Area available for reforestation

An area of 119 hectares of degraded forest is available for reforestation.

Water availability

Water is available.

There are three lakes within the forest area, named Cañoncillo, Gallinazo and Larga (figure 9). The lakes comprise a total area of 2.5 hectares. Outside of the forest there are several agricultural canals that could be used as source of water.

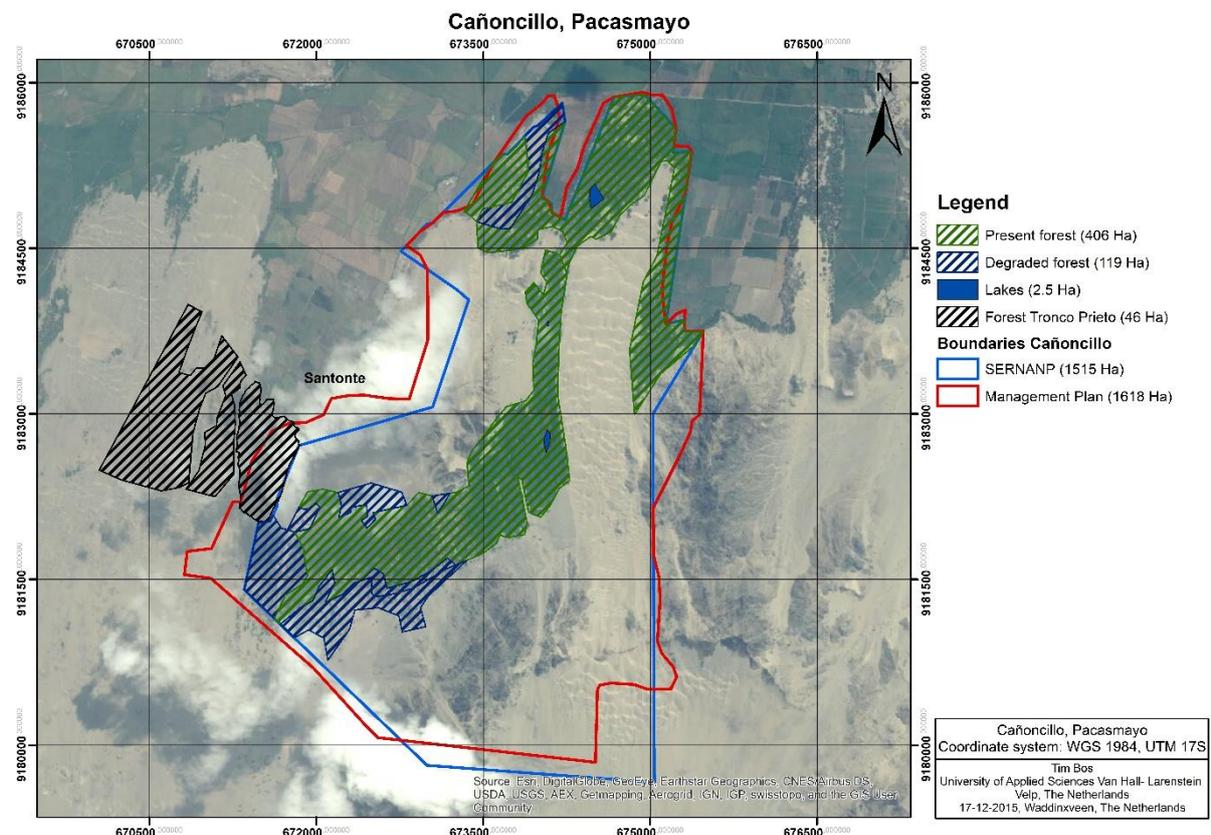


Figure 7: The Cañoncillo forest is located next to Santonte and is surrounded by sand dunes and 'cerros'. In the north the forest is bordered by agricultural fields. (Source: ESRI, 2013; SERNANP, 2015; Novoa, 2010; T. Bos, 2015)

Community organization

Cañoncillo is owned and managed by the Cooperativa Agraria de Usuarios (C.A.U.) Tecapa, a relatively well organized cooperative with many years of experience in patrolling and protecting the forest, as well as in reforestation.

The C.A.U was formed in the 1980s by 171 original members from the nearby villages Tecapa, Santa María de Tecapa, Pueblo Nuevo, Portada de la Sierra and Campanitas. The active number of members varies however, since at least 20 of them have died. The actual president of the C.A.U. speaks of 140 members. The members are descendants of the employees of the former Hacienda Tecapa. The C.A.U. has let Cañoncillo declare a natural reserve and has four forest guards that are paid from the income of the

²⁰ Source: Delgado et al., 2008

Cooperative. The C.A.U. makes rules on the amounts people can harvest from the forest and the amount of livestock that can graze in the area, although these rules are not always followed by forest users. The C.A.U. holds regular meetings, but according to the president of the C.A.U. it is often difficult to get the members together, because they are busy with their work and live in different communities, separated from each other. The C.A.U. gets a large part of its income from eco-tourism. Cañoncillo is a popular destination for tourists, visitors pay 2 soles (roughly €0.60) as entrance fee and can get guided tours for 20 soles from one of the forest guards.

Community's interest for forest conservation

Generally speaking, the conservation of Cañoncillo is regarded as important by inhabitants of adjacent communities. However, the forest is still threatened, despite all efforts.

Inhabitants of five nearby communities are active in the protection and conservation of Cañoncillo, through the C.A.U. Tecapa. Furthermore, many people from nearby communities assist in the protection of Cañoncillo, although they are no members of the Cooperative. The closest communities are Tecapa, Santa María de Tecapa and Santonte, these villages are therefore most closely related to Cañoncillo. The forest is also used by inhabitants of other nearby communities, like Pueblo Nuevo, Mazanca, Chocofán, San Pedro de Lloc, Verdún and Cutambo, as well as by farmers that cultivate land next to the forest. Cañoncillo is used for harvest of firewood and timber; livestock keeping and hunting (especially of Cañán and Biscacha). Despite the management rules and forest guards of the C.A.U., Cañoncillo is under high pressure and large parts of the forest are degraded (figure 8). The pressure on Cañoncillo has become more severely after the intensification of the protection of Tronco Prieto.

Relation between community and local government institutions

Cañoncillo is often visited by representatives of ministries and municipalities, but gets little active assistance, because of its legal problems and the fact it is a private reserve.

Interest of local authorities for forest conservation

All local government authorities in the area underline the importance of conservation of Cañoncillo, but Cañoncillo gets little active assistance.

The Ministries of Culture, Agriculture and Environment and the Municipalities of San José and San Pedro de Lloc all say it is important to conserve the forest and are willing to cooperate in a reforestation project when possible. The district of San José claims to be 'the capital of the environment', because a large part of the forest is located within its boundaries. However, due to the fact that Cañoncillo is a private reserve and that there is a legal dispute over the terrain of Cañoncillo, the C.A.U. gets little active assistance from local authorities.



Figure 8: Large parts of Cañoncillo are heavily degraded.
(Source: T.Bos, 2015)

Favourability of legal status of the forest area

Cañoncillo is a Private Conservation Area, and is part of the National Service of Areas Protected by the State (SERNANP). The area is owned and administered by the C.A.U. Tecapa. Due to several events in the past, the C.A.U. has a legal dispute with a private person who has bought the area. The Conservation Area is located within a larger Archaeological Complex.

Cañoncillo used to be part of the Hacienda Tecapa. With the Agricultural Reforms of the 1970s, the C.A.U. was formed by the employees of the former Hacienda and Cañoncillo became cooperative property. Ten years after the formation of the cooperation, many belongings of the C.A.U. were sold and also the forest was put for sale. Around the year 2004, the forest was sold by a few members of the cooperation to a private person, without the official accord of the other members (textbox 7). This illegitimate sale of the forest led to a legal dispute over the ownership of Cañoncillo. Until today this lawsuit remains a restriction for many nature conservation organizations and governments to take part in the management

of Cañoncillo. The forest area is located within the Archaeological Complex “El Cañoncillo”²¹ (Annex V). The Archaeological Complex has no management plan, but activities affecting soil and ground water (for example reforestation) should be consulted with the Ministry of Culture before executing, in many cases it is necessary to execute an authorized archaeological inventory, before the start of reforestation activities.

Interest of legal owner/ tenure rights holder for forest conservation

The C.A.U. Tecapa has let Cañoncillo declare a Private Area of Conservation and claims to fight for protection and conservation of the forest. Nevertheless, many people doubt about the true intentions of the C.A.U.

The specific objectives of Cañoncillo are “to guaranty the conservation of the dry forest ecosystem of Natural Forest El Cañoncillo; search for a legal status that ensures conservation, while minimizing the negative effects of the actual legal status; improve the capacity of the administration and management of the protected area; permit a sustainable development of the area and its surroundings; to implement facilities for recreational, educational and cultural use.” (Novoa, 2010)

According to people outside the C.A.U. with a stake in Cañoncillo (government officials, mayors and inhabitants of nearby communities), the cooperative of Tecapa is not protecting its area well. The park has only four forest guards and the income generated from tourism is not invested in the protection of the forest. In fact, large scale forest degradation is still going on (figure 8). The forest guards of Cañoncillo agree it is difficult to control the whole area with only four guards, but trust on their management “without good management there would not have been any forest left”. Perceived risks are illegal logging, contamination by tourists and forest fires. They agree that it is difficult to control the use of the forest and that the existing management rules are not always followed by the people that make use of the forest.

On behalf of the Cooperation of Tecapa, the SENASA²² was planning an investigation on a plague the Algarrobos in Cañoncillo are suffering from, which has never been executed. The reason for this remains unclear, but according to a representative of SENASA, the study was suspended because the C.A.U. refused to pay for the costs of the investigation.



Figure 9: Cañoncillo habits three natural fresh water lakes. (Source: T.Bos, 2015)

Ecological importance of the forest area

Cañoncillo is one of the most biodiverse natural areas in the coast of La Libertad. The reserve has a total surface of 1515 hectares, of which 525 are covered with forest.

The diversity of landscapes (lakes, forest, hills, sand dunes) and the fact that it is still rather well preserved makes Cañoncillo a refuge for many dry forest species. According to an Environmental Impact Evaluation done for Cañoncillo, the forest habits 57 different bird species, of which three are endemic to the Equatorial Pacific Ecoregion. Furthermore 7 reptile species and 7 mammal species were indicated.²³ A list of plant species and animal species occurring in Cañoncillo can be found in Annex VIII. The Algarrobo in Cañoncillo is suffering from a plague, causing the trees to dry out and eventually die. Many Algarrobo forests in northern Peru suffer from the same plague. Various explanations for the plague have been given, like parasites (Araña roja), chemicals used in nearby agricultural fields, fungi and contamination by the nearby mining industry. A study of the SENASA on this plague has never been done.

²¹ Patrimonio Cultural de la Nación ‘El Complejo Arqueológico “El Cañoncillo” (ES): An archaeological heritage site of 3800 hectares which comprises the forests of Cañoncillo and Tronco Prieto and a large area of bare sand surrounding these forests.

²² SENASA: Servicio Nacional de Sanidad Agraria (ES), National Service of Agricultural Sanitation.

²³ Source: Delgado et al., 2008

Text box 7: History of Cañoncillo

Historically, Cañoncillo belonged to the Comunidad Campesina of San Pedro de Lloc, but for customary reasons the area was always used and controlled by the Hacienda Tecapa. Until 1975 Cañoncillo remained de facto private property, as part of Hacienda Tecapa. During this period, only the employees of the Hacienda had the right to use the forest. The owner of the Hacienda, 'el patrón'²⁴, maintained groups of forest guards to protect the forest from intruders and divided the rights for firewood, timber, hunting and pasture among his employees. The 'patrón' decided which areas could be used when and by whom. Employees had to hand over half of their livestock as payment for the use of the forest. With the agricultural reform of the 1970s, Cañoncillo was transferred to the ex-employees of the former Hacienda, as was the rest of the Hacienda and all its belongings. The area was divided into parcels and distributed among the ex-employees. In 1980 Cañoncillo became officially property of the Cooperativa Agraria de Usuarios (C.A.U.) Tecapa^{25,26}.

In 1990 the Hacienda Tecapa and Cañoncillo were in a process of sale. A committee of liquidation was formed and the Hacienda's mill, machinery, vehicles and tools were sold. The forest came up for sale as well and was divided into parcels. In 1994 the National Cultural Institute (INC²⁷) of La Libertad recognized the exceptional cultural value of Cañoncillo. In March 2000 the Management Committee of the Forest and Archaeological Complex El Cañoncillo was formed by local government institutions and the Committee of forest guards²⁴. In 2001 an area of 3825 hectares was declared as Cultural Heritage of the Nation "El Complejo Aqueológico El Cañoncillo". In February 2003, during the Extraordinary Assembly of Shareholders, 115 of the original 171 shareholders (20 had died and 36 were absent) firmed unanimously the act to declare Cañoncillo Private Conservation Area (ACP²⁸), at that time an area of 1310.90 hectares was recognized as ACP. In September 2004 the area was recognized by the Ministry of Agriculture as ACP "Bosque Natural El Cañoncillo"²³.

Around 1997, a group of inhabitants of the nearby villages Tecapa and Santonte formed a group of forest guards, in order to protect the natural heritage of Cañoncillo. The group of forest guards was a private initiative and was initially not backed by the C.A.U., local authorities or any other organization. For about six years, the association of forest guards worked on private title, protecting the forest, planting trees, placing land marks and cleaning the water bodies. During the start-up period, 37 donkeys, loaded firewood were captured daily. After six years, the UNDP started to fund the forest guards and appointed a forest engineer to the project. The UNDP had allocated a 50000 USD budget to the project and financed the construction of a forest guard house (12000 USD) and many road blocks on the entrance ways to the forest.

With the money started the problems in Cañoncillo, the direction of the C.A.U. disagreed with the forest guards and the direction of the UNDP-project on the way the money was spent and wanted to manage the funds by itself. The director of the C.A.U. demanded for the withdraw of the UNDP-engineer in charge. The Association of Forest Guards ended in 2004/2005 after the frontman was prohibited by the C.A.U. to be active in Cañoncillo any longer. With the termination of the Association of Forest Guards, the UNDP withdrew, disagreeing with the management of the C.A.U. According to the UNDP website, the project had a budget of \$30053.00 and was satisfactorily completed after 15 months²⁹.

In the same period, the forest was sold to a private person. According to a former president of the C.A.U., the son of the president at that time used the signature of his father to sign the contract. In reaction, the C.A.U. hired a lawyer to redo the illegal sale. To secure the property of Cañoncillo, the ownership rights were put on the lawyer's name. He tried to sell the forest again and was sent to jail for four and a half years. According to the ex-president of the C.A.U., the Association of Forest Guards (and the UNDP-forest engineer) used Cañoncillo as source of income through illegal harvest of firewood and even took part in the sale of the forest. As reaction on this, the Association of Forest Guards states that they have been fighting for the conservation of the forest on their own account, without making any money with it, while the C.A.U. did not concern about forest conservation. The Association states that the C.A.U. only became interested in the management of the forest because of the money from UNDP and the rise in income from tourism.

²⁴ El patrón (ES): the boss. The term patrón was used to refer to the owner of a Hacienda.

²⁵ Source: Delgado et al., 2008

²⁶ Source: Novoa, 2010

²⁷ INC – Instituto Nacional de Cultura (ES): National Institute of Culture, a former institute of the Ministry of Culture that guarded the protection of cultural heritage in Peru.

²⁸ ACP – Área de Conservación Privada (ES): Private Conservation Area.

²⁹ Source: SGP-UNDP, 2012

4.5. Calipuy

The National Reserve of Calipuy is located in the districts of Chao (province of Virú) and Santiago de Chuco (province of Santiago the Chuco) in the department of La Libertad and the district of Chimbote (province of Santa) in the department of Ancash. The National Reserve of Calipuy covers a total area of 62 thousand hectares, with a buffer zone of 39 thousand hectares surrounding it. A map of the National Reserve is shown in figure 10. The National Reserve is located on the transition from *Costa* to *Sierra* and represents three different eco-systems, habiting a wide variety of species³⁰. The National Reserve Calipuy is property of the state of Peru and managed by SERNANP. The Calipuy National Reserve was formed in January 1981, with the objective to conserve the last relicts of natural Guanaco *Lama guanaco cacsilencis*) populations, the largest South-American camelid.

Area available for reforestation

There is a plan to reforest 186 hectares with Algarrobo in the southwest of the National Park, located in the Sechura Desert ecosystem.

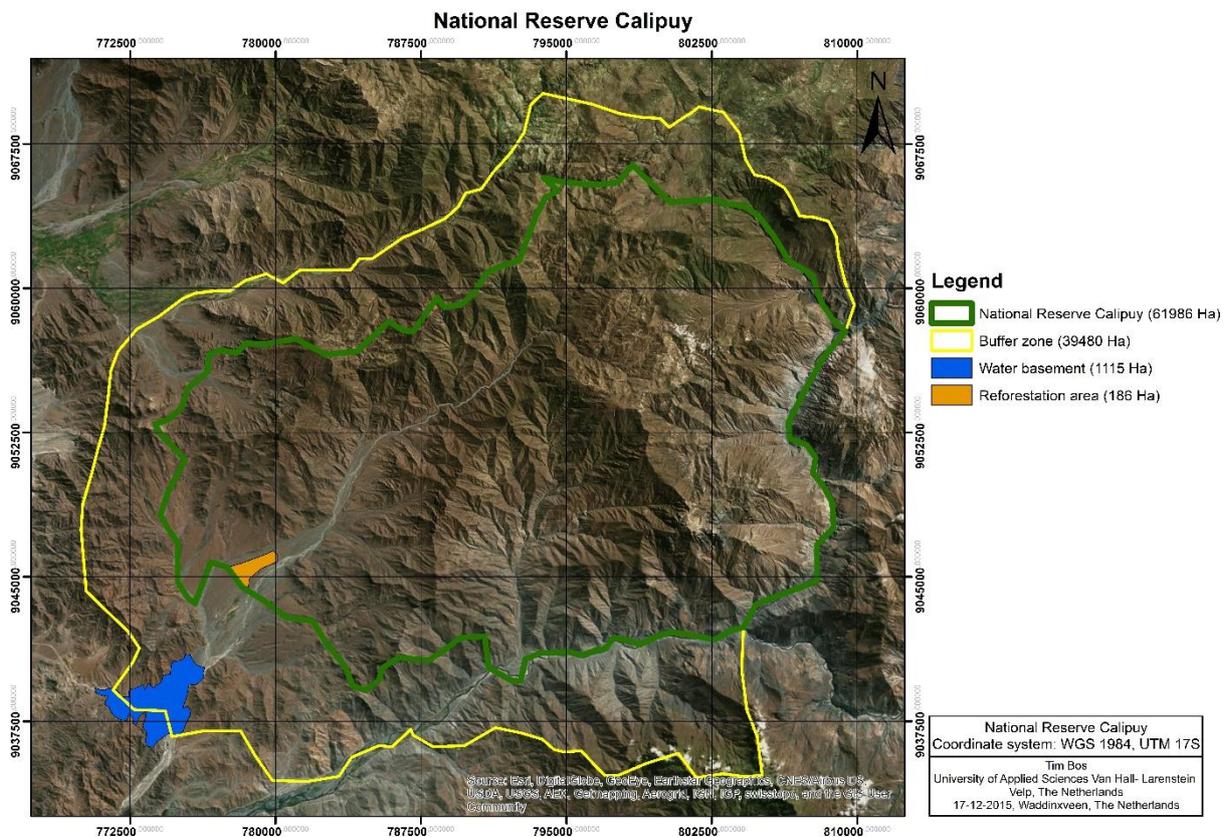


Figure 10: Calipuy National Reserve has a surface of 62 thousand hectares. A reforestation of 186 hectares is planned in the southwest of the park. (Source: Moquillaza, 2015; ESRI, 2013; T.Bos, 2015)

Water availability

Water in the reforestation area is scarce, but could be provided by an artificial dam that is planned to be built.

The reforestation is planned in a rather dry area. The area is crossed by a riverbed, which in normal years without El Niño phenomenon stays dry. CHAVIMOCHIC is planning to construct a dam and artificial water basement at 5900 metres of the reforestation area (see figure 10). The water captured in this basement can be used for reforestation. The artificial lake will have a surface of 1115 hectares and a projected storage volume of 120 million cubic metres, large enough to supply the trees of water during the first year after planting. According to the director of Calipuy, CHAVIMOCHIC has confirmed that the water can be used for the reforestation of the area. Besides reforestation, the water will be used for agriculture

³⁰ Source: Moquillaza, 2015

and human consumption and for the production of electricity³¹. The construction of the dam and water capturing is planned to be initiated in 2016. When the construction will be finished and the water available for use is not yet known.

Community organization

How the nearby communities are organized is not known, but the SERNANP wants to incorporate the communities in the management of the area.

Calipuy's Management Plan foresees an economic development of the adjacent communities, through sustainable use of natural resources, tourism and better grazing practices in the National Park and its buffer zone³². The nearby communities will be incorporated in the management of the park and planned reforestation project and will take part in guarding, decision making and the obtaining of economic benefits from natural resources produced through reforestation (primarily meat of Cañán and firewood).

Community's interest for forest conservation

Inhabitants of nearby communities heavily rely on the natural resources of the National Park and its buffer zone. Overuse by inhabitants of these communities has led to severe forest degradation and deforestation in the southern parts of Calipuy. The communities are not active in forest conservation, but will be incorporated in the reforestation project.

The settlements most closely located to the reforestation area are Tanguche (at 13 kilometres), Vinzón (20 kilometres) and Suchimán (23 kilometres). People come even all the way from Chao (35 kilometres from the reforestation area) to harvest firewood and hunt for meat. These communities are regarded as very poor. Trees are cut for firewood and charcoal; game is hunted (Venado and Cañán) and the area is used for livestock herding, putting a high pressure on the ecosystem.

Interest of local authorities for forest conservation

The National Reserve is owned by the Ministry of Environment, which cooperates with the Municipalities of Virú and Puente Virú.

Favourability of legal status of the forest area

Calipuy is owned and managed by the state.

The National Reserve is state-owned and is managed by the SERNANP (part of the Ministry of Environment). Most of the buffer is owned by the CHAVIMOCHIC project (part of the government of La Libertad). Only a few small pieces of land in the northwest and south of the buffer zone are owned by farmers. These areas are located far away from the area that is designated to reforestation, so legal problems are not foreseen.

Interest of legal owner/ tenure rights holder for forest conservation

Calipuy is managed by the SERNANP, with the objective to conserve its biodiversity. SERNANP has the need to reforest parts of the park and guard the park more intensively.

The National Reserve Calipuy was established with the objective to "conserve its populations of Guanaco, as well as other wild flora and fauna; promote scientific research on the natural resources of the region and stimulate touristic development, ensuring in this way the socioeconomic development of the region". (Prieto, 2001)

The direction of Calipuy is planning to reforest an area of 186 hectares in the southwest of the Reserve with Algarrobo (figure 10), in order to revitalize the local Cañán population. A technical evaluation of the reforestation project is still lacking. According to the director of Calipuy, the National Reserve needs more intensive surveillance, there are only four guards to control the 62 thousand hectares park. Especially in the low part of the park, close to human settlements, the protection of the area is insufficient.

Ecological importance of the forest area

Calipuy has a surface of 62 thousand hectares and habits three types of ecosystems and a large variety of plant and animal species.

³¹ Source: P.E. CHAVIMOCHIC, 2014

³² Source: Moquillaza, 2015

Within its 62 thousand hectares, the National Reserve habits the Sechura Desert, Central Andes-high Andean shrub vegetation and Central Andes– coastal desert shrub vegetation. Together these ecosystems provide habitat to a large variety of species, including large mammals like Puma (*Puma concolor*), Venado gris (*Odocoileus virginianus*), Oso de Anteojos (*Tremarctos ornatus*) and the endangered Guanaco (*Lama guanicoe cacsilencis*). These species live in the mountainous part of the Reserve and regularly come down in search for food. The area of reforestation is located in the Sechura Desert, a year round green shrubland, dominated by Espino (*Acacia macracantha*), Peruvian pepper (*Schinus molle*), Algarrobo (*Prosopis pallida*) and Zapote (*Capparis avicenifolia*, *C. cordata* and *C. scabrida*)³³. A more extensive list of species found in the Calipuy National Reserve is shown in Annex IX.

4.6. San Pedro de Lloc

The forest of San Pedro de Lloc is located east of the city of San Pedro de Lloc, in the district San Pedro de Lloc, Province of Pacasmayo and has a total surface of 40 hectares. The area is divided into El Algarrobal, La Yuca and the forest of the Mingo family, the first two owned by the Municipality of San Pedro de Lloc and the last one by the Comunidad Campesina. In El Algarrobal and La Yuca most of the forest has disappeared and been replaced by houses and a dump for old vehicles. A map of the area is shown in figure 11.

Area available for reforestation

Potentially, an area of nine hectares can be reforested, of which three in El Algarrobal, two in La Yuca and four in the Mingo forest (figure 11).

Water availability

In the case of reforestation of the area water is available. A rain-fed irrigation canal, which can be opened when water is necessary, is located next to La Yuca.

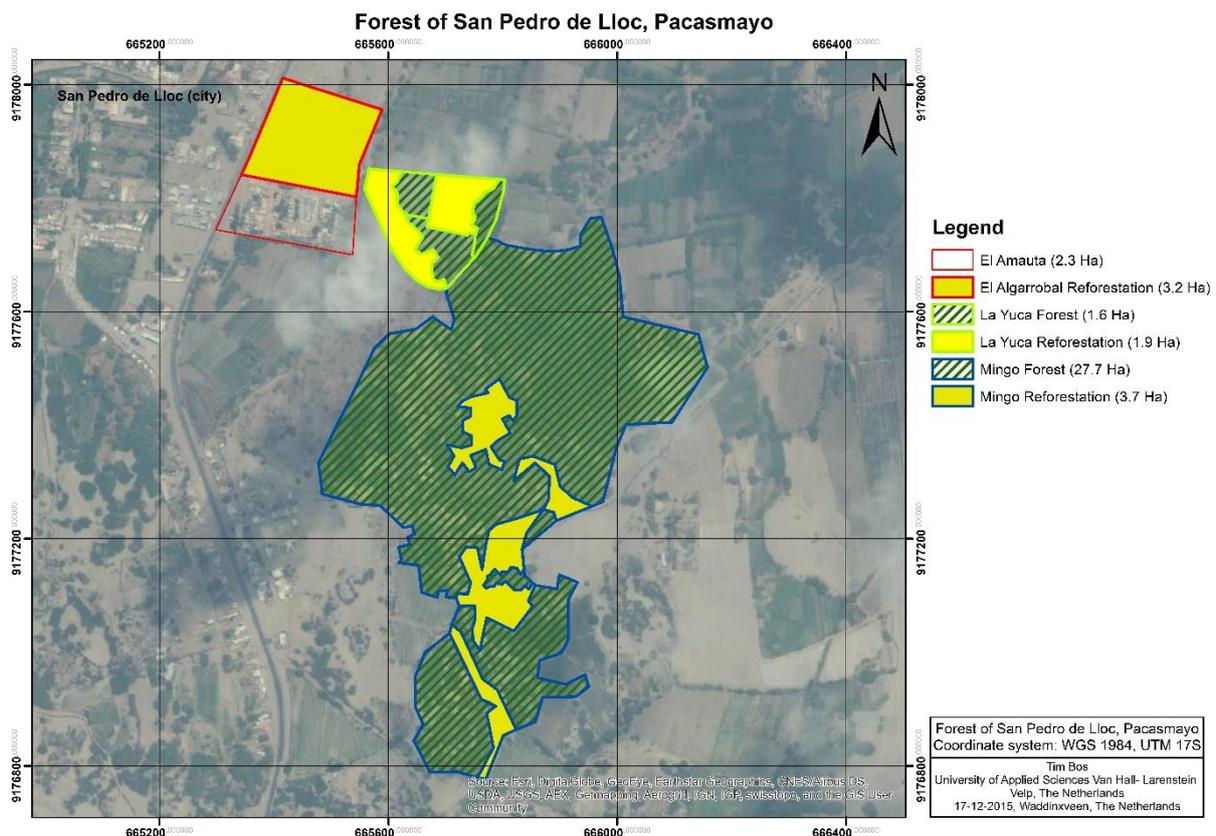


Figure 11: The forest of San Pedro de Lloc has an area of forty hectares, and is divided into La Yuca, El Algarrobal and the Mingo forest. Nine hectares of the forest are available for reforestation. (Source: ESRI, 2013; Municipalidad San Pedro de Lloc, 2015; T.Bos, 2015)

³³ Source: Moquillaza, 2015

Community's interest for forest conservation

The forest is not patrolled and is used for the harvest of charcoal, firewood and construction wood and for hunting. Almost all trees in El Algarrobal have been cut down deliberately by the population. The forest of the Mingo family is more or less conserved.

The people living in El Algarrobal have deliberately cut down the forest in order to build their houses. The neighbourhood next to El Algarrobal is called El Amauta. Part of the 75 houses in this neighbourhood is inhabited by professors of schools in San Pedro de Lloc. According to the municipality these people are interested in conservation of the forest.

Relation between community and local government institutions

The Municipality of San Pedro de Lloc has not a very good relation with the inhabitants of the area.

The present administration of the Municipality of San Pedro de Lloc considers the people living in El Algarrobal as invaders and wants to remove their buildings. The Municipality has little contact with the Mingo family and adjacent farmers, but seems to have a rather good relation with the people in El Amauta.

Interest of local authorities for forest conservation

The local authorities are interested in reforestation projects in the near future.

The Municipality of San Pedro de Lloc is planning to reforest its terrains in El Algarrobal and La Yuca and is also willing to assist in a project on the terrains of the Comunidad Campesina. San Pedro de Lloc has the objective to protect the natural environment and economically develop the area in a sustainable way. The Municipality has a nursery which is available for the production of seedlings for reforestation.

Favourability of legal status of the forest area

Most of the forest is property of the Comunidad Campesina and given into concession to a local family. The rest of the site is owned by the Municipality, which however has a dispute over El Algarrobal with the people living in this sector.

Of the forty hectares of forest, 31 are located on property of the Comunidad Campesina of San Pedro de Lloc and given into concession to the Mingo family. The Comunidad Campesina of San Pedro de Lloc has never registered its terrains and in the maps of the Regional Government these terrains are shown as property of the PEJEZA project. The Comunidad Campesina has however won a juridical trial against PEJEZA and the terrains are now in process of registration. The agricultural fields surrounding the forests are also property of the Comunidad Campesina of San Pedro de Lloc and given into concession to individual farmers.

El Algarrobal and La Yuca are owned by the Municipality of San Pedro de Lloc and are registered in the Public Registers. During the last ten years El Algarrobal was invaded by people that illegally occupied municipal terrain and built houses on it. The Municipality awarded building lots to certain families, where after other families started to build illegally on adjacent terrain. This resulted in the total destruction of these three hectares of forest. According to the Municipality, many invaders saw the invasion as an investment. It states that 10% of the families in El Algarrobal has built a house out of necessity, where the majority (90%) only uses the situation as a way to earn money. The former administration, which was in office until January 2015, tolerated the illegal occupation of El Algarrobal. The new administration wants to remove the illegally built houses coming year and says that it has the legal right to do this. Practically it can be difficult however to remove the people from the area, since the invasion started ten years ago and a lot of money has been invested since then. Furthermore, the Municipality has to find replacement for the houses that were built out of necessity.

Interest of legal owner/ tenure rights holder for forest conservation

The Municipality is actively looking for possibilities to reforest the area. The Comunidad Campesina would be interested, but is at the moment not active in a forest conservation or reforestation project.

The new administration of the Municipality states that conservation of the environment and reforestation will be top priority and wants to remove the buildings in El Algarrobal and clean up La Yuca coming year, in order to reforest the area with Algarrobo. It has the plan to use the forest for biodiversity conservation, (eco-) tourism and recreation. The Comunidad Campesina has shown interest in the conservation of the area, but is not active in it. The concession holder of the area (the Mingo family)

conserves the forest, although trees are cut. It is not known whether the concession holder is active in protection and management of the forest.

Ecological importance of the forest area

The forest has a surface of 40 hectares and is especially interesting because of the many old and large Algarrobos that are present (figure 12). Furthermore, the forest of San Pedro de Lloc is not far away from the other forest areas Tronco Prieto and Cañoncillo.

The forest is dominated by Algarrobo with ages varying from seedlings to over 100 years old (with dbh³⁴ up to 50 cm). Many old individuals are still producing fruits. At least three species of Algarrobo (*Prosopis spp.*) were identified. Furthermore, Zapote (*Capparis scabrida*) and Espino (*Acacia macracantha*) are found in the forest. The old Algarrobo trees are an important source of food for many animal species related to the Peruvian dry forest. During a visit to the Mingo forest, at least ten Cañanes were spotted on a forty minutes' walk, indicating the high density of Cañán in the forest. Also Chilala (*Furnarius leucopus*) and Añaz (*Conepatus semistriatus*) were spotted. On La Yuca is a young Espino forest (germinated in 1998) located of less than one hectare.



Figure 12: The forest of San Pedro de Lloc is home to Algarrobos of more than 100 years old. (Source: T.Bos, 2015)

4.7. Virú

Two possible project locations in the district of Virú were visited, one state owned and managed by a local farmer (Poza del Gato) and the other one owned by the mayor of Puente Virú. The sites are located in an agricultural region at 1300 metres from each other. A map of both sites is shown in Annex X. The nearest community to both forests is Huancaquito Alto.

Area available for reforestation

Poza del Gato: 2.4 hectares.

Forest mayor: 0.5 hectares.

Water availability

Poza del Gato: Water is available in a pool located at the edge of the forest area, at less than 200 metres from the area designated for reforestation (2.5 hectares).

Forest mayor: Water is available in the agricultural canals in the area, the closest is located at 200 metres.

Community's interest for forest conservation

Despite some small initiatives, there is little activity in forest conservation.

A local promotor of forest conservation is the Casa de la Cultura Virú, located in Virú and Puente Virú. The Casa de la Cultura wants to set up a reforestation project, starting with the two investigated sites. For local communities, the most interesting quality of the dry forests is the Cañán. This lizard is an important part of local cuisine and is at risk of extinction in the region.

Favourability of legal status of the forest area

Poza del Gato: An individual farmer manages a forest concession of 6.3 hectares on state owned land. The land is officially registered and can be used by the farmer as long as he complies with the objectives of an approved management plan.

Forest mayor: The area is located on private land which is titled and registered.

³⁴ Dbh (abbreviation, EN): diameter at breast height, standard way to indicate tree diameters.

Interest of legal owner/ tenure rights holder for forest conservation

Poza del Gato: The objectives of the concession are conservation and harvest of fruits and seeds as fodder³⁵. There are however signs that the concession holder does not conserve the forest well.

Originally, the forest area had a surface of 12.3 hectares. According to a forest engineer at the Ministry of Agriculture responsible for the authorization of forest concessions, the concession holder has cut down half of the forest. Looking at satellite images, it can be concluded that between 1970 and 2010 six hectares of forest have been lost and between 2010 and 2012 another 2.5 hectares (Annex X). The concession holder now says that he wants to reforest the parts of the forest that have been deforested. He uses the forest as grazing area for his goats, other people are not allowed to enter the forest.

Forest mayor: The owner of the site is reforesting the terrain with Algarrobo, but needs more (financial) support. The area is used to grow Cañán for local consumption.

Ecological importance of the forest area

Poza de Gato: The area has a surface of 6.3 hectares, of which 3.9 hectares are covered with forest (mainly Algarrobo and Espino). In the forest Poza del Gato Iguana (*Iguana iguana*) and Cañán (*Dicrodon holmbergi*) are found, according to the concession holder these animals are not hunted.

Forest mayor: The site has a surface of 0.8 hectares, about one third of the terrain is actually covered with Algarrobo.

4.8. Chicama

The Municipality of Chicama has various locations within its territories, available for afforestation and reforestation. The most promising one is the afforestation of a piece of land along the Chicama River as part of a river defence project. The aims of the afforestation are the caption of bare soil behind a dyke that is to be made, together with the provision of an alternative source of income to local farmers. The afforested area will act as a buffer zone between the dyke and agricultural land behind it. The location of the area is shown in Annex XI. The site is located near the village Quemazón.

Area available for reforestation

The afforestation will have a total surface of more than 50 hectares and comprises a strip of land of 50 by 10000 metres behind the dyke and a rectangular area of approximately five hectares.

Water availability

There is sufficient water available for afforestation, since the site is located next to the Chicama River.

Interest of local authorities for forest conservation

The afforestation project is initiated by the Municipality of Chicama and supported by the Ministry of Agriculture.

Favourability of legal status of the forest area

The project will be executed on terrain of a local Agricultural Association.

Interest of legal owner/ tenure rights holder for forest conservation

According to the Municipality of Chicama, the Agricultural Association is interested in afforesting part of their area after the construction of the dyke. The terrain on which the afforestation is planned is not suitable for agriculture.

4.9. Higuerón

El Higuerón is a huge natural forest area located north of the town of Mocan, in the northeast of the district of Casa Grande, province of Ascope. The Higuerón forest begins at the foot of the Cordillera Occidental, the westernmost mountain range of Peru. In fact, Higuerón is the name with which local people refer to the closest part of the infinitive area of forests and shrublands in the mountain region, called after a Higuerón

³⁵ Source: Palomino, 2013

(*Ficus urbaniana*) tree standing at the entrance of the forest. Higuerón cannot be reached by car, only by foot or on horseback. Weather conditions in the mountains make it often impossible to visit El Higuerón.

Community's interest for forest conservation

El Higuerón is used for the harvest of firewood and hunting and is every now and then visited by tourists. There is a plan of a local tourist agency from Casa Grande to make a living fence of trees, probably Algarrobo, in order to protect the forest from outsiders. This plan has not led to any concrete action yet.

Interest of local government authorities for forest conservation

There is no action undertaken by local governments to conserve El Higuerón.

Favourability of legal status of the forest area

El Higuerón is state-owned, it is possible to apply for a concession with the purpose of forest conservation. In the past, mining companies have applied for mining concessions in the area, which up to date not have been granted.

Interest of legal owner/ tenure rights holder for forest conservation

The government has no management plan for El Higuerón and is not active in the conservation of the area.

Ecological importance of the forest area

A nature conservation project in El Higuerón comprises potentially thousands of hectares, the area is inhabited by various (large) mammal species, like Venado (*Odocoileus virginianus*) and Oso de anteojos (*Tremarctos ornatus*)³⁶.

4.10. Conache

Conache is a small Algarrobo forest in the district of Laredo, province of Trujillo. Algarrobal Conache is located next to the artificial lake Conache, a touristic destination. A map of the area is shown in Annex XII.

Water availability

Water for reforestation is available in the nearby lake.

Community's interest for forest conservation

The community has little interest for the conservation of the forest. Inhabitants of nearby villages illegally enter the area to harvest trees and cultivate crops.

Interest of local authorities for forest conservation

Interest from local authorities for conservation of the forest is lacking.

Some local politicians want to build a boulevard with houses on the location of the forest and are hindering the conservation of the forest and the granting of a forest concession to the owner of the lake.

Favourability of legal status of the forest area

The forest of Conache is state-owned, the owner of the nearby lake is trying to get a forest concession.

The owner of the lake applied for the first time for a forest concession in 2005. Since then, several applications were done at the Ministry of Agriculture. All these applications have been rejected by high officials in the Ministry, although the applications complied with all requirements.

Interest of legal owner/ tenure rights holder for forest conservation

The owner of the lake wants to conserve the forest and has made a forest management plan. The legal owner of the area (the state of Peru) is not assisting him in his efforts.

Ecological importance of the forest area

The Conache forest has a surface of 4.6 hectares. The dominant tree species is Algarrobo.

³⁶ Source: La Riva, 2012

4.11. Analysis of results

This chapter discusses the outcomes of the result analysis, which lead to the conclusion in Chapter 5. Table 5 shows the outcomes of the suitability assessment. Only Tronco Prieto was assessed as suitable for the establishment of a community forestry project. Four investigated sites were assessed as unsuitable (Bosque Pitura, La Quinta, Cañoncillo and Conache) and about the 5 other investigated sites more information is needed for a definitive judgement. For these five sites, there is no information about certain criteria, or only information from one source.

Tronco Prieto seems to be the most promising future project site. This site scores positive at both Community interest as Interest of owner/tenure rights holder and was not judged negatively on any criteria. The main difficulties in Tronco Prieto are the quarrels within the community and the restrictions for reforestation because of the Archaeological Heritage site “El Cañoncillo”. These difficulties are countered by an interest from the community for forest conservation and support from the local government. Tronco Prieto is not a very large forest, but Asociación Muchick has a concession of 200 hectares, which increases the potential area available for reforestation to 100 hectares.

Bosque Pitura is unsuitable, it has major legal uncertainty and interest for conservation of the forest from the community, government authorities and the Comunidades Campesinas is lacking. It would be very difficult to initiate an A Rocha project in Bosque Pitura.

Table 5: All sites were assessed per criterion as positive (green), neutral (yellow) or negative (red), followed by an overall judgement of each site’s suitability. Only Tronco Prieto was judged as suitable, four sites as not suitable and about five others more information is needed for definitive judgement. A dash (-) means that there is no or too little information available on the respective criterion.

Study site	Reforestation area	Water avail.	Comm. Organization	Comm. interest	Relation Comm.- Govmnt.	Interest Govmnt.	Legal status	Interest owner/ tenure rights holder	Size area	Overall
Tronco Prieto	Yellow	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Green	Yellow	Green
Bosque Pitura	Green	Yellow	Yellow	Yellow	Red	Red	Red	Red	Yellow	Red
La Quinta	Red	Yellow	Red	Red	Red	Red	Yellow	Red	Green	Red
Cañoncillo	Green	Green	Green	Green	Yellow	Yellow	Red	Yellow	Green	Red
Calipuy	Green	Red	-	-	-	Green	Green	Green	Green	-
San Pedro de Lloc	Yellow	Green	-	Yellow	-	Yellow	Yellow	Yellow	Yellow	-
Virú	Red	Green	-	Yellow	-	-	Green	Yellow	Red	-
Chicama	Green	Green	-	-	-	Green	-	-	Yellow	-
Higuerón	-	-	-	Yellow	-	Red	Yellow	-	Green	-
Conache	Red	Green	-	Red	Red	Red	Red	Yellow	Red	Red

In the case of **La Quinta**, the implementation of a community forestry project is practically impossible, because of the fact that the owner of the area - Grupo Gloria - is not interested in long term conservation of the forest. Interest of the adjacent communities in forest conservation is little as well.

Cañoncillo would be an interesting location for a project, especially because of its biodiversity and ecological importance. The main problem in Cañoncillo is the legal dispute between the C.A.U. and a private person that claims to have bought the area. As long as this problem is not solved, it would be very difficult

to initiate a project in this forest. Furthermore, the intentions of the C.A.U. are disputed and their actual efforts and interests in nature conservation are questionable.

Calipuy would be a very interesting area because of its environmental value, but more information is needed about the nearby communities, their organization and their interest for forest conservation. Advantages of a project in Calipuy would be the direct support of the Ministry of Environment and the absence of legal disputes over the area. The major technical issue is the absence of water, which would be solved with the installation of the Palo Redondo water basin. More information about the nearby communities is needed.

The forest of **San Pedro de Lloc** could be an interesting site, apart from the current occupation of the former forest 'El Algarrobal' by illegal invaders there were no negative aspects encountered at this location. Both the Comunidad Campesina as the Municipality of San Pedro de Lloc seem to be interested in the conservation and reforestation of the area.

The researched sites in **Virú** are very small and it was chosen not to investigate them intensively, since they were difficult to reach.

The river defence project in **Chicama** was not investigated intensively, since it was only discovered during the last weeks of the investigation period in Peru. Its plus could be the cooperation of the municipality and the clear legal status. Its importance for biodiversity conservation is not very clear, but the project could have a positive impact on the economic development of the local Farmers Association.

When looking at protection of biodiversity, the **Higuerón** forest could be an interesting site, there is little information available about this forest however.

Conache suffers from major legal issues. Furthermore, interest from government institutions and local communities in its conservation are lacking, or even absent.

5. Conclusion and discussion

The main objective of this study was to find locations suitable to set up a community based project of forest conservation and reforestation. Out of ten investigated sites, only the forest Tronco Prieto is regarded as suitable. Two other areas, Calipuy and San Pedro de Lloc seem to be suitable as well, but more research is needed for a definitive judgement of these two study sites. Besides fulfilling the main objective, this study gives an inside into La Libertad's problematic around deforestation and the main restrictions for community forestry and reforestation projects. The main reasons for deforestation are overuse of the forest by local people for hunting, firewood, timber and as greasing area, together with the conversion of forest into agricultural land. This confirms statements from other literature (Mejía et al., 1991; Huamán et al., 2000). In general, it can be concluded that it is difficult to establish community forestry in the coastal zone of La Libertad. Out of the nine criteria that were examined in this study, most obstacles for a new project were related to the criteria Interest of local government authorities (4 negative judgements); Community interest for forest conservation; Relation between community and local government authorities; and Legal status (3 negative judgements). In three cases there was no, or little space available for reforestation.

The difficulties for the establishment of community forestry projects are often interlinked, disinterest (or absence of initiatives) from communities for the conservation of nearby forests is often (partly) caused by unclear legal situations and the fact that village communities have no official title to the land, where legal rights on the land motivate people to participate in communal forest management activities (Hlaing & Inoue, 2013). Results from this study indicate that the most well preserved forest sites in populous areas – Tronco Prieto, Cañoncillo, San Pedro de Lloc – are managed by a local community that has tenure or ownership rights over the area, where the local community in the forests most under pressure – Bosque Pitura, La Quinta, Conache – has close to zero legal rights on the forest. Equally, little assistance (or even obstruction) from the part of government authorities for a forest conservation or reforestation project, makes it difficult for communities or private persons to successfully initiate such activities. Little governmental support and a bad relation between local government authorities and communities often goes hand in hand with little communal interest for projects of forest conservation (La Quinta, Bosque Pitura, Conache).

The difficulties with forest conservation and reforestation in the coastal zone of La Libertad can be brought back to two main problems, which are 1) an unsatisfactory functioning political and legal system and 2) an absence of interest for forest conservation (at communal, governmental and private level). According to the World Resources Institute (2008), the important elements of “good governance” regarding forest policy are Transparency, Participation, Accountability, Coordination and Capacity. Examples from this study show problems in La Libertad with four of these five elements of good governance: (Transparency) tenure rights are unsure and people are unaware of government regulations; (Accountability) different governmental institutions are active in the same field and it is often unclear which one is responsible for what, which goes hand in hand with corruption; (Coordination) information from different governmental institutions is contradicting; (Capacity) the capacity of governmental institutions, in terms of money or man power is insufficient. In literature, the same problems are recognized for the Peruvian situation, Barrenechea and Villagarcía (2014) state that people are generally discontent about their politics, there is a poor connection between people and their government, there exist no solid political institutions and corruption is widespread, where research of Smith et al. (2006) shows that ineffective enforcement of laws and regulations, together with insecurity of property rights leads to prevalence of short term perspectives: because of insecurity it is more interesting to harvest a tree today than to let it grow for tomorrow.

The absence of interest for forest conservation is not only caused by the political situation, socio-economic problems form also a difficulty that has to be overcome in order to get local communities interested. The cases in this study show that disinterest for forest conservation is often a matter of money. Bluntly, poor farmers sell charcoal and firewood in order to survive and more powerful actors (companies, Comunidades Campesinas, politicians) convert forests into agricultural land or speculate with the land, in order to get rich. In literature, forest dependence of local communities is often regarded as a positive stimulus for forest conservation (Lise, 2000; Sudtongkong & Webb, 2008), where the cases in La Libertad show a different picture: poor, highly forest depending communities (La Quinta, Calipuy) overexploit their natural resources, where less forest depending communities (Tronco Prieto, Cañoncillo) come up with measures to conserve their woodlands. This indicates the importance of economic development and diversification of sources of income for the conservation of forests.

Despite all problems and difficulties, this study gives several positive examples of the will for forest conservation and reforestation of private persons, communities and governments, confirming the experience of Holmgren (2015). Furthermore, organizational capital does not seem to be a major restriction for communal forest management. The statement of Taylor (2006) about weak communal organizations in Peru is partly contradicted, communal organizations exist in the form of Agricultural Cooperatives and Comunidades Campesinas and have a large influence (either positive or negative) on land use management and forest conservation. Organization at village level is often difficult, because communities have few common interests and leadership is lacking.

Research restrictions

For practical reasons, the suitability of the sites was assessed in a rather simplified matter. Other authors have done detailed studies on the theories of social capital (e.g. Bebbington, 1999; Mary et al, 2007; Onyx & Bullen, 2000) and stakeholder analysis and conflict management (e.g. Renard, 2004; Grimble, 1998; Grimble & Wellard, 1997) and methods to investigate these theories. This research is however more in the tradition of Rapid Appraisals (e.g. Wilde, 2001; Evans et al., 2006): simple methods and frameworks, in order to obtain relative reliable information in a fast way. Still, the main restriction for this research was time. The ten research sites were not selected randomly but on practical grounds, it is therefore possible that other suitable locations have been overlooked. Because forest areas had to be ‘discovered’ and contact with key persons had to be made, few results were obtained during the first weeks of field work. After getting familiar with the area, key-informants were more easily found and contacted and trust from local communities was gained more rapidly. However, since the field work period was restricted to four and a half months, the suitability study of some of the sites could not be completed. Lacking in this report is an economic analysis of project establishment on each site, also due to time restrictions. A calculation of costs and benefits, for both the promoting organization (A Rocha) as the local communities could shed a different light on the feasibility of the sites and the impact of a future project. Probably, the available time could have been spent more effectively if the most promising sites were selected at an earlier stage, so that these would have been investigated more intensively. In practice an early selection of study sites turned out to

be impossible, since some locations were only come across at a later stage of the research, where other suitability assessments had already been completed. In other cases key-informants were sometimes difficult to contact. In some cases, this has led to gaps of information. Finally, the research could be improved with the incorporation of a local researcher in the team. A team of several researchers from different backgrounds, could lead to a more objective interpretation of the results and better understanding of the situation.

6. Recommendations

This chapter describes the recommendations for A Rocha. It is advised to continue investigating the study sites Tronco Prieto, Calipuy and San Pedro de Lloc, since these seem to be most promising to set up a project in the coming years. In the future, Cañoncillo could be an interesting option, if its legal problems are solved.

Tronco Prieto

Tronco Prieto is the most promising study site and it is advised to further explore the possibilities to establish a project in this forest. The community of Santonte has experience with communal management of the forest and most villagers seem to be aware of the importance of forest conservation and reforestation. In addition, it is expected that the Comunidad Campesina and local government authorities will support a community forestry project in Tronco Prieto. Tronco Prieto counts with two difficulties, which are the internal problems of the community and a somewhat difficult legal situation. These two difficulties need to be taken away, thereafter the community needs to be advised and assisted on sustainable forest management.

Most internal quarrels among the villagers of Santonte can be tracked back to bad communication during former communal projects. The disputes could be overcome with capacity building and clear communication with the community members, together with clear commitments between A Rocha and the community and between the community members themselves. It is important to create a communal organization that is accepted and respected by all community members, including the livestock keepers and those being referred to as 'The Opposition'. This organization could be formed with the inclusion of more villagers in the Asociación Muchick, or with the establishment of an entirely new communal organization. The organization should regularly call for meetings, for which all villagers are invited. It is also advised to elect a new chairman for this organization, one that is respected by all villagers.

Regarding the legal situation, it is advised to update the concession of Muchick, exactly define the concession boundaries and register these boundaries, both at the Comunidad Campesina as in the Public Registers. An explicit, signed confirmation of the Comunidad Campesina about the concession's borders is needed, the actual concession documents with verbal agreements about the location of the concession are not sufficient. Furthermore, reforestation activities in the pampa and other non-forested parts of the concession are complicated, because of the restrictions of the Archaeological Complex "El Cañoncillo". The studies that have to be done and the permits that are needed in case of artificial reforestation will be very costly. It is therefore not recommended to start planting trees outside the forest, reforestation of the degraded part of the forest is possible however. The restrictions from the Ministry of Culture could perhaps be tackled with some help of nature itself: since the El Niño event is expected to take place in Peru during the coming rainy season (NASA, 2015), reforestation of large areas will take place naturally (Holmgren et al, 2006), as long as Algarrobo seeds in combination with sufficient nutrients (in other words, droppings from browsing livestock) are available. The only thing to do in order to reforest large parts of the concession of Muchick would therefore be to close them off for cattle and people when the first rain arrives.

Besides reforestation, it is important to improve the management of the forest. More patrols are needed, especially in the morning; and clear rules on harvestable amounts and grazing periods and practices have to be made; strictly enforced and maintained. Muchick has already ordered the elaboration of a forest management plan, which could be used as a base for management rules. An overall forest inventory is needed, in order to calculate annual increment and seed production, on which the management rules should be based.

San Pedro de Lloc

With the limited available information, the forest of San Pedro de Lloc looks like a suitable site for the establishment of a community forestry project, it is advised to further investigate the uncertainties in communal interest and organization.

San Pedro de Lloc is a beautiful, old-grown forest. Furthermore, the forest is located closely to Tronco Prieto, so a combination of these two sites in one project, supported by the Comunidad Campesina and the municipality could be an option. For the forest of San Pedro de Lloc it is advised to investigate the organization, interests and capacities of the inhabitants of 'El Algarrobal', 'El Amauta', the adjacent farmers, and the Mingo family. The municipality and Comunidad Campesina are rather enthusiastic about a future project in the area and its implications for the local environment and economy. It is however important to investigate the needs and wishes of the local communities intensively and to guaranty the incorporation of the communities in the decision making process. The illegally built houses in El Algarrobal will definitely form a difficulty in the process to communal forest conservation. The municipality wants to remove the buildings in order to make room for reforestation, although it is questionable whether this is practically possible. It is important to make sure that the inhabitants of El Algarrobal do not perceive the community forestry project as municipality driven. From the point of rural development, it might be a better solution to plant trees in between the houses and let the inhabitants of this neighbourhood take part in the management of the forest.

Calipuy

Little is known yet about Calipuy, its ecological importance is undoubted however. More information is needed about the interests and circumstances of the nearby communities. In addition, the water scarcity problem needs to be solved, in order to make reforestation possible.

It is advised to investigate whether the nearby communities are interested in taking part in reforestation and conservation of the national park, as was stated by the park's director. If so, communal organizations need to be formed and trained in forest conservation practices. With the support of the Ministry of Environment and possibly other funding partners (Annex IV) a community forestry project lies within reach. Looking at the economic situation of the nearby communities and their distance to the reforestation area, it might be necessary for the project to already start producing economic benefits within a short period of time, for example in the form of bush meat (Cañán) or the processing of Algarrobo pods into cattle fodder and products for human consumption.

The obstacle of water scarcity will probably be solved with the creation of the Palo Redondo water basin. The planning of the water basin is still unclear however and it is not yet known when it will be finished. In case a reforestation project would be initiated on short term, the El Niño phenomenon might also help to solve the water scarcity problem in Calipuy.

Cañoncillo

A project in Cañoncillo can only be implemented if the legal situation of the area would improve. If the problems with tenure rights would be solved, it is advised to further investigate the intentions and functioning of the C.A.U. Tecapa.

As long as the C.A.U. is in dispute with the private person that bought Cañoncillo, a project cannot be established, if it is only supported by one of them. A possibility would be to bring both 'owners' together in order to find a solution for the problem. This would be difficult, looking at the nature of the dispute. In the meantime, the C.A.U. can only be assisted with advice on forest management, training of its staff and capacity building among its members, without any legal commitments between A Rocha and the C.A.U. A project in the nearby forests of Tronco Prieto or San Pedro de Lloc could also be used to improve the situation of Cañoncillo. Both options are not ideal however, so it is advised to establish a project in one of the three other areas mentioned above.

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Annexes

This report contains the following annexes:

- I. Applied research methods per area
- II. Overview of important organizations
- III. Proposed reforestation projects
- IV. Identified stakeholders per study site
- V. Large maps
- VI. Species existing in Tronco Prieto
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I. Applied research methods per site

This Annex gives an overview of the applied methods and number of executed interviews per study site.

Appendix table I: The amount of interviews taken and the exact applied research methods differ from site to site.

Study site	Number of interviews (respondents)	Function respondents	People contacted per mail	Village meeting (number)	Number of transect walks	Official documents reviewed
Tronco Prieto	25 (21)	Agriculturalists Santonte, professor local school, Teniente Gobernador, village mayor, government officials (Ministries of Agriculture and Culture, SENASA, government of La Libertad), representatives Municipality of San Pedro de Lloc, representatives Comunidad Campesina San Pedro de Lloc, representatives of NGO CEDEPAS Norte and UNDP	Professors of local universities, Municipality of San José	Yes (2)	3	GRAAT, PEJEZA, Ministry of Culture, Comunidad Campesina San Pedro de Lloc
Bosque Pitura	9(7)	Agriculturalists Portada de la Sierra, village mayor, government representatives (Ministries of Agriculture and Culture), director Village Ronda, representatives of Comunidad Campesina San Pedro de Lloc	Former professor of local school	No	2	GRAAT, PEJEZA, Ministry of Culture, Comunidad Campesina San Pedro de Lloc
La Quinta	12 (9)	Agriculturalists Mocan and La Quinta, village mayors, representatives Casa Grande, government officials (Ministry of Agriculture)		Yes (1)	2	Casa Grande S.A.
Cañoncillo	12 (12)	Agriculturalists Tecapa and Santonte, professor local school, government officials (Ministry of Culture), representatives Municipality of San Pedro de Lloc, representatives Comunidad Campesina San Pedro de Lloc, representative UNDP, administration C.A.U. Tecapa, university professors	Professors of local universities, former professor of local school	No	1	Plan Maestro Cañoncillo (management plan), SERNANP
Calipuy	2 (2)	Director National Reserve, park guard National Reserve	Representatives GIZ	No	1	Plan Maestro Calipuy (management plan)
San Pedro de Lloc	6 (6)	Representatives Municipality of San Pedro de Lloc, representatives Comunidad Campesina San Pedro de Lloc, mayor San Pedro de Lloc		No	2	Municipality San Pedro de Lloc
Virú	6 (6)	Representatives Casa de la Cultura Virú, mayor Puente		No	1	-

		Virú, agriculturalist (Sector Poza del Gato)				
Chicama	5 (4)	Representatives Municipality of Chicama, mayor of Chicama, directors of company executing the project, government officials (Ministry of Agriculture)		No	0	-
Higuerón	5 (5)	Government officials (Ministry of Agriculture), Mayor Mocan, agriculturalists Mocan and La Quinta		No	0	-
Conache	2 (2)	Government official (Ministry of Agriculture), owner of area		No	1	Plan Manejo Forestal Conache

II. Overview of important organizations

This Annex gives an overview of the important organizations active in the field of land use management and reforestation in La Libertad.

Ministry of Agriculture and Irrigation (MinAgri)

The Ministry of Agriculture is responsible for the management of forest resources, the assigning of forest concessions on state-owned land and the enforcement and control of rules and regulations on forest resources. The Ministry of Agriculture is in La Libertad represented by the regional office (Gerencia de Agricultura) in Trujillo and the local offices (Agencias Agrarias) in most provincial capitals.

Ministry of Culture (Ministerio de Cultura)

The Ministry of Culture is responsible for the conservation and protection of cultural heritage and the management of archaeological heritage sites. Since forests are often located within these sites, the Ministry of Culture can have an influence on the possibilities for reforestation activities. The Ministry of Culture has an office in Trujillo (Dirección Desconcentrada).

Ministry of Environment (MINAM)

The Ministry of Environment consists of various entities, of which the SERNANP and OEFA are the most important.

National Service for Natural Areas Protected by the State (SERNANP)

The SERNANP is the organization responsible for the establishment of technical and administrative criteria for the conservation of Natural Protected Areas and take precautions for the management of biodiversity. The SERNANP is in charge of administration of state-owned national parks and monitoring and law enforcement of non-state-owned natural protected areas. (SERNANP, 2015)

Organism of Environmental Evaluation and Prosecution (OEFA)

The OEFA is the governmental entity in charge of environmental law enforcement and prosecution. The OEFA has the goal to guaranty an economic development in harmony with the natural environment. (OEFA, 2015)

National Public Registers (SUNARP)

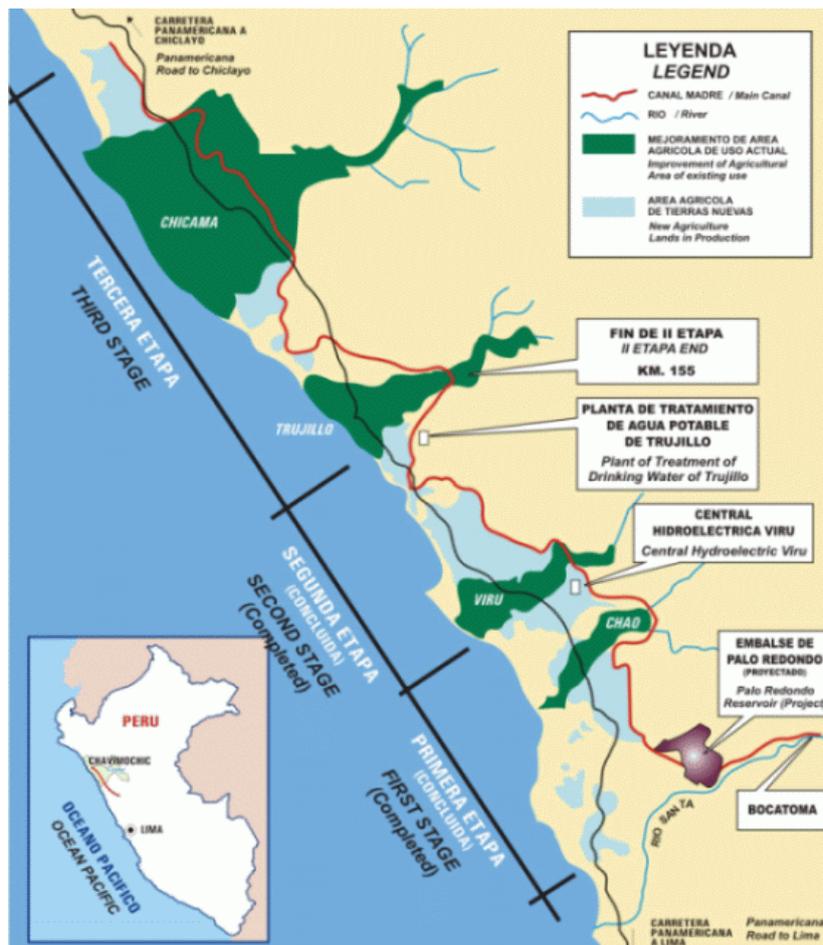
The National Public Registers are the governmental body that administrates and manages the registration and publication of legal acts, contracts and land titles (SUNARP, 2015). The SUNARP is part of the Ministry of Justice and Human Rights.

The Regional Administration for the Administration and Sale of Terrain (GRAAT) La Libertad

The GRAAT is the regional governmental body, in charge of the promotion, management and administration of agricultural property in rural areas and is part of the Department of La Libertad. (GRAAT La Libertad, 2013) The GRAAT has the objective to formalize and legalize agricultural property.

The Special Project of Chao, Virú, Moche and Chicama (CHAVIMOCHIC)

CHAVIMOCHIC is one of the large scale irrigation programs of the Peruvian government, responsible for the valleys of Chao, Virú, Moche and Chicama and the bare lands in between. The objectives of the project are the improvement of water availability and privatization of state-owned land and comprises of canals, hydroelectricity plants, an artificial lake, water cleaning facilities and the sale of public land to private investors and farmers. The infrastructure of the project consists of three stages (Etapas). An overview of the project's infrastructural works is shown in Appendix figure I. CHAVIMOCHIC is part of the Regional Government of La Libertad.



Appendix figure I: The Project CHAVIMOCHIC consists of a mother channel (red line) and various infrastructural works in the valleys of Chao, Virú, Moche and Chicama (green areas).

Proyecto Especial de Jequetepeque y Zaña (PEJEZA)

PEJEZA is a project similar to CHAVIMOCHIC, active in the valleys of Jequetepeque and Zaña, in the north of La Libertad and in the neighbouring departments Cajamarca and Lambayeque. PEJEZA is part of the Ministry of Agriculture and is a national institution. (PEJEZA, 2015)

Comunidades Campesinas (Peasant Communities)

The Comunidades Campesinas are rural communities formed by farmers and farmers cooperatives that own land and provide this to their members.

According to the “Law on Comunidades Campesinas”, the Comunidades Campesinas are “legally recognized organizations of public interest. They were formed by families that occupy certain territories, and are attached to these areas by ancestral, social, economic and cultural bonds. The Comunidades Campesinas are characterized by communal property of the land, communally executed work, mutual assistance among its members, a democratic organization and development of multisector activities, in order to make full development of its members and the country possible.” (Campo, 1987)

Village Rondas

“Self-defence committees (Rondas) were set up to protect communities from the threat of terrorism in the 1980s and early 1990s, and have been retained despite the abating of the conflict. In rural areas, Rondas now consist of men who patrol the area around the village at night, primarily to deter animal rustlers. They also intervene in local disputes, and may administer punishments for petty thefts or other misdemeanours.” (Silva et al., 2007) In the case of Portada de la Sierra the Ronda is active against illegal loggers in the area

III. Proposed reforestation projects

The following reforestation projects in La Libertad's coastal zone are proposed by the government of La Libertad in the Regional Reforestation Plan 2012-2021 (Región La Libertad, 2011). A project in Tronco Prieto, Bosque Pitura, Cañoncillo, Calipuy, San Pedro de Lloc, Chicama or Virú would directly contribute to the reforestation plan.

Trujillo:

1. Reforestation with native species of the borders of the Moche River, in the districts of Simbal, Laredo and Poroto (300 hectares).
2. Reforestation of the River Moche basin with native species (500 hectares).

Chepén/Pacasmayo

1. Broadening of the irrigation canal in the sector Pitura-Pampas de Huereque, in order to establish 1000 hectares of plantation of Algarrobo and Tara, which could form a buffer zone around the Cañoncillo forest, in order to stop its rapid deforestation. (sites Cañoncillo, Tronco Prieto, San Pedro de Lloc)
2. Reforestation of the borders of the rivers Chaman and Jequetepeque, with native forest species (2000 hectares). (site Bosque Pitura)
3. Conservation and improvement of the watershed area of the lake of Moncoche and Pacasmayo.

Ascope

1. Reforestation of the borders of the Chicama river, with the objective to protect the province of Ascope. (site Chicama)
2. Sustainable management of the watershed areas in the province of Ascope.
3. Recovery and valuation of native species. (sites La Quinta, Chicama)
4. Capacitation of families about protection of the environment.

Virú

1. Reforestation of the borders of the Virú and Huamansaña River, with native species.
2. Reforestation of 500 hectares of Tara and Algarrobo in the lower part of the province, using drip irrigation. In order to recuperate the Cañán population. (sites Virú, Calipuy)

IV. Identified stakeholders per study site

This annex gives an overview of the stakeholders that were identified in the study sites. The overview can be used as a starting point to (re)contact stakeholders when it would be decided to establish a project in one of the investigated sites.

Tronco Prieto

Asociación Muchick

The members of the Asociación say to be in favour of any reforestation and or forest conservation project, there is however some distrust between them and some other community members, especially those being referred to as 'The Opposition'. 'The Opposition states that the members of the Asociación are acting as owners of the forest, rather than as communal protectors and even allow the illegal cutting of trees. The Asociación would not call for village reunions and would hold the other village members outside decision making. The distrust between the two groups is partially based on quarrels in the past, during the PNUD period in Cañoncillo and the CEDEPAS period in Tronco Prieto.

'The Opposition' in Santonte

A group of inhabitants of the community of Santonte disagrees with the Asociación on the way Tronco Prieto is managed. The 'Opposition' is represented by three villagers, one of them is the Teniente Gobernador. The three representatives of this group all used to be involved in the conservation of Cañoncillo and Tronco Prieto and are in favour of forest conservation and reforestation projects. They state that such a project should be beneficiary for the whole community and not for just one group (referring to the Asociación Muchick).

Livestock keepers

The livestock keepers of Santonte (growing goats and bovine cattle) rely heavily on the forest to feed their animals. They are obliged to pay a fee for the use of the forest, which they not always do. Other village members state that the livestock keepers put a pressure too high on the forest and that they are not concerned enough about forest protection and conservation.

Other inhabitants of Santonte

The inhabitants of Santonte use the forest Tronco Prieto as a source of firewood and timber; to feed their animals and for hunting. Almost all inhabitants have their own agricultural plots and work most of the time on their fields. Some of them are more active in the actual conservation of the forest than others. During the village meeting almost no people that are not regarded as either member of the Asociación Muchick or 'The Opposition' spoke out loudly.

Teniente Gobernador Santonte

The Teniente Gobernador of Santonte is a representative of the government and is responsible for law and order. He plays an important role within the community, but is not trusted by all inhabitants of the village.

Mayor Santonte

The mayor of Santonte underlines the importance of conservation of Tronco Prieto. Her capacity is however disputed by part of the community.

Agency of Agriculture- Office of San Pedro de Lloc

The Ministry of Agriculture (provincial seat in San Pedro de Lloc), in the person of Eng. Marco Rabanál has always supported the Asociación and its intentions with capacitation, advice and regular visits. Recently Eng. Rabanál has been transferred to another office and is temporarily replaced by the head of the San Pedro de Lloc office (Eng. Rázurri). In the case of a new reforestation and/or forest conservation project the Agency of Agriculture would assist technically, it can also assist with the punishment of illegal loggers. It has however little budget, which makes it often difficult to take action.

Ministry of Culture- La Libertad

The Ministry of Culture has not a very positive relationship with the Asociación Muchick after the intervention in the Cultural Heritage Site. However, as long as the necessary steps regarding protection of the archaeological heritage are taken, Culture would not oppose a reforestation with Algarrobo in the area.

Municipality of San Pedro de Lloc

The forest Tronco Prieto is located within the boundaries of the district of San Pedro de Lloc. The administration of the Municipality changed last January (2015) and the new administration states that nature conservation and sustainable development will be important focal points for the coming years. The Municipality of San Pedro de Lloc has a nursery from which seedlings could be supplied in case of a reforestation project. The new administration also wants to fight more actively against illegal logging, working together with the Ministry of Agriculture, the Fiscalía (Prosecutor) and village communities themselves.

Municipality of San José

The village of Santonte is in a process of transfer between the districts San Pedro the Lloc and San José. Only the final steps have to be taken before the transfer becomes official. The forest Tronco Prieto remains in the district of San Pedro however. The Municipality of San José has assisted the Asociación Muchick with the provision of irrigation tubes for reforestation of the forest.

Administration of Natural Resources La Libertad

The office of the Administration of Natural Resources La Libertad in Trujillo is enthusiastic about reforestation projects in the area around San Pedro de Lloc, endorsing the importance of conservation of the Algarrobales in the region. A reforestation project in this area would also fit in the Reforestation Plan of La Libertad. The Administration of Natural Resources therefore offers technical assistance to any nature conservation project in the area.

Private Reserve “El Cañoncillo”

The nearby Private Reserve “El Cañoncillo” is owned by the Cooperation of Tecapa (C.A.U.) and is the largest and most biodiverse forest in the area. Cañoncillo is under high pressure of illegal logging, even more since Tronco Prieto is guarded more intensively. Inhabitants of Santonte sometimes assist in the protection of Cañoncillo. Cooperation between C.A.U. and Asociación Muchick is not always regarded as satisfactory.

Secondary school of Tecapa

Professors of the nearby secondary school in Tecapa have declared to be interested to take part in environmental and reforestation programs in the area, as part of their curriculum. In the past, professors of the school in Tecapa assisted in the conservation of Cañoncillo.

Comité Gestión (Governance Council)

The Comité Gestión is a group of villagers that is responsible for public village activities and is should be a link between villagers and the local authorities. The head of the Comité is part of ‘The Opposition’ and lives in Trujillo.

Bosque Pitura

Ronda Portada de la Sierra

The Ronda is formed by inhabitants of Portada de la Sierra and fights against illegal logging in Bosque Pitura.

Mayor Portada de la Sierra

The mayor of Portada de la Sierra underlines the importance of Bosque Pitura for the community is positive about conservation initiatives. His actual efforts in the fight against deforestation and illegal logging are regarded as limited.

Members Comunidad Campesina San Pedro de Lloc

Inhabitants of Portada de la Sierra with concessions of the Comunidad Campesina of San Pedro de Lloc have their agricultural plots mostly located on land that was historically used for agriculture, west of Bosque Pitura.

Members Comunidad Campesina Trinidad

Many recent immigrants in Portada de la Sierra are member of the Comunidad Campesina of Trinidad. Trinidad gives them agricultural concessions against a yearly payment. The agricultural lots are located on legally disputed land, sometimes within the forest. The individual concession holders of Trinidad are responsible for a significant part of the deforestation in the area.

Comunidad Campesina San Pedro de Lloc

The Comunidad Campesina of San Pedro de Lloc is perceived by most government institutions as the legal owner of Bosque Pitura and Cerro Pitura. San Pedro de Lloc has for many years neglected the area, which has led to claims of the Comunidad Campesina of Trinidad over the ownership of the area.

Comunidad Campesina of Trinidad

Trinidad is a Comunidad Campesina from Cajamarca that claims to be the legal owner of (parts of) Cerro Pitura and Bosque Pitura. Trinidad has divided Bosque Pitura into parcels and gives these in concession to its members.

Ministry of Culture – Cajamarca

The Regional Office of the Ministry of Culture in Cajamarca has initiated a process to declare Cerro Pitura Cultural Heritage of the Nation and has executed several investigations in the area.

Ministry of Culture – La Libertad

The Regional Office of the Ministry of Culture in Trujillo does not take part yet in the process to declare Cerro Pitura a National Heritage Site.

Agency of Agriculture – Office of San Pedro de Lloc

The Agency of Agriculture in San Pedro de Lloc has executed some interventions against illegal logging in Bosque Pitura. Due to restricted budget and manpower, the Agency's influence is limited however.

La Quinta

Inhabitants Mocan and La Quinta

The inhabitants of Mocan and La Quinta are mostly small scale farmers cultivating crops and/or keeping livestock. They use the forest as a source of commercial and self-subsistence products. Large parts of the communities rely on the forest for their survival, there are however few signs of interest for (communal) forest conservation.

Individual farmers with land claims

Some farmers in the area dispute with Casa Grande about tenure rights over agricultural land. The land was used by the farmers to cultivate crops or as a grazing land and is now occupied by Casa Grande. Some farmers want to plant trees on these disputed lands.

Casa Grande/Grupo Gloria

Casa Grande is the owner of the forest. The company has an ambiguous relation with the communities in the area: it is both the largest employer of the area as a cause for many environmental problems and tenure conflicts. Casa Grande has the objective to converse the forest into agriculture.

Employees of Casa Grande

The employees of Casa Grande are accused of illegally cutting of trees and robbing of archaeological artefacts for their own benefit.

Ministry of Culture - La Libertad

The Ministry of Culture has a dispute with Casa Grande about the illegitimate exploration of parts of the forest where archaeological rests have been found, causing damage to cultural heritage.

Cañoncillo

C.A.U. Tecapa

The C.A.U. is a cooperative organization formed by inhabitants of the villages Tecapa, Santa María de Tecapa, Pueblo Nuevo, Portada de la Sierra and Campanitas and has 140 actual members. The C.A.U. is the owner and managing authority of Forest El Cañoncillo and is responsible for guarding, protecting and cleaning of the forest and managing of the revenues coming from the forest. The C.A.U. is accused of abuse of its funds and inadequate protection of the forest against illegal logging and degradation.

Livestock keepers

Many farmers living around Cañoncillo use the forest as grazing for their livestock (mostly goats, but also horses and bovine cattle). Use of the forest for livestock keepers is not well regulated and overgrazing of Cañoncillo leads to further degradation of the forest.

Inhabitants of Tecapa, Santonte, Santa María de Tecapa and adjacent farmers

These villages are located most closely to Cañoncillo, there inhabitants therefor frequently use the forest for the harvest of timber and other forest products and as grazing area.

Inhabitants of other communities

Cañoncillo is also used by inhabitants of villages farther away from the forest (like San Pedro de Lloc, San José, and Mazanca).

Mr. Pasos

Mr. Pasos bought Cañoncillo around the year 2004. The sale is conceived as illegal by the C.A.U., but leads up to date to uncertainty about the forest's legal status.

Tourists

Cañoncillo is annually visited by thousands of tourists, coming from the direct surroundings, but also from Trujillo and Lima. The tourists have to pay an entrance fee of 2 soles and can walk freely through the park or follow a guided tour.

National University of Trujillo, Pontifical Catholic University of Peru (Lima), Agricultural University La Molina (Lima)

Professors and students of the National University in Trujillo and Catholic University and Agricultural University in Lima have executed various studies on the management, biodiversity and cultural and economic importance of Cañoncillo and often give advice the C.A.U. on forest management.

Ministry of Culture – La Libertad

Since the forest is located within the National Cultural Heritage Site “El Cañoncillo”, regulations of the Ministry of Culture have an important influence on the management of Cañoncillo. In case of activities that could disturb the soil or water streams, the Ministry should be informed and asked for advice about possible consequences for the above and belowground archaeological heritage.

Calipuy

Nearby communities

The communities that are most closely located to the reforestation site are Tanguche, Vinzón and Suchimán. The people living in these communities make use of the natural resources of the National Park and its buffer zone. Calipuy has the objective to incorporate these people in decision making and management of the park.

SERNANP

The SERNANP is in charge of the management of National Park Calipuy and the Buffer Zone that surrounds it.

Proyecto Especial CHAVIMOCHIC

Most of the land of the buffer zone is owned and managed by CHAVIMOCHIC. The starting point of CHAVIMOCHIC's main canal, the 'Bocatoma' is located within Calipuy and the National Park is crossed by several canal of the project. The artificial lake Palo Redondo is also part of CHAVIMOCHIC, the water captured in Palo Redondo will be available for reforestation of the area

GIZ/KfW

The German development company GIZ used to be partner of the SERNANP and helped to professionalize its management of protected areas, through the "Tri-national Initiative: Strengthening of National Systems of Protected Natural Areas in Colombia, Ecuador and Peru" (GIZ, 2015). The project ended in March 2015. The German development bank KfW is a possible financial partner in the reforestation of parts of Calipuy.

Universidad Nacional de Trujillo – Virú seat

The Virú auxiliary branch of the National University of Trujillo is a partner of the SERNANP for research in Calipuy and its surroundings.

Casa de la Cultura Virú

The Casa de la Cultura Virú, a private initiative to promote all facets of local culture – including the natural heritage of the province of Virú – assists the SERNANP in research, education and local promotion of Calipuy.

San Pedro de Lloc

Inhabitants El Amauta

El Amauta is a small community next to the San Pedro de Lloc forest, partly inhabited by teachers of primary and secondary schools in the area.

Inhabitants El Algarrobal

The inhabitants of El Algarrobal live, according to the Municipality of San Pedro de Lloc, in illegally built houses. El Algarrobal used to be an Algarrobo forest which was cut, mainly to build these houses.

Mingo family

The Mingo family has a concession of the Comunidad Campesina that comprises a large part of the forest of San Pedro de Lloc. This makes them the legal tenure rights holders over this piece of forest.

Individual members Comunidad Campesina with agricultural fields

The forest is surrounded by agricultural plots which are cultivated by members of the Comunidad Campesina.

Municipality of San Pedro de Lloc

The Municipality is the owner of El Algarrobal and La Yuca and wants to conserve the existing forests and reforest both areas.

Comunidad Campesina San Pedro de Lloc

The Comunidad Campesina owns most of the forest and the area surrounding it and is willing to assist in forest conservation and reforestation.

Virú

Casa de la Cultura Virú

The Casa de la Cultura Virú, a private initiative to promote all facets of local culture – including the natural heritage of the province of Virú – is developing a reforestation project on the two visited sites in Virú. The Casa de la Cultura has good connections with the Municipalities of Virú and Puente Virú.

Farmer Poza del Gato

The concession holder of Poza del Gato, a farmer that owns an adjacent agricultural field, uses the forest as grazing area for his cattle. He claims to be protecting and reforesting Poza del Gato and is assisted by the Casa de la Cultura.

Mayor Puente Virú

The mayor of Puente Virú is the owner of one of the two investigated sites. He wants to reforest his property with Algarrobo in order to produce Cañán meat for the local market. The mayor gets assistance from the Casa de la Cultura.

Ministry of Culture – La Libertad

Next to forest Poza del Gato an archaeological heritage site is located. The site has been invaded by local farmers who illegally cultivate crops on the terrain.

Chicama

Municipality of Chicama

The Municipality of Chicama is the initiator of the river defence and reforestation project near the Chicama River and funds a large part of the project. The Municipality has the intention to set-up a project for the processing of Algarrobo pods, in order to economically develop the area.

Farmers Association

A local farmers association owns the land on which the afforestation is planned. The land is currently not in use and the association would be interested in afforestation of the area. The afforested area can be used as a source of fodder, firewood and other forest products.

Project Management Consulting S.A.C.

Project Management Consulting is in charge of the execution of the river defence project and is willing to assist in afforestation of the area and allocate part of its budget to the forestation project.

Higuerón

Mi Valle Tours

Mi Valle Tours is a private organization that promotes cultural identity, education and tourism in the district of Chicama. Mi Valle Tours organises trips to El Higuerón for students and tourists and is looking for ways to protect the forest.

Conache

Owner Lake Conache

The owner of the lake and restaurant near the forest has applied for a forest concession and wants to conserve the forest.

Nearby farmers

Inhabitants of the area regularly intrude the Conache forest to harvest trees. Crops are also cultivated inside the forest.

Ministry of Agriculture – La Libertad

The forest is state-owned land, which makes the Ministry of Agriculture responsible for the administration of the terrain. The owner of the Conache Lake applied for a forest concession for the first time ten years ago. Since then, the process was delayed several times and the forest concession has up to now not been granted.

Municipality of Laredo

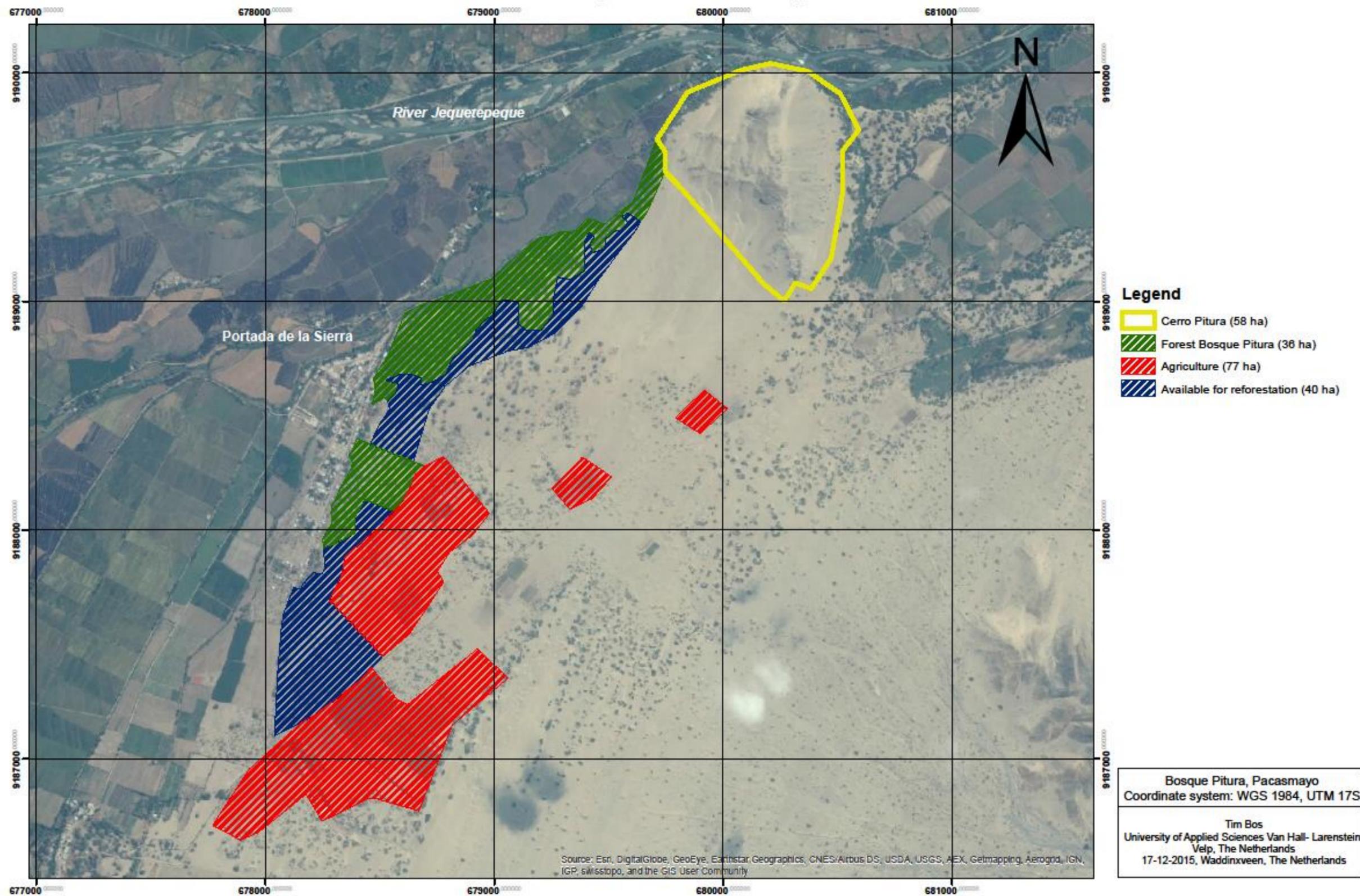
Within the Municipality of Laredo some people would like to see the forest cut down and replaced by houses. This frustrates the granting of a forest management concession.

V. Large maps

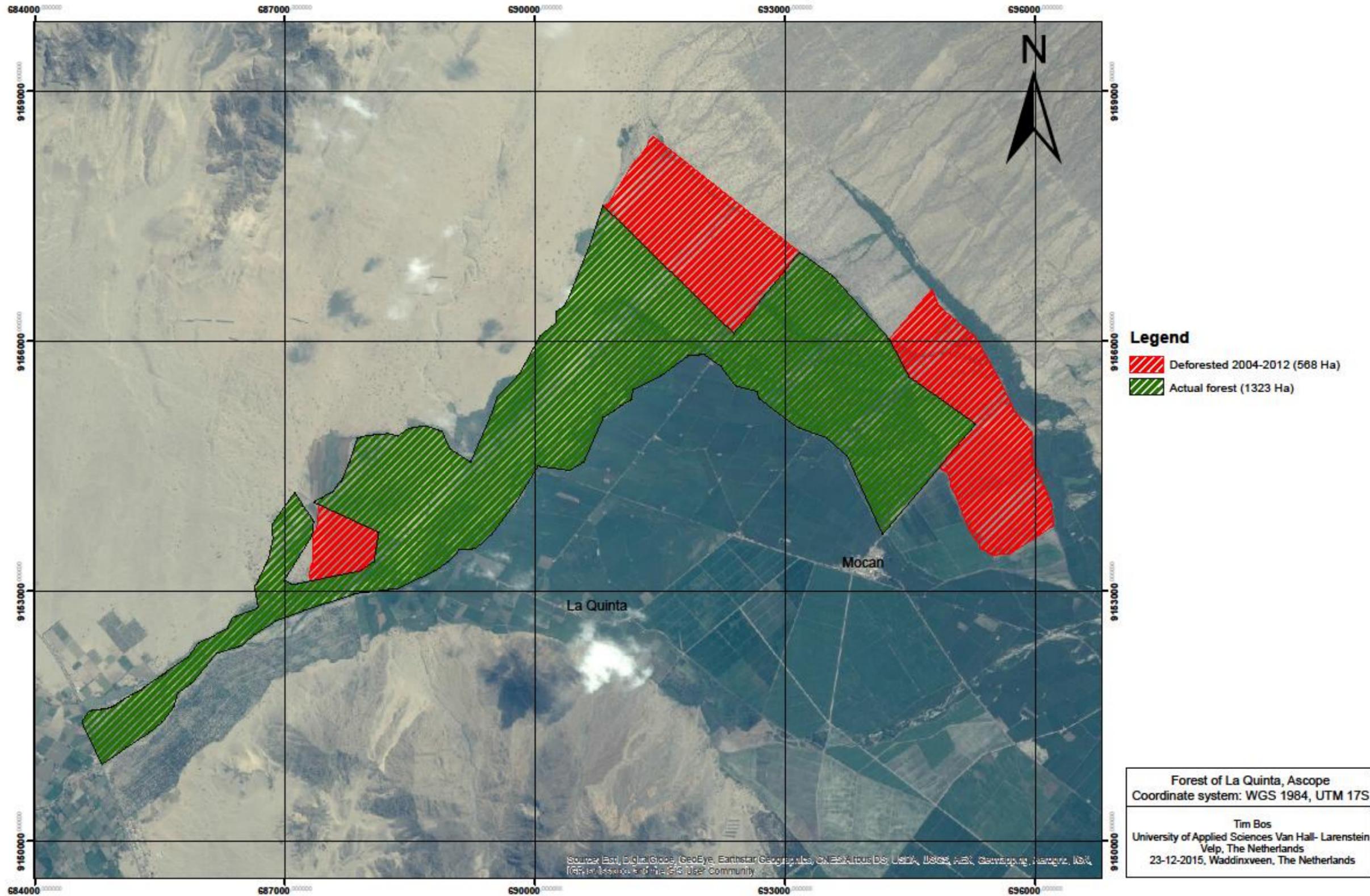
This Annex contains the following large-sized maps:

- Bosque Pitura
- Forest of La Quinta
- Archaeological Complex “El Cañoncillo”
- National Reserve Calipuy
- Forest of San Pedro de Lloc

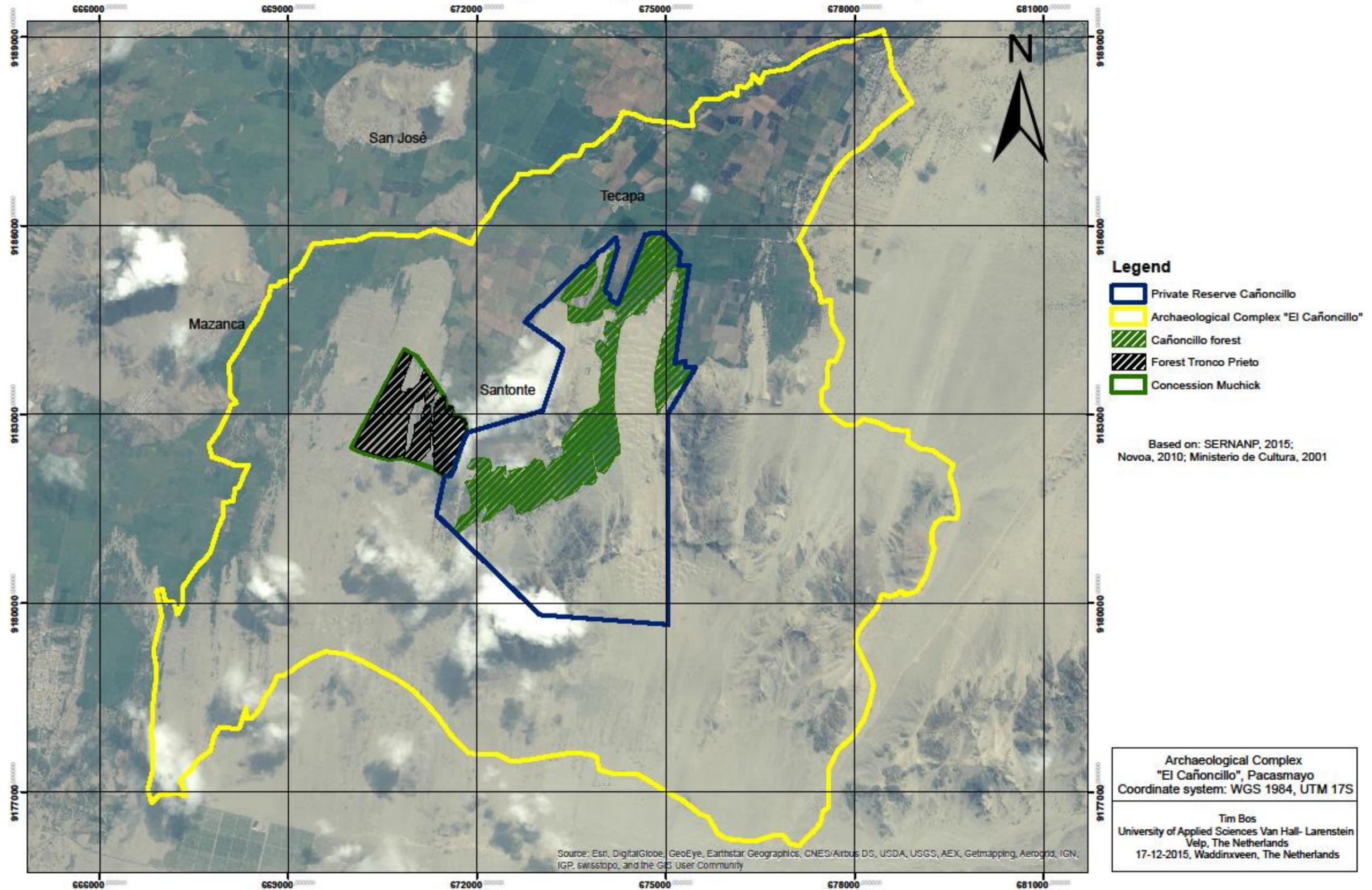
Bosque Pitura, Pacasmayo



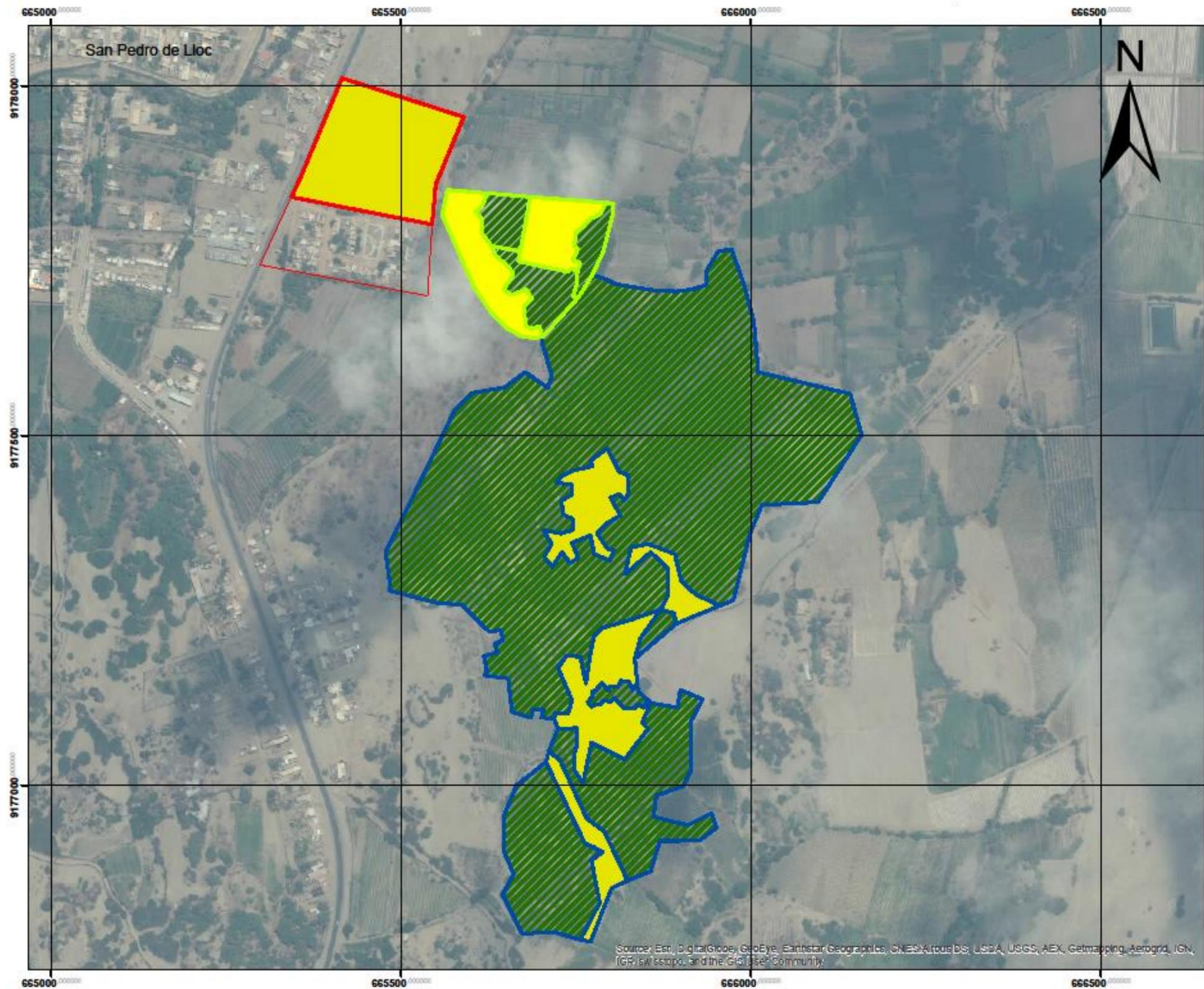
Forest of La Quinta, Ascope



Archaeological Complex "El Cañoncillo", Pacasmayo



Forest of San Pedro de Lloc, Pacasmayo



Legend

- El Amauta (2.3 Ha)
- El Algarrobal Reforestation (3.2 Ha)
- La Yuca Forest (1.6 Ha)
- La Yuca Reforestation (1.9 Ha)
- Mingo Forest (27.7 Ha)
- Mingo Reforestation (3.7 Ha)

Based on:
Municipalidad San Pedro de Lloc, 2015

Forest of San Pedro de Lloc, Pacasmayo
Coordinate system: WGS 1984, UTM 17S

Tim Bos
University of Applied Sciences Van Hall- Larenstein
Velp, The Netherlands
17-12-2015, Waddinxveen, The Netherlands

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGR, swisstopo, and the GIS User Community

VI. Species existing in Tronco Prieto

Based on interviews with inhabitants of Tronco Prieto

Family	Scientific name	Vernacular name	IUCN Red-List
Mammals			
CANIDAE	<i>Pseudalopex sechurae</i>	Zorro costeño	NT ^a
SCURIDAE	<i>Sciurus spp.</i>	Ardilla	LC ^a
Birds			
COLUMBIDAE	<i>Columbidae spp.</i>	Paloma	
FURNARIIDAE	<i>Furnarius leucopus</i>	Chilala	LC ^a
MIMIDAE	<i>Mimus longicaudatus</i>	Chisco	LC ^a
Reptiles			
IGUANIDAE	<i>Iguana iguana</i>	Iguana	-
TEIIDAE	<i>Dicrodon holmbergi</i>	Cañan/Lagartija	-
TEIIDAE	<i>Callopietes flavipunctatus</i>	Pacazo	-
Plants			
FABACEAE	<i>Acacia macracantha</i>	Espino/Faique/Huarango	NT ^b
FABACEAE	<i>Prosopis pallida</i>	Algarrobo/Huarango	VU ^b

^a IUCN-status derived from <http://www.iucnredlist.org/> (IUCN, 2015)

^b IUCN-status derived from *Plan Maestro Calipuy 2015-2019* (Moquillaza, 2015)

vii. Species existing in La Quinta

Based on interviews with inhabitants of La Quinta and Mocan

Family	Scientific name	Vernacular name	IUCN Red-List
Mammals			
CANIDAE	<i>Pseudalopex sechurae</i>	Zorro costeño	NT ^a
MEPHITIDAE	<i>Conepatus chinga</i>	Zorrillo	LC ^a
FELIDAE	<i>Leopardus colocolo</i>	Gato monés	NT ^a
Birds			
FURNARIIDAE	<i>Furnarius leucopus</i>	Chilala	LC ^a
COTINGIDAE	<i>Phytotoma Raimondii</i>	Corta Rama	EN ^a
N.N	N.N.	“Para Caballo”	-
Reptiles			
IGUANIDAE	<i>Iguana iguana</i>	Iguana	-
TEIIDAE	<i>Dicrodon holmbergi</i>	Cañan/Lagartija (almost extinct)	-
Plants			
CAPPARIDACEAE	<i>Capparis scabrida</i>	Zapote/Sapote	CR ^b
FABACEAE	<i>Acacia macracantha</i>	Espino/Faique/Huarango	NT ^b
FABACEAE	<i>Prosopis pallida</i>	Algarrobo/Huarango	VU ^b

^a IUCN-status derived from <http://www.iucnredlist.org/> (IUCN, 2015)

^b IUCN-status derived from *Plan Maestro Calipuy 2015-2019* (Moquillaza, 2015)

VII. Species existing in Cañoncillo

Based on an environmental impact study for Cañoncillo (Delgado et al., 2008) and the area's management plan (Novoa, 2010).

Family	Scientific name	Vernacular name	IUCN Red-List
Mammals			
CANIDAE	<i>Pseudalopex sechurae</i>	Zorro costeño	NT ^a
CHINCHILLIDAE	<i>Lagidium peruanum</i>	Vizcacha costera	LC ^a
CRICETIDAE	<i>Paralomys gerbillus</i>	Ratón	LC ^a
FELIDAE	<i>Leopardus colocolo</i>	Gato monés	NT ^a
MEPHITIDAE	<i>Conepatus semistriatus</i>	Añás	LC ^a
MUSTELIDAE	<i>Eira barbara</i>	Hurón	LC ^a
SCIURIDAE	<i>Sciurus ramineus</i>	Ardilla nuca blanca	-
Reptiles			
BOIDAE	<i>Boa constrictor ortonii</i>	Boa de costa	-
COLUBRIDAE	<i>Mastigodryas boddaertii</i>	Corredora	-
ELAPIDAE	<i>Micrurus tschudii</i>	Coralillo/Coral	-
IGUANIDAE	<i>Iguana iguana</i>	Iguana	-
TEIIDAE	<i>Dicrodon holmbergi</i>	Cañan/Lagartija	-
TROPIDURIDAE	<i>Tropidurus occipitalis</i>	Lagartija	-
VIPERIDAE	<i>Bothrops barnetti</i>	Sancaranca	-
Birds			
ANATIDAE	<i>Oxyura vittata</i>	Zambullidor	-
COLUMBIDAE	<i>Columbidae spp.</i>	Paloma	-
FURNARIIDAE	<i>Synallaxis stictothorax</i>	Pijuí collarejo	LC ^a
MIMIDAE	<i>Mimus longicaudatus</i>	Chisco	-
RALLIDAE	<i>Fulica Americana</i>	Gallareta	-
STRIGIDAE	<i>Athene cunicularia</i>	Lechuza de los arenales	-
THAMNOPHILIDAE	<i>Sakesphorus bernardi</i>	Batará acollarado	LC ^a
TROGLODYTIDAE	<i>Cantorchilus superciliaris</i>	Carachero cejón	-
Visiting birds			
CATHARTIDAE	<i>Vultur gryphus</i>	Cóndor andino	NT ^a
PANDIONIDAE	<i>Pandion haliaetus carolinensis</i>	Águila	LC ^a
ACCIPITRIDAE	<i>Parabuteo unicinctus</i>	Gavilán	LC ^a
ARDEIDAE	<i>Egretta thula</i>	Garza	LC ^a
Plants			
APOCYNACEAE	<i>Vallesia glabra</i>	Cuncuno	-
ASTERACEAE	<i>Baccharis glutinosa</i>	Chilco	-
ASTERACEAE	<i>Tessaria integrifolia</i>	Pájaro bobo	-
ASCLEPIADACEAE	<i>Asclepias curassavica</i>	Fosforito	-
ASCLEPIADACEAE	<i>Funastrum dombeyanum</i>	Amarra de judío	-
BORAGINACEAE	<i>Tiquilia spp.</i>	Flor de arena	-
CACTACEAE	<i>Neoraimondia gigantean</i>	Gigantón	-
CACTACEAE	<i>Setaria verticillata</i>	Rabo de zorro	-

^a IUCN-status derived from <http://www.iucnredlist.org/> (IUCN, 2015)

^b IUCN-status derived from *Plan Maestro Calipuy 2015-2019* (Moquillaza, 2015)

CAPPARIDACEAE	<i>Capparis avicenniifolia</i>	Bichayo	-
CAPPARIDACEAE	<i>Capparis crotonoides</i>	Yunto	-
CAPPARIDACEAE	<i>Capparis scabrida</i>	Zapote/Sapote	CR ^b
CONVOLVULACEAE	<i>Ipomoea crassifolia</i>	Bejuco	-
FABACEAE	<i>Acacia macracantha</i>	Espino/Faique/Huarango	NT ^b
FABACEAE	<i>Prosopis pallida</i>	Algarrobo/Huarango	VU ^b
NYMPHAEACEAE	<i>Nymphaea ampla</i>	Lapa	-
RHAMNACEAE	<i>Scutia spicata</i>	Pial	-
RUBIACEAE	<i>Uncaria tomentosa</i>	Uña de gato	-
TYPHACEAE	<i>Typha angustifolia</i>	Hinea	-

^b IUCN-status derived from *Plan Maestro Calipuy 2015-2019* (Moquillaza, 2015)

VIII. Species list National Reserve Calipuy

Based on an inventory for the national park's management plan (Moquillaza, 2015).

Family	Scientific name	Vernacular name	IUCN-red list
Large mammals in the national park			
CAMELIDAE	<i>Lama guanaco cacsilencis</i>	Guanaco	CR ^b
CERVIDAE	<i>Odocoileus virginianus</i>	Venado gris	LC ^a
FELIDAE	<i>Puma concolor</i>	Puma	LC ^a
URSIDAE	<i>Tremarctos ornatus</i>	Oso de anteojos	VU ^a
Representative fauna Sechura Desert ecosystem			
Mammals			
CANIDAE	<i>Pseudalopex sechurae</i>	Zorro costeño	NT ^a
CERVIDAE	<i>Odocoileus virginianus</i>	Venado gris	LC ^a
Birds			
ELAPIDAE	<i>Micrurus spp.</i>	Coralillo/Coral	-
FALCONIDAE	<i>Falco femoralis</i>	Halcón perdiguero	LC ^a
TEIIDAE	<i>Dicrodon holmbergi</i>	Cañan/Lagartija	-
TROCHILIDAE	<i>Polyonimus caroli</i>	Colibri cola de cometa	LC ^a
VIPERIDAE	<i>Bothrops spp.</i>	Jergón	EN/LC ^a
Dominant plant species Sechuga Desert ecosystem			
ANACARDIACEAE	<i>Schinus molle</i>	Peruvian pepper	-
CAPPARIDACEAE	<i>Capparis avicenifolia</i>	Bichayo	-
CAPPARIDACEAE	<i>Capparis cordata</i>	Zapote/Sapote	-
CAPPARIDACEAE	<i>Capparis scabrída</i>	Zapote/Sapote	CR ^b
FABACEAE	<i>Acacia macracantha</i>	Espino/Faique/Huarango	NT ^b
FABACEAE	<i>Prosopis pallida</i>	Algarrobo/Huarango	VU ^b
Protected plant species National Reserve Calipuy			
CACTACEAE	<i>Espostoa melanosteie</i>	-	NT ^{ab}
LAMIACEAE	<i>Salvia oppositiflora</i>	Jentipa	NT ^b
FABACEAE	<i>Acacia macracantha</i>	Espino/Faique/Huarango	NT ^b
ASTERACEAE	<i>Chuquiraga spinosa</i>	Huamanpinta	NT ^b
KRAMERIACEAE	<i>Krameria lappacea</i>	Rataña	EN ^b
ROSACEAE	<i>Kageneckia lanceolata</i>	Lloque	VU ^a , CR ^b
CARICACEAE	<i>Vasconcellea candicans</i>	Mito	CR ^b
CAPPARIDACEAE	<i>Capparis scabrída</i>	Zapote/Sapote	CR ^b
PTERIDOPHYTA	<i>Argyroschisma nivea</i>	Cuti	VU ^b
FABACEAE	<i>Prosopis pallida</i>	Algarrobo/Huarango	VU ^b
EUPHORBIACEAE	<i>Jatropha macrantha</i>	Huanarpo macho	VU ^b

^a IUCN-status derived from <http://www.iucnredlist.org/> (IUCN, 2015)

^b IUCN-status derived from *Plan Maestro Calipuy 2015-2019* (Moquillaza, 2015)

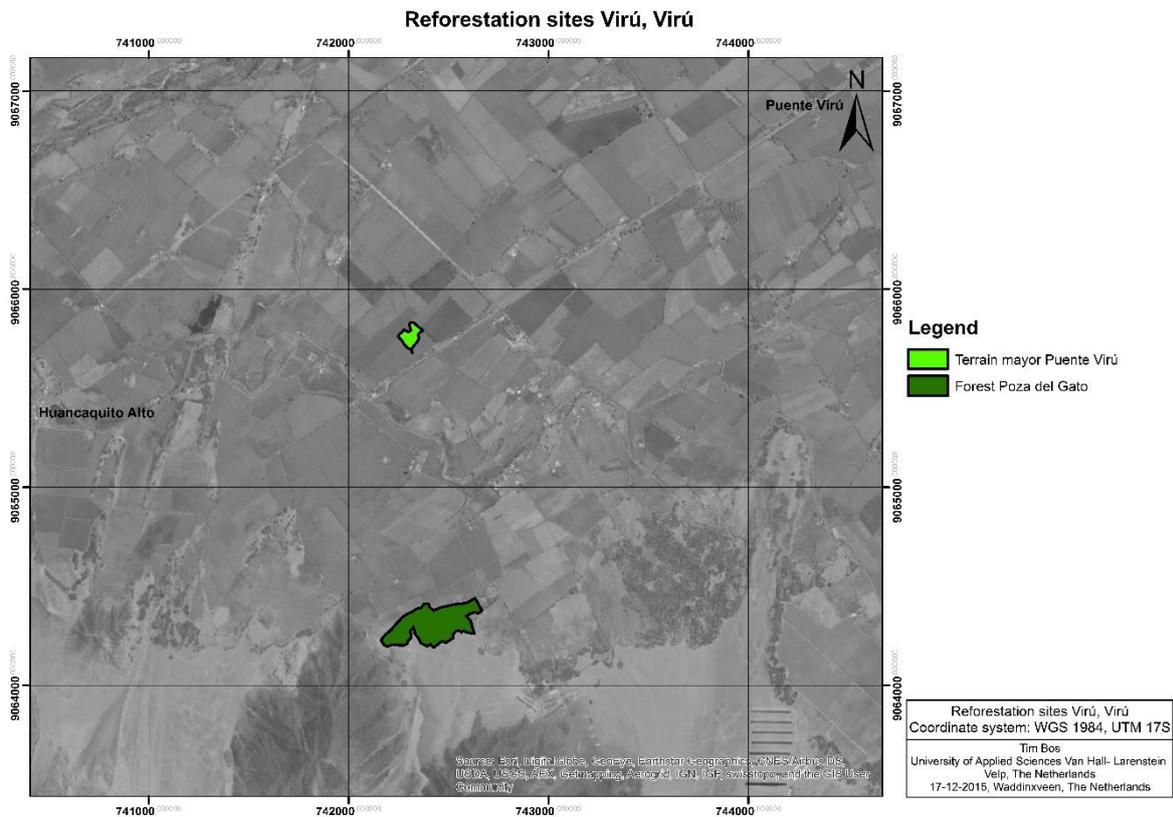
Endemic plant species National Reserve Calipuy

APIACEAE	<i>Arracacia incisa</i>	-	-
ASCLEPIADACEAE	<i>Cynanchum tarmense</i>	-	-
ASTERACEAE	<i>Baccharis kingie</i>	-	-
ASTERACEAE	<i>Flourensia macrophylla</i>	-	-
ASTERACEAE	<i>Helogyne ferreyrii</i>	-	-
ASTERACEAE	<i>Lomanthus tovarii</i>	-	-
ASTERACEAE	<i>Lomanthus albaniae</i>	-	-
ASTERACEAE	<i>Lomanthus truxillense</i>	-	-
ASTERACEAE	<i>Orphryosporus galioides</i>	-	-
ASTERACEAE	<i>Orphryosporus pubescens</i>	-	-
ASTERACEAE	<i>Pappobolus microphyllus</i>	-	-
ASTERACEAE	<i>Philoglossa peruviana</i>	-	-
ASTERACEAE	<i>Proustia berberidifolia</i>	-	-
ASTERACEAE	<i>Senecio campanelliferus</i>	-	-
ASTERACEAE	<i>Senecio emmae</i>	-	-
BORAGINACEAE	<i>Heliotropium ferreyrae</i>	-	-
BORAGINACEAE	<i>Helogyne calocephala</i>	-	-
BORAGINACEAE	<i>Pectocarya anomala</i>	-	-
CACTACEAE	<i>Espositoa melanostele</i>	-	LC ^a
CACTACEAE	<i>Neoraimondia arequipensis</i>	-	LC ^a
CALCEOLARIACEAE	<i>Calceolaria weberbaueriana</i>	-	-
CARYOPHYLLACEAE	<i>Drymaria divaricate</i>	-	-
CONVOLVULACEAE	<i>Merremia grandiflora</i>	-	-
CRASSULACEAE	<i>Sedum reniforme</i>	-	-
EUPHORBIACEAE	<i>Jatropha macrantha</i>	Huanarpo macho	VU ^b
FABACEAE	<i>Dalea cylindrical</i>	-	-
GROSSULARIACEAE	<i>Ribes viscosum</i>	-	-
LAMIACEAE	<i>Clinopodium clivorum</i>	-	-
LAMIACEAE	<i>Clinopodium speciosum</i>	-	-
LAMIACEAE	<i>Clinopodium weberbaueri</i>	-	-
LAMIACEAE	<i>Salvia perlucida</i>	-	-
LOASACEAE	<i>Caiophora grandiflora</i>	-	-
LOASACEAE	<i>Nasa chenopodiifolia</i>	-	-
LOASACEAE	<i>Presliophytum heucheraefolium</i>	-	-
LORANTHACEAE	<i>Tristerix peruvianus</i>	-	-
MALVACEAE	<i>Abutilon pedunculare</i>	-	-
MALVACEAE	<i>Tarasa cerratei</i>	-	-
PASSIFLORACEAE	<i>Passiflora peduncularis</i>	-	-
POACEAE	<i>Festuca huamachucensis</i>	-	-
SOLANACEAE	<i>Exodeconus prostrates</i>	-	-
SOLANACEAE	<i>Leptoglossis schwenkioides</i>	-	-
SOLANACEAE	<i>Salpichroa dependens</i>	-	-
VERBENACEAE	<i>Verbena clavata</i>	-	-

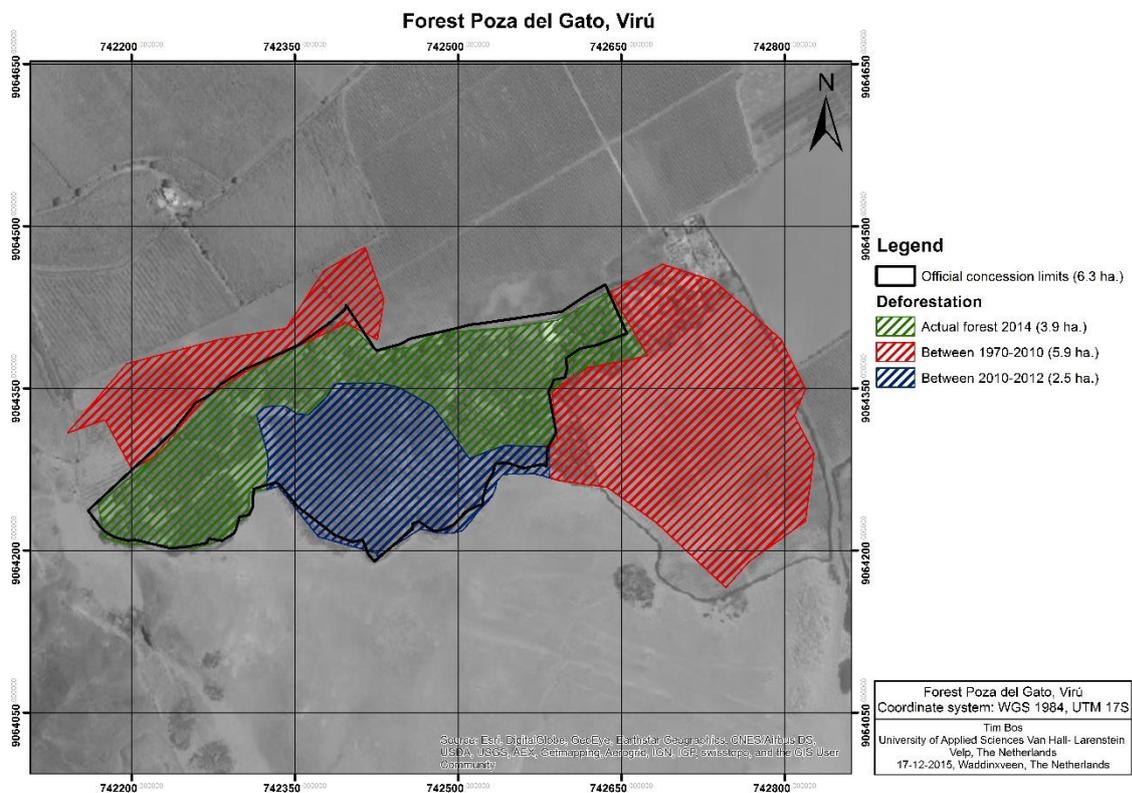
^a IUCN-status derived from <http://www.iucnredlist.org/> (IUCN, 2015)

^b IUCN-status derived from *Plan Maestro Calipuy 2015-2019* (Moquillaza, 2015)

IX. Maps study sites Virú

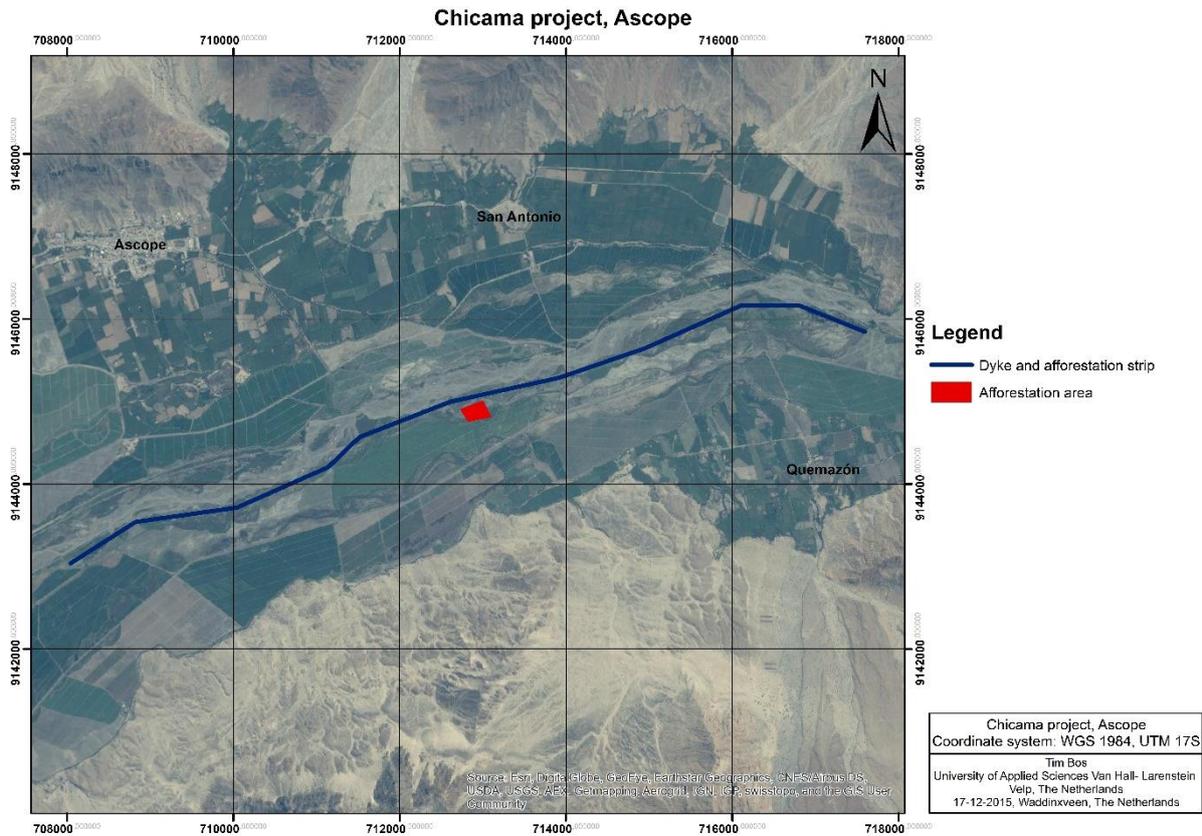


Appendix figure II: Two project sites in the Virú province have been researched



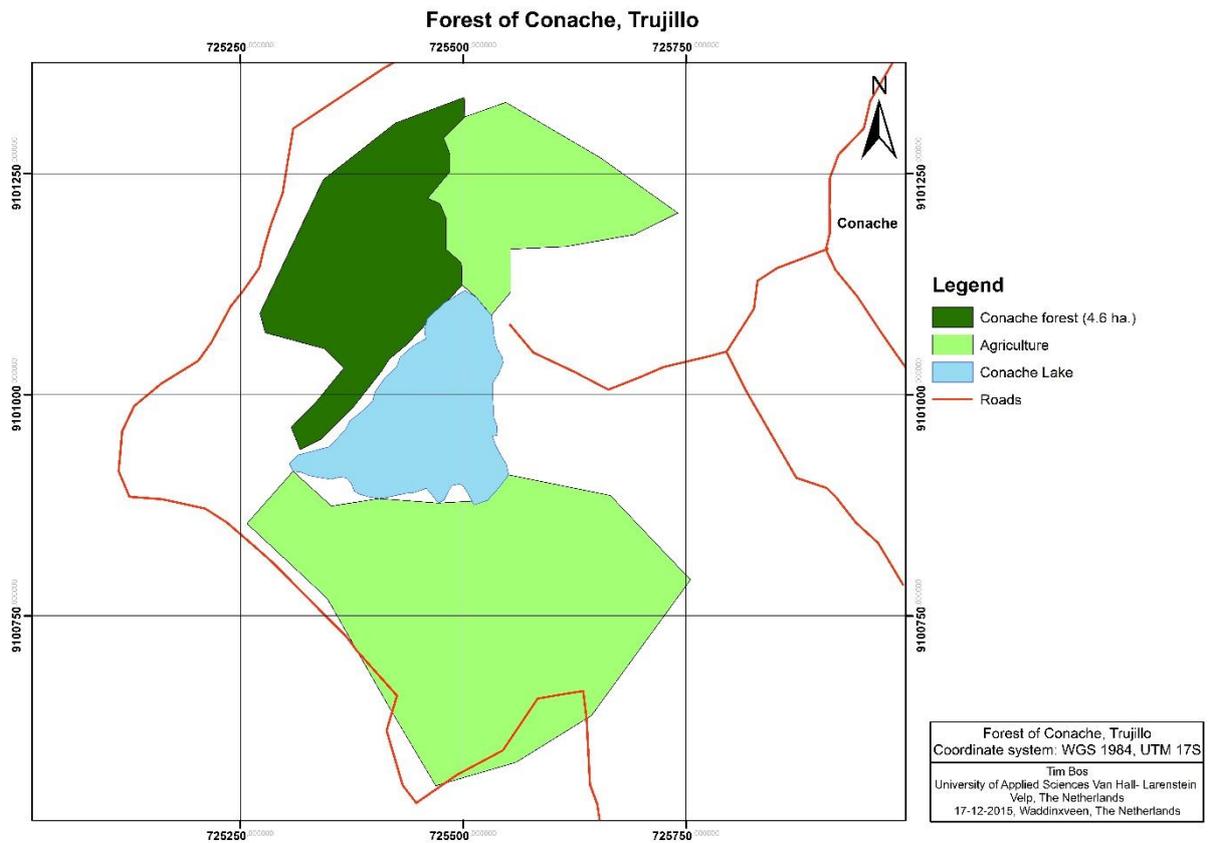
Appendix figure III: The forest Poza del Gato is managed by a local farmer. He has a forest concession and is responsible for the conservation of the forest. Parts of the forest have been degraded however.

X. Map study site Chicama



Appendix figure IV: The afforestation in Chicama is part of a river defence project. This map gives an indication of the project's location, the exact location is not yet known.

XI. Map study site Conache



Appendix figure V: The Conache forest is located next to the Conache lake. The owner of the lake has applied for a forest concession, in order to conserve the forest.