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Ethnobotanical study of the plant use in the natural landscape of two mestizo communities in the Ucayali region of the Peruvian Amazon

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The promoters,

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TABLE OF CONTENTS

LIST OF ABBREVIATIONS

CIAT	International Center for Tropical Agriculture
DAPA	Decision and Policy Analysis Research Area
EPSA	Ecosystem Services for Poverty Alleviation
INEI	Instituto Nacional de Estadistica e Informática
IPNI	The International Plant Names Index
UNIA	Universidad Nacional Intercultural de la Amazonia

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

ABSTRACT

Although mestizos are the largest group of inhabitants in the Peruvian Amazon, up till now, their plant uses have not been studied well, especially not in the Ucayali region. Furthermore, this area has to deal with high rates of deforestation and (illegal) logging. This not only threatens the local people's livelihood, but also their traditional knowledge. Therefore, the aim of the study was to document the plant use of two mestizo communities, and compare both communities to determine the differences in plant use. Several factors can be responsible for these differences, like market access and social, cultural, socio-economic, environmental, and geographical factors. The factor accessibility was one of the criteria to select Pueblo Libre and Naranjal, which were easily and difficult to access respectively. The accessibility was expected to influence plant use knowledge. Furthermore, food and medicinal plants were studied more in detail. Data were obtained in both mestizos communities in the Peruvian Amazon of the Ucayali region between August and September 2014. Data collection was carried out through focus group discussions and pile-sorting exercises. Plant samples were also collected in the field. Eventually lists were obtained with botanical and vernacular names of plants together with their used plant parts and their purpose, the plant's habitats and whether or not they were sold or traded. Results showed several factors influencing the plant use in both communities; the most important factor was accessibility which also influences several other factors like deforestation, market access, modernization, etc. which on their turn also influence plant use of local people. Remarkable was the large difference in number of used plant species in general between Pueblo Libre (161 useful plant species) and Naranjal (224 useful plant species), for which Naranjal counts 63 useful plants more than Pueblo Libre. Also for medicinal plants the difference was enormous, with 55 medicinal plants more in Naranjal (127 medicinal plant species) than in Pueblo Libre (72 medicinal plant species). For food plants, the most important conclusion was the importance of the botanical family Arecaceae for both food and beverages in both communities. The results gathered in this research showed the importance of plant knowledge of mestizos in this area and how this knowledge was influenced by several factors. This study can be used as a basis for further (ethnobotanical) research, such as a study on food security to investigate the nutritional value of the food plant species or for a quantitative ethnobotanical study.

SAMENVATTING

Ondanks dat mestizos de grootste bevolkingsgroep is in het Peruviaanse Amazonewoud, is hun plantengebruik nog maar beperkt bestudeerd, vooral in de Ucayali regio is er een gebrek aan etnobotanische studies met mestizos. Daarnaast heeft deze regio te kampen met grootschalige ontbossing en (illegale) houtkap. Dit bedreigt niet alleen de lokale bevolking en hun voorzieningen, maar ook hun plantenkennis. Daarom was het doel van deze studie om het plantengebruik vast te leggen van twee mestizo dorpen en deze te vergelijken om de verschillen vast te stellen. Verscheidene factoren kunnen deze verschillen veroorzaken, zoals de bereikbaarheid van markten en sociale, culturele, socio-economische, omgevings- en geografische factoren. De bereikbaarheidsfactor was één van de criteria om Pueblo Libre en Naranjal te kiezen, respectievelijk met goede en slechte bereikbaarheid. De bereikbaarheid wordt verwacht een invloed te hebben op de kennis van plantengebruik. Verder werden ook de voedsel- en medicinale planten meer in detail bestudeerd. De data werden verzameld in beide mestizo dorpen in het Peruviaanse Amazonewoud van de regio Ucayali tussen augustus en september 2014. Het verzamelen van de data gebeurde op basis van focus groep discussies en 'pile-sorting' oefeningen. Verder werden ook planten verzameld in het veld. Dit resulteerde uiteindelijk in lijsten met wetenschappelijke en lokale plantennamen alsook in informatie omtrent de gebruikte plantendelen en hun specifiek gebruik, de groeivorm van de planten, hun standplaats en of ze al dan niet verkocht of geruild werden. De resultaten toonden verschillende factoren die een invloed speelden op vlak van het plantengebruik in beide dorpen; de belangrijkste factor is de bereikbaarheid die op zijn beurt ook andere factoren beïnvloedt zoals ontbossing, marktbereikbaarheid, modernisatie, enz. Opvallend is het grote verschil tussen het totaal aantal planten die gebruikt worden in Pueblo Libre (161 nuttige planten) en Naranjal (224 nuttige planten), waarbij Naranjal 63 nuttige planten meer telt dan Pueblo Libre. Het verschil was ook duidelijk op te merken bij de medicinale planten, met 55 medicinale planten meer in Naranjal (127 medicinale planten) dan in Pueblo Libre (72 medicinale planten). Voor planten gebruikt voor voedselconsumptie, was de belangrijkste vaststelling het belang van de botanische familie Arecaceae voor zowel voedsel als drankjes. Bijkomend toonden de resultaten in deze studie het belang van de plantenkennis van mestizos en hoe deze kennis beïnvloed werd door verschillende factoren. Deze studie kan gebruikt worden als een basis voor toekomstige onderzoek, zoals bijvoorbeeld een studie omtrent voedselzekerheid waarbij de nutritionele waarde van voedselplanten wordt onderzocht of als basis voor een kwantiatief ethnobotanisch onderzoek.

1 Introduction

1.1 Problem statement

The Ucayali region, the study area of this research, has high deforestation rates and even bigger problems with logging (Foley *et al.*, 2007; Fujisaka *et al.*, 2000; Coca-Castro *et al.,* 2013). As a consequence, the area suffers from a loss of biodiversity accompanied by loss of traditional knowledge and cultures. Effects of widespread deforestation and logging in the Amazon, such as changes to the climate, have implications not only in the Amazon itself, but also far beyond (Foley *et al.*, 2007; Fujisaka *et al.*, 2000).

Generally, it is assumed that mestizos have less traditional plant knowledge compared to indigenous communities. Lawrence *et al.* (2005) were the first to compare the traditional knowledge between the indigenous and mestizo communities located in the Amazon of Madre de Dios in Peru. Their study demonstrated that mestizos do not have less traditional knowledge than indigenous people, but they do value the natural resources differently. Next to that, mestizos migrated a long time ago to the Amazon, making them long term inhabitants with a deep traditional knowledge (Lawrence *et al.*, 2005; Dufour, 1990). The traditional knowledge of mestizo communities may come from the extinct or endangered original indigenous cultures that inhabited the area in which they migrated. Also a lot of migration happened within the mestizo communities, which may have led to an exchange of information and an enrichment of the traditional knowledge of plants within the mestizo communities (Jovel *et al.*, 1996). However, indigenous communities are still more studied than mestizos (Dufour, 1990; Lawrence *et al.,* 2005). Next to the deep traditional knowledge that mestizos have, they are also the largest population group in the Peruvian Amazon. As the biggest population group in the Amazon, they will likely have the most influence on the Amazon ecosystem in the future. When general representative conclusions about land use and management practices in the Amazon are formulated, not only original indigenous communities, but all inhabitants of the Peruvian Amazon should be considered, including mestizos (Jovel, 1996; Lawrence *et al.*, 2005; Murray, 2006).

There are only a few reports on ethnobotanical studies conducted with mestizos in the Peruvian Amazon, they cover Madre de Dios (Philips and Gentry, 1993; Lawrence *et al.,* 2005) and some studies in Loreto (Jovel *et al.*, 1996; Luna, 1984). Moreover, a lot of these studies only focus on medicinal plant use (Luna, 1984; Jovel *et al.*, 1996; Polesna *et al.*, 2011). None of them, however, took place in the Ucayali region of the Peruvian Amazon. The only ethnobotanical research in this area has been carried out with original indigenous communities, e.g. Shipibo-Conibo communities (Tournon, 2006; Polesna *et al.*, 2011).

Therefore, and in light of rapid and widespread changes, like land use changes, the consequences of these changes, and the lack of research on mestizos in the Peruvian Amazon of Ucayali region, ethnobotanical research plays a crucial role for the cultural survival and biodiversity conservation, particularly in an area increasingly threatened by high deforestation rates and loss of biodiversity.

1.2 Thesis objectives

In the face of this knowledge gap in the research area and the problems that the region has to deal with, the main objective of the thesis is an 'Ethnobotanical study of the plant use in the natural landscape of two mestizo communities in the Ucayali region of the Peruvian Amazon'. Specifically, this means we will document general local knowledge on plant use and investigate which factors influence local plant use by comparing two mestizo communities. Of all the potential uses of plants, the ones related to foods and medicine have local importance because they play an essential role for human survival, e.g. food security (Toledo *et al*., 2009). That is why, next to the general use of local plants, food and medicinal plants were more closely investigated.

To reach this main objective, the specific objectives of this thesis are to:

1) Generate an inventory of the plants used in both communities.
2) Compare the two communities to determine the differences in plant use.
3) Study which factors are responsible for these differences.
4) Provide an overview of plants used for food and beverages and information about the plant part used, food type, preparations, storage time and storage method, availability, use frequency, and restrictions.
5) Use these data about food and beverages for an assessment of the food security in both communities.
6) Document the medicinal purposes of plants and discuss the differences in medicinal plant knowledge between the two communities.
7) Compare results of our study with medicinal plant knowledge in literature.

1.3 Thesis outline and research questions

Following on this first chapter, this thesis continues with a literature review (chapter 2) and methodology (chapter 3), followed by three chapters based upon the uses of the plants.

In the chapter of general use of plants (chapter 4), the following main research questions were addressed:

1) Which plant species are used in Pueblo Libre and Naranjal?
2) Which botanical families are the most important among the useful plant species in Pueblo Libre and Naranjal?
3) Which use categories are distinguished in each community and how many plant species does each category contain?
4) Which plants parts are used?
5) How many plant parts are sold in each use category and which category is most common on the market?
6) Which use categories have the highest number of plant species?
7) What are the growth forms and growth locations of these useful plant species?

In chapter 5 on food and beverages, the main research questions were:

1) Which botanical families are the most important among the plant species used for food and beverages in Pueblo Libre and Naranjal?
2) Which plant parts are mostly used for food and beverages?

3) What are the growth forms and growth locations of the plants used for food and beverages?
4) How many plant species contains each food type?

Chapter 6 handled about medicinal plants and research questions that were investigated in this chapter were as following:

1) For medicinal plants, which are the most abundant botanical families in Pueblo Libre and Naranjal?
2) What are the most used plant parts for medicinal purposes?
3) Which growth form contains most medicinal plant species and where do most medicinal plants grow?

At the end of this thesis, there is a last chapter (chapter 7) linking everything together, addressing some remarks on this study and suggestions for future research.

1.4 Hypotheses

Access to a road or river can influence plant use knowledge between different communities. Differences in knowledge can be for example different number of plant species used or different uses of the same plant species. By choosing two communities with the same ethnicity, one at a river and another next to a road, accessibility and other factors responsible for differences in plant use knowledge can be investigated independently of the factor ethnicity.

1.5 Framework

This study is a complement to the ongoing project 'Managing ecosystem services for food security and the nutritional health of the rural poor at the forest-agricultural interface', also called ASSETS, which is part of the ESPA (Ecosystem Services for Poverty Alleviation) initiative, which documents the relations between ecosystem services, food security and nutritional health of indigenous communities living in the forest-agriculture interface.

2 Literature review

2.1 General information

2.1.1 Ethnobotany

Definition of ethnobotany

Ethnobotany is part of the discipline ethnobiology, which studies the dynamic relationships among peoples, biota and environments (Ethnobiology Working Group 2003). The term 'ethnobotany' was first used in 1895 by the American botanist John William Harshberger, but the discipline of ethnobotany dates back long before the term was introduced, e.g. the Greek Pedanius Dioscorides of Anazarbus wrote about the useful plants from the Mediterranean he collected in the book *De Materia Medica* (Pardo de Santayana *et al.*, 2010). Harshberger defined ethnobotany as 'the use of plants by aboriginal people'. Since Harshberger's time, the definition of ethnobotany has evolved to include both anthropology and botany: 'studying the dynamic relation between people and plants' (Cotton, 1996; Martin, 1995).

Along with the definition, the discipline of ethnobotany also changed a lot during the past years and has grown from its initial focus on the use and management of plants, to the addition of socio-cultural and economic aspects and the perceptions, concepts, views and values of the local people (Balick and Cox, 1996; Cruz-Garcia, 2014). This has led to the more multidisciplinary nature of ethnobotany that not only includes anthropology and botany, but also ecology, economics, linguistics, geography, agriculture, pharmacology, etc. (Cruz-Garcia, 2014; Martin, 1995).

Traditional knowledge

The fast current globalization has led to lifestyle changes which can lead to big losses of traditional knowledge (Cámara-Leret *et al.*, 2014). The multidisciplinary nature of ethnobotany makes it the perfect tool to collect rapidly disappearing traditional knowledge, e.g. from local people in the Amazon rainforest. Next to ensuring traditional knowledge does not get lost, ethnobotanical research helps showing the needs and priorities of local people when new systems or policies for biodiversity conservation or management strategies are developed (Beltrán-Rodríguez *et al.*, 2014; Cossío *et al*, 2014). Ecosystems, like the Amazon rainforest, provide local people with goods and services like food, shelter, medicine, energy, etc. (Pimentel, 1997; De-la-Cruz *et al.*, 2007).

Use and management of ecosystem services and goods

For local people, the natural environment is the main source of ecosystem services and goods (Cámara-Leret *et al.,* 2014; Cruz-Garcia, 2014; Foley *et al.,* 2007). Use and management of ecosystem goods and services by local people depend on different factors. A first factor is initial ecosystem richness: higher plant diversity is linked to a higher use (or knowledge) of plant species (Begossi, 1996; De la Torre *et al.,* 2012; Thomas, 2008). Other factors influencing use and management include market access and social, cultural, socio-economic, environmental, and geographical factors (De la Torre *et al.*, 2012; Thomas, 2012; Vandenbroek *et al.,* 2004).

2.1.2 Drivers of change

The depletion of elements of traditional knowledge, like languages or material aspects of a culture (e.g. instruments), but also losses in ecosystems, biodiversity, natural resources, soils, etc. are all influenced by drivers of change (Foley *et al.*, 2007; Fujisaka *et al.*, 2000). Losses of natural resources can result in less food security, medicinal plants, etc., leading to impoverishment of local people (Foley *et al.*, 2007; Murray, 2006). Drivers of change can be deforestation, logging, overexploitation, etc. Deforestation is a shift in land-use, i.e. conversion of forest to another land-use practice like agricultural land. With logging there is no land-use change, it is the selective extraction of timber trees causing major changes for the environment (Millenium Ecosystem Assessment 2005; Sasaki *et al.*, 2009). These drivers of change influence the natural environment and can have big consequences on numerous aspects of the ecosystem (Foley *et al.*, 2007; Fujisaka *et al.*, 2000).

Large parts of the Amazon Basin have already been deforestated and deforestation continues at ever increasing rates. During 7.5 years, from 2004 until 2011, Terra-I, a monitoring system using satellite images, recorded forest loss in Peru by looking to the change in vegetation. During this period, annual forest loss was 468 km^2 with the highest losses in the regions of Ucayali, Madre de Dios, Loreto and San Martin, all located in the Amazon (CIAT, 2012). Deforestation is still the most destructive change in land-use, but the influence of logging on the environment has been highly underestimated, because it is more difficult to observe from satellite images compared to deforestation (Asner *et al.*, 2005). In Peru, 80 to 95% of logging practices are illegal, this means that almost all timber that originates from the Peruvian Amazon is illegal (Cossío *et al.*, 2014; Sears and Pinedo-Vasquez, 2011). Especially after the new regime, introduced in 2002, more and more logging became illegal when a lot of contract holders lost their permission (Smith *et al.*, 2006). In the study of Smith *et al.* (2006), in the Loreto and Ucayali region, up to 88% of the respondents admitted to have extracted timber trees outside the authorized areas. They get contracts for a certain area, but almost a lot of contract holders do not respect the borders of this authorized area, leading to a substantial amount of illegal logging also from contract holders themselves (Smith *et al.,* 2006).

Although deforestation has the advantage of increased economic opportunities, e.g. jobs, in short term, it has enormous negative repercussions in the long term. Not only does it destroy important natural ecosystems and biodiversity, but it also increases greenhouse gas emissions, reduces the capacity of the forests and soils to store carbon, increases susceptibility to infectious diseases, disrupts the regulation of overall water balance and river flow, etc., thereby greatly influencing weather and the climate (Foley *et al.*, 2007; Fujisaka *et al.*, 2000). Another consequence of both deforestation and logging is a lower forest resilience which makes the latter more susceptible for fires, drought, etc. which are mostly, directly or indirectly, caused by human activity (Fraser, 2014; Malhi *et al.*, 2008).

2.2 Study site

2.2.1 The research area in the Peruvian Amazon

With its 5.4 million km^2 (2001 figure), the Amazon rainforest of South America is the largest remaining tropical rainforest on Earth, it contains an enormous amount of biodiversity (Foley *et al.*,2007; Lu,

2009; Malhi *et al*., 2008). The Amazon spans nine different countries (Figure 1): Brazil, Colombia, Bolivia, Ecuador, Guyana, Venezuela, Suriname, French Guyana and Peru (Fujisaka *et al.*, 2000).

Peru is situated on the Pacific Ocean and borders Ecuador, Colombia, Brazil, Bolivia and Chile; it has a total land surface of 1,285,000 km^2 and a population of 30 million (INEI, 2014; Fujisaka *et al.*, 2000). Furthermore, Peru contains 10% of the earth's plant diversity of which 8% can be found in the Peruvian Amazon (De-la-Cruz *et al.,* 2007; Desmarchelier and Schaus, 2000). After Brazil, it is the country with the second largest area of the Amazon rainforest within its borders (Lu, 2009). The Peruvian Amazon has an area of 691,801 km^2. Administratively, the country is divided in 25 different regions, which are made up of provinces, which comprise of districts.

Figure 1 The Amazon (green area) with Ucayali region and its capital Pucallpa (Fujisaka *et al.*, 2000)

This study took place in the humid tropical rainforest of the Peruvian Amazon in the Ucayali region, which is located in the east of Peru next to the Brazilian border. The Ucayali region is divided into four provinces and 14 districts. Pucallpa is the capital of this region. The latter is the second largest region in Peru with an area of 102,410 km^2 and comprises 87,689 km^2 of the Peruvian Amazon rainforest. The estimated population in Ucayali in 2012 was 490,000, with most of them (60 %) located in Pucallpa, which has the second highest number of inhabitants in the Peruvian Amazon. In 2012, average annual relative humidity was 90 % , total annual rainfall amount was 2407.7 mm whereas average annual temperature was 25.5°C for the entire Ucayali region (INEI, 2014). The climate description according to the Köppen-Geiger classification is Am, the A stands for equatorial

climate and m is related to the amount of rainfall (Kottek *et al.*, 2006). The amount of rainfall in this region differs throughout the year and is marked by two rainy seasons, one from February to May and the other from September to December (Fujisaka *et al.*, 2000; INEI, 2014).

Drivers of change in Ucayali region

Nowadays, the timber industry is of great economic importance in the Ucayali region, it is the main center of the timber industry in Peru. The all-weather road from Pucallpa to Lima has led to a benefit for the timber industry because of the easy transport. But these logging practices result in disturbances for biodiversity and can have serious consequences (see paragraph "2.1.2 Drivers of change") (Foley *et al.,* 2006; Porro *et al.*, 2014; Smith *et al.*, 2006). Also, a shift in land-use from forest to agriculture is a major factor increasing deforestation in the Peruvian Amazon (Jaeregui *et al.*, 2011; Porro *et al.*, 2014). INEI reported that in 2000 about 6,270 km^2 of forest were deforested in the Ucayali region, a figure that even increased to 7,870 km^2 in 2010 (Porro *et al.*, 2014).

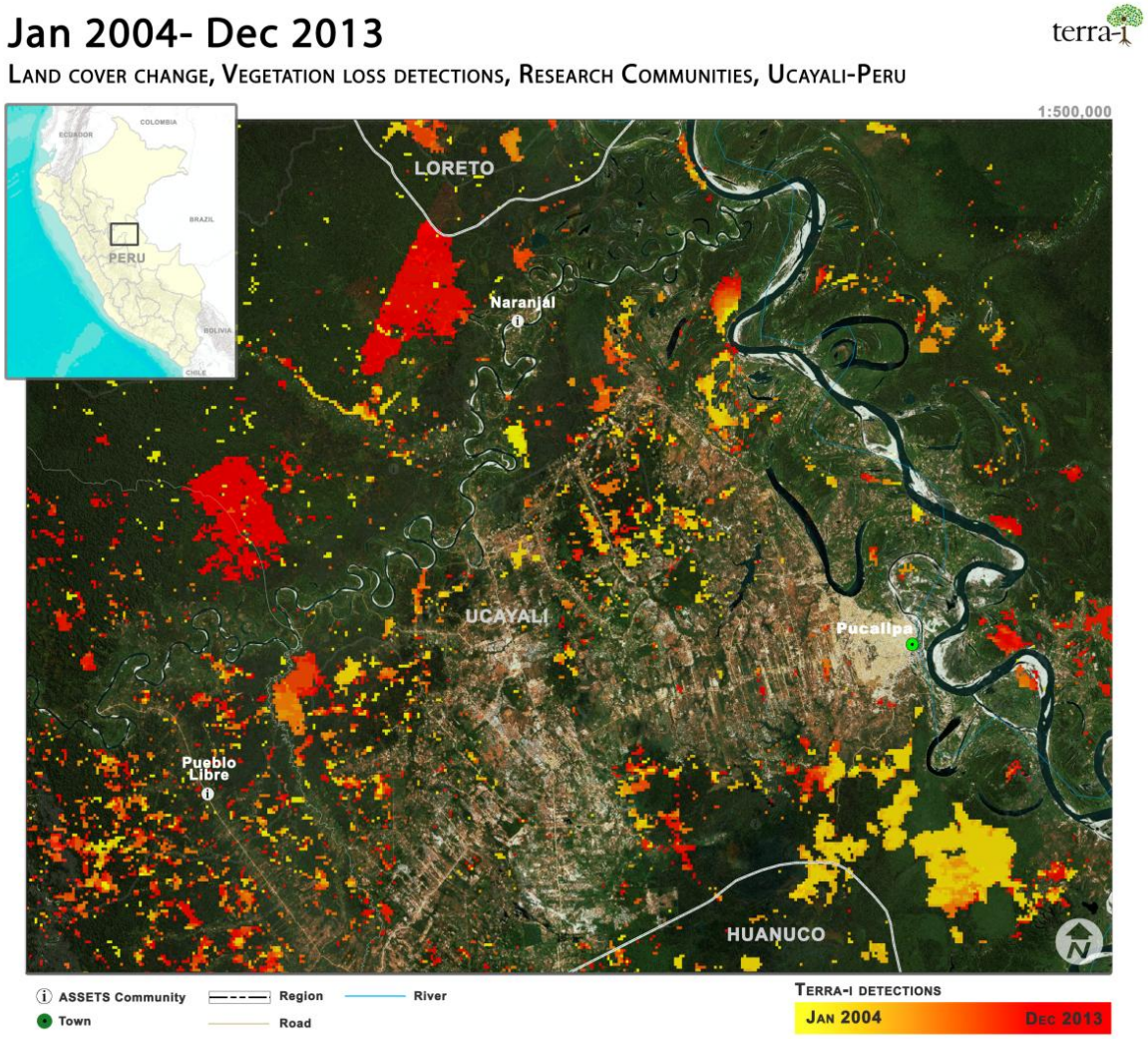

Figure 2 Map indicating the location of Pueblo Libre and Naranjal and showing deforestation trends in the Ucayali region from January 2004 until December 2013 (prepared by Paula Paz of the Terra-I team, CIAT)

2.2.2 Characteristics of the two studied communities

For this study we selected two mestizo communities in Ucayali region: Pueblo Libre and Naranjal.

Geographical situation

The first community, Pueblo Libre, is an upland community, mainly located next to a dirt road in the Curimana district of the Padre Abad province. Coordinates for Pueblo Libre are 08°23'14"S and 74°50'14"W, and it is located at 174 masl. It can be accessed from Pucallpa by following the Federico Basadre Highway, a highway that leads to Lima, and turning right before arriving in Neshuya on the dirt road leading to Curimana, the capital of the Curimana district.

The second community, Naranjal, is more difficult to access. It is a lowland floodplain community next to the Aguaytia river and is located in the Nueva Requena district of the Coronel Portillo province. Coordinates for Naranjal are 08°09'14"S and 74°49'57"W, and lies about 146 masl. From Pucallpa to Naranjal, one has to take the Federico Basadre Highway as for Pueblo Libre, but should leave this road before arriving in Campo Verde by turning right onto a dirt road. Roads to Narnajal are not permanent and disappear during the wet season, Nueva Requena and Pucallpa are then accessed by boat.

Ethnicity

Both communities chosen for this study are comprised of mestizos. The term mestizos made its introduction after the Europeans first arrived in the 15th century (Jovel, 1996; Hunefeldt, 2004). Biologically, the term mestizo means mixed inhabitant who descends from an European colonizer and an indigenous parent (Hunefeldt, 2004).

The exploitation in the Peruvian Amazon first started in the 19th century. In the beginning, there were not too many settlements, but when rubber exploitation started more Peruvian mestizos moved into the Amazon and spread to the Amazonian Lowlands of the Ucayali region (Jovel, 1996; Padoch and de Jong, 1989). The exploitations introduced different people of all origins (European, Black, Asian and Arab) in Peru, making mestizos a biological mix of different races (Jovel, 1996). In 2012, about 53,000 mestizos lived in non-indigenous communities in Ucayali. Most of them still live in the Coronel Portillo and Padre Abad provinces (Porro *et al.*, 2014). Today mestizos are seen as the Spanish-speaking inhabitants with some Hispanic influences in their cultural and social beheaviours (Hunefeldt, 2004).

Market access

Pueblo Libre sells and trades their harvest and products in the community, with neighbouring communities, but the most important markets are in Curimana, Neshuya and Pucallpa. Naranjal also sells and trades its products within the community and with the communities nearby, but their big markets are Nueva Requena and Pucallpa.

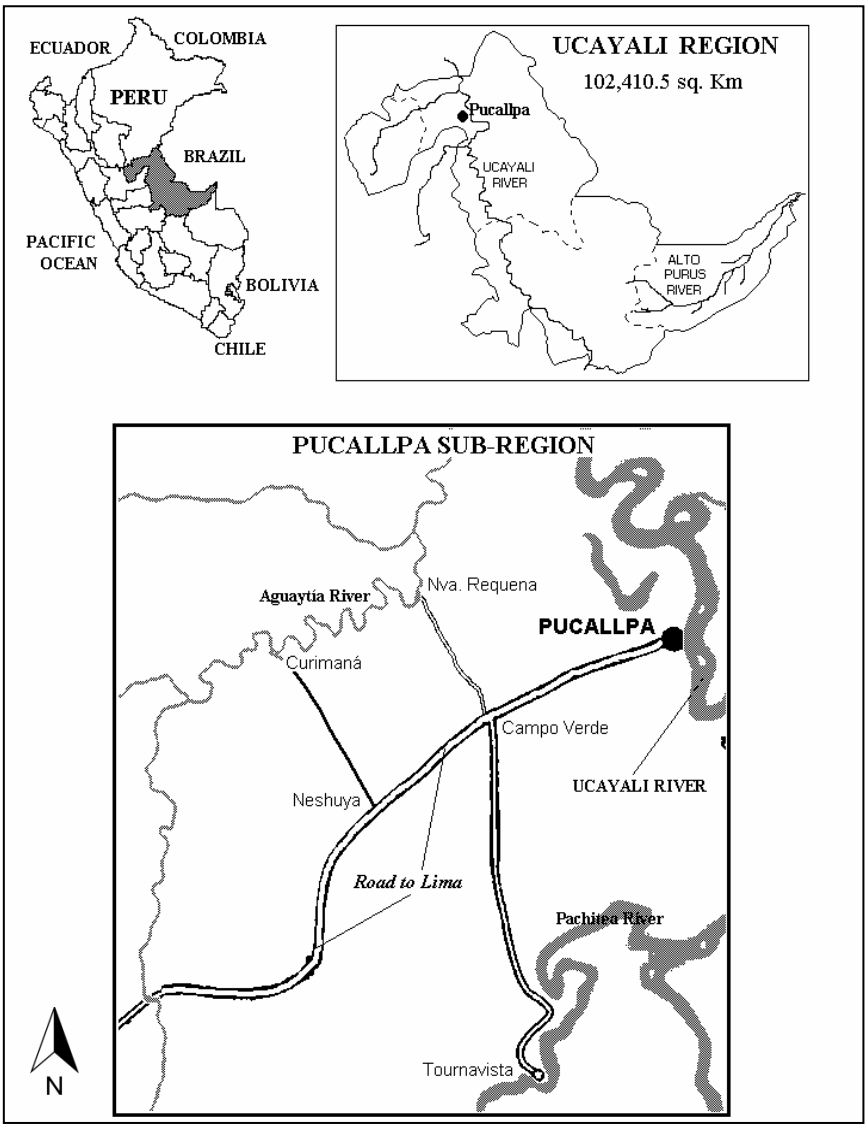

Figure 3 Map with roads to Nueva Requena and Curimana (Murray, 2001)

Infrastructure

Pueblo Libre is a relatively new community founded in 1994 and consists of people who migrated from the Andes, coastal or other Amazonian communities in the area. Pueblo Libre has electricity. A lot of houses also have running water, but this depends on the location in the community. There is also phone signal, internet connection and a telecenter with several computers available because of a USAID project in 2013. Around 75 families live in Pueblo Libre, i.e., more than 350 people. Naranjal is much smaller with about 30 families and 160 people. It only has a generator that provides electricity every night for about two to three hours.

Natural resources

The most important crops in Pueblo Libre are oil palm, cocoa and plantain. In earlier years, untill 1995, a lot of coca was cultivated. According to people from Pueblo Libre US planes sprayed herbicides killing the coca plants, forcing the people to change to other crops. All the forest in Pueblo Libre is private property, owned by individuals of the community. For their daily food consumption people depend on the products they grow, but also from the income they generate from selling the

products they grow. There is one family owning artificially constructed ponds to breed fish. There are also a number of cattle and pig farms, most people keep some chickens and pigs for their own consumption. Wild food plants or plant products are gathered by men from Pueblo Libre while they go hunting from time to time in their forests. The community of Naranjal depends more on its natural resources than Pueblo Libre. People from Naranjal hunt, fish, gather food plants and cultivate different crops. The forest of Naranjal is private property that belongs to and is managed by the whole community.

3 Methodology

3.1 Introduction

During the past years, ethnobotany has matured as a science and two main research methods can be distinguished: the qualitative and the quantitative method. The qualitative approach in ethnobotany allows to study the dynamic relationship between plants and people. Quantitative ethnobotany consists of a systematic empirical study that provides data for statistical analysis (Cruz-Garcia, 2014). Quantitative and qualitative ethnobotany use different types of interviewing techniques. Open-ended and semi-structured interviewing methods are mostly used for qualitative studies, while structured interviews and questionnaires are more likely to be used when a quantitative study is carried out (Cotton, 1996).

As Cruz-Garcia (2014) mentioned, interviews can be conducted either with one person or with a group of people. The latter can either be experts on a certain topic, or just ordinary people. More specifically, when only one person is interviewed it is called a key informant interview, while questioning a group of ordinary people is called a focus group discussion. Although focus group discussions are claimed to be a technique resulting in less precise information, it is perfect to start with since they allow a quick documentation of plant use knowledge to start from when no basic data is available (Rennie and Singh, 1996; Termote, 2012).

A lot of other methods can be used to collect data. One of them is pile-sorting (Cruz-Garcia, 2014). For pile-sorting, participants are asked to group items according to a certain criterion (Borgatti, 1998; Cruz-Garcia, 2014). Typically, each name of an item, for example a plant, is written down on a card and participants are asked to group these items. In this kind of exercises, people can either choose the criterion or either a criterion for grouping the items is given to them. By letting the local people choose their own criteria for grouping items, it gives an idea of the emic view of how they see and categorize certain things and what is important to them (Borgatti, 1998).

When the views, values, concepts and perceptions of local people are used in the categorization process, it is called an emic categorization. This differs from etic categorization, which uses criteria defined by researchers (Cruz-Garcia, 2014; Martin, 1995).

Data collection for this ethnobotanical study was conducted in two mestizo communities in the Peruvian Amazon of Ucayali region close to Pucallpa. The study was conducted in Spanish. Since mestizos are native Spanish speakers. Criteria for selecting these communities were ethnicity and access to roads or rivers.

The first community is Pueblo Libre, a community located along a road in the district of Curimana in the Padre Abad Province. The second one is Naranjal in the Nueva Requena district of the Coronel Portillo Province and is located next to the Aguaytia river.

Data was obtained in August and September 2014 by collecting plant samples and by conducting focus group discussions and pile-sorting exercises. This study adopted an emic approach and used categorizations defined by local people.

Before each exercise, participants were explained for which purpose the information would be used and they were asked if recordings and photographs could be taken during the discussions. When this was clear for the participants, they were asked to sign a consent form (Appendix 1) which gave permission to use the information provided by them for this study.

3.2 Focus group discussions and pile-sorting

Three topics were discussed in three different focus group discussions. The first focus group discussion was about the general use of plants in the community, only plants that naturally grow there. The other two focus group discussions handled more specific topics, one was about plants used for food and beverages, and the third focused on medicinal plants. Focus group discussions could not be finished in one session. Therefore, different sessions for each focus group discussions were necessary.

The aim of the first general focus group discussion was to establish a list of all useful plants. Participants listed all useful plant species they could think of, gave their local names and clarified which parts of the plants they use and for which purpose, their growth location and whether they sell or trade the plant part or product. In practice, local names of the plants were written down on a large paper while participants were listing them (Figure 4). Extra information about plants was written next to the name in different columns. This exercise has the advantage of also including plants that grow or have fruits in another season. To eventually obtain a complete list, the latter was completed with all the missing plants mentioned during plant sample collection or during the other focus group discussions about food and medicinal plants. In both communities, two sessions were necessary to complete this exercise about the use of plants (Tables 1 and 2).

Figure 4 Example of sheet with information from first focus group discussion in Naranjal

Table 1 The number of different sessions needed to complete the focus group discussions, the number of participants, the range of age and gender of the participants for each session of the focus group discussion for the Pueblo Libre community

Topic	Session	Number of participants	Ages	Gender
Use of plants	1	6	23-59	Mixed
	2	5	23-59	Mixed
Food and beverages	1	5	23-50	Women
	2	5	23-50	Women
	3	3	28-50	Women
Medicinal plants	1	6	23-59	Mixed
	2	4	23-59	Mixed

Table 2 The number of different sessions needed to complete the focus group discussions, the number of participants, the range of age and gender of the participants for each session of the focus group discussion for the Naranjal community

Topic	Session	Number of participants	Ages	Gender
Use of plants	1	6	18-69	Mixed
	2	6	21-58	Mixed
Food and beverages	1	4	18-32	Women
	2	5	21-35	Women
Medicinal plants	1	7	18-69	Mixed
	2	7	18-48	Mixed
	3	4	18-45	Mixed

Based on the results of the first general discussion, a second about plants used for food and beverages and a third about medicinal plants were added.

When looking at previous research, food and beverages are mostly grouped together in the same use category. Since the people of both communities explicitly divided food and beverages in separate use categories during the first focus group discussion, they were kept separately as categories, but for the second focus group discussion food and beverages were put together. Cards with names of all plants used for food and beverages, mentioned during the first focus group discussions, were made in advance. During this second focus group discussion, for each plant the method and duration of storage, the method of preparation, consumption pattern, restrictions for eating this food and seasonal availability, were written down on the cards. A pile-sorting exercise was also performed in this second focus group discussion by putting all plants in groups according to the type of food plant, e.g. vegetable, fruit, etc. Since one session of a focus group discussion lasted one hour and a half, three sessions were needed in Pueblo Libre and two in Naranjal to finish completely this focus group discussion (Table 1 and 2). The storage of used plant parts is understood as the storage of the raw product, e.g. the fruit, and not the product made from this fruit. Frequency is related to the frequency of consumption of processed or prepared food, or raw products. These frequencies were divided into different ranges starting with consumption every day, several times a week, once a week, several times a month, once a month, several times a year and once a year.

The third and last part of this study was about medicinal plants. This focus group discussion was also conducted with cards with the names of medicinal plants mentioned in the first focus group

discussion written on them. For medicinal plants, there was asked which symptoms or diseases could be treated with them. Symptoms and diseases are deliberated together in one question, because it is sometimes difficult for participants to make a distinction between the two. Information was gathered about the preparation, extra ingredients, and application (Figure 5). The second part about medicinal plants consisted of two pile sorting exercises. In the first pile sorting exercise participants were asked to group the medicinal plants according to their own criterion. In other words they had the freedom to choose their own way of classifying the plants. This gives an insight on the way the people of the community group and approach the plants. For the second pile sorting exercise participants had to group cards with the symptoms and diseases written on them and mentioned in the focus group discussion about medicinal plants into different piles. For this pile sorting exercises they also got to choose their own criteria to group the symptoms and diseases. After all piles were made, participants were asked to explain their criteria and give a general name to each pile.

Figure 5 Cards from focus group discussion on medicinal plants in Pueblo Libre

3.3 Collection of plant specimens

The aim of collecting plant samples is to provide scientific evidence for the identification of plant species. Plant samples are preferably taken from fertile individuals with flowers/inflorescences or fruits (Vogl *et al.*, 2004).

The plant collection took place in home gardens, fields and forests of the communities. Before starting plant collection participants were asked to sign a consent form after explaining the purpose for which the information would be used (Appendix 1).

With the list obtained in the general focus group discussion, plant sample collection started. Whenever possible, a plant voucher specimen was collected. However, it was not possible to collect voucher specimens for all plants because of the short time span and seasonality (not all plants or reproductive parts of some plants are available during the months of the field work). Since the two specific focus group discussions handled about food and beverages, and medicinal plants, the collection of these plants was a priority. Collection of plant specimen from large trees used for timber was only done when we came across the trees during the plant sample collection, we did not search for these timber trees specifically. In this study 187 plant species were identified by

identification of the collected plant specimens and 71 were identified using literature review, 11 species were not identified. The reference for the used Flora was not given.

During plant collection, a photo was taken from every plant, the local name was written down together with visible characteristics of the plant and eventually a few samples, mostly three, were taken for each plant. Important was to try to collect samples including the apical growing point, flowers/inflorescences, fruits, or other essential parts for identification. All collected plant parts (branches, fruits, flowers, etc.) received a number and were kept together in a well closed plastic bag during collection in the field. These plastic bags helped to prevent the plants from wilting too fast. On the same day of collection, plants were carefully put between newspapers and then industrial alcohol was poured over the plants to conserve them. The thick plastic bags were used again to conserve the plant piles individually in a big plastic box to prevent animals or insects from contaminating or damaging the plant samples during storage in the field. Fruits and flowers were conserved in small plastic bags with sufficient industrial alcohol and afterwards the bags were put in plastic boxes.

Once back in Pucallpa plant samples were put in an oven to dry for three to four days after which the identification could start at UNIA, Universidad Nacional Intercultural de la Amazonia (Figure 6). Identifications were carried out by María Elena Chuspe Zans, professor at UNIA. Plant samples are kept at the herbarium of the university UNIA in Pucallpa.

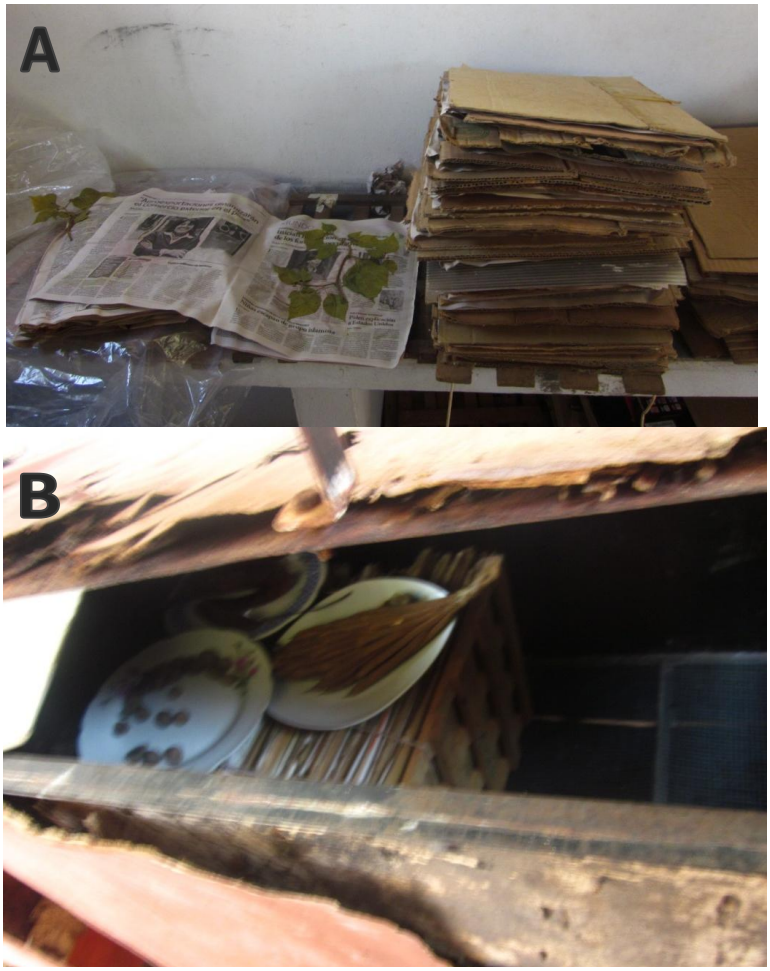

Figure 6 Staples of plants between cardboard to press them together (A), to dry them in the oven (B)

3.4 Selection of respondents

Participants were selected in a different way for the different focus group discussions. For the plant collection there were other criteria for selecting a participant.

For each session about five people participated. For the first general focus group discussion, concerning the use of plants, the participants were both men and women selected by going from house to house asking for people willing to participate. Based on the general focus group discussion, two more specific focus group discussions followed including pile sorting exercises. The second focus group discussion only included women as this discussion handled food and beverages and mostly women cook for their families. They were also selected by asking women of the communities who wanted to participate. The topic of medicinal plants was another focus group discussion and again both women and men were considered after noticing from the first focus group discussion that both men and women have medicinal plant knowledge. Contrary to the first two group discussions these women and men were not selected based on willingness to participate, but the people of the community who knew most about medicinal plants were invited. However since only one or two people were often pointed out to have the most medicinal plant knowledge, the group was completed with other people who wanted to participate. The latter also contributed a lot to this focus group discussion. In table 1 and table 2 (in part 3.2), an overview is given for respectively Pueblo Libre and Naranjal with the number of sessions needed to complete each focus group discussion, the number of participants for each part and the range of age of all the participants in each session.

To collect plant samples a person of the community helped to point out all plants on the list and to explain the use again. Not always the same people join me to collect plant species. In both communities these people were men, expect in Pueblo Libre there was one woman who helped out one day with plant sample collection. In Pueblo Libre, the person with the most medicinal plant knowledge was also pointed out to assist with the collection of the medicinal plants on the list, while another men or woman from the community assisted with the collection of other plants or very common medicinal plants. However, in Naranjal there was one person who knew the forest in-side-out, together with the names of the plants, and although he knew all plant names and growth locations, he did not know all uses of each plant into detail. For example, when the guide from Naranjal participated in the focus group discussion about medicinal plants, his medicinal knowledge of certain plants was incomplete, but it was complemented by other participants, mostly women. Also in Naranjal there were other people, next to the one who knew the forest, that went with me to collect plant samples.

3.5 Data analysis and remarks during analysis

To assign scientific names to plants that could not be collected in the field, literature review was conducted using different sources (DGFFS, 2014; Flores Bendezú, 2014; Gutiérrez Alvarado *et al*., 2010; Karsten *et al*., 2014, Llerena *et al*., 1979; Mazzentenka, 2007; Mendoza, 2011; Polesna *et al.,* 2011; Rostain, 2014; Ruiz *et al*., 2014; Saldaña Rojas and Montoya Núñez, 2007; Tournon, 2006; Vasquez and Gentry, 1989). Since both investigated communities belong to the same socio-cultural group of mestizos, scientific names of identified plants in one community were used in the other community when they had the same vernacular name.

Two plant species collected in Naranjal which were botanically identified, were removed from the data. The first one is *Vernonanthura patens* (*Ocuera*), which was removed because the mentioned plant part used, the palm heart, is not possible in the plant family of the Asteraceae. Therefore, this plant was left out together with *Costus lasius* (*Sachahuiro*), which was also deleted from the data in Naranjal because there was a lack of specific information for this medicinal plant.

To organize and analyze the collected information, the data was entered in Microsoft Excel. Both notes and recordings were used to complete all data. After receiving plant identification, scientific names were added next to their common name. All scientific names together with their botanical family were verified on the IPNI website (http://www.ipni.org/). All data sets were alphabetized first by family, then according to their scientific name, and when needed by vernacular name.

To make graphs and to calculate the number of plant species in each use category arrays were used (Figure 7). If in a certain selection the name matches the name within the quotation marks, it was given the value one, when it did not match, it received the value 0. By taking the sum, it calculated how many times a certain word, e.g. medicine, was mentioned. For numerical values the same was done, but the number did not have to be in between quotation marks. This made it possible to calculate for example amount of plant species with only one use or with different uses. This array was used to count all words and values in Microsoft Excel, from different plant parts, growth forms, growth locations, etc. These graphs and numbers were used to visualize and explore the differences between both communities.

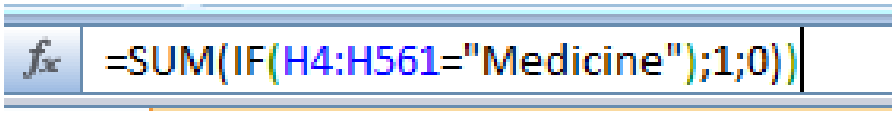

Figure 7 Example of using an array in excel to count how much plants are in the use category of medicine

For the Venn diagram in Figure 8, the program called 'Venn Diagram Plotter' was used. The number of plants for each community and the number of plants they have in common were all inserted into this program, resulting in a Venn diagram on scale.

All tables presenting numbers of plant species in plant families in the different chapters, only show botanical families with three or more plant species.

The growth form of each plant was determined with either field notes or using online herbaria Tropicos (http://www.tropicos.org/), Kew (http://www.kew.org/), The Linnaean Herbarium (http://linnean-online.org/) and Encyclopedia of Life (http://eol.org/). Seven different types of growth were distinguished in this study: herb, climber, shrub, tree, fern, succulent and aquatic plant. Climbers include all types of climbers, lianas and vines, both herbaceous or woody. The growth form 'tree' also includes palm trees. The distinction between these growth form was based on the typology used by Cruz-García and Price (2011). Here, the growth form 'fern' was separated from the growth form 'herbs'. Furthermore, the growth form 'succulent' was added.

To make the results in Appendix 4 more presentable, percentages below 1% were removed from the graph.

In chapter 5, plants from categories of food and beverages discussed in chapter 4 will be discussed together as food plants in general to facilitate the results in this chapter.

In the dataset of food plants (Appendix 5), the plant part mentioned for *Uncaria tomentosa* (*Uña de gato*) by the people was trunk, but it was changed to stem water. During plant collection, the trunk was cut to show the stream of natural stem water coming out, which can be drunk. Based on observation and the known usefulness of the stem water of this plant species as a perfect water source in the wild, trunk was changed to stem water (Thomas, 2008a).

Furthermore, for the food and beverage plants, a table (Appendix 7) with food availability was made. Together with botanical family, scientific and vernacular names, plant part, use frequency, storage time and availability of edible plant parts during the year were mentioned. Food availability in our study comprises both storage time and availability of edible plant parts, since storage time expends the availability of the edible plant part in nature.

The listed preparation methods in Appendix 10 and 11 could be formulated according to the standard methods of preparation of remedies (Polesna *et al.*, 2011): decoction (plant material boiled in water), tincture (plant material soaked in alcohol), infusion (extract in hot water), macerate (extract in cold water) or fresh material. Some preparation methods did not fit into these standard methods and were thus added separately: rasp, squeeze, heating above fire, soak, etc.

4 Use of plants

4.1 Introduction

In ethnobotanical studies, plants are usually divided into different categories based on their use pattern (Hoffman and Gallaher, 2007). Most-used categories as evidenced from literature are: medicine, food, construction, materials/tools, fuel/firewood, social uses, environmental uses and poison (Thomas, 2012). The classification into these categories differs depending on whether the classification is done from an emic or etic perspective (see Methodology) (Cruz-Garcia, 2014).

Data on the utility of plants is a dynamic and complex process involving people, their culture, and the natural environment from which they obtain their plants (Toledo *et al.*, 2009). As already mentioned (see 2.1.1), the way plants are distributed into different use categories depends on factors such as socio-economics, environment and geographics (De la Torre *et al.,* 2012; Toledo *et al.*, 2009).

This chapter presents the results related to the first three specific objectives to generate an inventory of plant uses for both communities, to determine differences in traditional knowledge between both communities, and study which factors explain these differences. This chapter is divided in the following sections: results, discussion and conclusions.

4.2 Results

4.2.1 Number of plant species

Appendix 2 and 3 show the results obtained from the first focus group discussion. In Pueblo Libre, 161 different plant species were listed by the local people; for Naranjal 224. Both lists have 116 plant species in common (Figure 8). In total, 269 different plants were listed by the people in the two communities. In total, 258 of the 269 different plants were identified botanically (from literature and collected plant samples); 216 plants were identified to species level, 41 up to genus level, one plant only upon family level, whereas 11 species were not identified.

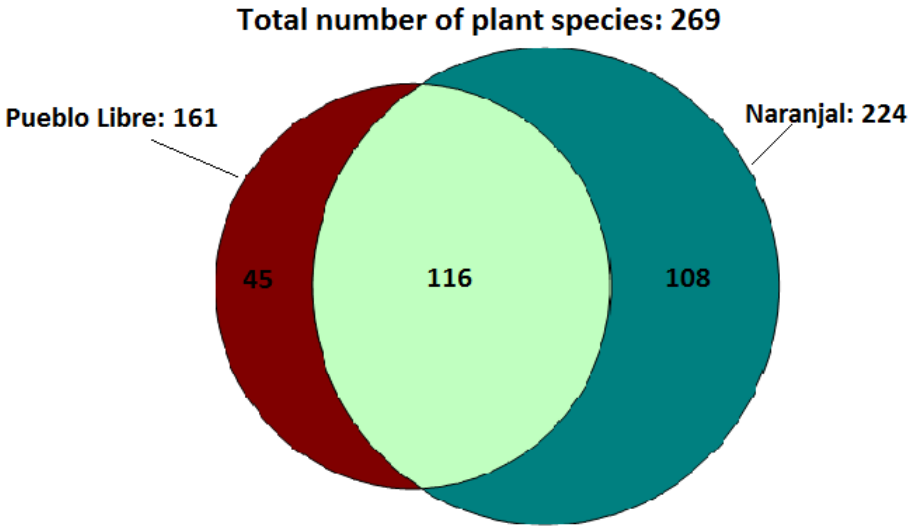

Figure 8 Number of useful plants listed in both communities

In Table 3, different plant families are shown with the number of plant species in each family for both Pueblo Libre and Naranjal. Pueblo Libre has plants in 64 different plant families, Naranjal 69 families. In total, all plants from both communities belong to 78 different plant families. For both communities, the plant family with most cited plants is Fabaceae. In Naranjal, Arecaceae and Moraceae are the families with the second highest number of plant species, followed by Solanaceae and Euphorbiaceae. In Pueblo Libre, Arecaceae is the second biggest plant family after Fabaceae. Solanaceae is third, followed by Moraceae and Rutaceae with an equal amount of different plants.

Table 3 Plant families ranked according to highest number of cited plant species in both communities. Only plant families with three or more mentioned species are shown.

Plant families	Pueblo Libre	Plant families	Naranjal
Fabaceae	17	Fabaceae	19
Arecaceae	10	Arecaceae	14
Solanaceae	9	Moraceae	14
Moraceae	7	Solanaceae	13
Rutaceae	7	Euphorbiaceae	9
Poaceae	6	Poaceae	8
Euphorbiaceae	5	Rubiaceae	7
Rubiaceae	5	Anacardiaceae	6
Anacardiaceae	5	Rutaceae	5
Cucurbitaceae	5	Araceae	5
Araceae	4	Apocynaceae	5
Bignoniaceae	4	Asteraceae	5
Apocynaceae	3	Cucurbitaceae	4
Malvaceae	3	Bignoniaceae	4
Piperaceae	3	Malvaceae	4
Sapotaceae	3	Piperaceae	4
Myrtaceae	3	Sapotaceae	4
Passifloraceae	3	Annonaceae	4
		Lauraceae	4
		Lecythidaceae	4
		Meliaceae	4
		Sterculiaceae	4
		Myrtaceae	3
		Passifloraceae	3
		Bombacaceae	3
		Verbenaceae	3

4.2.2 Use categories and plant parts used

We considered 14 use categories in total for both communities: food, beverages, medicine, firewood, biodiesel, fertilizer, materials, construction, propagation, feed, handicraft, aromatic, poison and smoking (Table 4). Beverages were not included in the food category because people explicitly mentioned them as a separate category and emic categorization was followed.

Table 4 Definition of and comments for each use category together with some examples

Category	Examples	Definition and comments
Aromatic	*Kalanchoe pinnata (Motelillo)*	Plants or plant parts with an aromatic scent.
Beverages	*Coffea arabica (Café), Saccharum officinarum (Caña de azucar)*	Fruits or other plant parts used to make beverages like juices or fermented alcoholic drinks.
Biodiesel	*Jatropha curcas (Piñon blanco)*	Plants harvested for the production of biodiesel.
Construction	*Lepidocaryum tessmannii (Irapay)*	Timber trees used for the construction of houses, fences, etc.
Feed	*Zea mays (Maiz)*	This includes both feed for domesticated animals, but in Naranjal also when the plant is eaten by certain wild animals like monkeys.
Fertilizer	*Pueraria phaseoloides var. Javanica (Cudzu)*	Plants or plant parts used to improve soil structure and composition.
Firewood	*Inga sp. (Shimbillo)*	Wood of plants used to make fires.
Food	*Mauritia flexuosa (Aguaje), Manihot esculenta (Yuca)*	All edible plant parts harvested like fruits, leaves, tubers, etc.
Handicraft	*Ormosia sp. (Huayruro)*	Plants or plant parts used to make handicrafts like bracelets, earrings, etc., but also for decoration, furniture or paint.
Materials	*Astrocaryum sp. (Huicungo), Tabernaemontana markgrafiana (Uchosanango)*	Plants used to make all kinds of materials, i.e., hats, (kitchen) tools, paper, boats, etc.
Medicine	*Plantago major (Llanten), Phyllanthus niruri (Chancapiedra)*	Plants used as remedies for diseases or physical injuries.
Poison	*Hura crepitans (Catahua)*	The poisonous nature of this plant makes it perfect to use as a herbicide, insecticide or poison.
Propagation	Seeds of several plants like *Oryzae sativa* (A*rroz), Theobroma cacao (Cacao)* or tubers like *Manihot esculenta* (Y*uca), Dioscorea cf. trifida (Sachapapa)*	Plants or plant parts used to grow new plants (seeds, tubers, etc.).
Smoking	*Nicotiana tabacum (Tabaco)*	Dried plant part used for smoking.

One plant species can have different uses, e.g. in Pueblo Libre the fruit of *Cucurbita cf. ficifolia* (*Zapallo*) is edible whereas the flower is used for medicinal purposes and the seeds are used as propagation material (Figure 9). The average number of different uses for a plant species is 1.96 for Pueblo Libre and 1.73 for Naranjal. The higher number of plant species (56.7%; 127 plant species) with only one use compared to Pueblo Libre (44.7%; 72 plant species), confirms the lower average number of different uses in Naranjal (Figure 10). Except for one use per plant species, Pueblo Libre always has higher percentages than Naranjal for higher plant uses (two uses or more), in Pueblo Libre there are thus more plant uses per plant species compared to Naranjal.

Figure 9 The fruit of *Cucurbita cf. ficifolia* (Zapallo)

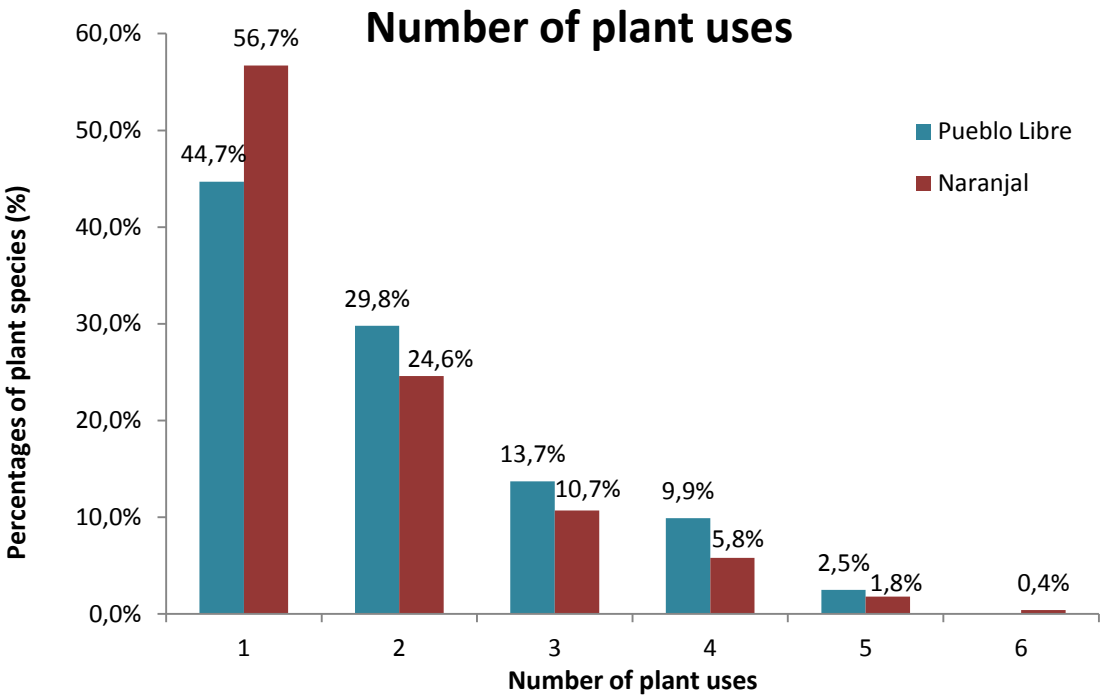

Figure 10 Number of plant uses per plant species in both communities

For Pueblo Libre, plants were grouped into 12 use categories as 'smoking' and 'poison' were not mentioned in this community. In Naranjal, 11 categories were mentioned, there were no plants in the use categories of aromatics, firewood and biodiesel. Figure 11 shows the percentages of plant species for each use category for both communities. People from Pueblo Libre use most plant species for food and medicine (each 44.7%; 72 plant species), whereas in Naranjal their most useful plants are used as medicinal plants with 56.7% (127 plant species).

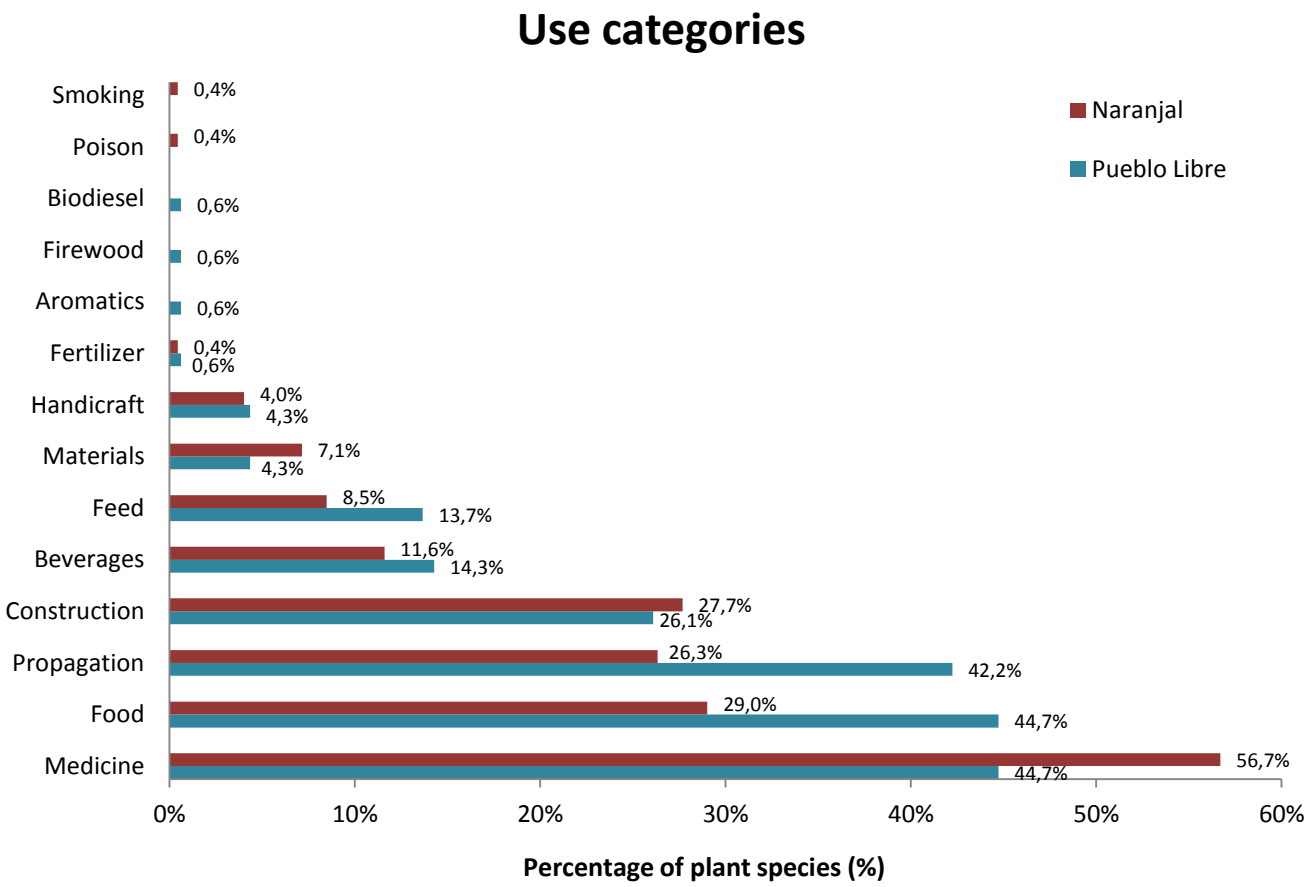

Figure 11 Distribution of plant species over different use categories for both communities

Furthermore, 25 of the 74 plants used as food and beverages in Pueblo Libre have also medicinal purposes or 33.8% of all food plants (Appendix 2). In Naranjal, this is even higher with 52.2% of all food plants or 36 of the 69 food plants (Appendix 3).

From one plant species different plant parts can be used for different purposes, but it is also possible that one plant part from a plant species is used in different use categories. In Naranjal for example, the seed of *Citrus limon* (*Limones*) is used as propagation material, whereas the fruit is used for food, beverage, and medicine, and the leaf is also used for medicine. All plant parts together with the percentages of plants from which that plant part can be used are presented in Figure 12. There are some big differences for most-used plant parts in both communities. In Pueblo Libre, most-used plant parts are seeds and fruits, while for Naranjal these are trunk, fruit and leaves.

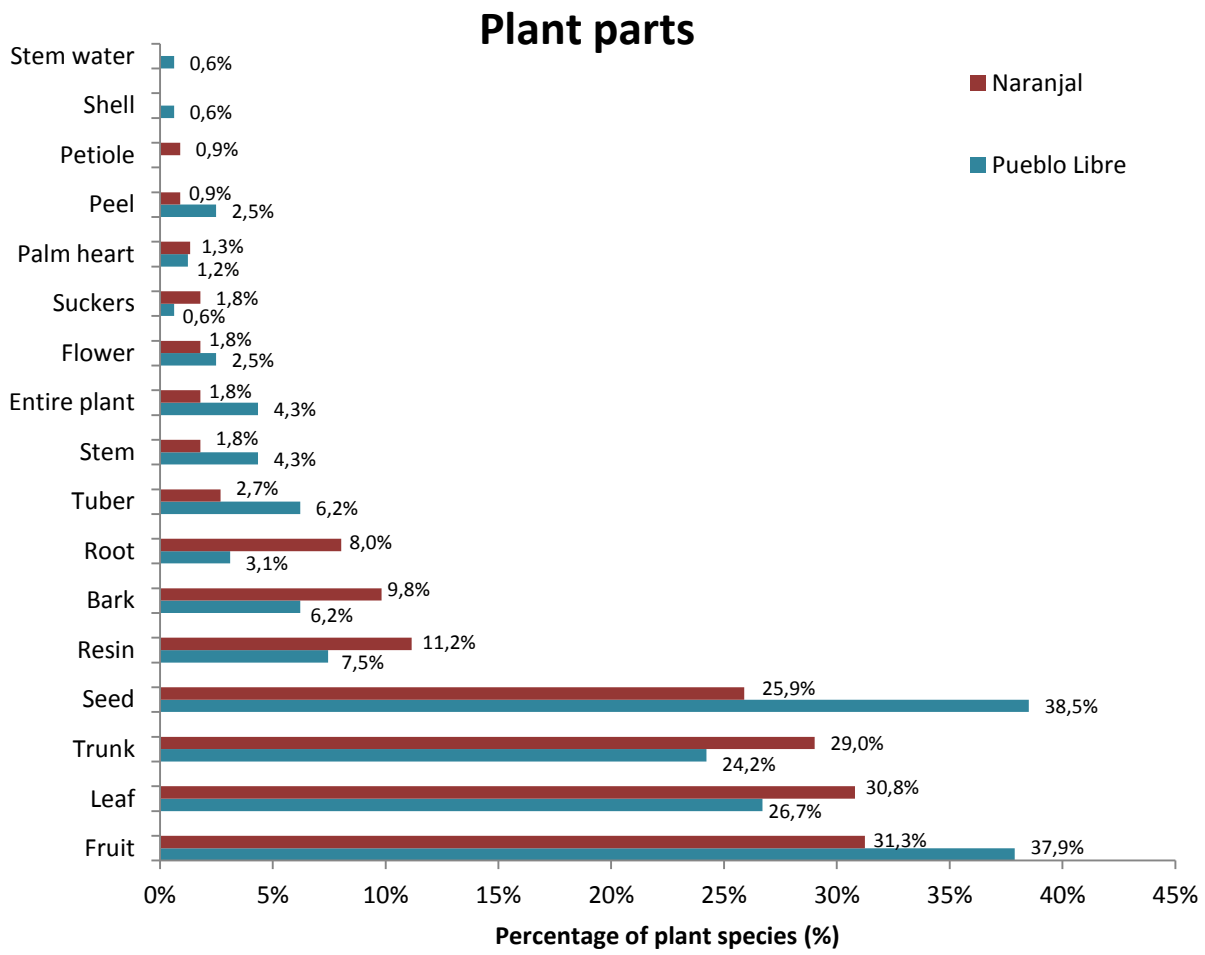

Figure 12 Percentages of plant species over different used plant parts in Pueblo Libre and Naranjal

For each use category, the percentage of plant parts used in each category was calculated (Appendix 4). All categories with 100% of one plant part are categories only containing one plant species from which only one plant part is used which is valid for the use categories smoking, poison, fertilizer, biodiesel and aromatics. Of all plant parts used for medicine, leaves are most used in both Pueblo Libre (40.7%) and Naranjal (37.3%). The most consumed plant part in the category of food is the fruit (74.7% in Pueblo Libre; 81.2% in Naranjal). Also for beverages, the fruit is used the most with 77.8% in Pueblo Libre and 88.5% in Naranjal. Trunks are most commonly used for construction in both communities (90.5% in Pueblo Libre; 91.9% in Naranjal), followed by leaves (7.1%; 8.1%) and in Pueblo Libre also entire plants are used for construction (2.4%). Fruits are also most used to feed animals in Pueblo Libre and Naranjal (85.7% vs. 59.1%), followed by leaves (4.8% vs. 18.2%), entire plant (4.8%; 9.1%), tubers (4.8% vs. 4.5%), and in Naranjal peels (4.5%) and seeds (4.5%) are also fed to animals. Propagation materials are mostly seeds, with 85.1% in Pueblo Libre and 86.7% in Naranjal, followed by tubers (7.5%) in Pueblo Libre, suckers in Pueblo Libre (3%) and Naranjal (6.7%) and the stem, with 3% in Pueblo Libre and 5% in Naranjal. For materials there are also a lot of different plant parts used. Pueblo Libre and Naranjal have following plant parts respectively in common in the category of materials: bark (16.7%; 5.9%), flowers (16.7%; 11.8%), fruits (16.7%; 5.9%), leaves (33.3%; 17.6%) and seeds (16.7%; 5.9%).

4.2.3 Trade

Whether a plant part or processed plant has the potential to be sold or traded can be found in the last columns in Appendix 2 and 3. One and the same plant part of a plant species can be sold in one use category and not in another, e.g. in Naranjal the fruit of *Pourouma cecropiifolia* (*Ubilla*) is used both as animal feed and as food, but the fruit is never sold in the first place for animals to eat, it is sold as a fresh food product. For each use category it was calculated how many of all plant uses are potentially sold (Table 5), it was not calculated per plant species since one plant species can have different plant parts used in the same category, but not both are sold, e.g. *Citrus limon* (*Limones*), both leaves and fruits are used for medicine, but only the fruits are sold, leaves not. In Naranjal, almost everything is sold, 93.5% of all uses, in Pueblo Libre 81.1% of all plant uses are sold (data not shown). All timber trees are sold, this is obvious since it is a high valuable market product. In both communities handicrafts are also always sold. Table 5 clearly shows that in Naranjal in each use category, more plant parts are sold compared to Pueblo Libre, e.g. 92.6% of the plant parts used to make beverages are sold in Pueblo Libre, whereas in Naranjal all plant parts used for beverages are sold, for the category of food the same trend is seen: 94.7% of the plant parts used for food are sold in Pueblo Libre and 100% in Naranjal. The largest difference is in the use category of 'propagation' where only 57.4% of the plant parts used for propagation are sold in Pueblo Libre and 91.5% in Naranjal.

Table 5 The proportion of plant uses (%) sold in each use category for both communities

Category	Pueblo Libre [%]	Naranjal [%]
Aromatics	100,0	/
Beverages	92,6	100,0
Biodiesel	100,0	/
Construction	97,6	98,4
Feed	18,2	22,7
Fertilizer	0,0	100,0
Firewood	100,0	/
Food	94,7	100,0
Handicraft	100,0	100,0
Materials	100,0	100,0
Medicine	90,2	98,0
Poison	/	0,0
Propagation	57,4	91,5
Smoking	/	100,0

4.2.4 Growth forms

Different types of growth forms can be distinguished, in this study there are seven: herb, climber, shrub, tree, fern, succulent and aquatic plant. In Figure 13, pie diagrams with the percentages of growth forms are presented. For both communities trees are the most common growth form, 53.4% of all plants in Pueblo Libre are trees and 59.4% in Naranjal. Herbs are the second most common growth form in both Pueblo Libre and Naranjal, with 22.4% and 20.1% respectively. Also climbers and shrubs are common growth forms in both communities. Only one fern and one succulent were found in each community, or 0.6% of all plants in Pueblo Libre and 0.4% of the plants in Naranjal. Naranjal

also has one aquatic herb (0.4%). For 0.9% of the plants in Naranjal, there were no growth forms reported (N.r.).

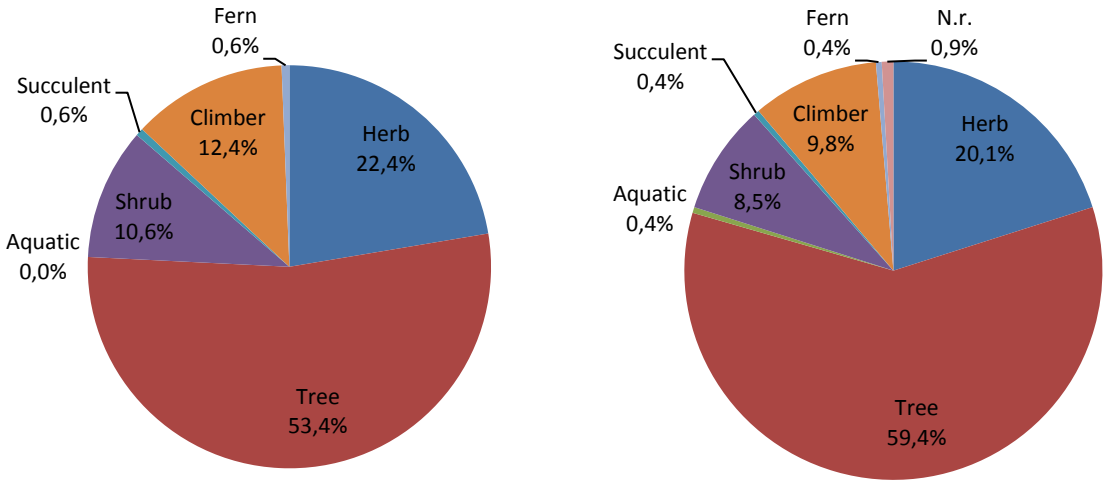

Figure 13 Percentages of growth forms for the plant species mentioned in Pueblo Libre (left) and Naranjal (right)

4.2.5 Growth location

For each plant, the growth location was asked, i.e. in which places the plant species can be found. Four different growth locations were mentioned: field, home garden, forest and lake. Only in Naranjal an aquatic plant *Huama* was registered growing in a lake. One plant can have different growth locations. In Pueblo Libre, there are only three growth locations (field, forest and home garden), 3.1% of the plant species can be found in each growth location, 34.8% can be found in two different locations and 62.1% only grows in one of the three growth locations. For Naranjal, 11.6% of all plant species can be found in all growth locations, 29.5% grows in two different growth locations and 58.9% grows only in one location: field, forest, home garden or in the lake. The percentages of plant species in each growth location was calculated for both communities (Figure 14). The most noticeable in Figure 14 is the high number of plant species (73.2%; 164 plant species) which can be found in the forest in Naranjal. In Pueblo Libre, most useful plant species grow in home gardens (53.4%; 86 plant species).

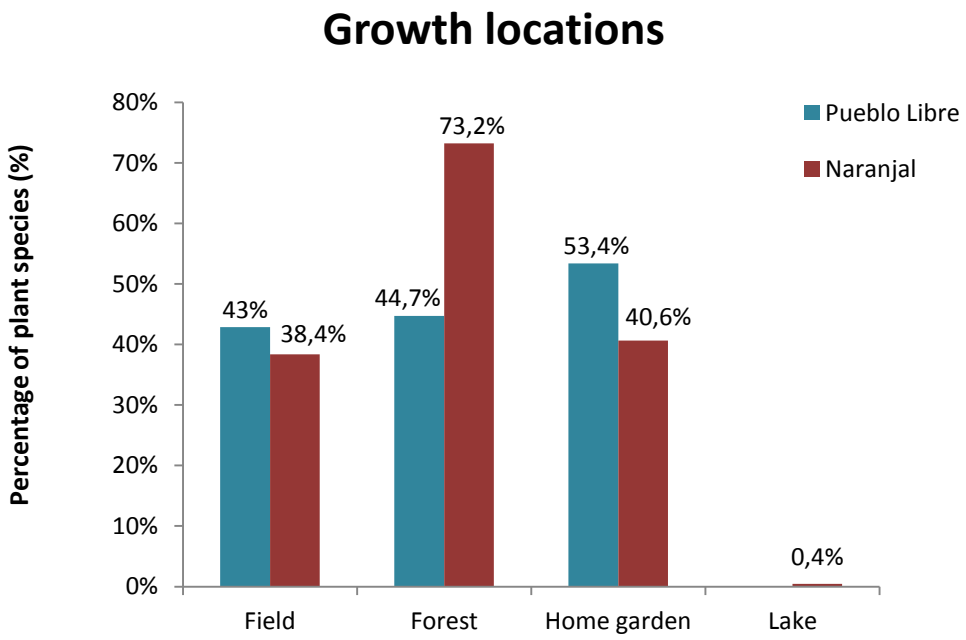

Figure 14 Growth locations of all plant species in each community

4.2.6 Handicrafts

Handicrafts include several items like paper, jewelry, furniture, instruments, etc. (Figure 15). All plants used as handicraft are listed in Table 6 for both communities. Two plant species, *Canna indica* (*Achira/Ashira*) and *Ormosia* sp. (*Huayruro*), are used both in Pueblo Libre and Naranjal to make jewelry.

Table 6 Plants used to make handicrafts in Pueblo Libre (P) and Naranjal (N)

Scientific name	Vernacular name	Community	Part	Handicraft
Amburana cearensis (Fr.Allem.) L.C.Sm.	Ishpingo	P	Bark	Artesanal paper
Anacardium occidentale L.	Cashu	P	Seeds	Jewelry
Anthurium barclayanum Engl.	Huanbe	N	Trunk	Baskets
Canna indica L.	Achira/Ashira	P/N	Seeds	Jewelry
Carica papaya L.	Papaya	N	Petiole	Flute
Carludovica palmata Ruiz & Pav.	Bonbonaje	N	Leaf	
Citrus x sinensis Osbeck	Naranja	P	Peel	Jewelry
Crescentia cujete L.	Huingo	N	Seeds	Jewelry
Guadua angustifolia Kunth	Marona	N	Trunk	
Gynerium sagittatum P. Beauv.	Caña brava	N	Trunk	
Heteropsis sp.	Tamishe	P	Entire plant	Broom
Mauritia flexuosa L.f.	Aguaje	N	Seeds	Jewelry
Ormosia sp.	Huayruro	P/N	Seeds	Jewelry
Swietenia macrophylla G. King	Caoba	P	Trunk	Furniture

Figure 15 All different kind of seeds and shells to make ornaments, jewelry, etc. (Naranjal)

4.2.7 Materials

In Pueblo Libre only six plant species are used as a material, whereas in Naranjal there are 16 (Table 7). They have two materials in common: leaves of Bijau (*Calathea lutea*) to prepare Juane. Juane is a typical dish of the Peruvian Amazon and the leaves of Bijau are used to wrap the rice dish in (Figure 16). Batan, mentioned in Table 7, is a large wooden material used in which for example Masato (a drink), is made.

Table 7 Plants used as materials in Naranjal (N) and Pueblo Libre(P)

Scientific name	Vernacular name	Community	Part	Material
Astrocaryum chambira Burret	Chambira	N	Leaf	Fiber
Astrocaryum sp.	Huicungo	N	Leaf	Sombrero
Attalea maripa Mart.	Conta	N	Seed	Batan
Bixa orellana L.	Achote	P	Seed	Paint
Calathea lutea (Aubl.) Schult.	Bijau	P/N	Leaf	Juane
Diplotropis martiusii Benth.	Chontaquiro	N	Trunk	Boat
Genipa americana L.	Huito	P	Fruit	Paint
Gossypium cf. barbadense L.	Algodon	P/N	Flower/Fruit	Coton
Guadua angustifolia Kunth	Marona	N	Trunk	
Gynerium sagittatum P. Beauv.	Caña brava	N	Trunk	
Heliconia rostrata Ruiz & Pav.	Situlli	N	Flower	Paper
Iriartea deltoidea Ruiz & Pav.	Pona	N	Palm heart	
Muntingia calabura L.	Yumanasa	N	Trunk	
Musa paradisiaca L.	Platano	P	Leaf	Juane

Scientific name	Vernacular name	Community	Part	Material
Ochroma pyramidale (Cav. ex Lam.) Urb.	Topa	N	Bark	
			Flower	Stuffing pillows
Pouroma aff. Bicolor Mart.	Cetico	N	Trunk	Paper
Swietenia macrophylla G. King	Caoba	P	Bark	
Tessaria integrifolia Ruiz & Pav.	Pajarobobo	N	Trunk	
Thoracocarpus bossectus (Vell.) Harling	Tambishi	N	Trunk	
Unidentified	Coucho	N	Resin	

Figure 16 Leaves of Bijau (*Calathea lutea)* (left) used to wrap Juane (right)

4.3 Discussion and conclusion

As already mentioned, there are several factors which can influence traditional plant knowledge. Both communities in this study were selected because of same ethnicity and their access to either a road or a river (see Methodology). Due to the same ethnicity in both communities, factors of influence will be completely independent of ethnicity. When studying communities with different ethnicity all differences in plant knowledge could be, directly or indirectly, linked to ethnicity. Both Beltrán-Rodríguez *et al.* (2014) and Lawrence *et al.* (2005) showed that accessibility, the other criterion for selecting both communities in this study, is one of the factors influencing ethnobotanical knowledge.

First of all, areas with easier access, such as areas close to roads, are more subjected to deforestation (CIAT, 2012; Foley *et al.,* 2007). Of the two communities investigated in this study, Pueblo Libre is the community located along the road and surrounding forests were already cleared more than ten years ago, mostly to make room for palm oil production. While forests around the community of Naranjal, which has limited access to permanent roads, have not been cleared yet. However, last year an oil palm company started plans to deforest in the year 2015 for the production of palm oil. By using a ferry to ship large machines for road construction, they started making improvements to the roads in Naranjal. This way the community can be accessed more easily. By the end of 2015, all 400 hectares of forest surrounding the community will be completely cleared in order to start large scale palm production. The trends in these communities supports the findings of Foley *et al.* (2007) showing that deforestation is situated in the most reachable areas. These are the edges of the forest and the

forests located close to or transected by roads. The situation in Naranjal demonstrates that these forest edges move and after the construction of the road they will also be submitted to deforestation that comes with palm oil production.

As already mentioned in the section about drivers of change, deforestation can have an enormous impact on ecosystem richness. De la Torre *et al.* (2012) and Thomas (2008b) showed that a high number of plant species is positively correlated to plant biodiversity. Although this study did not investigate plant biodiversity, the assumption could be made that Naranjal has a higher plant biodiversity compared to Pueblo Libre, since the list with plant species used has 63 species more in Naranjal. This assumption can be supported by the fact that Naranjal has low accessibility and thus low deforestation compared to Pueblo Libre where already years ago large amounts of forest were cut down for palm oil production.

Secondly, market access, also influenced by accessibility to rivers and roads, but also by the distance to markets, can cause less plant uses, but also a change in plant use (De la Torre *et al.,* 2012; Foley *et al.*, 2007; Murray and Sanchez-Choy, 2001; Thomas, 2012). This change in plant use has to do with the more commercial plants taking a more prominent role in the lives of the local people (De la Torre *et al.*, 2012; Lawrence *et al.*, 2005). This trend can also be seen in this study for Pueblo Libre which has an all-weather road available to several nearby markets, including the capital of Ucayali Region, Pucallpa, and shows less plants used compared to Naranjal. Next to that people in Pueblo Libre sell less plant parts or products, whereas Naranjal almost everything can be sold. For both communities all timber trees and handicrafts are sold. Timber trees are of high economic value. Other plant uses sold frequently in Pueblo Libre are economically important food plants and medicinal plants, confirming that more accessible communities lay their focus on fewer, but economically more valuable plants (Lawrence *et al.*, 2005).

Next to accessibility, several cultural and socioeconomic factors can be linked to differences in ethnobotanical knowledge, e.g. ethnicity, modernization, population characteristics, religion, gender, and age (Beltrán-Rodríguez *et al.*, 2014; De la Torre *et al.,* 2012; Lawrence *et al.*, 2005; Rudel *et al.* 2002; Thomas, 2012). Modernization, like access to government services, health services, electricity, resources, etc. causes a reduction of different species used (De la Torre *et al.*, 2012; Gray *et al.* 2008; Rudel *et al.* 2002; Thomas, 2012). The influence of modernization on the number of species used is definitely relevant in this study since Pueblo Libre is definitely an example of a modernized community, whereas Naranjal is not. The important road passing Pueblo Libre has provided a lot of opportunities and also easy travelling to other cities. The community is provided with electricity, but it also has cell phone reception and computers with internet access thanks to a project of USAID. In the community there is a modern health post with two permanent nurses who are trained in western medicine. Both accessibility and the health post have led to easy access to western medicine and made the people of Pueblo Libre less dependent on medicinal plant knowledge. While in Naranjal there is only electricity for a few hours each night by using a generator, so it has not yet been modernized, the health post is old and the nurse is not always available since she has to attend medical help to more than one community. This could explain why Naranjal (129 medicinal plants) has so much more medicinal plant knowledge compared to Pueblo Libre (72 medicinal plants).

Furthermore, Lawrence *et al.* (2005) found that modernized communities rely less on forest products for trade. Figure 8 showed clearly that the number of plants used in Naranjal mostly grow in forests,

while in Pueblo Libre, a modernized community, there were no big differences in growth locations registered.

Beltrán-Rodríguez *et al.* (2014) studied factors influencing ethnobotanical knowledge of mestizos in Mexico. These factors were farming activities, age, and gender. In this study, age and gender were not studied, but farming activities could definitely be of influence on traditional plant use knowledge. Pueblo Libre has been producing palm oil on a large scale for years now, while in Naranjal there is (for now) no palm production at all. When walking on the fields in Naranjal, there is much more biodiversity in one field compared to Pueblo Libre, where palms completely took over the natural landscape.

5 Food and beverages

5.1 Introduction

A plant can have one or different edible parts such as fruits, seeds, flowers, roots, rhizomes, bulbs and tubers, stems and leaves. When harvested, the plant part can be eaten fresh or can be prepared or processed before consumption. Different processing techniques can be applied, like grinding, soaking, drying, heating or parching. These techniques can be used when a highly toxic secondary compound needs to be removed, unwanted bitter qualities need to be eliminated or to be able to storage the food (Cruz-Garcia, 2014).

Losses in natural resources can result in less food security, leading to impoverishment of the health of local people (Foley *et al.*, 2007; Murray, 2006). Food systems for improved health start with food security for everyone. This means access to enough and good quality food to meet the daily energy requirements for everyone (Pinstrup-Anderson, 2009). Porro *et al.* (2014) investigated the relevance of forest products in the Ucayali region and concluded that most of the annual income of households in different communities with different ethnicities comes from activities related to forests and natural environment (including fisheries), secondly from agriculture, followed by wages and lastly from livestock. In the study of Murray and Sanchez-Choy (2001), fishing, wild food plants and crops are the main providers for food in communities of the Ucayali region. Both studies showed the importance of wild food plants and crops for local people to provide income and food.

Wild food plants are used worldwide as a food source (Balemie and Kebebew, 2006; Cruz-Garcia and Price, 2011). Not only as stereotypically thought by hunter-gatherers, but they can also be part of agricultural systems complementing the diet of local people. Grivetti and Ogle (2000) showed that edible wild plants provide essential micronutrients crucial for a complete nutritional diet. Next to complementing their diet, these wild food plants are also marketable and thus able to supplement the income of households giving them the opportunity to purchase other foods (Balemie and Kebebew, 2006; Jin *et al.*, 1999; Price, 1997).

There is a continuum between wild food plants and domesticated plants, so next to truly wild plants or wild plants protected by humans, also semi-domesticated plants can be considered as wild food plants or other plants with different management intensity (Cruz-Garcia and Price, 2014; Price, 1997; Thomas, 2012). Wild food plants have the advantage of ensuring food security for poor households or when yields are destroyed by changing floodplains, plagues or other events (Murray, 2001). But wild food plants also have to endure a lot of pressure mainly from anthropogenic factors, this is why local people sometimes intervene by propagating, protecting, selective harvesting or transplanting useful plants which are threatened (Balemie and Kebebew, 2006; Price, 1997; Cruz-Garcia and Price, 2011). These human interventions and the fact that there is a continuum between wild food plants and domesticated plants, make that wild food plants can be found in different locations in the forest or in other natural environments, home gardens and even fields (Cruz-Garcia and Price, 2011).

Crops also contribute to food security both by providing food for their own household as for selling a part of the harvest for their income (Porro *et al.,* 2014). However, the study of Leonard *et al.* (1993) shows that agriculture can intervene with a good balanced diet. In communities depending a lot on

cash crops, both for their own consumption and selling shares for their income, include less self-made products in their diets which on its turn influences the child's nutrition and growth negatively. The reasons for this bad influence on child's health are the low incomes obtained from selling their yield and thus buying inexpensive, but less nutritious, market foods. Communities where there is more home production and consumption of their own products seem to have better nutrition. Agriculture does not necessarily has to be at the expense of a good balanced diet of the local people, through integration of wild food plants into agricultural systems the diet of people can be complemented, providing them with the needed nutrients (Grivetti and Ogle, 2000). An example of integration of wild food plants into agriculture are the protection of certain weeds, producing edible parts, in a crop (Price, 1997).

This second chapter will assess the second objective on plants used for food and beverages. Next to the overview of several variables collected on food and beverage plants, food security will be investigated using the data collected on storage time and availability.

5.2 Results

5.2.1 General

In Pueblo Libre there are 74 plants used for consumption as food and beverages and in Naranjal 69. These plants are listed together with the plant part used, food type, preparation and storage method in Appendix 5 and 6 for Pueblo Libre and Naranjal respectively. To facilitate the results, plants from categories of food and beverages will be discussed together as food plants in general.

As shown in Table 8, the plant family with most food plants in Pueblo Libre is Arecaceae (8 species; 10.8%), followed by Rutaceae (6 species; 8.1%) and Solanaceae (6 species; 8.1%) with an equal number of plant species. For the use category of beverages, the most important families in Pueblo Libre are Arecaceae (4 species; 5.4%) and Rutaceae (4 species; 5.4%) (Table 9). In Naranjal, are Arecaceae (9 species; 13%) in the food category most abundant, followed by Anacardiaceae, Rutaceae and Solanaceae with the same number of plant species (5 species; 7.2%) (Table 8). In Naranjal in the category of beverages, Arecaceae (4 species; 5.8%) is again the most important plant family, followed by Anacardiaceae (3 species; 4.3%) and Rutaceae (3 species; 4.3%) (Table 9).

Table 8 Plant families with highest number of different plant species in the use category of food. Only plant families with at least 3 species mentioned are shown in the tables

Pueblo Libre		Naranjal	
Family	Food	Family	Food
Arecaceae	8	Arecaceae	9
Rutaceae	6	Anacardiaceae	5
Solanaceae	6	Rutaceae	5
Anacardiaceae	5	Solanaceae	5
Cucurbitaceae	5	Fabaceae	4
Fabaceae	5	Cucurbitaceae	3
Passifloraceae	3	Myrtaceae	3
Poaceae	3	Passifloraceae	3
		Poaceae	3

Table 9 Plant families with highest number of different plant species in the use category of beverages. Only plant families with at least 3 species mentioned are shown in the tables

Pueblo Libre		Naranjal	
Family	Beverage	Family	Beverages
Arecaceae	4	Arecaceae	4
Rutaceae	4	Anacardiaceae	3
		Rutaceae	3

In Appendix 5 and 6 preparations are listed; the first column of preparation describes whether the food part is eaten raw or cooked and in the second column the more detailed preparation method is given. In Pueblo Libre, of all possible plant parts and their different food types, 62.1% is eaten raw, whereas 27.4% is cooked, only 10.5% is eaten both raw or cooked. For Naranjal this is 69% for raw products, 30% for cooked products and 1% for plant parts eaten both raw or cooked.

For the food plants in Pueblo Libre, an average of 1.11 plant parts per plant species are used. For 72 plant species, or 93.5% of the edible plant species, only one edible plant part is mentioned, e.g. only fruits of *Spondias purpurea* (*Ciruelo*) are consumed in Pueblo Libre. Furthermore, 6.5% of the plant species have two edible parts in Pueblo Libre. In Naranjal, the average number of plant parts used for food is 1.05, with 94.2% of the plants with only one plant use and 5.8% with two plant parts used per plant species, like *Musa paradisiaca* (*Platano*) in Naranjal where the flowers and fruits are eaten.

In Figure 17, the different plant parts used for food consumption are shown: flowers, bark, stem, seeds, leaves, tubers, stem water and fruits. Nearly all cited used plant parts in both communities consist of fruits (79.7% in Pueblo Libre and 85.5% in Naranjal), followed by edible leaves with 9.5% of the plant species in Pueblo Libre and 4.3% in Naranjal. In Naranjal, tubers of three different plants (8.1%) are used for consumption, while in Pueblo Libre there are six (4.3%).

In Pueblo Libre, there is one plant, *Uncaria tomentosa* (*Uña de gato*), of which stem water was mentioned (Figure 17 and Appendix 5). It can be obtained in the forest by cutting the trunk of this wooden climber, causing the stem water to flow out, which can be drunk immediately.

The only flower consumed in both communities, is the edible flower of *Platano* (*Musa paradisiaca*) which is consumed in Naranjal as a vegetable by cooking it (Figure 17 and Appendix 5). Another plant part only used for consumption in Naranjal, is the bark of *Canela* (*Cinnamomum aff. Triplinerve*) used to make tea (Figure 17 and Appendix 6).

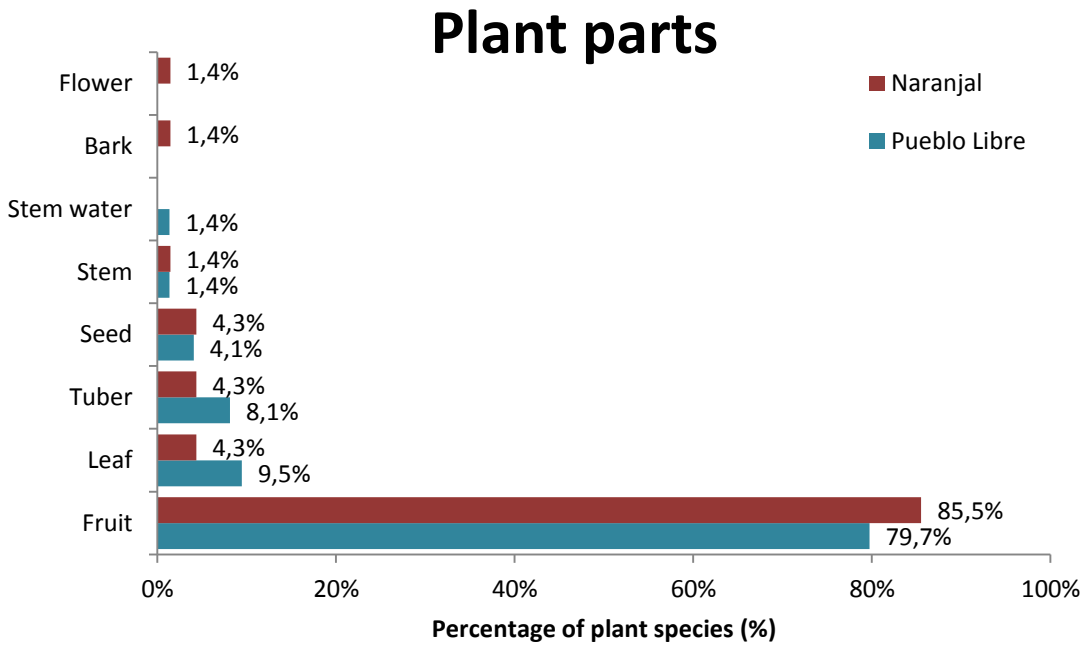

Figure 17 Proportion of plants for each plant part for the use categories food and beverage

In this chapter on food and beverage plants there are only four growth forms; trees, herbs, climbers and shrubs (Figure 18). The majority of the food plants in both communities are trees; 50% in Pueblo Libre and 58% in Naranjal, followed by herbs (22% in Pueblo Libre and 16% in Naranjal) and climbers (16% and 14%, respectively).

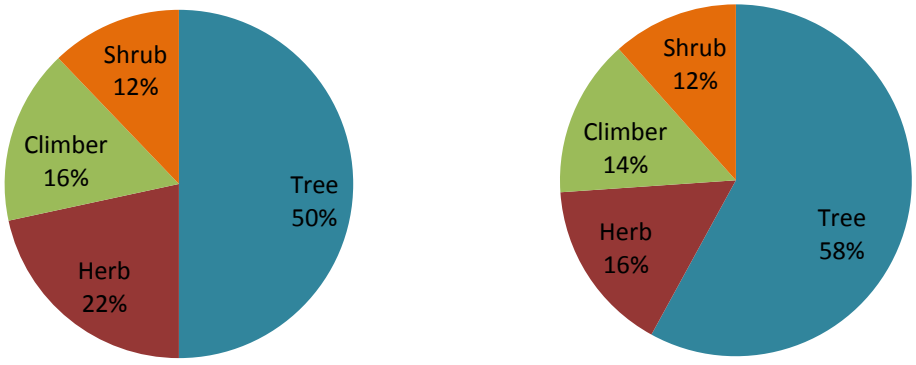

Figure 18 Percentages of growth forms for the plants of the use categories food and beverages in Pueblo Libre (left) and Naranjal (right)

Most plants used for food in Pueblo Libre can be found in fields (68.9%) and home gardens (68.9%) (Figure 19). In Naranjal, fields are the growth location with most food plants (68.1%), followed by home gardens with 62.3% of the plant species. The forest is the growth location where least of the plant species used for food grow, with 17.6% in Pueblo Libre and 42% in Naranjal. In Pueblo Libre, 45.9% of all food plants can only be found in one growth location, 50% in two growth locations and 4.1% in all three. For Naranjal, 46.4% of the food plants grow only in one place, 34.8% in two and 18.8% in all three growth locations.

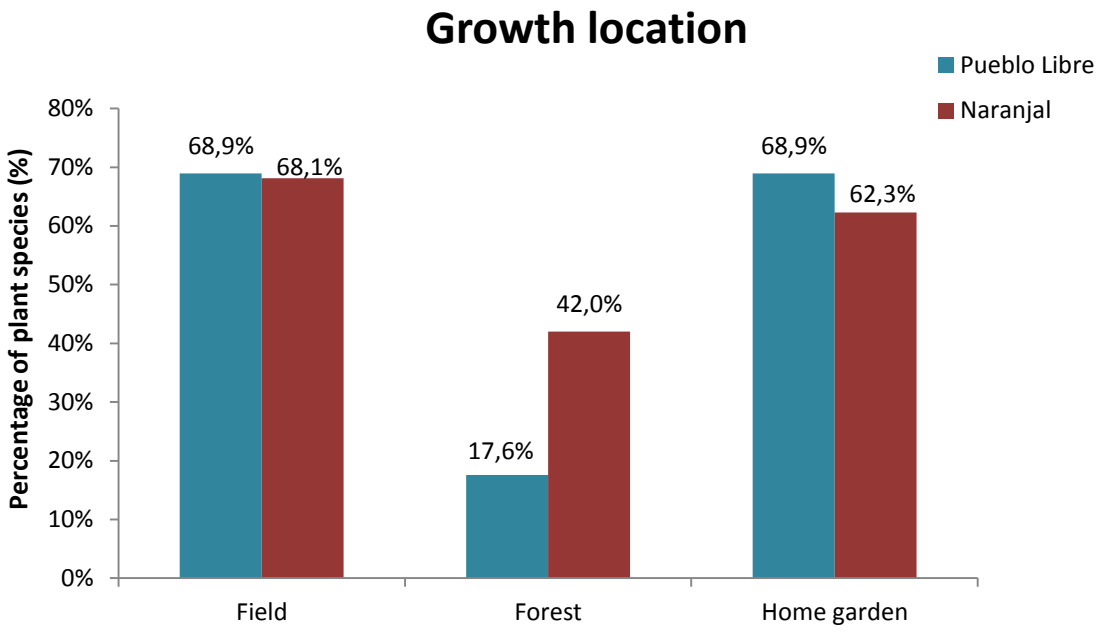

Figure 19 Growth locations for plants used for food and beverages

5.2.2 Preparations

In this chapter, the different uses of food plants were grouped according to food type: beverage, fruit, vegetable, carbohydrate, oil, spice, marmalade, snack and sauce (Appendix 5 and 6). One plant part of a plant species can be used for different food types, e.g. in Naranjal the fruit of *Citrus paradisi* (*Toronja*) is both consumed fresh or as a fruit, but also prepared in a beverage. Furthermore, one plant species can have different useful plant parts used for different food types, like in Naranjal the fruit of *Theobroma bicolor* (*Macambo*) is used as a fruit and the seeds are grilled as a snack.

Figure 20 presents the percentages of plants with a certain number of food types. The average number of different food types per food plant in Pueblo Libre is 1.58; for 66.2% of the plant species there is only one food type, e.g. the fruit of *Genipa americana (Huito)* is only eaten as a fruit. More specifically, 21.6% of the plant species were mentioned as two different food types, like for *Euterpe precatoria* (*Huasai*) of which the fruit is eaten as a fruit and the palm heart as a vegetable, and 12.2% of the plants used for food are used for three different food types, which is the case for the fruit of *Mauritia flexuosa* (*Aguaje*) that is eaten as a fruit, ice lolly and drunk as a beverage. There were also food plants with four types of food mentioned (4.1%) in Pueblo Libre, e.g. *Carica papaya* (*Papaya*). For Naranjal , the average number of different food types for one plant species is 1.42, with 68.1% of

the plants used for only one food type, 23.2% of the plants used for two different food types, and 7.2% used for three different food types, e.g. the tuber of *Manihot esculenta* (*Yuca*) is used to make beverages and is eaten as a carbohydrate, and the leaves are eaten as a vegetable. For 1.5% of the food plants, four types of food were registered.

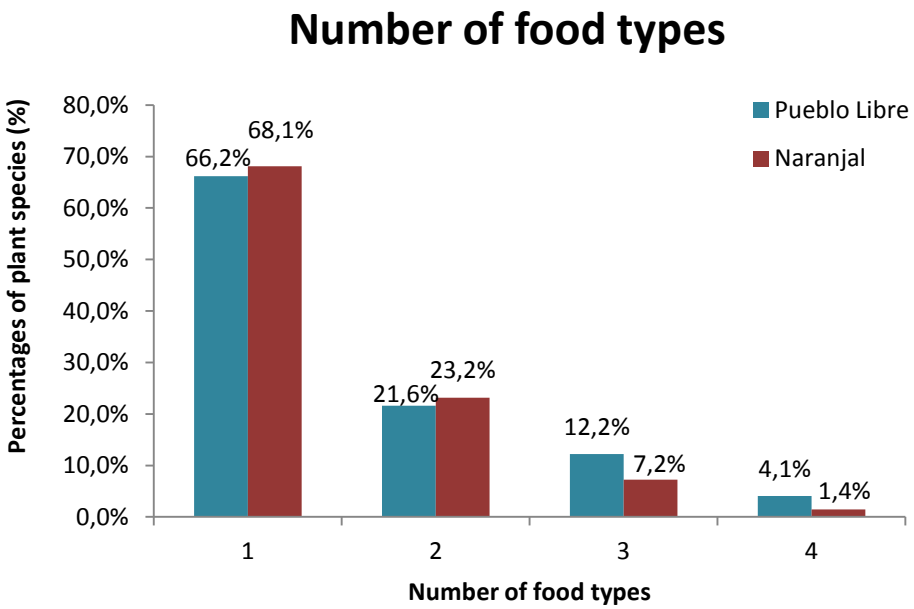

Figure 20 Percentages of food plants with different number of food types in both communities

The food type fruits is the one with most plant species both in Pueblo Libre, with 42 plant species (56.8%) eaten as a fruit, as in Naranjal, with 44 plant species (63.8%). For all fruits, it is the edible fruit that is consumed, except for the palm heart of *Euterpe precatoria* (*Huasai*) in Naranjal. *Coco nucifera* (*Coco*), which can be eaten both raw and cooked, and the palm heart of *Huasai*, which is always cooked, are the only ones that are cooked to consume as a fruit, all the other fruits to consume as a fruit are always eaten raw.

Beverages are the food type with second most plant species in both communities, 33.8% of the food plants in Pueblo Libre and 36.2% in Naranjal. In both communities there are different ways to prepare these drinks. Fruits can be squeezed and their juice can be drunk, like *Citrus limon* (*Limones*). Fermentation of certain plant parts results in alcoholic drinks, e.g. the stem of *Saccharrum officinarum* (*Caña de azucar*) from which they extract the juice using a kind of mill (Figure 20). Other drinks are refreshing drinks, which are made with fruits blended mostly with water and sugar, e.g. *Mangifera indica* (*Mango*). Furthermore, they have traditional coffee or *Coffea arabica* (*café*) in both communities and infusions, e.g. the leaves of *C. limon* (*Limones*) are used to make tea. Certain drinks are common in both communities and have specific names, like the alcoholic drink 'Masato' made of *Manihot esculenta* (*Yuca*) or 'Chicha' made from *Zea Mays* (*Maiz*).

Figure 21 Mill used to squeeze out the juice from the stems of *Saccharrum officinarum* (*Caña de azucar*)

Vegetables have the third largest number of plant species in both communities, with ten plant species (24.3%) in Pueblo Libre and six (20.3%) in Naranjal (Figure 23). Different plant parts are consumed as a vegetable in both communities:tubers, fruits, leaves and palm hearts. Naranjal has also one other plant part consumed as a vegetable, the flower of *Platano* (*Musa Paradisiaca*).

Pueblo Libre and Naranjal have four carbohydrates in common: the fruit of *Pijuayo* (*Bactris gasipaes*), the tuber of *Sachapapa* (*Dioscorea* sp.), the tuber of *Yuca* (*Manihot esculenta*) and the fruit of *Platano* (*Musa paradisiaca*). Both communities also consume *Arroz* (*Oryza sativa*) as a carbohydrate, but in Pueblo Libre they mentioned the seeds as the used plant part and in Naranjal the fruit (Appendix 5 and 6). In Naranjal, these are the only five plant species (8.7%) used as a carbohydrate, whereas in Pueblo Libre there are in total nine plant species (12.2%) used as carbohydrates (Figure 23). The other carbohydrates in Pueblo Libre are *Papaya* (*Carica papaya*), *Dale Dale* (*Calathea allouia*), *Pan de árbol* (*Artocarpus altilis*) and *Maiz* (*Zea mays*).

Pueblo Libre uses 11 plants to spice their food or 14.9% of all food plants (Figure 23). Only three spices (4.3%) were mentioned in Naranjal. Two spices are present in both communities: the seeds of *Achote* (*Bixa orellana*) (Figure 22) used to dye dishes and the fruit of *Pimienta* (*Piper nigrum*).

Figure 22 The seeds of *Bixa orellana* (Achote)

Snacks were only mentioned as a food type in Naranjal, this food type contains three plant species or 4.3% of all food plants (Figure 23).

Ice lollies are a food type only present in Pueblo Libre and are always made of the fruits of plant species. To make them, the fruits are cooked and other ingredients are added. Finally, everything goes into little plastic bags which are put in the freezer. Three fruits or 5.4% of all food plants are used to make ice lollies in Pueblo Libre (Figure 23).

To make marmalade, fruits were always used. They are cooked and sugar is added. Sometimes other ingredients are added as well, like cinnamon. In Pueblo Libre, 5.4% of the food plants are used to make marmalade, in Naranjal 2.9% (Figure 23).

In Figure 23, 2.7% of the plants in Pueblo Libre are used to produce edible oil. When fruits from species *Elaeis guineensis* (*Palma*) and *Oenocarpus bataua* (*Ungurahui*) are cooked, oil floats on the surface and this can be extracted as an edible oil.

Furthermore, 1.4% of the food plants in Pueblo Libre or one plant species, *Solanum sessiliflorum var. sessiliflorum* (*Cocona*), was listed to make a sauce (Figure 23).

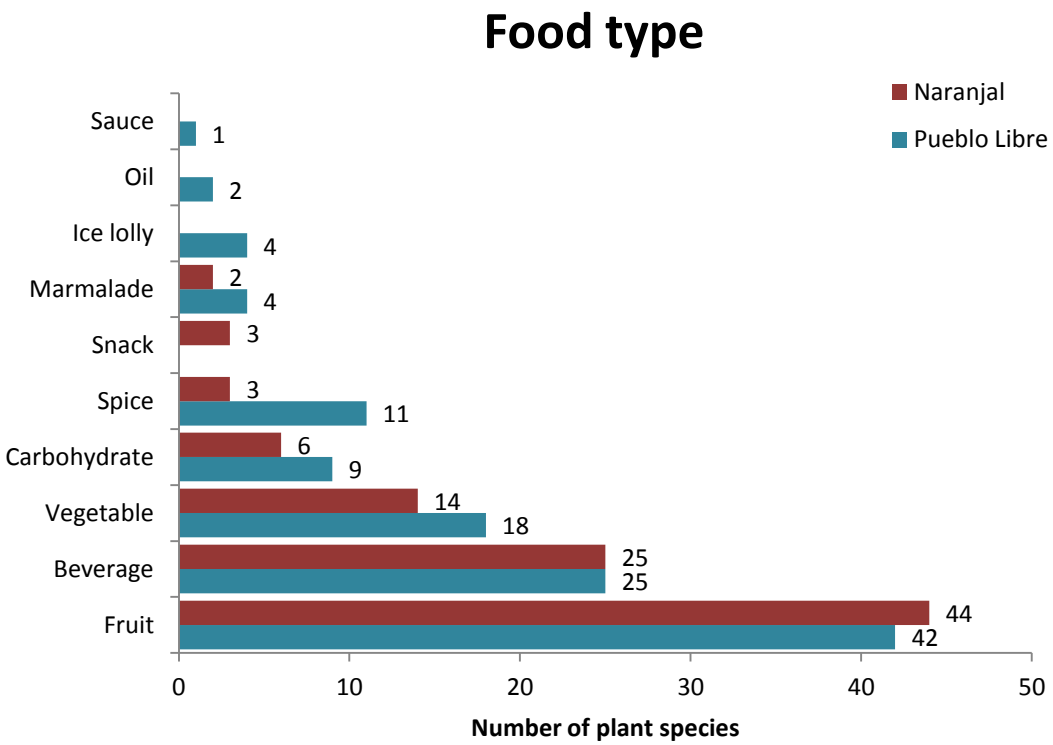

Figure 23 Different food types

5.2.3 Food availability, use frequency and storage

The participants were asked for the availability of each food plant during the year (Figure 24). Since Pueblo Libre has more plants (parts) in the use category of food and beverages, the number of plant species available in each month lies much higher, except for September. In Pueblo Libre, August is the month with 44 plant parts available for consumption, followed by September and October, with each 42 plant species. For Naranjal, September is the month with most available food plants (45 species), followed by August with 29 plant species. The general trend for Pueblo Libre is more available plant species from July until November and less from December until June. In Naranjal, the available food plants in September is remarkably higher than for the other months, but here there is the same trend of higher availability from August until November and less throughout the rest of the year.

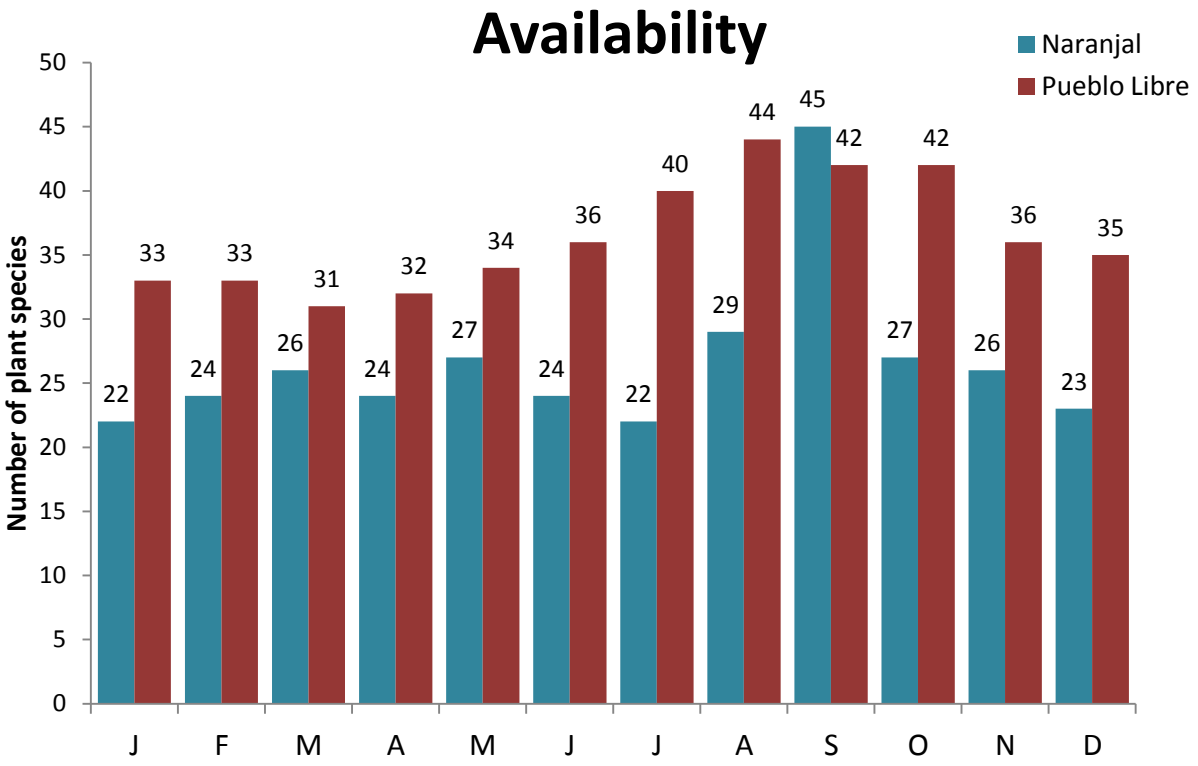

Figure 24 Availability of edible parts for consumption during the year

To assure a good and long storage of the used plant part, the plant part can be dried or it should be stored in a cool place, other plants cannot be stored and should be consumed immediately. In Pueblo Libre 2.5% of the used plant parts cannot be stored, 78.5% should be kept cool, 7.6% dry, 5.1% cool and dry and 5.1% should be dried before it is stored (Appendix 5). In Naranjal 10.1% is consumed fresh, 4.3% needs to be dried before storage, 10.1% should be stored in a dry environment, 69.6% is stored in a cool place and 5.8% needs to be kept dry and cool at the same time (Appendix 6).

The storage time depends not only on the storage method, but also on the plant species and its plant part, so the time of storage is different for every plant or plant part (Appendix 7).

In Appendix 7, the availability in nature is showed during the year for plants used for food, this gives an idea of the food security in both communities. There are many differences in plant availability for the same plant species mentioned in both communities. For *Spondias mombin/Spondias venosa* (*Uvos*), *Spondias radlkoferi* (*Taperiba*), *Matisia cordata* (*Zapote*), *Pouteria caimito* (*Caymito*), etc. there is exactly one month between the availability of the same plants in both communities. Some of the same plant species have completely different availability, e.g. *Attalea phalerata* (*Shebon/Shapaja*), *Bactris gasipaes* (*Pijuayo*), *Cucumis melo* (*Melon*), *Calathea allouia* (*Dale Dale*), etc. Others have more or less the same availability in both communities: *Mangifera indica* (*Mango*), *Cocos nucifera* (*Coco*), *Bixa orellana* (*Achote*), etc.

Use frequency of a plant species is the frequency of consumption during the time the edible plant part is available. The use frequencies are divided into different ranges from every day to once a year. In Appendix 7, most of the use frequencies are more or less the same, except for a few big differences, e.g. *Pouteria caimito* (*Caymito*) is consumed once a year in Pueblo Libre, whereas in Naranjal it is consumed every day when the fruit is available. Figure 25 presents the percentages of plant species in each range of use frequency.

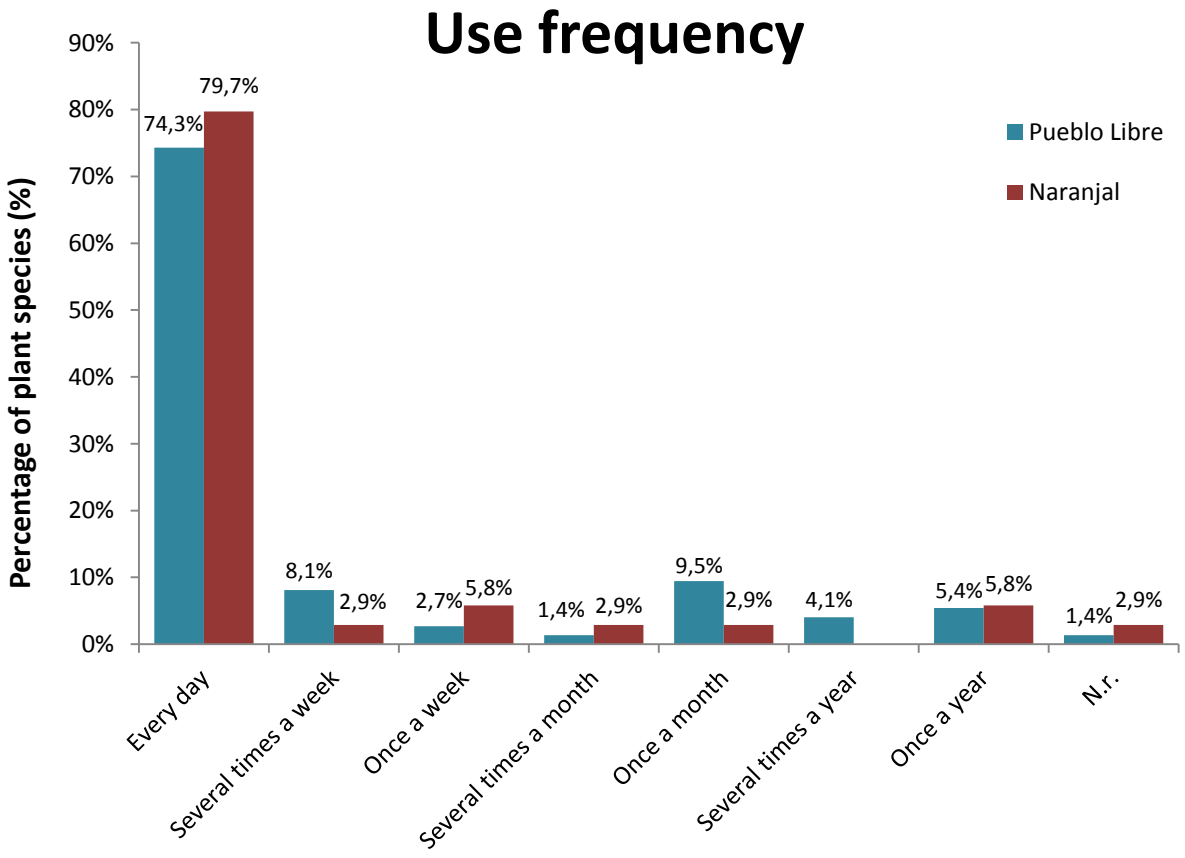

Figure 25 Percentages of plant species in each range of use frequency for both Pueblo Libre and Naranjal. This is the use frequency of plant species when the edible part is available.

5.2.4 Restrictions

In Appendix 8 and 9, all plant species with their plant part and the specific food type is mentioned with their restrictions for consumption. In both communities fermented drinks, alcohol, may not be consumed by children. In Pueblo Libre there is also a restriction to consume coffee for children and people with heart problems. In Naranjal there are almost no restrictions mentioned, except for the alcoholic drinks. Some foods can cause diarrhea, e.g. *Matisia cordata* (*Zapote*).

5.3 Conclusion and discussion

Reyes-García *et al.* (2005) concluded that indigenous people in more isolated villages have a higher plant use knowledge and plant consumption than people in the more accessible communities. As the results in chapter 4 show, Naranjal, the more isolated community, has indeed more general plant use knowledge than Pueblo Libre, the more accessible community. However, in this chapther on plant knowledge concerning food, Pueblo Libre has a higher number of plant species than Naranjal. The accessibility of Pueblo Libre makes them focus on trade of food plants, which is a use category of economic importance. This might be an explanation why in Pueblo Libre the number of plants used for food and beverages is slightly higher.

Another difference between both communities is that Naranjal has no food type 'ice lollies'. This is probably related to the fact that Pueblo Libre has electricity all the time, whereas Naranjal only has electricity for a few hours a day with a generator. Pueblo Libre is able to use a freezer to make and preserve ice lollies. Furthermore, it is remarkable that most plant parts of food plants can be stored for a longer period in Pueblo Libre compared to Naranjal. Pueblo Libre, has the possibility to store everything in refrigerators, prolonging the storage time of food plants in Pueblo Libre.

Not all plant parts are available during the whole year, availability defines not only the time, but also the frequency of harvesting plant parts. The availability not only changes from plant to plant, but due to ecological and climatic conditions availability can also be different from place to place (Balemie and Kebebew, 2006). When we look at food availability in both communities, a lot of the same plant species have different availabilities. Of these plant species, many have only one month in between their period of availability. This might be related to the different location of the villages; Naranjal is located next to a river and lies in the lowlands, while Pueblo Libre lies a little bit higher and not next to a river. This difference in environment might influence the availability of the same plant species in the different communities. The big differences in availability between both communities might be caused by errors. Since the information on food plants was gathered in a certain period of the year, it is possible people do not remember the availability of plants in other periods well, not only causing wrong data of availability, but also a higher number of plant species available during the time of data collection, since they are confronted with these plants at the moment of the study and forget other plants later during the year.

Most food and beverage plants belong to the family Arecaceae. Palms (Arecaceae) are among the most commonly mentioned plant families in the ethnobotanical literature and they constitute keystone resources in the subsistence of local people (Balslev *et al.*, 2008;Cámara-Leret *et al.*, 2014). Human food is among the categories with the highest number of useful plant species in datasets of

the study of Cámara-Leret *et al.* (2014). Both Balslev *et al.* (2008) and Cámara-Leret *et al.* (2014) mention some palm species which are of major importance as a food source (*Bactris gasipaes, Mauritia flexuosa, Euterpe precatoria, Oenocarpus bataua*), they are also found in the datasets of both communities in this study.

Food availability in this study shows how many plant species are available during the year, when these are available, and how long they can be stored. However, it does not describe the amount of food and the quality of these plant species that are consumed and in what way they contribute to a good balanced diet with enough nutrients during the whole year.

Medicinal plants

5.4 Introduction

5.4.1 Traditional medicinal knowledge

Indigenous communities in the Amazon have shared a lot of traditional plant knowledge in the past providing Western cultures with not only food, art, music instruments, and technology, but also important medicines or chemical components like quinine (Jovel, 1996). Long before the exchange of knowledge between indigenous communities and the Western world, mestizos adopted large quantities of traditional knowledge from indigenous people and from exchange of information between mestizos because of their mobility and internal migration (Jovel *et al.*, 1996; Philips and Gentry, 1993). This makes mestizos, next to indigenous communities, also a valuable source of traditional plant knowledge. Although most mestizos have access to cities and Western medicine, they are still mostly depending on their traditional medicinal knowledge to treat illnesses (Polesna *et al*., 2011). Reasons why mestizos in this region rely on traditional medicine are: not enough trained medical personnel in these remote areas, supplies are limited, consultations and Western medicines are very expensive for the majority of the people, and only basic supplies are available (disinfectants, antibiotics, pain killers, and anti-diarrhea) (Jovel *et al.*, 1996; Jovel, 1996; Philips and Gentry, 1993).

5.4.2 Importance and threats of traditional medicine

Worldwide, traditional medicine is still the most important form of health care for a lot of people or it serves to complement other medicinal practices (Calvet-Mir *et al*., 2008). A serious threat to this traditional plant knowledge is the fast destruction of the plant habitats, since that takes away the foundation of traditional medicine, the forest itself (Bussmann and Sharon, 2006; Jovel, 1996). Deforestation can have irreversible consequences for certain medicinal plants and for the people depending on them when they never grow back again. Some mestizo healers even fall back on some pharmaceuticals (like antibiotics and chemotherapeutical agents) to have the desired treatment since some plants cannot be found anymore. Not only do we still depend so much on natural resources for our Western medicines, we also depend on traditional knowledge to point us in the right direction of possible new pharmaceutical plants or components. Without their knowledge, Western medicine would not be where it is right now and finding new pharmaceutical plants would be a lot harder (Jovel, 1996).

5.4.3 Characteristics medicinal plants

Medicinal species need to be abundant and easily accessible and therefore rare species are usually not registered in pharmacopoeias because they would easily become extinct or hard to find or brought under cultivation (Leonti, 2011). Some plant families contain more plants with medicinal properties than others.

This chapter presents the results of the third objective on medicinal plants in which we will assess the medicinal properties of plants using several variables. The chapter is divided into following sections: results, discussion and conclusion. The focus will be on a comparison with other studies from literature.

5.5 Results

5.5.1 General

A total of 72 and 129 medicinal plants were recorded in Pueblo Libre and Naranjal respectively. Information collected for each medicinal plant species in Pueblo Libre (Appendix 10) and Naranjal (Appendix 11) includes used plant part, the disease that can be treated together with a description/an enumeration of its symptoms, the preparation and its ingredients and application method.

Table 10 presents the plant families, which were, when families and species were linked together, most mentioned in Pueblo Libre and Naranjal. The family of Moraceae has in both communities the highest number of medicinal plant species, with six plant species in Pueblo Libre (8.3%) and 14 in Naranjal (10.9%). In Pueblo Libre, Moraceae are followed by Euphorbiaceae and Solanaceae with both four plant species (or 5.6%), whereas in Naranjal these families have third (9 species; 7.0%) and fourth (7 species; 5.4%) highest number of plant species respectively. Although Solanaceae only takes fourth place in Naranjal, it has more or less the same percentage of plant species as in Pueblo Libre. Fabaceae, with ten medicinal plant species (or 7.8%), is the second largest plant family in Naranjal.

Table 10 Plant families ranked according to highest numbers of mentioned medicinal plants in Pueblo Libre and Naranjal

Pueblo Libre		Naranjal	
Family	Number of plant species	Family	Number of plant species
Moraceae	6	Moraceae	14
Euphorbiaceae	4	Fabaceae	10
Solanaceae	4	Euphorbiaceae	9
Anacardiaceae	3	Solanaceae	7
Bignoniaceae	3	Araceae	4
Fabaceae	3	Piperaceae	4
		Poaceae	4
		Rubiaceae	4
		Anacardiaceae	3
		Arecaceae	3
		Asteraceae	3
		Bignoniaceae	3
		Cucurbitaceae	3
		Rutaceae	3

For nearly half of the medicinal plant species mentioned in both communities, leaves are used to treat certain diseases/symptoms; for 47.2% of medicinal plant species (34 plant species), leaves are used in Pueblo Libre, and 44.9% (57 plant species) in Naranjal (Figure 26). Second most used plant part is resin with 16.7% (10 plant species) and 19.7% (25 plant species) for Pueblo Libre and Naranjal,

respectively. This is followed by the use of bark, with 10 plant species (13.9%) in Pueblo Libre and 21 (16.5%) in Naranjal.

In Pueblo Libre, the average number of plant parts used per plant for medicinal purposes is 1.14, in Naranjal this is 1.20.

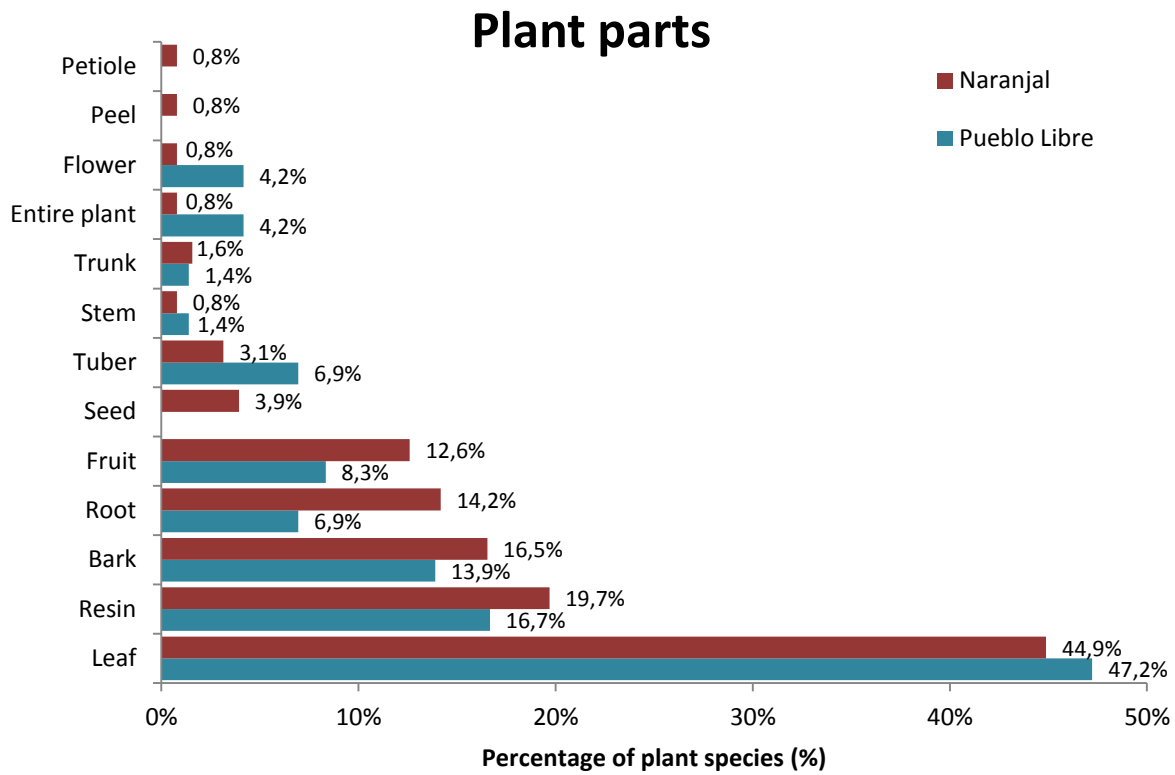

Figure 26 Percentages of plant species that use a certain plant part

Figure 27 shows the percentages of growth forms of all medicinal plants. Most medicinal plants are trees, 38% in Pueblo Libre and 44% in Naranjal, followed by herbs with 31% and 28% in Pueblo Libre and Naranjal respectively. In Naranjal shrubs are the third most common growth form with 13%, while the growth forms shrub and climber are both the third most common growth forms with each comprising 14% of medicinal plant species in Pueblo Libre.

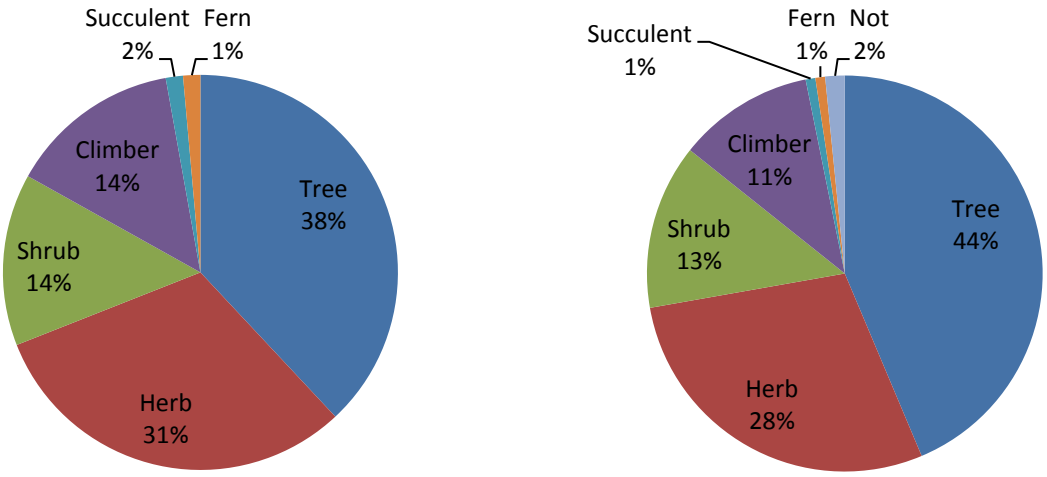

Figure 27 Percentages of growth forms in Pueblo Libre (left) and Naranjal (right)

Medicinal plants grow mostly in home gardens in Pueblo Libre, with 45 plant species out of 72 or 62.5% of all medicinal plant species, followed by fields and forest with each 28 plant species or 38.9% (Figure 28). While in Naranjal, the most important growth location for medicinal plant species is the forest, with 90 plant species from the total of 129 or 70.9%; secondly home gardens with 62 plant species (48.8%), followed by fields with 52 plant species (40.9%) and only one (0.8%) aquatic herb growing in lakes. In both Pueblo Libre and Naranjal, most plant species grow at only one location or 61.1% and 55.1%, respectively; in Pueblo Libre, 34.7%, and in Naranjal, 30.7% of all medicinal plant species can be found in two different growth locations; and, respectively 4.2% and 15% of mentioned species grow in all three growth locations, except for the lake.

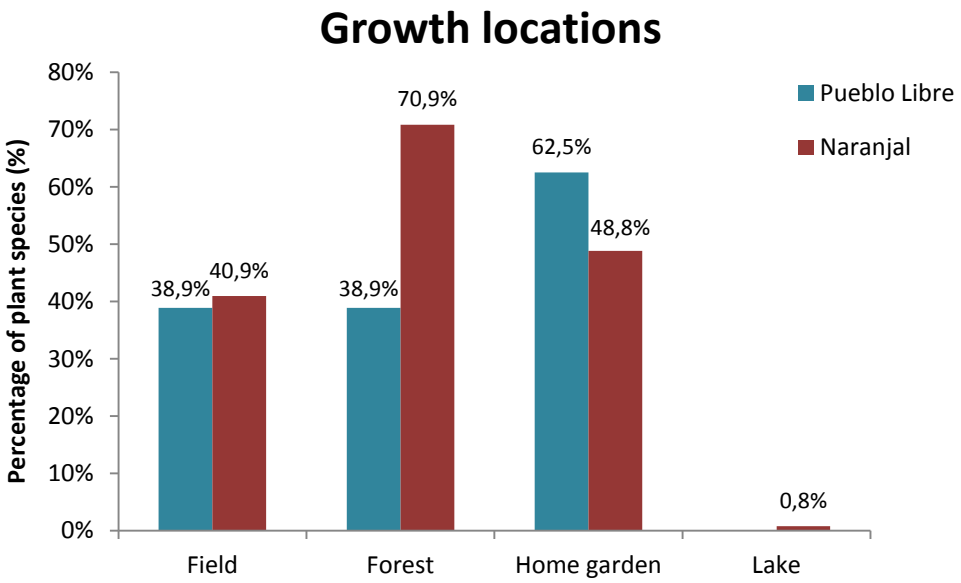

Figure 28 Percentages of plants species which can be found on several growth locations

5.5.2 Application

There are different ways to apply medicinal plants (Table 11). Plants can be taken orally as a drink, a tea, a drink as agua de tiempo or just by eat it. Agua de tiempo is a drink consumed like water, but it is a drink made with plants. Another application method is applying it externally on the skin or by using eye drops. Bathing, immersing head and washing are also application methods. The most used application method in both communities is drinking the preparation, 69.4% of the medicinal plant species (50 species) in Pueblo Libre and 64.6% (82 species) in Naranjal. External application and drinking tea are also common methods to apply medicinal plants in both communities; in Pueblo Libre 13.9% of the medicinal plants (10 species) is applied externally, whereas in Naranjal this percentage lies much higher, with 32.3% of the medicinal plant species (41 species). Tea is made for many medicinal treatments in both Pueblo Libre and Naranjal, with 20.3% and 25.2% of the medicinal plant species in each community, respectively. Naranjal indicated two application methods, which were not mentioned in Pueblo Libre: immersing the head in the preparation and eating the preparation. Furthermore, in Pueblo Libre eye drops were mentioned as application method, but it was not in Naranjal.

Table 11 Number of medicinal plants and percentage of medicinal plant species for each application method in Pueblo Libre and Naranjal

	Pueblo Libre		Naranjal	
Application	Number	Percentage	Number	Percentage
Drink	50	69,4%	82	64,6%
Apply externally	10	13,9%	41	32,3%
Drink as tea	15	20,3%	32	25,2%
Bathe	7	9,7%	9	7,1%
Drink as agua de tiempo	3	4,2%	8	6,3%
Immerse head	0	0,0%	6	4,7%
Eat	0	0,0%	5	3,9%
Wash (wounds, vagina)	1	1,4%	4	3,1%
Eye drops	1	1,4%	0	0,0%

In Appendix 12 and 13, the percentages of plant species that are applied according to a certain method were calculated per plant part for Pueblo Libre and Naranjal, respectively.

In Pueblo Libre, for all plant parts, the bark (72.7%), entire plant (50%), flower (66.7%), fruit (100%), leaf (34.2%), resin (68.8%), root (80%), shell (100%), stem (66.7%) and tuber (60%), drinking the preparation is the most used application method. The application methods bathe, drink as tea and drink as agua de tiempo each comprise 9.1% for the plant part bark. The entire plant has both apply externally and drink as tea as the second most used application with each 25%. Flowers are also applied with bathing (33.3%). Leaves are also drunk a lot as tea (31.6%), whereas the second most application method for resin is external application (31.3%). Roots are also applied by drinking it during the day as agua de tiempo (20%). Eye drops (33.3%) are the application method of only one plant species in Pueblo Libre of which the stem is used. For tubers the other two used application methods are external application (20%)and drinking as tea (20%).

Whereas in Pueblo Libre drinking of the prepared plant part is the most used application method for all plant parts, this is not the case for all plant parts in Naranjal. Only for the plant parts bark (39.1%), fruit (42.1%), peel (100%), resin (56.3%), root (78.9%) and stem (100%) drinking is the most used application method. Other applications which are used a lot with bark are drinking as tea (21.7%) and external application (17.4%). For flowers, 50% is applied externally and 50% is drunk as tea. After drinking, the most used application methods for fruit are external application (26.3%), eating (15.8%) and drinking as tea (10.5%). Leaves for medicinal purpose in Naranjal are mostly drunk (27.5%) and drunk as tea (27.5%). Only for one plant the petiole is used as a medicine by drinking it as tea (100%). External application (40.6%) and immersing the head (3.1%) are the other two application methods for resin next to drinking. For the applications methods of roots, drinking is followed by drinking as tea (10.5%) and drinking as agua de tiempo (10.5%). Seeds are mostly used by eating them (40%), ranking is followed by external application (20%), drinking (20%) and immerse the head (20%). Trunks are drunk (50%) or drunk as tea (50%) for medicinal application. For the plant part tuber, bathing (40%) and drinking (40%) are most used application methods, followed by external application with 20%.

5.5.3 Symptoms and diseases

A total of 95 different diseases and symptoms were mentioned in both communities; 60 in Pueblo Libre and 80 in Naranjal. During a pile-sorting exercise, cards with all symptoms and diseases mentioned in previous exercises, were divided into different groups by the participants and the participants gave each group their own name. Appendix 14 shows all diseases and symptoms mentioned in Pueblo Libre grouped by the participants into 19 groups. In Naranjal, symptoms and diseases were grouped into 22 different groups (Appendix 15). For a few diseases extra explanation is necessary:

- Frio: when you are cold, to improve blood circulation
- Pellagra: Vitamin (diarrhea, dermatitis, dementia)
- Pulsario: Tumor in stomach that causes anxiety, hyperactivity and/or anger
- Rabiosa: When someone has a high temper
- Siso: Skin disease

In Pueblo Libre, diabetes was grouped within the group of cancers and they also gave they defined it as cancer of the blood.

Most medicinal plant species were directed to the groups frio (8 species; 11.1%), headache (8 species; 11.1%), fever (9 species; 12.5%) and hernia (6 species; 8.3%) in Pueblo Libre (Appendix 14). In Narajal, frio (25 species; 19.7%), fever (11 species; 8.7%) and kidneys (9 species; 7.1%) were the symptoms/diseases with the most accorded medicinal plant species (Appendix 15). In both communities, frio and fever had the most plant species for treatment. One plant species can be used to treat several diseases/symptoms, the total of all percentages in Appendix 14 and 15 is thus higher than a hundred.

5.5.4 Preparation

The percentages of plant species with a certain preparation method were calculated for each plant part in Appendix 16 for Pueblo Libre and Appendix 17 for Naranjal.

Firstly for Pueblo Libre, for bark (70%), entire plant (66.7%), flowers (66.7%), shells (100%) and tubers (40%), the most used preparation method is decoction. From the fruits, juice (66.7%) is mostly made. The ranking of preparation methods for the leaves starts with infusion (33.3%), followed by maceration (30.6%), decoction (19.4%), mash and apply (11.1%), rasp (2.8%) and fresh material (2.8%). Resin is mostly not prepared, the resin is used pure (84.6%). When the root is prepared, it is mostly rasp and then decocted (40%), decoction, maceration and rasping and then adding water are second most used to prepare roots for medicine with each (20%). Stems are always prepared by extracting juice from the stem (100%). Tubers are next to decoction also prepared by infusion (20%), rasping (20%), and mashing (20%).

Secondly, in Naranjal, for only two plant parts, decoction is the most used preparation method: bark (31.8%) and peel (100%). For all plant parts of which the entire plant or petiole were used, infusion was the preparation method. Preparation methods most used for roots of medicinal plants are tincture (42.1%) and decoction (21.1%). The plant species of which the flower is used, can be prepared through infusion or decoction. Plant parts of which mostly the fresh material is used without any preparations are fruits (26.3%) and resin (66.7%). The preparation method 'maceration' is the most used for the plant parts leaf (39.1%), seed (50%) and tuber (40%). When the trunk is used as medicine it is not prepared at all (fresh material) or by infusion, with each 50%.

5.5.5 Grouping of medicinal plants according to emic point of view

During the second pile-sorting exercise, participants grouped the medicinal plants following their own criteria.

In Pueblo Libre medicinal plants were grouped according to growth form, growth location and whether it is difficult to harvest for women. Medicinal plants in Pueblo Libre were grouped into 5 groups and they wrote down for each group the criteria used for grouping certain plants together (Appendix 18):

- Group 1: Trees in the forest, which are too large and difficult for women to harvest.
- Group 2: Small plants with tubers which are very easy for women to manage and harvest.
- Group 3: Small plants which are also easy for women to manage, it are herbs.
- Group 4: Climbers which are very difficult for women to maintain, it is work for men.
- Group 5: Vegetables, easy to maintain by women.

Participants for this pile sorting exercise in Naranjal chose to group the medicinal plants according to their most frequently used medicinal purpose (symptom or disease). This resulted in 21 different groups, but no names were given to each group (Appendix 19).

5.6 Conclusion and discussion

Chapter 4 illustrated already that the use category of medicine contains most useful plant species both in Pueblo Libre and Naranjal. In Naranjal, also the number of medicinal plant species is much higher compared to Pueblo Libre. Possible factors influencing this big difference were already discussed in chapter 4.

Asteraceae, Fabaceae, Lamiaceae, Solanaceae, Poaceae and Euphorbiaceae are some of the families most mentioned in studies on medicinal plants in Peru (Bussmann and Sharon, 2006; De-la-Cruz *et al.*, 2007; Polesna *et al.*, 2011). In this study however, most of the medicinal plant species belong to the botanical family of Moraceae, which normally is not the plant family with most medicinal plants compared to other studies in literature. After Moraceae, most medicinal plants species belong to the botanical families of the Euphorbiaceae, Solanaceae and Fabaceae, which are families known to contain a lot of medicinal plant species.

Leaves are the most used plant part for medicine in Pueblo Libre and Naranjal. Several other studies on medicinal plants confirm leaves as the most used plant part in traditional medicine (De-la-Cruz *et al.*, 2007; Sanz-Biset *et al.,* 2009; Thomas, 2008a).

Home gardens are recognized as a place for conservation of important resources for local people (Perrault-Archambault *et al.,* 2008; Vogl *et al.,* 2004). Perrault-Archambault *et al*. (2008) found in their study that the three use categories with most plant species in the home garden were fruit species, non-fruit food species and medicinal species. In Pueblo Libre most medicinal plant species are found in home gardens, this can be related to less available forest in Pueblo Libre, so they transplanted useful medicinal plant species to their home gardens. Naranjal has most medicinal plant species growing in the forest.

Different plant species can be used to treat the same symptoms or diseases, this might have different reasons. First, accessibility and availability of medicinal plant species determines when medicinal plants or plant parts are available during the year and forced people to search for different plants for the same treatment. Thus, several medicinal plant species with the same medicinal purpose, make sure certain symptoms and diseases can be cured any time of the year (Bastien, 1987; Thomas, 2008a). Furthermore, some symptoms or diseases occur more than others, this also explains why these symptoms or diseases with high incidence have more different plant species to treat them (Thomas, 2008a; Vandebroek *et al.*, 2008).

As mentioned in chapter 4, access to Western medical care can decrease the use of medicinal plants. However, medicinal plants against witch craft, black magic and bad luck are more related to the spiritual aspect of medicine and can thus only be treated with traditional medicine (Calvet-Mir *et al.,* 2008).

Of the 116 plant species Pueblo Libre and Naranjal have in common, 52 of them are medicinal in both Pueblo Libre and Naranjal. Since Polesna *et al*. (2011) conducted a recent study with both indigenous communities and mestizos in the Ucayali region, the comparison is made between the 52 common plant species in both communities and the plant species mentioned in the article of Polesna *et al.* (2011). The first plant species they all have in common, is *Dracontium loretense* (*Jergon sacha*)

of which the tuber is used to treat pulsario (tumor) in Naranjal and hernia in Pueblo Libre. In the the reseach of Polesna *et al.* (2011), both ailments are mentioned. Another plant species in all lists is *Euterpe precatoria* (*Huasai*), of which the root is used for the kidneys in both communities and also the Polesna *et al.* (2011) list kidney disorders. Next is the bark of *Maytenus macrocarpa* (*Chuchuahuasi/Chuchuhuasi*) treating frio in Pueblo Libre and healing the abdomen of women after giving birth in Naranjal, both of these symptoms/diseases were mentioned in the table of Polesna *et al.* (2011). However, it does mention arthritis and rheumatism, linking it to frio which was grouped into the same symptom/disease group as arthritis and rheumatism in both communities. Also *Croton lechleri* (*Sangredegrado*) can be found in all tables, the resin of this plant is used to heal scars and internal diseases in Pueblo Libre, while in Naranjal a lot of different symptoms/diseases were mentioned: wounds, cuts, operation wounds, ulcers, stomach problems and vaginal wash. Several of these ailments were also listed in the article of Polesna *et al.* (2011): wounds, ulcers, inner injuries, vaginal infections, after operations and stomach ulcers. The entire plant of *Phyllanthus niruri* (*Chancapiedra*) is used to treat kidney problems in both communities as well as in the study. For *Petiveria alliaceae* (*Mucura*), completely different medicinal uses were mentioned; in Pueblo Libre it is used against fevers, but also for good luck, whereas in Naranjal it is used for frio. Only fever was also mentioned in the comparative study. However, rheumatism and arthritis were mentioned and again, these were grouped together in one of the pile-sorting exercises in both communities. The leaves of *Piper peltatum* (*Santa Maria*) are used in medicine and are used for frio in Pueblo Libre and heart problems and frio in Naranjal. Frio and heart problems were not mentioned in the study of Polesna *et al*. (2011), but again frio was grouped together with rheumatism which was mentioned in the comparative study. *Uncaria tomentosa* (*Uña de gato*) is a well-known plant species for its natural stem water which can be drunk, but the medicinal properties of the bark are also mentioned in several studies. The participants of Pueblo Libre and Naranjal both listed this plant to cure cancer, this was also one of the ailments treated in the comparative study. This plant species has been investigated a lot for its medicinal properties and it was confirmed to have cytostatic and anti-inflammatory activity, and mutagenic and antimutagenic properties (Riva *et al*., 2001). This study of Riva *et al.* (2001). confirmed the inhibitory effects on tumors of components in the bark. The last plant species all lists have in common, is *Brunfelsia grandiflora* (*Chirisanango*), of which the root is used in both communities for frio. In the comparative study rheumatism, arthritis and cold are also mentioned. In total, all lists have nine plant species in common and most of the mentioned symptoms/diseases in Pueblo Libre and Naranjal, were also listed in the study of Polesna *et al*. (2011).

General discussion and conclusion

With this study, documenting useful plant species in the communities of Pueblo Libre and Naranjal, we are one step closer filling in the knowledge gap of ethnobotanical studies with mestizos in the Ucayali region of the Peruvian Amazon. By comparing these two communities, it was possible to investigate the influences of several factors on plant use and plant use knowledge. Choosing the same ethnicity in both communities, other influencing factors for plant use and plant use knowledge were all independent of ethnicity.

Accessibility was one of the criteria to select both communities as it plays an important role in deforestation of areas, which on its turn influences biodiversity and therefore the usage of plants by local people. Next to this, accessibility also determines access to markets. In this study it was very clear that people from Pueblo Libre, situated next to a road, could transport a lot of things more easily than people from Naranjal where there were no permanent roads.

The road in Pueblo Libre also gave the opportunity to travel easily to the capital of the Ucayali region, giving them more access to buy things in the city leading to faster modernization. This modernization was also present in the infrastructure; in Pueblo Libre electricity was available and a lot of families also had running water, whereas in Naranjal one generator provided electricity for only a few hours a day. This had also an impact on food and beverages since people in Pueblo Libre had refrigerators and freezers available, which gave them the advantage of storing food longer and they could make ice lollies, while in Naranjal this food type was not available.

Furthermore, it was very clear that the people of Naranjal were more in contact with the forest than the people of Pueblo Libre as they used more plants that grew in the forest. This result is also confirmed by observations during the field work; in Naranjal, men went hunting more in the forest compared to the men in Pueblo Libre. They also went more frequently into the forest to harvest edible plant parts.

Chapter 5 gave a more detailed description of edible plants, while chapter 6 handled about medicinal plants. However, there should be noticed that these two chapters are closely linked together as both communities mentioned that there is always a special diet to be followed when taking medicinal plants, e.g. a less salted diet. Next to this, in Naranjal, more than half of all food plants also had a medicinal purpose, in Pueblo Libre, this is lower with one third of all food plants. Etkin and Ross (1982) showed the link between medicinal and food plants and suggested that the use of medicinal plants in the daily diet of people helped the disease resistance by providing vitamins, minerals, proteins or caloric value.

Next to these conclusions some remarks on this study can be made that should be kept in mind during further research. First of all, the short time span made it difficult to document all useful plants in both communities. The lists made in this study are absolutely not complete. This was also mentioned by one of the participants in Naranjal, saying it is really difficult to list so many plant species in such a short time. I recommend to go back for a longer period, at least a few months, to obtain a more complete list. This is of course also related with seasonality and availability of

resources which influences the use and management of plants in different locations (Murray and Sanchez-Choy, 2001).

Secondly, modernization was also present in the lifestyles of the people in Pueblo Libre, where a lot of women were more independent and had their own jobs. Whereas in Naranjal women took a more traditional place in society by staying home and taking care of all the children, cooking, cleaning, etc. To execute the focus group discussions in Pueblo Libre, it was not possible to find enough women to participate in the morning, because most of them were working. In Naranjal, focus group discussions with only women could be conducted in the morning since they stayed at home.

Furthermore, there were elections during the time of the field work, limiting the moments to conduct exercises. In Pueblo Libre, it was also the anniversary of the community, which made it near to impossible to do anything during a week. Together with the short time there was spent in the communities, this made it really hard to collect data and it showed that it is of major importance to take enough time to go to communities to do research. For people to participate in this research, it was not only important to show respect for and interest in their work and community, but also to participate in the activities of the communities. This again stressed out the importance of time to conduct a thorough study.

This study provided a good basis for further research with a focus on quantitative ethnobotanical research. However, it can also be interesting to proceed a dietary and nutritional analysis.

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Appendices

Appendix 1 FORMULARIO DE CONSENTIMIENTO ORAL (VERSIÓN ORAL 31-07-14)

[SE UTILIZA PARA GRUPOS DE MIEMBROS DE LA COMUNIDAD QUE PARTICIPAN EN LOS EJERCICIOS. EL FORMULARIO DE CONSENTIMIENTO DEBE SER LEÍDO AL INICIO DEL EJERCICIO Y EL CONSENTIMIENTO GRABADO EN UN DICTÁFONO O PRESENCIADO POR OTRO INVESTIGADOR. LOS NOMBRES DE LOS PARTICIPANTES DEBEN REGISTRARSE EN LA PARTE INFERIOR DE LA HOJA CON FIRMAS SI LOS PARTICIPANTES SABEN LEER Y ESCRIBIR.]

Introducción a la Investigación:

Mi nombre es: LORE VAEL

Soy una estudiante de Belgica y trabajo por mi thesis en conjunto con CIAT (Centro de Investigación de Agricultura Tropical) y IIAP (Instituto de Investigaciones de la Amazonía Peruana).

Estoy llevando a cabo una investigación sobre los usos de las plantas. Es un inventario del uso de las plantas de la selva y de las comunidades de mestizos en la region de Pucallpa de la Amazonía Peruana. Este investigacion es parte de mi thesis de maestria de mis estudios.

Primero quiero saber todas las plantas que utilizan. Y por que utilizan la planta. Tambien estoy interesado en saber más sobre la planta.

El ultimo parte de mi thesis es la coleccion en lo possible de las plantas mentionado en los ejercicios.

El ejercicio durará de 2 a 3 horas, pero ustedes son libres de irse en cualquier momento. Antes de empezar quiero asegurarme de que ustedes entienden la investigación que estoy haciendo y lo que voy a hacer con la información que recopilo.

Guía de consentimiento oral

1. Les he proporcionado información acerca de la naturaleza de este estudio sobre el uso de las plantas. ¿El mensaje fue claro? ¿Quieres hacerme alguna pregunta sobre el estudio?
2. Voy a mantener toda la información que me dan confidencial hasta donde la ley lo permita. Todas las notas o grabaciones que hago se mantendrán en un equipo protegido por contraseña. No compartiré sus datos personales u opiniones personales con nadie más. ¿Les parece bien?
3. Parte de la información que ustedes me proporcionen puede ser publicado, pero su nombre real no será asociado con alguno de los datos que me ha facilitado, a menos que usted expresen que desean que utilizo su nombre real. ¿Les parece bien?
4. Usted debe saber que a pesar de que no uso sus nombres en mis publicaciones, todavía existe una posibilidad de que la gente los reconozcan por las cosas que dicen. Si en algún momento usted se siente preocupado de que se divulgue su testimonio, por favor, no dude en detenerse y hablar con mi sobre el tema. Si usted dice algo que más tarde cree que debe ser eliminado de mis notas de discusión, hágamelo saber. ¿Les parece claro?
5. Si menciona algo que no quiere que publico, díganmelo y accederé a su petición. ¿De acuerdo?
6. Usted puede dejar esta discusión en cualquier momento sin dar ninguna explicación. ¿De acuerdo?
7. Me gustaría grabar esta discusión con una grabadora de audio digital. Así puedo escuchar la grabación después y recoger algunas cosas que no se pude entender completamente durante el debate o que se me olvidó. Sólo el personal de mi proyecto podrá escuchar la grabación. ¿Me da permiso para grabar?
8. Si está de acuerdo, nos gustaría tomar algunas fotos. Podría utilizarlos en presentaciones o publicaciones sobre este proyecto. ¿Está bien?
9. ¿Tienen preguntas? ¿Puedo empezar la discusión ahora?

- Fecha: ……
- Nombre del pueblo: ……
- Sujeto: .....
- Nombre de los facilitadores:
    - Lore Vael

Nombre de los participantes:	Firma

Appendix 2 General information of all plant species in Pueblo Libre

Family	Scientific Name	Local Name	Growth form	Growth location	Use category	Part	Sold
Aloaceae							
	Aloe barbadensis Mill.*	Sabila	H	H	Medicine	Resin	Y
Amaranthaceae							
	Alternanthera brasiliana (L.) Kuntze	Lancetilla	Sh	H	Medicine	Leaf	Y
Amaryllidaceae							
	Allium cepa L.*	Cebolla	H	F/H	Food	Tuber	Y
					Propagation	Tuber	N
Anacardiaceae							
	Anacardium occidentale L.	Cashu/Marañon	T	F/H	Beverage	Fruit	Y
					Food	Fruit	Y
					Handicraft	Seed	Y
					Medicine	Leaf	Y
						Peel	Y
					Propagation	Seed	Y
	Mangifera indica L.	Mango	T	H	Beverage	Fruit	Y
					Feed	Fruit	N
					Food	Fruit	Y
					Medicine	Peel	Y
					Propagation	Seed	Y
	Spondias mombin L. [a] / *Spondias venosa* Mart. ex Colla [a]	Uvos	T	Fo	Feed	Fruit	N
					Food	Fruit	N
					Medicine	Bark	Y
	Spondias purpurea L.	Ciruelo	T	F/H	Food	Fruit	Y
					Propagation	Seed	N
	Spondias radlkoferi Donn. Smith. [a]	Taperiba	T	F	Feed	Fruit	N
					Food	Fruit	Y
					Propagation	Seed	N

Family	Scientific Name	Local Name	Growth form	Growth location	Use category	Part	Sold
Annonaceae							
	Annona dolabripetala Raddi	Anona	T	F/H	Food	Fruit	Y
				F	Propagation	Seed	Y
	Annona muricata L.	Guanabana	T	H	Beverage	Fruit	Y
					Food	Fruit	Y
					Medicine	Leaf	Y
					Propagation	Seed	Y
Apiaceae							
	Coriandrum sativum L.	Culantro regional	H	F/H	Food	Leaf	Y
					Propagation	Seed	Y
	Eryngium foetidum L.	Sacha culantro	H	F/H	Food	Leaf	Y
					Propagation	Seed	N
Apocynaceae							
	Aspidosperma sp.*	Quillobordon	T	Fo	Construction	Trunk	Y
	Himatanthus sucuuba (Spruce ex Müll. Arg.) Woodson	Bellacocaspi	T	Fo	Construction	Trunk	Y
					Medicine	Resin	Y
	Tabernaemontana vanheurckii Müll. Arg.	Uchosanango	T	Fo	Medicine	Root	Y
Araceae							
	Dieffenbachia cf. Seguine Schott	Patikina	H	Fo	Medicine	Leaf	Y
					Propagation	Seed	N
	Dracontium loretense K.Krause/*Dracontium peruvianum* G.H.Zhu & Croat	Jergon sacha	H	Fo/H	Medicine	Tuber	Y
	Heteropsis sp.*	Tamishe	C	Fo	Handicraft	Entire plant	Y
Arecaceae							
	Astrocaryum sp. [a]	Huicungo	T	Fo	Food	Seed	N

Family	Scientific Name	Local Name	Growth form	Growth location	Use category	Part	Sold
	Attalea phalerata Mart. ex Spreng.	Shebon	T	Fo	Construction	Leaf	Y
					Food	Fruit	Y
	Attalea sp.*	Shapaja	T	Fo	Construction	Leaf	Y
	Bactris gasipaes Kunth	Pijuayo	T	F/H	Beverage	Fruit	Y
						Palm heart	Y
					Feed	Fruit	N
					Food	Fruit	Y
						Palm heart	Y
					Propagation	Seed	Y
	Cocos nucifera L.	Coco	T	F/H	Beverage	Fruit	Y
					Food	Fruit	Y
					Medicine	Shell	Y
					Propagation	Fruit	Y
	Elaeis guineensis Jacq.	Palma	T	F/H	Food	Fruit	Y
	Euterpe precatoria Mart.	Huasai	T	Fo	Food	Palm heart	Y
						Fruit	Y
					Medicine	Root	Y
	Mauritia flexuosa L.f.	Aguaje	T	F/Fo/H	Beverage	Fruit	Y
					Food	Fruit	Y
					Propagation	Seed	Y
	Oenocarpus bataua Mart.	Ungurahui	T	Fo	Beverage	Fruit	Y
					Feed	Fruit	N
					Food	Fruit	Y
	Phytelephas macrocarpa Ruiz & Pav.*	Yarina	T	Fo	Construction	Leaf	Y
					Feed	Fruit	Y
Asteraceae							
	Tagetes erecta L.	Rosasisa	H	H	Medicine	Flower	Y
						Leaf	Y

Family	Scientific Name	Local Name	Growth form	Growth location	Use category	Part	Sold
Bignoniaceae							
	Crescentia cujete L.	Huingo/Wuingo	T	H	Medicine	Fruit	Y
					Propagation	Seed	N
	Mansoa alliacea (Lam.) A.H.Gentry	Ajos sacha	C	Fo/H	Medicine	Leaf	Y
						Root	Y
	Tabebuia serratifolia Nicholson*	Tahuari	T	Fo	Construction	Trunk	Y
	Tynanthus aff. villosus A.H.Gentry	Clavohuasca	C	Fo/H	Medicine	Bark	Y
Bixaceae							
	Bixa orellana L.	Achote	Sh	F/H	Food	Seed	Y
					Materials	Seed	Y
					Propagation	Seed	Y
Bombacaceae							
	Ceiba samauma (Mart.) K.Schum. in Mart. [a]	Lopuna	T	Fo	Construction	Trunk	Y
	Matisia cordata Bonpl.	Zapote	T	F/Fo/H	Construction	Trunk	Y
					Feed	Fruit	N
					Food	Fruit	Y
					Propagation	Seed	Y
Bromeliaceae							
	Ananas comosus (L.) Merr.	Piña	H	F/H	Beverage	Fruit	Y
						Peel	Y
					Feed	Fruit	N
					Food	Fruit	Y
					Propagation	Suckers	Y
Burseraceae							
	Protium sp.*	Copal	T	Fo	Construction	Trunk	Y
Cactaceae							

Family	Scientific Name	Local Name	Growth form	Growth location	Use category	Part	Sold
	Opuntia cochenillifera (L.) Mill.	Tuna	S	H	Medicine	Leaf	N
Caesalpiniaceae							
	Hymenaea sp.*	Azucarhuayo	T	Fo	Construction	Trunk	Y
Cannaceae							
	Canna indica L. [a]	Achira	H	H	Handicraft	Seed	Y
Caricacaeae							
	Carica papaya L.	Papaya	T	F	Beverage	Fruit	Y
					Feed	Fruit	N
					Food	Fruit	Y
					Medicine	Leaf	N
					Propagation	Seed	Y
Cecropiaceae							
	Cecropia obtusa Trécul	Cetico blanco	T	F/Fo	Medicine	Bark	Y
	Pourouma cecropiifolia Mart.	Ubilla	T	F/H	Feed	Fruit	N
					Food	Fruit	Y
					Propagation	Seed	N
Celastraceae							
	Maytenus macrocarpa (Ruíz &. Pav.) Briq.*	Chuchuahuasi	T	Fo	Medicine	Bark	Y
Chenopodicaceae							
	Chenopodium ambrosioides L.	Payco	H	H	Food	Leaf	Y
					Medicine	Leaf	Y
Combretaceae							
	Terminalia sp.*	Yacushopana	T	Fo	Construction	Trunk	Y

Family	Scientific Name	Local Name	Growth form	Growth location	Use category	Part	Sold
Commelinaceae							
	Callisia aff. gracilis (Kunth) D.R.Hunt	Boasacha	H	F/Fo	Medicine	Stem	Y
Costaceae							
	Costus scaber Ruiz & Pav.	Sachahuiro	H	F/Fo	Medicine	Stem	Y
Crassulaceae							
	Kalanchoe pinnata (Lam.) Pers. [a]	Motelillo	H	H	Aromatic	Tuber	Y
Cucurbitaceae							
	Citrullus lanatus (Thunb.) Matsum. & Nakai [a]	Sandia	C	F	Feed	Fruit	N
					Food	Fruit	Y
	Cucumis melo L.*	Melón	C	H	Beverage	Fruit	Y
					Feed	Fruit	N
					Food	Fruit	Y
					Propagation	Seed	N
	Cucumis sativus L. [a]	Pepino	C	F	Food	Fruit	Y
					Medicine	Fruit	Y
					Propagation	Seed	Y
	Cyclanthera pedata Schrad.	Cayhua	C	F/H	Food	Fruit	Y
					Propagation	Seed	N
	Cucurbita cf. ficifolia Bouché	Zapallo	C	H	Food	Fruit	Y
					Medicine	Flower	Y
					Propagation	Seed	N
Cyperaceae							
	Scleria melaleuca Rchb. ex Schltdl. & Cham.	Cortadera	H	F/Fo	Medicine	Leaf	N
						Root	N
Dioscoreaceae							
	Dioscorea cf. trifida L.f.	Sachapapa	C	F/H	Food	Tuber	Y
					Propagation	Tuber	Y

Family	Scientific Name	Local Name	Growth form	Growth location	Use category	Part	Sold
Euphorbiaceae							
	Croton lechleri Mueller Arg./ Croton draconoides Mueller Arg.*	Sangredegrado	T	F/Fo/H	Medicine	Resin	Y
					Propagation	Seed	N
	Jatropha curcas L.	Piñon blanco	Sh	H	Biodiesel	Seed	Y
					Medicine	Leaf	Y
						Resin	Y
	Jatropha gossypiifolia L.	Piñon colorado	Sh	H	Medicine	Leaf	Y
						Resin	Y
	Manihot esculenta Crantz	Yuca	Sh	F/H	Beverage	Tuber	Y
					Feed	Tuber	Y
					Food	Leaf	Y
						Tuber	N
					Propagation	Stem	Y
	Phyllanthus niruri L./*Phyllanthus stipulatus* (Raf.) G.L.Webster	Chancapiedra	H	F/Fo/H	Medicine	Entire plant	Y
					Propagation	Seed	N
Fabaceae							
	Amburana cearensis (Fr.Allem.) L.C.Sm.*	Ishpingo	T	Fo	Construction	Trunk	Y
					Handicraft	Bark	Y
	Apuleia leiocarpa J.F.Macbr.*	Anacaspi	T	Fo	Construction	Trunk	Y
	Cajanus cajan (L.) Millsp.	Frejol de palo/puspo poroto	Sh	F/H	Food	Fruit	Y
					Medicine	Leaf	Y
					Propagation	Seed	Y
	Copaifera paupera (Herzog) Dwyer [a]	Copaiba	T	Fo	Construction	Trunk	Y
					Medicine	Resin	Y
	Dioclea aff. coriacea Benth.	Mashoshillo	C	F/Fo	Medicine	Leaf	Y
	Dipteryx cf. alata Vogel [a]	Shihuahuaco	T	Fo	Construction	Trunk	Y
	Erythrina amazonica Krukoff	Amasisa	T	F/H	Construction	Entire plant	N

Family	Scientific Name	Local Name	Growth form	Growth location	Use category	Part	Sold
	Inga edulis Mart.	Guaba	T	F/H	Food	Fruit	Y
					Propagation	Seed	Y
	Inga feuillei DC.*	Pacay	T	Fo/H	Food	Fruit	Y
					Propagation	Seed	N
	Inga sp.	Shimbillo	T	F/Fo	Firewood	Trunk	Y
					Food	Fruit	Y
	Machaerium inundatum Ducke*	Aguanomasho	T	Fo	Construction	Trunk	Y
	Ormosia sp.*	Huayruro	T	Fo	Construction	Trunk	Y
					Handicraft	Seed	Y
	Phaseolus vulgaris L.	Chiclayo	C	H	Food	Fruit	Y
					Propagation	Seed	Y
	Pueraria phaseoloides (Roxb.) Benth. *var. Javanica* (Benth.) Baker	Cudzu	C	F/H	Fertilizer	Entire plant	N
					Propagation	Seed	Y
	Schizolobium amazonicum Huber Ducke*	Pashacua	T	Fo	Construction	Trunk	Y
	Senna reticulata (Willd.) H.S.Irwin & Barneby	Retama	T	F/H	Medicine	Flower	Y
						Leaf	Y
Icacinaceae							
	Poraqueiba sericea Tul.	Umari	T	F/H	Food	Fruit	Y
					Propagation	Seed	N
Iridaceae							
	Eleutherine bulbosa Urb.	Piri Piri	H	H	Medicine	Tuber	Y
Lamiaceae							
	Ocimum americanum L.	Sharamasho	H	H	Medicine	Leaf	Y
	Ocimum campechianum Mill.	Albaca	H	H	Food	Leaf	Y
					Medicine	Leaf	Y
					Propagation	Seed	N

Family	Scientific Name	Local Name	Growth form	Growth location	Use category	Part	Sold
Lauraceae							
	Aniba sp./*Nectandra* sp./*Ocotea* sp.*	Muena	T	Fo	Construction	Trunk	Y
	Persea americana Mill. [a]	Palta	T	F	Feed	Fruit	Y
					Food	Fruit	N
					Propagation	Seed	N
Lecythidaceae							
	Cariniana sp.*	Cachimbo	T	Fo	Construction	Trunk	Y
	Eschweilera sp.*	Machimango	T	Fo	Construction	Trunk	Y
Loranthaceae							
	Phthirusa micrantha Eichler	Suelda con suelda	C	F/H	Medicine	Leaf	Y
Lythraceae							
	Punica granatum L.	Granada	Sh	H	Food	Fruit	Y
					Propagation	Seed	N
Malpighiaceae							
	Banisteriopsis caapi Spruce ex Griseb. [a]	Ajahuasca	C	Fo	Medicine	Entire plant	Y
Malvaceae							
	Ceiba sp.*	Wuinba/Huinba	T	Fo	Construction	Trunk	Y
	Gossypium cf. barbadense L.	Algodon	Sh	F/H	Materials	Flower	Y
					Medicine	Leaf	Y
	Malachra ruderalis Gürke/*Malachra alceifolia* Jacq.	Malba	H	H	Medicine	Leaf	Y
Marantaceae							
	Calathea allouia (Aubl.) Lind. [a]	Dale Dale	H	F	Food	Tuber	Y
					Propagation	Tuber	Y

Family	Scientific Name	Local Name	Growth form	Growth location	Use category	Part	Sold
	Calathea lutea (Aubl.) Schult. [a]	Bijau	H	F/Fo	Materials	Leaf	Y
Meliaceae							
	Cedrela odorata L. [a]	Cedro	T	Fo	Construction	Trunk	Y
	Swietenia macrophylla G. King*	Caoba	T	Fo	Construction	Trunk	Y
					Materials	Bark	Y
					Handicraft	Trunk	Y
Moraceae							
	Artocarpus altilis (Parkinson) Fosberg	Pan de arbol	T	F/H	Feed	Fruit	N
					Food	Fruit	Y
					Medicine	Resin	Y
					Propagation	Seed	Y
	Brosimum sp.*	Manchinga	T	Fo	Construction	Trunk	Y
					Medicine	Resin	Y
	Clarisia racemosa Ruiz and Pavon*	Mashonaste	T	Fo	Construction	Trunk	Y
	Ficus insipida Willd.	Oje	T	Fo	Construction	Trunk	Y
					Medicine	Resin	Y
	Ficus sp. [a]	Renaquilla	T	Fo	Medicine	Entire plant	Y
						Resin	Y
	Ficus sp.	Zapote renaco	T	Fo/H	Medicine	Resin	Y
	Maquira coriacea (H.Karst.) C.C.Berg*	Capinuri/Janchama	T	Fo	Medicine	Resin	Y
Musaceae							
	Musa paradisiaca L.	Platano	H	F	Beverage	Fruit	Y
					Feed	Fruit	N
					Food	Fruit	Y
					Materials	Leaf	Y
					Propagation	Suckers	Y
Myristicaceae							
	Virola sp.*	Cumala	T	Fo	Construction	Trunk	Y

Family	Scientific Name	Local Name	Growth form	Growth location	Use category	Part	Sold
Myrtaceae							
	Myrciaria dubia (Kunth) Mc Vaugh. [a]	Camu Camu	T	F	Beverage	Fruit	Y
					Medicine	Fruit	Y
					Propagation	Seed	N
	Psidium guajava L.	Guayaba	Sh	F/H	Feed	Fruit	N
					Food	Fruit	Y
					Medicine	Bark	N
						Leaf	N
					Propagation	Seed	N
	Syzygium malaccense (L.) Merr. & L.M.Perry	Pomarosa	T	H	Food	Fruit	Y
					Propagation	Seed	Y
Oxalidaceae							
	Averrhoa carambola L.	Carambola	T	H	Beverage	Fruit	Y
					Food	Fruit	Y
					Propagation	Seed	N
Passifloraceae							
	Passiflora acuminata DC.	Granadilla	C	F/Fo/H	Food	Fruit	Y
					Medicine	Leaf	Y
					Propagation	Seed	Y
	Passiflora edulis Sims	Maracuya	C	H	Beverage	Fruit	Y
					Food	Fruit	Y
					Propagation	Seed	Y
	Passiflora quadrangularis L.*	Tumbo	C	F/H	Beverage	Fruit	Y
					Food	Fruit	Y
					Propagation	Seed	N
Phytolaccaceae							
	Gallesia integrifolia (Spreng.) Harms. [a]	Ajos quiro	T	Fo	Construction	Trunk	Y

Family	Scientific Name	Local Name	Growth form	Growth location	Use category	Part	Sold
					Medicine	Bark	Y
	Petiveria alliacea L.	Mucura	H	H	Medicine	Leaf	Y
Piperaceae							
	Piper aff. aduncum L.	Maticu	T	F/Fo	Medicine	Leaf	Y
	Piper nigrum L.	Pimienta	C	F/H	Food	Seed	Y
					Propagation	Seed	Y
	Piper peltatum L.	Santa Maria	Sh	F/Fo	Medicine	Leaf	N
Plantaginaceae							
	Plantago major L.	Llanten	H	H	Medicine	Leaf	Y
Poaceae							
	Cymbopogon citratus Stapf	Hierba Luisa	H	H	Medicine	Leaf	Y
	Digitaria ciliaris (Retz.) Koeler*	Frente de toro	T	Fo	Construction	Trunk	Y
	Oryza sativa L.	Arroz	H	F	Feed	Fruit	N
					Food	Fruit	Y
					Propagation	Seed	Y
	Saccharum officinarum L.	Caña de azucar	H	F/H	Feed	Leaf	N
					Food	Stem	Y
					Medicine	Stem	Y
					Propagation	Stem	N
	Zea mays L. [a]	Maiz	H	F	Beverage	Seed	Y
					Feed	Entire plant	Y
					Food	Seed	Y
					Propagation	Seed	Y
	Unidentified*	Bambu	T	Fo	Construction	Trunk	Y
Portulacaceae							
	Talinum paniculatum Ruiz & Pav.	Verdulaga	H	F	Medicine	Leaf	Y

Family	Scientific Name	Local Name	Growth form	Growth location	Use category	Part	Sold
Pteridophyta							
	Phlebodium aereolatum	Cotochupa	F	F	Medicine	Tuber	Y
Rubiaceae							
	Capirona decorticans Spruce/ *Calycophyllum spruceanum* (Bentham) Hooker f. ex Schumann*	Capirona	T	Fo	Construction	Trunk	Y
	Coffea arabica L.	Café	Sh	F	Beverage	Fruit	Y
					Propagation	Seed	N
	Genipa americana L. [a]	Huito	T	Fo/H	Construction	Trunk	Y
					Food	Fruit	Y
					Materials	Fruit	Y
					Propagation	Seed	N
	Morinda citrifolia L.	Noni	T	H	Medicine	Fruit	Y
	Uncaria tomentosa DC.	Uña de gato	C	Fo	Beverage	Resin	N
					Medicine	Bark	Y
Rutaceae							
	Citrus limetta Risso/*Citrus limon* (L.) Burm. f.	Limones (different variaties)	T	H	Beverage	Fruit	Y
						Leaf	N
					Food	Fruit	Y
					Medicine	Fruit	Y
					Propagation	Seed	Y
	Citrus limettioides Tanaka	Lima Dulce	T	H	Food	Fruit	Y
					Propagation	Seed	N
	Citrus paradisi Macfad.	Toronja	T	H	Beverage	Fruit	Y
					Food	Fruit	Y
					Medicine	Fruit	Y
					Propagation	Seed	Y

Family	Scientific Name	Local Name	Growth form	Growth location	Use category	Part	Sold
	Citrus reticulata Blanco	Mandarinas	T	F/H	Food	Fruit	Y
					Propagation	Seed	Y
	Citrus x sinensis Osbeck	Naranja	T	F/H	Beverage	Fruit	Y
					Food	Fruit	Y
					Handicraft	Peel	Y
					Propagation	Seed	Y
	Citrus x tangelo J.W.Ingram & H.E.Moore	Tanyelo	T	F/H	Beverage	Fruit	Y
					Food	Fruit	Y
					Propagation	Seed	N
	Zanthoxylum albuquerquei D.R.Simpson*	Hualaja	T	Fo	Construction	Trunk	Y
Sapotaceae							
	Manilkara bidentata (A.DC.) A.Chev. [a]	Quinilla	T	Fo	Construction	Trunk	Y
					Feed	Fruit	N
					Food	Fruit	Y
	Micropholis sp./*Pouteria* sp.*	Caymitillo	T	Fo	Construction	Trunk	Y
	Pouteria caimito Radlk.	Caymito	T	F/H	Feed	Fruit	N
					Food	Fruit	Y
					Propagation	Seed	N
Simaroubaceae							
	Simarouba amara Aubl.*	Marupa	T	Fo	Construction	Trunk	Y
Solanaceae							
	Brugmansia suaveolens (Willd) Bercht. & J.Presl.	Toe	Sh	H	Medicine	Leaf	Y
	Brunfelsia grandiflora D. Don.	Chirisanango	Sh	F/H	Medicine	Root	Y
	Capsicum annuum L.	Aji Dulce	Sh	F/H	Food	Fruit	Y
					Propagation	Seed	Y
	Capsicum chinense Jacq.*	Aji picante	Sh	H	Food	Fruit	Y
					Propagation	Seed	N

Family	Scientific Name	Local Name	Growth form	Growth location	Use category	Part	Sold
	Capsicum frutescens L.	Aji charapita	Sh	F/H	Food	Fruit	Y
					Propagation	Seed	Y
	Cestrum sp.*	Hierba Santa	H	F/H	Medicine	Leaf	Y
	Lycopersicum esculentum Mill.	Tomate regional	H	F/H	Food	Fruit	Y
					Propagation	Seed	Y
	Physalis angulata L.	Muyaca	H	F/H	Food	Fruit	Y
					Propagation	Seed	N
	Solamun sessiliflorum var. Sessiliflorum Dunal	Cocona	Sh	F/H	Beverage	Fruit	Y
					Food	Fruit	Y
					Medicine	Leaf	N
					Propagation	Seed	Y
Sterculiaceae							
	Guazuma crinita Mart. [a]	Bolaigna	T	Fo	Construction	Trunk	Y
	Theobroma cacao L.	Cacao	T	F	Food	Fruit	Y
					Propagation	Seed	Y
Tiliaceae							
	Apeiba membranacea Spruce ex Benth.*	Peine de mono	T	Fo	Construction	Trunk	Y
Verbenaceae							
	Lippia alba (Mill.) N.E.Br.	Oregano	H	H	Food	Leaf	Y
					Medicine	Leaf	Y
	Verbena litoralis Kunth	Vervena	H	H	Medicine	Leaf	Y
Vochysiaceae							
	Vochysia venulosa Warm.*	Mauba	T	Fo	Construction	Trunk	Y

Family	Scientific Name	Local Name	Growth form	Growth location	Use category	Part	Sold
Zingiberaceae							
	Zingiber officinale Roscoe	Kion	H	F/H	Food	Tuber	Y
					Medicine	Tuber	Y
					Propagation	Tuber	Y
Unknown							
	Unidentified	Aucatadijo	T	Fo	Construction	Trunk	Y
	Unidentified	Abuta	C	Fo	Medicine	Bark	Y
	Unidentified	Palillo	H	F/H	Food	Tuber	Y
					Medicine	Leaf	Y
						Tuber	Y
					Propagation	Tuber	Y

*plants identified from literature
Growth forms: A=Aquatic plant, C=Climber, F=Fern, H=Herb, Sh=Shrub, S=Succulent, T=Tree
Growth location: F=Field, Fo=Forest, H= Home garden, L=Lake
Sold: N=No, Y=Yes

Appendix 3 General information of all plant species in Naranjal

Family	Scientific Name	Vernacular name	Growth form	Growth location	Use category	Part	Sold
Acanthaceae							
	Justicia boliviana Rusby	Aire sacha	H	H	Medicine	Leaf	Y
	Sanchezia macrocnemis (Nees) Wassh.	Arco sacha	H	Fo	Medicine	Leaf	Y
Amaranthaceae							
	Alternanthera brasiliana (L.) Kuntze	Lancetilla	Sh	H	Medicine	Leaf	Y
Amaryllidaceae							
	Eucharis ulei Kraenzl.	Cebolla sacha	H	Fo	Medicine	Root	Y
Anacardiaceae							
	Anacardium occidentale L.	Cashu	T	F/H	Beverage	Fruit	Y
					Food	Fruit	Y
	Mangifera indica L.	Mango	T	F/Fo/H	Beverage	Fruit	Y
					Feed	Fruit	N
					Food	Fruit	Y
					Medicine	Bark	Y
					Propagation	Seed	Y
	Spondias mombin L./	Uvos	T	F/Fo/H	Construction	Trunk	Y
	Spondias venosa Mart. ex Colla				Feed	Fruit	N
					Food	Fruit	Y
					Medicine	Bark	Y
	Spondias purpurea L. [a]	Sirhuela	T	H	Food	Fruit	Y
	Spondias radlkoferi Donn.Sm.	Taperiba	T	F/Fo/H	Beverage	Fruit	Y
					Food	Fruit	Y
					Medicine	Leaf	Y
					Propagation	Seed	Y

Family	Scientific Name	Vernacular name	Growth form	Growth location	Use category	Part	Sold
	Spondias sp.*	Ushun	T	Fo	Construction	Trunk	Y
Annonaceae							
	Annona muricata L.	Guanabana	T	H	Beverage	Fruit	Y
					Food	Fruit	Y
					Medicine	Leaf	Y
					Propagation	Seed	Y
	Malmea sp./*Oxandra* sp./*Xylopia* sp.*	Espintana	T	Fo	Construction	Trunk	Y
	Rollinia mucosa Jacq.	Anona	T	F/Fo/H	Feed	Fruit	N
					Food	Fruit	Y
					Propagation	Seed	Y
	Unonopsis sp.*	Icoja	T	Fo	Medicine	Bark	Y
Apiaceae							
	Eryngium foetidum L.	Culantro	H	H	Food	Leaf	Y
					Medicine	Leaf	N
						Root	N
					Propagation	Seed	Y
Apocynaceae							
	Aspidosperma cylindrocarpon Müll.Arg.*	Pumakiro	T	Fo	Construction	Trunk	Y
	Aspidosperma sp.*	Quillabordon	T	Fo	Construction	Trunk	Y
	Aspidosperma sp.*	Remocaspi	T	Fo	Construction	Trunk	Y
	Himatanthus sucuuba (Spruce ex Müll.Arg.) Woodson [a]	Bellacocaspi/ Platanocaspi	T	Fo	Medicine	Resin	Y
	Tabernaemontana markgrafiana J.F.Macbr.	Uchosanango	T	Fo	Medicine	Root	Y

Family	Scientific Name	Vernacular name	Growth form	Growth location	Use category	Part	Sold
Araceae							
	Alocasia indica Schott/	Patikina	H	F/Fo/H	Medicine	Leaf	Y
	Xanthosoma sagittifolium (L.) Schott	(blanco/negro)				Resin	Y
				H	Propagation	Stem	N
	Anthurium barclayanum Engl.	Huanbe	C	Fo	Handicraft	Trunk	Y
	Anthurium kunthii Poepp.	Trompetero sacha	T	Fo	Medicine	Root	Y
	Dracontium loretense K.Krause/*Dracontium peruvianum* G.H.Zhu & Croat	Jergon sacha	H	Fo/H	Medicine	Tuber	Y
	Monstera dubia Engl. & K.Krause	Pulsario sacha	C	Fo	Medicine	Root	Y
Arecaceae							
	Astrocaryum chambira Burret*	Chambira	T	Fo	Materials	Leaf	Y
	Astrocaryum sp.	Huicungo	T	Fo	Food	Fruit	Y
					Materials	Leaf	Y
	Attalea butyracea (Mutis ex L.f.) Wess.Boer	Shebon	T	Fo/H	Construction	Leaf	Y
	Attalea maripa Mart.*	Conta	T	Fo	Materials	Seed	Y
	Attalea phalerata Mart. ex Spreng.	Shapaja	T	Fo	Construction	Leaf	Y
					Food	Fruit	Y
	Bactris acanthocarpa Mart.	Nejilla	T	Fo	Food	Fruit	Y
	Bactris gasipaes Kunth	Pijuayo	T	F/Fo/H	Beverage	Fruit	Y
					Food	Fruit	Y
						Palm heart	Y
					Propagation	Seed	Y
	Cocos nucifera L.	Coco	T	F/H	Beverage	Fruit	Y
					Food	Fruit	Y
					Medicine	Fruit	Y
					Propagation	Suckers	Y

Family	Scientific Name	Vernacular name	Growth form	Growth location	Use category	Part	Sold
	Euterpe precatoria Mart.	Huasai	T	Fo	Food	Palm heart	Y
					Medicine	Root	Y
	Iriartea deltoidea Ruiz & Pav.*	Pona	T	Fo	Materials	Palm heart	Y
					Medicine	Root	Y
	Lepidocaryum tessmannii Burret	Irapay	T	Fo	Construction	Leaf	Y
	Mauritia flexuosa L.f.	Aguaje	T	F/Fo/H	Feed	Fruit	N
					Beverage	Fruit	Y
					Food	Fruit	Y
					Handicraft	Seed	Y
					Propagation	Seed	Y
	Oenocarpus bataua Mart. [a]	Ungurahui	T	F/Fo/H	Beverage	Fruit	Y
					Feed	Fruit	N
					Food	Fruit	Y
					Propagation	Seed	Y
	Oenocarpus cf. mapora H.Karst.	Sinamillo	T	Fo	Food	Fruit	Y
Aristolochiaceae							
	Aristolochia aff. acutifolia Duch.	Zapohuasca	C	Fo/H	Medicine	Bark	Y
	Aristolochia cauliflora Ule	Huancahua sacha	C	F/Fo	Medicine	Leaf	Y
						Root	Y
Asteraceae							
	Ambrosia peruviana Willd.	Marco sacha	H	F/H	Medicine	Leaf	Y
	Clibadium aff. peruvianum Poepp. ex DC.	Rivisacha	H	Fo	Medicine	Fruit	Y
						Leaf	Y
	Tagetes erecta L.	Rosasisa	H	H	Medicine	Leaf	Y
	Tessaria integrifolia Ruiz & Pav.	Pajarobobo	T	Fo	Materials	Trunk	Y

Family	Scientific Name	Vernacular name	Growth form	Growth location	Use category	Part	Sold
Bignoniaceae							
	Crescentia cujete L.	Huingo	T	Fo/h	Handicraft	Seed	Y
					Medicine	Fruit	Y
						Leaf	Y
	Mansoa alliacea (Lam.) A.H.Gentry	Ajos sacha	C	Fo	Medicine	Leaf	Y
						Root	Y
	Tabebuia serratifolia G.Nicholson*	Tahuari	T	Fo	Construction	Trunk	Y
	Tynanthus aff. villosus A.H.Gentry [a]	Clavohuasca	C	Fo	Medicine	Bark	Y
Bixaceae							
	Bixa orellana L.	Achote	Sh	F/Fo/H	Feed	Leaf	N
					Food	Seed	Y
					Medicine	Leaf	Y
					Propagation	Seed	Y
Bombacaceae							
	Ceiba samauma K.Schum.	Lopuna	T	Fo	Construction	Trunk	Y
	Matisia cordata Bonpl.	Zapote	T	F/H	Food	Fruit	Y
					Propagation	Seed	Y
	Ochroma pyramidale (Cav. ex Lam.) Urb.	Topa	T	F/Fo	Materials	Bark	Y
						Flower	Y
					Medicine	Leaf	Y
Bromeliaceae							
	Ananas comosus (L.) Merr.	Piña	H	F/H	Beverage	Fruit	Y
					Food	Fruit	Y
					Propagation	Stem	Y

Family	Scientific Name	Vernacular name	Growth form	Growth location	Use category	Part	Sold
Cactaceae							
	Opuntia cochenillifera (L.) Mill. [a]	Tuna	S	H	Medicine	Leaf	Y
Cannaceae							
	Canna indica L.	Ashira	H	Fo/H	Handicraft	Seed	Y
					Medicine	Leaf	Y
Caricaceae							
	Carica papaya L.	Papaya	T	F/H	Beverage	Fruit	Y
					Feed	Fruit	N
						Leaf	N
					Food	Fruit	Y
					Handicraft	Petiole	Y
					Medicine	Resin	Y
					Propagation	Seed	Y
Cecropiaceae							
	Pourouma cecropiifolia Mart.	Ubilla	T	F/Fo	Feed	Fruit	Y
					Food	Fruit	Y
					Propagation	Seed	Y
	Pouroma aff. Bicolor Mart.	Cetico	T	F/Fo	Construction	Trunk	Y
					Materials	Trunk	Y
Celastraceae							
	Maytenus macrocarpa Briq.*	Chuchuhuasi	T	Fo	Construction	Trunk	Y
					Medicine	Bark	Y

Family	Scientific Name	Vernacular name	Growth form	Growth location	Use category	Part	Sold
Chenopodiaceae							
	Chenopodium ambrosioides L.	Payco	H	H	Medicine	Leaf	Y
Clusiaceae							
	Calophyllum brasiliense Cambess.*	Lagarto caspi	T	Fo	Construction	Trunk	Y
					Medicine	Resin	Y
Commelinaceae							
	Callisia ciliata Pers.	Boasacha	H	F/Fo	Medicine	Bark	Y
Convolvulaceae							
	Ipomoea trifida G.Don	Camote	C	Fo/H	Food	Fruit	Y
Costaceae							
	Costus scaber Ruiz & Pav.	Caña agria	Sh	Fo	Medicine	Trunk	Y
Crassulaceae							
	Kalanchoe pinnata Pers.	Motelillo	H	H	Medicine	Tuber	Y
Cucurbitaceae							
	Citrullus lanatus (Thunb.) Matsum. & Nakai	Sandia	C	F/H	Beverage	Fruit	Y
					Food	Fruit	Y
					Medicine	Seed	Y
					Propagation	Seed	Y
	Cucumis melo L.*	Melon	C	F/H	Feed	Fruit	N
					Food	Fruit	Y
					Propagation	Seed	Y

Family	Scientific Name	Vernacular name	Growth form	Growth location	Use category	Part	Sold
	Cucumis sativus L.	Pepino	C	F	Feed	Peel	N
					Food	Fruit	Y
					Medicine	Fruit	Y
					Propagation	Seed	Y
	Momordica charantia L.	Papailla	C	F/Fo	Medicine	Leaf	Y
Cyclanthaceae							
	Carludovica palmata Ruiz & Pav.	Bonbonaje	H	Fo	Handicraft	Leaf	Y
	Thoracocarpus bossectus (Vell.) Harling	Tambishi	C	Fo	Medicine	Bark	Y
					Materials	Trunk	Y
Cyperaceae							
	Cyperus luzulae Rottb.	Piri Piri	H	F/Fo	Medicine	Leaf	Y
	Scleria melaleuca Rchb. ex Schltdl. & Cham. [a]	Cortadera	H	F/Fo	Medicine	Root	Y
Dioscoreaceae							
	Dioscorea sp.	Sachapapa	C	F/Fo/H	Food	Tuber	Y
					Propagation	Suckers	Y
Elaeocarpaceae							
	Muntingia calabura L.	Yumanasa	T	Fo	Materials	Trunk	Y
	Sloanea sp.*	Huangana casho	T	Fo	Construction	Trunk	Y
Erythroxylaceae							
	Erythroxylum coca Lam.	Coca	Sh	F/H	Medicine	Leaf	Y
					Propagation	Seed	Y

Family	Scientific Name	Vernacular name	Growth form	Growth location	Use category	Part	Sold
Euphorbiaceae							
	Alchornea cf. latifolia Sw.	Ipururo	T	Fo	Medicine	Bark	Y
						Leaf	Y
	Croton cuneatus Klotzsch	Aji sanango	T	Fo	Medicine	Root	Y
	Croton lechleri Muller Arg./ *Croton draconoides* Müll.Arg.*	Sangredegrado	T	F/Fo/H	Construction	Trunk	Y
					Medicine	Resin	Y
					Propagation	Seed	Y
	Hura crepitans L.	Catahua	T	Fo	Construction	Trunk	Y
					Medicine	Leaf	Y
						Resin	Y
					Poison	Resin	N
	Jatropha curcas L.	Piñon blanco	Sh	F/Fo/H	Medicine	Leaf	Y
						Resin	Y
					Propagation	Seed	Y
	Jatropha gossypiifolia L.	Piñon colorado	Sh	F/Fo/H	Medicine	Leaf	Y
						Resin	Y
					Propagation	Seed	Y
	Manihot esculenta Crantz	Yuca	Sh	F	Beverage	Tuber	Y
					Feed	Tuber	Y
					Food	Leaf	Y
						Tuber	Y
					Medicine	Tuber	Y
						Leaf	Y
					Propagation	Stem	Y
	Phyllanthus niruri L.	Chancapiedra	H	F/Fo/H	Medicine	Entire plant	Y
	Plukenetia volubilis L.	Sacha inchi	C	F	Beverage	Fruit	Y
					Medicine	Fruit	Y

Family	Scientific Name	Vernacular name	Growth form	Growth location	Use category	Part	Sold
Fabaceae							
	Amburana cearensis (Fr.Allem.) L.C.Sm.*	Ishpingo	T	Fo	Construction	Trunk	Y
	Apuleia leiocarpa J.F.Macbr.*	Anacaspi	T	Fo	Construction	Trunk	Y
	Arachis hypogaea L.*	Manhi	H	F	Food	Seed	Y
					Medicine	Seed	Y
	Cajanus cajan (L.) Millsp.	Frejol de palo	Sh	F/H	Food	Fruit	Y
					Medicine	Fruit	Y
	Calliandra angustifolia Spruce ex Benth.	Bobinsana	T	Fo/H	Medicine	Bark	Y
						Leaf	Y
	Cedrelinga cateniformis (Ducke) Ducke*	Tornillo	T	F	Construction	Trunk	Y
	Copaifera paupera (Herzog) Dwyer	Copaiba	T	F	Construction	Trunk	Y
					Medicine	Resin	Y
					Propagation	Seed	Y
	Dipteryx cf. alata Vog.	Shihuahuaco	T	F/Fo	Construction	Trunk	Y
					Medicine	Resin	Y
					Propagation	Seed	Y
	Erythrina amazonica Krukoff	Amasisa	T	Fo/H	Medicine	Bark	Y
	Inga edulis Mart.	Guaba	T	F	Food	Fruit	Y
					Medicine	Seed	Y
					Propagation	Seed	Y
	Inga sp.	Guabilla	T	F	Food	Fruit	Y
					Propagation	Seed	Y
	Leucaena sp.	Pashaquilla	Sh	F	Medicine	Leaf	Y
	Machaerium inundatum Ducke*	Aguanomasha	T	Fo	Construction	Trunk	Y
	Mimosa bonplandii Benth.	Hierba Vervensosa	H	Fo/H	Medicine	Leaf	Y
	Myroxylon balsamum Harms*	Estoraqui	T	Fo	Construction	Trunk	Y

Family	Scientific Name	Vernacular name	Growth form	Growth location	Use category	Part	Sold
	Ormosia sp.*	Huayruro	T	F/Fo/H	Construction	Trunk	Y
					Handicraft	Seed	Y
					Propagation	Seed	Y
	Pueraria phaseoloides (Roxb.) Benth. *var. Javanica* (Benth.) Baker	Cudzu	C	F/Fo	Fertilizer	Entire plant	Y
					Propagation	Seed	Y
	Senna aff. Loretensis (Killip) H.S.Irwin & Barneby	Tamara	T	Fo/H	Construction	Trunk	Y
	Senna reticulata (Willd.) H.S.Irwin & Barneby	Retama	T	Fo	Medicine	Flower	Y
						Fruit	Y
Heliconiaceae							
	Heliconia rostrata Ruiz & Pav.	Situlli	H	F/Fo	Construction	Leaf	N
					Materials	Flower	Y
Lamiaceae							
	Ocimum americanum L.	Sharamasho	H	H	Medicine	Leaf	Y
						Petiole	Y
					Propagation	Seed	N
	Ocimum campechianum Mill.	Albaca	H	Fo/H	Medicine	Leaf	Y
Lauraceae							
	Aniba sp./*Nectandra* sp./*Ocotea* sp.*	Muena	T	Fo	Construction	Trunk	Y
	Cinnamomum aff. triplinerve (Ruiz & Pav.) Kosterm.	Canela	T	F/Fo/H	Beverage	Bark	Y
					Medicine	Bark	Y
						Leaf	Y
					Propagation	Seed	Y
	Mezilaurus sp.*	Itauva	T	Fo	Construction	Trunk	Y

Family	Scientific Name	Vernacular name	Growth form	Growth location	Use category	Part	Sold
	Persea americana Mill.	Palta	T	F/H	Food	Fruit	Y
					Medicine	Fruit	Y
					Propagation	Seed	Y
Lecythidaceae							
	Cariniana sp.*	Cachimbo	T	Fo	Construction	Trunk	Y
	Couroupita guianensis Aubl.	Ajahuma	T	Fo	Medicine	Bark	Y
						Fruit	Y
	Eschweilera sp.*	Machimango	T	Fo	Construction	Trunk	Y
	Grias peruviana Miers	Sacha mangua	T	Fo/H	Food	Fruit	Y
					Medicine	Bark	Y
Loranthaceae							
	Passovia pyrifolia (Kunth) Tiegh.	Suelda con suelda	C	H	Medicine	Leaf	Y
Malpighiaceae							
	Banisteriopsis caapi (Spruce ex Griseb.) Morton	Ajahuasca	C	Fo/H	Medicine	Leaf	Y
Malvaceae							
	Ceiba sp.*	Wuinba	T	Fo	Construction	Trunk	Y
	Gossypium cf. barbadense L.	Algodon	Sh	F/H	Materials	Fruit	Y
					Medicine	Leaf	Y
	Malachra alceifolia Jacq.	Malba	H	F/Fo/H	Medicine	Leaf	Y
						Resin	Y
	Septotheca tessmannii Ulbr.*	Utucuro	T	Fo	Construction	Trunk	Y

Family	Scientific Name	Vernacular name	Growth form	Growth location	Use category	Part	Sold
Marantaceae							
	Calathea allouia (Aubl.) Lindl.	Dale Dale	H	F	Food	Tuber	Y
					Propagation	Suckers	Y
	Calathea lutea (Aubl.) Schult.	Bijau	H	Fo	Materials	Leaf	Y
Meliaceae							
	Cedrela odorata L.	Cedro	T	F/Fo/H	Construction	Trunk	Y
					Medicine	Bark	Y
					Propagation	Seed	Y
	Guarea kunthiana A.Juss.*	Requilla	T	Fo	Construction	Trunk	Y
	Swietenia macrophylla King*	Caoba	T	F/Fo	Construction	Trunk	Y
					Propagation	Seed	Y
	Trichilia poeppigii C.DC.*	Ushumujaca	T	Fo	Construction	Trunk	Y
Moraceae							
	Artocarpus altilis (Parkinson) Fosberg	Pan de arbol/pandisho	T	F/Fo/H	Food	Fruit	Y
					Medicine	Resin	Y
					Propagation	Seed	Y
	Brosimum lactescens (S.Moore) C.C.Berg*/	Tamamuri	T	Fo	Construction	Trunk	Y
	Naucleopsis glabra Spruce*				Medicine	Bark	Y
	Brosimum rubescens Taub.	Pali sangre	T	Fo	Medicine	Resin	Y
	Brosimum sp.*	Huayrocaspi	T	Fo	Medicine	Resin	Y
	Brosimum sp.*	Manchinga	T	Fo	Medicine	Resin	Y
	Ficus insipida Willd.	Oje	T	F/Fo	Construction	Trunk	Y
					Feed	Leaf	N
						Seed	Y
					Medicine	Resin	Y

Family	Scientific Name	Vernacular name	Growth form	Growth location	Use category	Part	Sold
					Propagation	Seed	Y
	Ficus sp.*	Kame renaco	T	Fo	Medicine	Resin	Y
	Ficus sp.*	Sacha renaco	T	Fo	Medicine	Resin	Y
	Ficus sp. [a]	Zapote renaco	T	Fo	Medicine	Resin	Y
	Ficus sp.	Renaquilla	T	Fo	Medicine	Resin	Y
	Ficus trigona L.f.	Renaco	T	Fo	Medicine	Resin	Y
	Maclura tinctoria (L.) D.Don ex Steud.	Insira	T	Fo	Medicine	Resin	Y
	Maquira coriacea (H.Karst.) C.C.Berg*	Capinuri/Janchama	T	Fo/H	Construction	Trunk	Y
					Medicine	Bark	Y
						Resin	Y
	Pseudolmedia laevis J.F.Macbr.	Chimicua	T	Fo	Food	Fruit	Y
					Medicine	Resin	Y
Musaceae							
	Musa paradisiaca L.	Platano	H	F	Beverage	Fruit	Y
					Feed	Fruit	N
					Food	Flower	Y
						Fruit	Y
					Medicine	Peel	Y
					Propagation	Suckers	N
Myristicaceae							
	Virola sp.*	Cumala	T	Fo	Construction	Trunk	Y
Myrtaceae							
	Myrciaria dubia (Kunth) McVaugh	Camu Camu	T	Fo	Beverage	Fruit	Y
					Food	Fruit	Y
					Medicine	Fruit	Y

Family	Scientific Name	Vernacular name	Growth form	Growth location	Use category	Part	Sold
	Psidium guajava L.	Guayaba	Sh	F/Fo/H	Food	Fruit	Y
					Medicine	Bark	Y
						Leaf	Y
					Propagation	Seed	Y
	Syzygium malaccense (L.) Merr. & L.M.Perry	Pomarosa	T	Fo/H	Food	Fruit	Y
					Propagation	Seed	Y
Oxalidaceae							
	Averrhoa carambola L.	Carambola	T	H	Beverage	Fruit	Y
					Food	Fruit	Y
Papilionaceae							
	Diplotropis martiusii Benth.*	Chontaquiro	T	Fo	Construction	Trunk	Y
					Materials	Trunk	Y
Passifloraceae							
	Passiflora edulis Sims [a]	Maracuya	C	F	Beverage	Fruit	Y
					Food	Fruit	Y
					Propagation	Seed	N
	Passiflora ligularis Juss.	Granadilla	C	Fo/H	Food	Fruit	Y
					Medicine	Leaf	Y
	Passiflora quadrangularis L.*	Tumbo	C	H	Food	Fruit	Y
					Propagation	Seed	Y
Phyllanthaceae							
	Margaritaria nobilis L.f.*	Loromicuna	T	Fo	Construction	Trunk	Y

Family	Scientific Name	Vernacular name	Growth form	Growth location	Use category	Part	Sold
Phytolaccaceae							
	Gallesia integrifolia (Spreng.) Harms.	Ajos quiro	T	Fo	Medicine	Bark	Y
	Petiveria alliacea L.	Mucura	H	Fo	Medicine	Leaf	Y
Piperaceae							
	Piper aduncum L.	Cordoncillo	Sh	F/Fo	Medicine	Trunk	Y
	Piper hispidum Sw.	Maticu	T	Fo/H	Medicine	Leaf	N
	Piper nigrum L.	Pimienta	C	F	Food	Fruit	Y
					Propagation	Seed	Y
	Piper obliquum Ruiz & Pav.	Gajinaso sacha	H	Fo	Medicine	Root	Y
	Piper peltatum L.	Santa Maria	Sh	F/Fo	Medicine	Leaf	Y
Plantaginaceae							
	Plantago major L.	Llanten	H	H	Medicine	Leaf	Y
					Propagation	Seed	Y
	Scoparia dulcis L.	Sinchipichana	H	Fo	Medicine	Leaf	Y
Poaceae							
	Axonopus compressus (Sw.) P.Beauv.	Turulco	H	Fo/H	Medicine	Root	Y
	Cymbopogon citratus Stapf.	Hierba Luisa	H	F/H	Medicine	Leaf	Y
	Guadua angustifolia Kunth	Marona	T	Fo	Handicraft	Trunk	Y
					Materials	Trunk	Y
	Gynerium sagittatum P. Beauv.*	Caña brava	H	F/Fo	Handicraft	Trunk	Y
					Materials	Trunk	Y
	Imperata brasiliensis Trin.	Cashahutsha	H	H	Medicine	Root	Y
	Oryza sativa L. [a]	Arroz	H	F	Food	Fruit	Y
					Propagation	Seed	Y

Family	Scientific Name	Vernacular name	Growth form	Growth location	Use category	Part	Sold
	Saccharum officinarum L.	Caña de azucar	H	F	Beverage	Stem	Y
					Food	Stem	Y
					Medicine	Stem	Y
					Propagation	Seed	Y
	Zea Mays L.	Maiz	H	F	Beverage	Fruit	Y
					Feed	Entire plant	Y
					Food	Fruit	Y
					Propagation	Seed	Y
Polygonaceae							
	Coccoloba densifrons C. Mart. ex Meisn.	Romero	T	Fo	Food	Fruit	Y
	Triplaris sp.*	Tangarana	T	Fo/H	Construction	Trunk	Y
Portulacaceae							
	Portulaca oleracea L.	Verdulaga	H	F/Fo/H	Medicine	Leaf	Y
Pteridophyta							
	Phlebodium aereolatum	Cotochupa	F	Fo	Medicine	Tuber	Y
Rubiaceae							
	Capirona decorticans Spruce/*Calycophyllum spruceanum* (Benth.) K.Schum.*	Capirona	T	F/Fo	Construction	Trunk	Y
					Propagation	Seed	Y
	Coffea arabica L.	Café	Sh	F/H	Beverage	Fruit	Y
					Medicine	Leaf	Y
					Propagation	Seed	Y
	Coutarea hexandra (Jacq.) K.Schum.*	Huacomayocaspi	T	Fo	Construction	Trunk	Y

Family	Scientific Name	Vernacular name	Growth form	Growth location	Use category	Part	Sold
	Genipa americana L.	Huito	T	F/Fo/H	Feed	Fruit	N
					Food	Fruit	Y
					Medicine	Fruit	Y
	Morinda citrifolia L.	Noni	T	Fo/H	Medicine	Fruit	Y
	Palicourea sp.*	Panguana	T	Fo	Construction	Trunk	Y
	Uncaria tomentosa DC.	Uña de gato	C	Fo	Medicine	Bark	Y
Rutaceae							
	Citrus aurantiifolia (Christm.) Swingle.	Naranja	T	F/H	Beverage	Fruit	Y
					Food	Fruit	Y
					Propagation	Seed	Y
	Citrus limettioides Tanaka	Lima Dulce	T	F/H	Food	Fruit	Y
					Medicine	Fruit	Y
						Leaf	Y
	Citrus limon (L.) Burm.f./*Citrus limetta* Risso	Limones	T	F/H	Beverage	Fruit	Y
					Food	Fruit	Y
					Medicine	Fruit	Y
						Leaf	Y
					Propagation	Seed	Y
	Citrus paradisi Macfad.	Toronja	T	F	Beverage	Fruit	Y
					Food	Fruit	Y
					Medicine	Fruit	Y
					Propagation	Seed	Y
	Citrus reticulata Blanco	Mandarina	T	F/H	Food	Fruit	Y
					Propagation	Seed	N
Salicaceae							

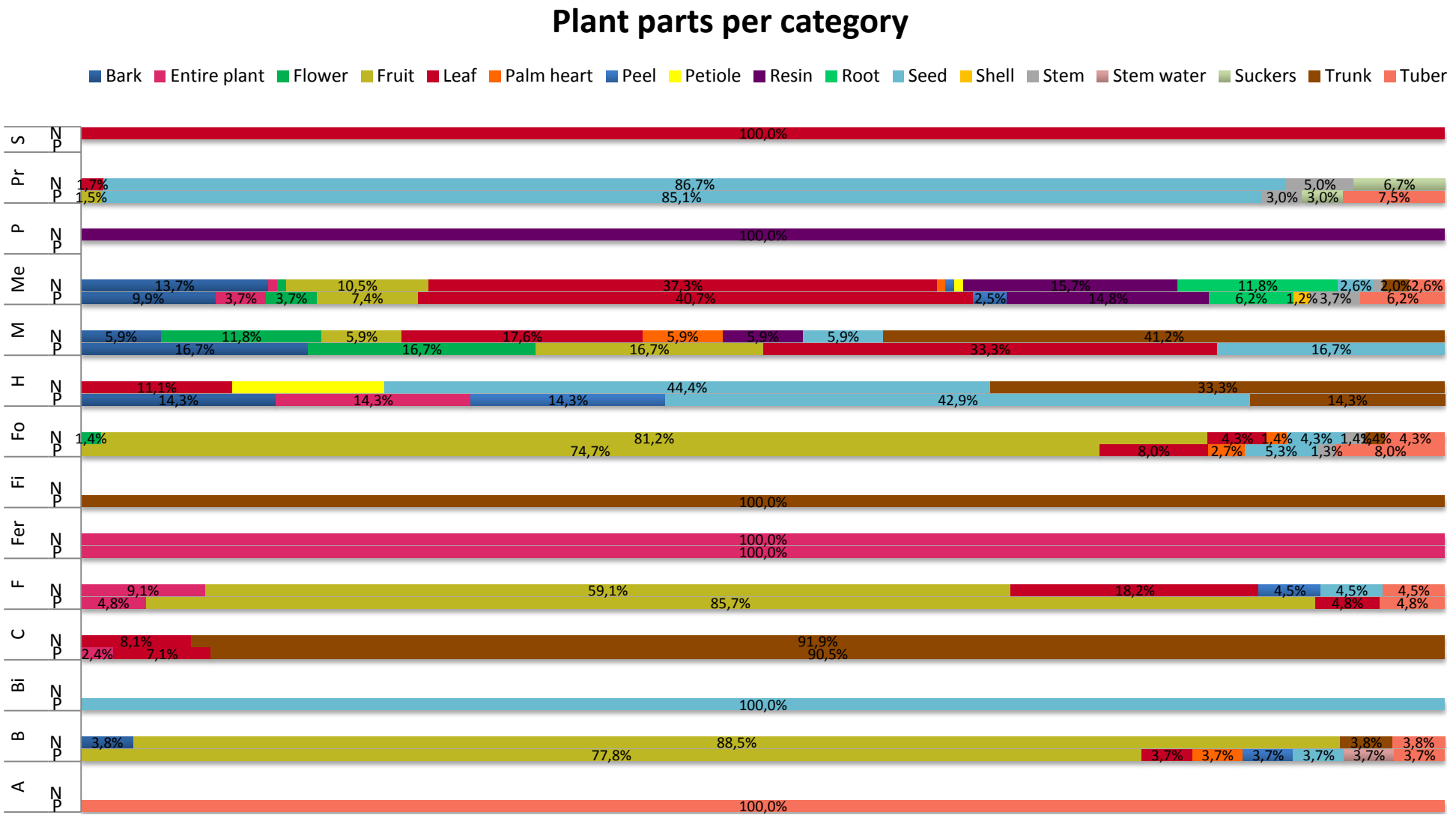
Family	Scientific Name	Vernacular name	Growth form	Growth location	Use category	Part	Sold
	Laetia sp.*	Timareo	T	F	Construction	Trunk	Y
Sapotaceae							
	Manilkara bidentata (A.DC.) A.Chev.	Quinilla	T	F/Fo/H	Construction	Trunk	Y
					Feed	Fruit	N
					Propagation	Seed	Y
	Micropholis sp./*Pouteria* sp.*	Caymitillo	T	Fo	Construction	Trunk	Y
	Pouteria caimito Radlk.	Caymito	T	F/H	Food	Fruit	Y
					Propagation	Seed	Y
	Pouteria sp.*	Kina Kina	T	Fo	Construction	Trunk	Y
Simaroubaceae							
	Simarouba amara Aubl.*	Marupa	T	Fo	Construction	Trunk	Y
Solanaceae							
	Brugmansia sp.	Toe	Sh	F/Fo/H	Medicine	Leaf	Y
	Brunfelsia grandiflora D.Don.	Chirisanango	Sh	Fo/H	Medicine	Root	Y
	Capsicum annuum L.	Aji Dulce	Sh	F/H	Feed	Fruit	N
						Leaf	N
					Food	Fruit	Y
					Propagation	Seed	Y
	Cestrum sp.*	Hierba Santa	H	Fo	Medicine	Leaf	Y
	Lycopersicon esculentum Mill.	Tomate regional	H	H	Food	Fruit	Y
	Nicotiana tabacum L.	Tabaco	H	F/H	Medicine	Leaf	Y
					Smoking	Leaf	Y
	Physalis angulata L.	Muyaca	H	F	Food	Fruit	Y
					Medicine	Seed	Y
						Leaf	Y
	Solanum aff. foetens Pittier ex S.Knapp	Lobosanango	T	Fo	Medicine	Leaf	Y

Family	Scientific Name	Vernacular name	Growth form	Growth location	Use category	Part	Sold
						Root	Y
	Solanum frutescens A.Braun & C.D.Bouché	Aji charapita	Sh	H	Food	Fruit	Y
	Solanum grandiflorum Ruiz & Pav.	Ciucahito	T	Fo	Medicine	Fruit	Y
	Solanum sessiliflorum var. sessiliflorum Dunal	Cocona	Sh	F/H	Beverage	Fruit	Y
					Food	Fruit	Y
	Solanum sp.	Cashillo	T	Fo/H	Feed	Fruit	N
	Solanum sp.*	Coconilla	T	Fo	Construction	Trunk	Y
Sterculiaceae							
	Guazuma crinita Mart.	Bolaina	T	F/Fo	Construction	Trunk	Y
					Propagation	Seed	Y
	Theobroma bicolor Bonpl.	Macambo	T	Fo/H	Food	Fruit	Y
						Seed	Y
					Propagation	Seed	Y
	Theobroma cacao L.	Cacao	T	F	Food	Fruit	Y
	Theobroma grandiflorum (Willd. ex Spreng.) K.Schum.*	Cupasu	T	Fo	Beverage	Fruit	Y
Ulmaceae							
	Trema micrantha (L.) Blume	Atadijo	T	Fo	Construction	Trunk	Y
Urticaceae							
	Urera caracasana (Jacq.) Gaudich. ex Griseb.	Ishanga	T	F/Fo/H	Medicine	Leaf	Y
Verbenaceae							
	Lippia alba (Mill.) N.E.Br.	Oregano	H	Fo/H	Food	Leaf	Y
					Medicine	Leaf	Y
	Verbena litoralis Kunth	Vervena	H	Fo/H	Construction	Leaf	Y
	Vitex pseudolea Rusby	Curmiñon	T	Fo/H	Construction	Trunk	Y

Family	Scientific Name	Vernacular name	Growth form	Growth location	Use category	Part	Sold
Vochysiaceae							
	Vochysia venulosa Warm.*	Mauba	T	Fo	Construction	Trunk	Y
Unknown							
	Unidentified	Aji palo	T	Fo	Construction	Trunk	Y
	Unidentified	Atchunicaspi	T	Fo	Medicine	Bark	Y
						Root	Y
	Unidentified	Banasisa	T	Fo	Construction	Trunk	Y
	Unidentified	Coucho	T	Fo	Construction	Trunk	Y
					Materials	Resin	Y
	Unidentified	Huama	A	L	Feed	Entire plant	Y
					Medicine	Leaf	Y
	Unidentified	Nucñu		F/Fo/H	Medicine	Leaf	Y
	Unidentified	Pisho	T	Fo	Construction	Trunk	Y
	Unidentified	Sarsa		Fo	Medicine	Root	Y

*plants identified from literature
Growth forms: A=Aquatic plant, C=Climber, F=Fern, H=Herb, Sh=Shrub, S=Succulent, T=Tree
Growth location: F=Field, Fo=Forest, H= Home garden, L=Lake
Sold: N=No, Y=Yes

Appendix 4 **Percentages of plant parts used in each category (A=Aromatic, B=Beverage, Bi=Biodiesel, C=Construction, F=Feed, Fer=Fertilizer, Fi=Firewood, Fo=Food, H=Handicraft, M=Materials, Me=Medicine, P=Poison, Pr=Propagation, S=Smoking)**



Appendix 5 Food plants in Pueblo Libre with used plant part, food type and their preparation and storage method (R=Raw; C=Cooked)

Family	Scientific name	Vernacular name	Part	Food type	Preparation		Storage
					R/C	Explanation	
Amaryllidaceae							
	Allium cepa L.	Cebolla	Tuber	Vegetable	C	Peel, cut and cook with lemon and salt	Cool and dry
Anacardiaceae							
	Anacardium occidentale L.	Marañon/ Cashu	Fruit	Beverage	R	Cut, get the seed out and blend with water and sugar	Cool
			Fruit	Fruit	R	Eat raw	
	Mangifera indica L.	Mango	Fruit	Beverage	R	Peel, blend and add water and sugar	Cool
			Fruit	Fruit	R	Peel	
			Fruit	Marmalade	C	Cook and add sugar	
	Spondias mombin L./	Uvos	Fruit	Beverage	R	Blend and add water and sugar	Cool
	Spondias venosa Mart. ex Colla		Fruit	Fruit	R	Eat raw	
	Spondias purpurea L.	Ciruelo	Fruit	Fruit	R	Eat raw	Cool
	Spondias radlkoferi Donn. Smith.	Taperiba	Fruit	Fruit	R	When it is ripe it is peeled and the seed is removed, then it is blended with water and sugar	Cool
			Fruit	Vegetable	R	Unripe: peel and eat with salt/Ripe: peel	
Annonaceae							
	Annona dolabripetala Raddi	Anona	Fruit	Fruit	R	Peel	Cool
	Annona muricata L.	Guanabana	Fruit	Beverage	R	Peel, remove seeds and blend with water and sugar	Cool
			Fruit	Fruit	R	Cut and peel	
Apiaceae							
	Coriandrum sativum L.	Culantro regional	Leaf	Spice	R/C	Cut and add to the dish	Cool
			Leaf	Vegetable	R/C	Cut and eat raw or cooked	

Family	Scientific name	Vernacular name	Part	Food type	Preparation		Storage
					R/C	Explanation	
	Eryngium foetidum L.	Sacha culantro	Leaf	Spice	R/C	Cut and add to dish	Cool
			Leaf	Vegetable	R/C	Cut and eat raw or cooked	
Arecaceae							
	Astrocaryum sp.	Huicungo	Fruit	Fruit	R	Cut in half and eat the inside	Cool
	Attalea phalerata Mart. ex Spreng.	Shebon	Fruit	Fruit	R	Cut the shell and eat the inside	Cool
	Bactris gasipaes Kunth	Pijuayo	Fruit	Beverage	C	Cook, mash and add sugar	Cool
			Fruit	Beverage	C	Cook, mash, get the pit out and liquefy in a bucket with water and sugar	
			Fruit	Carbohydrate	C	Cook	
			Fruit	Fruit	R	Peel and eat raw	
			Palm heart	Beverage	C	Peel, cut and cook in water	N.r.
			Palm heart	Vegetable	R	Peel and cut	
	Cocos nucifera L.	Coco	Fruit	Beverage	R	Cut the coconut and drink the juice	Cool
			Fruit	Fruit	R/C	Squeeze or rasp and cook with sugar or eat raw	
			Fruit	Ice lolly	C	Cook, mash and add liquid from coco with milk, cinnamon and sugar and put it in bags to make ice lollies and put in freezer	
	Elaeis guineensis Jacq.	Palma	Fruit	Oil	C	Mash and cook in water, oil will float and it can be separated	Cool
	Euterpe precatoria Mart.	Huasai	Fruit	Fruit	R	Peel	Cool
			Palm heart	Vegetable	R	Peel and cut	Cool
	Mauritia flexuosa L.f.	Aguaje	Fruit	Beverage	R	Mash and mix until the seed floats above and remove them	Cool
			Fruit	Fruit	R	Put in warm water and peel	
			Fruit	Ice lolly	C	Cook, mash and put the juice in plastic bags to make ice lollies and put in freezer	

Family	Scientific name	Vernacular name	Part	Food type	Preparation		Storage
					R/C	Explanation	
	Oenocarpus bataua Mart.	Ungurahui	Fruit	Beverage	R	Mix raw with water and sugar	Cool
			Fruit	Fruit	R	Raw	
			Fruit	Ice lolly	C	Cook, mash and later they make juice and put it in bags to make ice lollies and put it in the freezer	
			Fruit	Oil	C	Mash and cook in water, the oil will rise on top of the water	
Bixaceae							
	Bixa orellana L.	Achote	Seed	Spice	R	Remove seed, let it dry and make powder to use as a colorant in dishes	Dried
Bombacaceae							
	Matisia cordata Humb. & Bonpl.	Zapote	Fruit	Fruit	R	Eat raw	Cool
Bromeliaceae							
	Ananas comosus (L.) Merr.	Piña	Fruit	Beverage	R	Rasp/peel and blend with water and sugar	Cool
			Fruit	Fruit	R	Peel	
			Fruit	Ice lolly	C	Cook the fruit and mash, then put the juice in plastic bags to make ice lollies and put in freezer	
Caricacaeae							
	Carica papaya L.	Papaya	Fruit	Beverage	R	Peel and remove seed and blend with water and sugar	Cool
			Fruit	Carbohydrate	C	Unripe: cook (instead of potatoes)	
			Fruit	Fruit	R	Peel and eat raw	
			Fruit	Marmalade	C	Cook and add sugar	
Cecropiaceae							
	Pourouma cecropiifolia Mart.	Ubilla	Fruit	Fruit	R	Peel	Cool
Chenopodicaceae							
	Chenopodium ambrosioides L.	Payco	Leaf	Spice	R/C	In soup (mixed with other vegetables)	No

Family	Scientific name	Vernacular name	Part	Food type	Preparation		Storage
					R/C	Explanation	
Cucurbitaceae							
	Citrullus lanatus (Thunb.) Matsum. & Nakai	Sandia	Fruit	Fruit	R	Cut in half and eat raw	Cool
	Cucurbita cf. ficifolia Bouché	Zapallo	Fruit	Vegetable	R/C	Raw or cooked	Cool
	Cucumis melo L.	Melón	Fruit	Beverage	R	Peel, remove seed and blend with water and sugar	Cool
			Fruit	Fruit	R	Peel	
	Cucumis sativus L.	Pepino	Fruit	Vegetable	R	Peel, cut and eat with salt and lemon	Cool
	Cyclanthera pedata Schrad.	Cayhua	Fruit	Vegetable	R/C	Cut and eat with salt and lemon or cook it	Cool
Dioscoreaceae							
	Dioscorea cf. trifida L.f.	Sachapapa	Tuber	Carbohydrate	C	Cook	Dry
Euphorbiaceae							
	Manihot esculenta Crantz	Yuca	Leaf	Vegetable	C	Cut in pieces and cook	Cool
			Tuber	Beverage	C	Peel, cook, mash and add sugar and ferment during 3 more days (called: Masato)	Cool and dry
			Tuber	Carbohydrate	C	Peel and cook	
Fabaceae							
	Cajanus cajan (L.) Millsp.	Frejol de palo	Fruit	Vegetable	C	Soak one day in water and then cook it with salt	Dry
	Inga edulis Mart.	Guaba	Fruit	Fruit	R	Open and get the fruit out	Cool
	Inga feuillei DC.	Pacay	Fruit	Fruit	R	Open and remove seed	Cool
	Inga sp.	Shimbillo	Fruit	Fruit	R	Open and remove the seeds and eat the fleshy meat	Cool
	Phaseolus vulgaris L.	Chiclayo	Fruit	Vegetable	C	Open the fruit and get the beans out and cook them	Cool
Icacinaceae							
	Poraqueiba sericea Tul.	Umari	Fruit	Fruit	R	Eat raw	Cool
Lamiaceae							
	Ocimum campechianum Mill.	Albaca	Leaf	Spice	R	Raw in a dish	Cool
Lauraceae							
	Persea americana Mill.	Palta	Fruit	Vegetable	R	Peel, remove pit, cut and eat with lemon and salt	Cool

Family	Scientific name	Vernacular name	Part	Food type	Preparation		Storage
					R/C	Explanation	
Marantaceae							
	Calathea allouia (Aubl.) Lind.	Dale Dale	Tuber	Carbohydrate	C	Cook and peel	Cool and dry
Moraceae							
	Artocarpus altilis (Parkinson) Fosberg	Pan de árbol	Fruit	Carbohydrate	C	Cook	Dry
Musaceae							
	Musa paradisiaca L.	Platano	Fruit	Beverage	R	Peel, mix (raw) with milk, eggs, sugar and water	Cool and dry
			Fruit	Beverage	R	Peel, cut and add water or milk and sugar (With ripe fruit it is called: Chapo/unripe: Masamora)	
			Fruit	Carbohydrate	C	Peel and Cook	
			Fruit	Fruit	R	Peel	
Myrtaceae							
	Myrciaria dubia (Kunth) Mc Vaugh.	Camu Camu	Fruit	Beverage	R	Remove seed and blend	Cool
	Psidium guajava L.	Guayaba	Fruit	Fruit	R	Eat raw	Cool
			Fruit	Marmalade	C	Cook and add sugar	
	Syzygium malaccense (L.) Merr. & L.M.Perry	Pomarosa	Fruit	Fruit	R	Eat raw	Cool
Oxalidaceae							
	Averrhoa carambola L.	Carambola	Fruit	Beverage	R	Wash and blend with water and sugar	Cool
			Fruit	Fruit	R	Eat raw (with salt)	
Passifloraceae							
	Passiflora acuminata DC.	Granadilla	Fruit	Fruit	R	Peel	Cool

Family	Scientific name	Vernacular name	Part	Food type	Preparation		Storage
					R/C	Explanation	
	Passiflora edulis Sims	Maracuya	Fruit	Beverage	R/C	Cook (with peel) or use only the pulp raw and add water and sugar	Cool
			Fruit	Fruit	R	Eat raw or peel	
	Passiflora quadrangularis L.	Tumbo	Fruit	Beverage	R	Cut and blend	Cool
			Fruit	Fruit	R	Cut	
Piperaceae							
	Piper nigrum L.	Pimienta	Fruit	Spice	R	Crush it after drying	Dried
Poaceae							
	Oryza sativa L.	Arroz	Seed	Carbohydrate	C	Cook	Dry
	Saccharum officinarum L.	Caña de azucar	Stem	Beverage	R	Squeeze the juice out of the stem and ferment	Cool
			Stem	Spice	R	Squeeze the juice out of the stem and from this juice they make sugar	
	Zea mays L.	Maiz	Fruit	Beverage	C	Cook with water and sugar (When fermented it is called: chicha)	Dry
			Fruit	Vegetable	R/C	Cut and eat like this or cook it	
			Seed	Carbohydrate	C	Cook	Dry
Rubiaceae							
	Coffea arabica L.	Café	Fruit	Beverage	R	Peel and dry in the sun for 3 to 7 days. Afterwards crush and serve with warm water	Dried
	Genipa americana L.	Huito	Fruit	Fruit	R	Eat raw	Cool
	Uncaria tomentosa DC.	Uña de gato	Stem water	Beverage	R	Cut the stem in half and the juice runs out	Cool
Rutaceae							
	Citrus limetta Risso/	Limones	Fruit	Beverage	R	Squeeze and add water and sugar	Cool
	Citrus limon (L.) Burm. f.		Leaf	Beverage	C	Cook in water (tea)	Cool

Family	Scientific name	Vernacular name	Part	Food type	Preparation		Storage
					R/C	Explanation	
	Citrus limettioides Tanaka	Lima dulce	Fruit	Fruit	R	Peel	Cool
	Citrus paradisi Macfad.	Toronja	Fruit	Fruit	R	Peel	Cool
			Fruit	Beverage	R	Squeeze and add water and sugar	
	Citrus reticulata Blanco	Mandarinas	Fruit	Fruit	R	Peel	Cool
	Citrus x sinensis Osbeck	Naranja	Fruit	Fruit	R	Peel	Cool
			Fruit	Beverage	R	Squeeze and add water and sugar	
	Citrus x tangelo J.W.Ingram & H.E.Moore	Tanyelo	Fruit	Fruit	R	Peel	Cool
			Fruit	Beverage	R	Cut and squeeze	
Sapotaceae							
	Manilkara surinamensis Dubard	Qinilla	Fruit	Fruit	R	Eat raw	Cool
	Pouteria caimito Radlk.	Caymito	Fruit	Fruit	R	Open the peel and remove the four pits and eat raw	Cool
Solanaceae							
	Capsicum annuum L.	Aji Dulce	Fruit	Vegetable	C	Cut, cook and remove the seeds	Cool
	Capsicum chinense Jacq.	Aji picante	Fruit	Marmalade	C	Cut and cook in water, put in refrigerator, mix with sugar, clove and cinnamon	Cool
			Fruit	Spice	C	Cook with lemon	
			Fruit	Vegetable	C	Cut and cook	
	Capsicum frutescens L.	Aji Charapita	Fruit	Vegetable	R	Mash and eat with lemon and sal (spicy)	Cool
	Lycopersicum esculentum Mill.	Tomate regional	Fruit	Vegetable	R/C	Cut and eat raw or cooked	Cool
	Physalis angulata L.	Muyaca	Fruit	Fruit	R	Eat raw	Cool

Family	Scientific name	Vernacular name	Part	Food type	Preparation		Storage
					R/C	Explanation	
	Solanum sessiliflorum var. sessiliflorum Dunal	Cocona	Fruit	Beverage	C	Cook and add water and sugar	Cool
			Fruit	Fruit	R	Peel (eat with salt)	
			Fruit	Sauce	R	Peel the cocona and mix	
Sterculiaceae							
	Theobroma cacao L.	Cacao	Fruit	Fruit	R	Open the pod and eat the white pulp, the seeds are removed and fermented, dried and crushed	Cool
Verbenaceae							
	Lippia alba (Mill.) N.E.Br.	Oregano	Leaf	Spice	R/C	Add leaf in the dish	No
Zingiberaceae							
	Zingiber officinale Roscoe	Kión	Tuber	Spice	R	Peel, cut and mash and put in the dish	Cool
Unknown							
	Unidentified	Palillo	Tuber	Spice	R	Cut, dry and crush, then add to dish	Dried

Appendix 6 Food plants in Naranjal with used plant part, food type and their preparation and storage method (R=Raw; C=Cooked)

Family	Scientific name	Vernacular name	Part	Food type	Preparation		Storage
					R/C	Explanation	
Anacardiaceae							
	Anacardium occidentale L.	Cashu	Fruit	Beverage	R	Peel, cut and blend with water and sugar	Cool
			Fruit	Fruit	R	Eat raw	
	Mangifera indica L.	Mango	Fruit	Beverage	R	Peel, cut and blend with water and sugar	Cool
			Fruit	Fruit	R	Peel	
			Fruit	Marmalade	C	Peel, cut, cook in water and add sugar	
	Spondias mombin L.	Uvos	Fruit	Fruit	R	Raw, without seed	Cool
	Spondias purpurea L.	Sirhuela	Fruit	Fruit	R	Raw, without seed	Cool
	Spondias radlkoferi Donn. Sm.	Taperiba	Fruit	Beverage	R	Peel, cut and blend with water and sugar	Cool
			Fruit	Fruit	R	Peel	
Annonaceae							
	Annona cherimola Miller	Guanabana	Fruit	Fruit	R	Peel	Cool
			Fruit	Beverage	R	Peel, cut and blend with water and sugar	
	Rollinia mucosa Jacq.	Anona	Fruit	Fruit	R	Cut in half	Cool
Apiaceae							
	Eryngium foetidum L.	Culantro	Leaf	Vegetable	C	Cut and cook in dish	No
Arecaceae							
	Astrocaryum sp.	Huicungo	Fruit	Fruit	R	Cut and eat the white meat inside (like coconut)	Cool
	Attalea phalerata Mart. ex Spreng.	Shapaja	Fruit	Fruit	R	Cut in half and eat the pulp inside	Cool
	Bactris acanthocarpa Mart.	Nejilla	Fruit	Fruit	R	Eat raw	Cool

Family	Scientific name	Vernacular name	Part	Food type	Preparation		Storage
					R/C	Explanation	
	Bactris gasipaes Kunth	Pijuayo	Fruit	Beverage	R	Peel, blend with water and sugar	Cool
			Fruit	Beverage	C	Peel, cook, mash, ferment and add sugar (called: Masato)	
			Fruit	Carbohydrate	C	Peel and cook	
			Fruit	Fruit	R	Peel	
			Palm heart	Vegetable	R	Peel and cut	
	Cocos nucifera L.	Coco	Fruit	Beverage	R	Drink the water inside the coconut	Cool
			Fruit	Fruit	R	Cut the coconut and eat the white coconut meat	
			Fruit	Spice	C	Rallar y cocinar and add with water and sugar to pork dish (chicharron)	
	Euterpe precatoria Mart.	Huasai	Palm heart	Fruit	C	Cut and cook	No
	Mauritia flexuosa L.f.	Aguaje	Fruit	Beverage	R	Peel, mash and add water and sugar	Cool
			Fruit	Fruit	R	Peel	
	Oenocarpus bataua Mart.	Ungurahui	Fruit	Beverage	R	Peel, mash and add water and sugar	Cool
			Fruit	Fruit	R	Peel	
	Oenocarpus cf. mapora H.Karst.	Sinamillo	Fruit	Fruit	R	Raw, without seed	No
Bixaceae							
	Bixa orellana L.	Achote	Seed	Spice	R	Mash	Dried
Bombacaceae							
	Matisia cordata Bonpl.	Zapote	Fruit	Fruit	R	Peel	Cool
Bromeliaceae							
	Ananas comosus (L.) Merr.	Piña	Fruit	Beverage	R	Peel, cut and blend with water and sugar	Cool
			Fruit	Fruit	R	Peel and cut	
Caricaceae							
	Carica papaya L.	Papaya	Fruit	Beverage	R	Peel, cut and blend with water and sugar	Cool
			Fruit	Fruit	R	Peel	

Family	Scientific name	Vernacular name	Part	Food type	Preparation		Storage
					R/C	Explanation	
Cecropiaceae							
	Pourouma cecropiifolia Mart.	Ubilla	Fruit	Fruit	R	Eat raw	Cool
Convolvulaceae							
	Ipomoea trifida G.Don	Camote	Fruit	Vegetable	C	Peel and cook or fry	Cool
Cucurbitaceae							
	Citrullus lanatus (Thunb.) Matsum. & Nakai	Sandia	Fruit	Fruit	R	Cut in pieces	Cool
	Cucumis melo L.	Melon	Fruit	Fruit	R	Cut in pieces	Cool
	Cucumis sativus L.	Pepino	Fruit	Vegetable	R	Peel (not always) and cut in a salad	Cool
Dioscoreaceae							
	Dioscorea sp.	Sachapapa	Tuber	Carbohydrate	C	Cook and peel after cooking	Cool
Euphorbiaceae							
	Manihot esculenta Crantz	Yuca	Leaf	Vegetable	R	Cut	Dry
			Tuber	Beverage	C	Peel, cook, mash, ferment and add sugar (called: Masato)	
			Tuber	Carbohydrate	C	Peel and cook or rasp and dry for one week in the sun (result: flour)	
	Plukenetia volubilis L.	Sacha inchi	Fruit	Beverage	C	Cook in water when it is ripe and blend	Dry
Fabaceae							
	Arachis hypogaea L.	Manhi	Seed	Snack	R	Get the nuts out of the shell	Dry
	Cajanus cajan (L.) Millsp.	Frejol de palo	Fruit	Vegetable	C	Open and cook	Dry
	Inga edulis Mart.	Guaba	Fruit	Fruit	R	Open it	Cool
	Inga sp.	Guabilla	Fruit	Fruit	R	Open it	Cool
Lauraceae							
	Cinnamomum aff. triplinerve (Ruiz & Pav.) Kosterm.	Canela	Bark	Beverage	C	Drink as tea	Dried
	Persea americana Mill.	Palta	Fruit	Fruit	R	Peel and eat raw or in a salad or with bread and salt	Cool

Family	Scientific name	Vernacular name	Part	Food type	Preparation		Storage
					R/C	Explanation	
Lecythidaceae							
	Grias peruviana Miers	Sacha mangua	Fruit	Fruit	R	Peel	Cool
Marantaceae							
	Calathea allouia (Aubl.) Lind.	Dale Dale	Tuber	Fruit	C	Cook and peel after cooking and then eat as a fruit	Cool
Moraceae							
	Artocarpus altilis (Parkinson) Fosberg	Pan de arbol	Fruit	Carbohydrate	C	Peel and cook	No
	Pseudolmedia laevis J.F.Macbr.	Chimicua	Fruit	Fruit	R	Eat raw	Cool
Musaceae							
	Musa paradisiaca L.	Platano	Flower	Vegetable	C	Cook and cut	Cool and dry
			Fruit	Beverage	C	Peel, cut and cook in water. Blend or squash it and add sugar and milk (called: Chapo)	
			Fruit	Beverage	C	Peel, cut and cook with rice in water. Then add milk while cooking and finish with adding sugar and milk (called: Masamora)	
			Fruit	Carbohydrate	C	Cook and fry	
Myrtaceae							
	Myrciaria dubia (Kunth) Mc Vaugh.	Camu Camu	Fruit	Beverage	C	Cook in water and let the pit get loose and remove it, blend the pulp and add sugar	Cool
			Fruit	Fruit	R	Eat raw	
	Psidium guajava L.	Guayaba	Fruit	Fruit	R	Eat raw	Cool
			Fruit	Marmalade	C	Cook in water and add sugar	
	Syzygium malaccense (L.) Merr. & L.M.Perry	Pomarosa	Fruit	Fruit	R	Eat raw	Cool

Family	Scientific name	Vernacular name	Part	Food type	Preparation		Storage
					R/C	Explanation	
Oxalidaceae							
	Averrhoa carambola L.	Carambola	Fruit	Beverage	R	Cut and blend with water and sugar	Cool
			Fruit	Fruit	R	Eat raw	
Passifloraceae							
	Passiflora edulis Sims	Maracuya	Fruit	Beverage	R	Blend fruit with water and sugar	Cool
			Fruit	Fruit	R	Cut in half	
	Passiflora ligularis Juss.	Granadilla	Fruit	Fruit	R	Peel	Cool
	Passiflora quadrangularis L.	Tumbo	Fruit	Vegetable	R	Peel, cut and eat raw	Cool
Piperaceae							
	Piper nigrum L.	Pimienta	Fruit	Spice	R	Dry in the sun for 4 to 7 days. After drying, crush it	Dried
Poaceae							
	Oryzae sativa L.	Arroz	Fruit	Carbohydrate	C	Cook (in water or milk)	Dry
	Saccharum officinarum L.	Caña de azucar	Stem	Beverage	R	Squeeze the juice out of the trunk	No
			Stem	Beverage	R	Squeeze the juice out of the trunk and ferment (called: Leva)	
			Stem	Snack	R	Get the sugar like water out by sucking/biting the trunk	
	Zea Mays L.	Maiz	Fruit	Beverage	C	Grind and boil the flour and add clove and cinnamon (called chicha)	Cool and dry
			Fruit	Vegetable	C	Cook (called: choclo)	
Polygonaceae							
	Coccoloba densifrons C. Mart. ex Meisn.	Romero	Fruit	Fruit	R	Eat raw	No
Rubiaceae							
	Coffea arabica L.	Café	Fruit	Beverage	R	Peel and dry in the sun for 3 to 7 days. Afterwards crush and serve with warm water	No
	Genipa americana L.	Huito	Fruit	Fruit	R	Peel	Cool

Family	Scientific name	Vernacular name	Part	Food type	Preparation		Storage
					R/C	Explanation	
Rutaceae							
	Citrus aurantiifolia (Christm.) Swingle.	Naranja	Fruit	Beverage	R	Squeeze and add sugar (and eggs)	Cool
			Fruit	Fruit	R	Eat raw	
	Citrus limetta Risso/*Citrus limon* (L.) Burm.f.	Limones	Fruit	Beverage	R	Squeeze for juice (used for ceviche)	Cool
	Citrus limettioides Tanaka	Lima Dulce	Fruit	Fruit	R	Eat raw	Cool
	Citrus paradisi Macfad.	Toronja	Fruit	Beverage	R	Squeeze	Cool and dry
			Fruit	Fruit	R	Eat raw	
	Citrus reticulata Blanco	Mandarina	Fruit	Fruit	R	Peel	Cool and dry
Sapotaceae							
	Pouteria caimito Radlk.	Caymito	Fruit	Fruit	R	Cut in half	Cool
Solanaceae							
	Capsicum annuum L.	Aji Dulce	Fruit	Vegetable	C	Cut and cook it in the dish	Cool
	Lycopersicon esculentum Mill.	Tomate regional	Fruit	Vegetable	R/C	Eat raw or cut and cook	Cool
	Physalis angulata L.	Muyaca	Fruit	Fruit	R	Eat raw	Cool
	Solanum frutescens L.	Aji Charapita	Fruit	Vegetable	C	Cut and cook	Cool
	Solamun sessiliflorum var. Sessiliflorum Dunal	Cocona	Fruit	Beverage	C	Cut, cook and blend	Cool
			Fruit	Fruit	R	Peel (eat like this or with salt)	
			Fruit	Vegetable	C	Cut, cook with salt and blend (like a sauce)	
Sterculiaceae							
	Theobroma bicolor Bonpl.	Macambo	Fruit	Fruit	R	Suck the white pulp from the seeds	Cool
			Seed	Snack	C	Grill the (peeled) seed	
	Theobroma cacao L.	Cacao	Fruit	Fruit	R	Suck white pulp from seeds	Dry

Family	Scientific name	Vernacular name	Part	Food type	Preparation		Storage
					R/C	Explanation	
	Theobroma grandiflorum (Willd. ex Spreng.) K.Schum.	Cupasu	Fruit	Beverage	R	Ferment during 2 or 3 days to have an acid drink	Cool
Verbenaceae							
	Lippia alba (Mill.) N.E.Br.	Oregano	Leaf	Vegetable	C	Cut and cook in dish	Dry

Appendix 7 **Food availability during the year of all food plants in Pueblo Libre and Naranjal together with the used plant part, their use frequency and storage time (F=Fruit, Fl=Flower, L= Leaf, P=Palm heart, S=Seed, St=Stem, T=Tuber)**

Family	Scientific name	Vernacular name	Part	Vernacular name	Part	Use frequency		Storage (time)		Availability											
		P	P	N	N	P	N	P	N	J	F	M	A	M	J	J	A	S	O	N	D
Amaryllidaceae	*Allium cepa* L.	Cebolla	T	/	/	Every day	/	1 year	/												
Anacardiaceae	*Anacardium occidentale* L.	Marañon/ Cashu	F	Cashu	F	Every day	Every day	1 week	2 days												
	Mangifera indica L.	Mango	F	Mango	F	Every day	Every day	1 week	1 week												
	Spondias mombin L./Spondias venosa Mart. ex Colla	Uvos	F	Uvos	F	Once a month	Several times a month	1 week	1 day												
	Spondias purpurea L.	Ciruelo	F	Sirhuela	F	Every day	Every day	3 days	1 day												
	Spondias radlkoferi Donn. Smith.	Taperiba	F	Taperiba	F	Every day	Every day	Ripe: 1 week/Unripe: 2 weeks	1 week												
Annonaceae	*Annona cherimola* Miller	/	/	Guanabana	F	/	Every day	/	1 day												
	Annona muricata L.	Guanabana	F	/	/	Every day	/	1 week	/												
	Annona dolabripetala Raddi	Anona	F	/	/	Every day	/	3 days	/												
	Rollinia mucosa Jacq.	/	/	Anona	F	/	Every day	/	2 days												
Apiaceae	*Coriandrum sativum* L.	Culantro regional	L	/	/	Every day	/	2 days	/												
	Eryngium foetidum L.	Sacha culantro	L	Culantro	L	Every day	Every day	2 days	No												
Arecaceae	*Astrocaryum* sp.	Huicungo	F	/	/	Several times a month	/	1 week	/												
	Attalea phalerata Mart. ex Spreng.	Shebon	F	Shapaja	F	Once a year	Once a week	1 month	1 month												

Family	Scientific name	Vernacular name	Part	Vernacular name	Part	Use frequency		Storage (time)		Availability											
		P	P	N	N	P	N	P	N	J	F	M	A	M	J	J	A	S	O	N	D
	Bactris acanthocarpa Mart.	/	/	Nejilla	F	/	Once a week	/	1 week												
	Bactris gasipaes Kunth	Pijuayo	F	Pijuayo	F	Every day	Every day	3 to 4 days	3 days												
		Pijuayo	P	Pijuayo	P	Several times a year	N.r.	1 day	1 day												
	Cocos nucifera L.	Coco	F	Coco	F	Every day	Every day	1 week	1 month												
	Elaeis guineensis Jacq.	Palma	F	/	/	Every day	/	1 week	/												
	Euterpe precatoria Mart.	Huasai	P	Huasai	P	Once a month	Once a year	2 to 3 days	No												
		Huasai	F	/	/	Once a month	/	2 to 3 days	/												
	Mauritia flexuosa L.f.	Aguaje	F	Aguaje	F	Every day	Every day	Ripe: 1 day/Unripe: 1 week	20 days												
	Oenocarpus bataua Mart.	Ungurahui	F	Ungurahui	F	Several times a week	Every day	2 to 3 days	20 days												
	Oenocarpus cf. mapora H.Karst.	/	/	Sinamillo	F	/	Once a year	/	No												
Bixaceae	*Bixa orellana* L.	Achote	S	Achote	S	Every day	Once a week	2 years	1 month												
Bombacaceae	*Matisia cordata* Bonpl.	Zapote	F	Zapote	F	Every day	Every day	1 week	1 week												
Bromeliaceae	*Ananas comosus* (L.) Merr.	Piña	F	Piña	F	Every day	Every day	1 week	1 week												
Caricaceae	*Carica papaya* L.	Papaya	F	Papaya	F	Every day	Every day	Ripe: 3 to 4 days/Unripe: 1 week	1 week												

Family	Scientific name	Vernacular name	Part	Vernacular name	Part	Use frequency		Storage (time)		Availability											
		P	P	N	N	P	N	P	N	J	F	M	A	M	J	J	A	S	O	N	D
Cecropiaceae	*Pourouma cecropiifolia* Mart.	Ubilla	F	Ubilla	F	Every day	Every day	1 week	1 day												
Chenopodicaceae	*Chenopodium ambrosioides* L.	Payco	L	/	/	Several times a year	/	No	/												
Convolvulaceae	*Ipomoea trifida* G.Don	/	/	Camote	F	/	Every day	/	4 days												
Cucurbitaceae	*Citrullus lanatus* (Thunb.) Matsum. & Nakai	Sandia	F	Sandia	F	Every day	Every day	1 week	1 week												
	Cucurbita cf. ficifolia Bouché	Zapallo	F	/	/	Several times a week	/	2 weeks	/												
	Cucumis melo L.	Melon	F	Melon	F	Every day	Every day	2 days	1 to 2 days												
	Cucumis sativus L.	Pepino	F	Pepino	F	Every day	Every day	1 week	1 week												
	Cyclanthera pedata Schrad.	Cayhua	F	/	/	Every day	/	1 week	/												
Dioscoreaceae	*Dioscorea cf. trifida* L.f.	Sachapapa	T	/	/	Every day	/	3 to 4 days	/												
	Dioscorea sp.	/	/	Sachapapa	T	/	Every day	/	1 week												
Euphorbiaceae	*Manihot esculenta* Crantz	Yuca	T	Yuca	T	Every day	Every day	3 to 4 days	1 week												
		Yuca	L	Yuca	L	Once a month	Once a year	1 day	1 week												
	Plukenetia volubilis L.	/	/	Sacha inchi	F	/	Every day	/	1 to 2 months												
Fabaceae	*Arachis hypog*aea L.	/	/	Manhi	S	/	N.r.	/	N.r.												
	Cajanus cajan (L.) Millsp.	Frejol de palo	F	Frejol de palo	F	Every day	Every day	1 year	2 months												
	Inga edulis Mart.	Guaba	F	Guaba	F	Several times a week	Every day	8 days	2 to 3 days												

Family	Scientific name	Vernacular name	Part	Vernacular name	Part	Use frequency		Storage (time)		Availability											
		P	P	N	N	P	N	P	N	J	F	M	A	M	J	J	A	S	O	N	D
	Inga feuillei DC.	Pacay	F	/	/	Every day	/	1 week	/												
	Inga sp.	/		Guabilla	F	/	Every day	/	1 week												
	Inga sp.	Shimbillo	F	/	/	Once a year	/	3 days	/												
	Phaseolus vulgaris L.	Chiclayo	F	/	/	Once a week	/	1 day	/												
Icacinaceae	*Poraqueiba sericea* Tul.	Umari	F	/	/	Every day	/	1 week	/												
Lamiaceae	*Ocimum campechianum* Mill.	Albaca	L	/	/	Once a month	/	3 days	/												
Lauraceae	*Cinnamomum aff. triplinerve* (Ruiz & Pav.) Kosterm.	/	/	Canela	B	Every day	/	N.r.	/												
	Persea americana Mill.	Palta	F	Palta	F	Every day	Every day	1 week	3 days												
Lecythidaceae	*Grias peruviana* Miers	/	/	Sacha mangua	F	/	Every day	/	1 week												
Marantaceae	*Calathea allouia* (Aubl.) Lind.	Dale Dale	T	Dale Dale	T	Every day	Every day	3 to 4 days	1 to 2 days												
Moraceae	*Artocarpus altilis* (Parkinson) Fosberg	Pan de árbol	F	Pan de arbol	F	Every day	Every day	1 day	No												
	Pseudolmedia laevis J.F.Macbr.	/	/	Chimicua	F	/	Every day	/	N.r.												
Musaceae	*Musa paradisiaca* L.	Platano	F	Platano	F	Every day	Every day	Ripe: 3 days/Unripe: 1 to 2 weeks	1 week												
		/	/	Platano	Fl	/	Once a month	/	1 week												
Myrtaceae	*Myrciaria dubia* (Kunth) Mc Vaugh.	Camu Camu	F	Camu Camu	F	Every day	Every day	10 days	1 to 2 days												

Family	Scientific name	Vernacular name	Part	Vernacular name	Part	Use frequency		Storage (time)		Availability											
		P	P	N	N	P	N	P	N	J	F	M	A	M	J	J	A	S	O	N	D
	Psidium guajava L.	Guayaba	F	Guayaba	F	Every day	Every day	3 days	1 day												
	Syzygium malaccense (L.) Merr. & L.M.Perry	Pomarosa	F	Pomarosa	F	Every day	Every day	3 days	1 day												
Oxalidaceae	*Averrhoa carambola* L.	Carambola	F	Carambola	F	Every day	Every day	1 week	3 to 4 days												
Passifloraceae	*Passiflora acuminata* DC.	Granadilla	F	/	/	Several times a week	/	1 week	/												
	Passiflora ligularis Juss.	/	/	Granadilla	F	/	Every day	/	2 to 3 days												
	Passiflora edulis Sims	Maracuya	F	Maracuya	F	Every day	Every day	1 month	2 weeks												
	Passiflora quadrangularis L.	Tumbo	F	Tumbo	F	Every day	Once a year	1 week	2 to 3 days												
Piperaceae	*Piper nigrum* L.	Pimienta	F	Pimienta	F	Every day	Every day	3 months	1 year												
Poaceae	*Oryza sativa* L.	Arroz	S	Arroz	F	Every day	Every day	6 months	6 months												
	Saccharum officinarum L.	Caña de azucar	St	Caña de azucar	St	Every day	Several times a week	N.r.	No												
	Zea mays L.	Maiz	F	Maiz	F	Every day	Every day	N.r.	6 months												
Polygonaceae	*Coccoloba densifrons* C. Mart. ex Meisn.	/	/	Romero	F	/	Once a week	/	No												
Rubiaceae	*Coffea arabica* L.	Café	F	Café	F	Once a week	Every day	1 year	1 year												
	Genipa americana L.	Huito	F	Huito	F	Once a month	Every day	4 days	1 to 2 days												
	Uncaria tomentosa DC.	Uña de gato	St	/	/	Several times a year	/	5 days	/												

Family	Scientific name	Vernacular name	Part	Vernacular name	Part	Use frequency		Storage (time)		Availability											
		P	P	N	N	P	N	P	N	J	F	M	A	M	J	J	A	S	O	N	D
Rutaceae	*Citrus aurantiifolia* (Christm.) Swingle.	/	/	Naranja	F	/	Every day	/	1 week												
	Citrus x sinensis Osbeck	Naranja	F	/	/	Every day	/	1 month	/												
	Citrus limetta Risso/Citrus limon (L.) Burm. f.	Limones	F	Limones	F	Every day	Once a month	1 month	1 week												
		Limones	L	/	/	Every day	/	1 month	/												
	Citrus limettioides Tanaka	Lima dulce	F	Lima dulce	F	Every day	Every day	2 weeks	1 week												
	Citrus paradisi Macfad.	Toronja	F	Toronja	F	Every day	Several times a week	1 month	2 to 3 days												
	Citrus reticulata Blanco	Mandarinas	F	Mandarinas	F	Every day	Every day	1 month	1 week												
	Citrus x tangelo J.W.Ingram & H.E.Moore	Tanyelo	F	/	/	Every day	/	1 month	/												
Sapotaceae	*Manilkara surinamensis* Dubard	Qinilla	F	/	/	Once a month	/	1 day	/												
	Pouteria caimito Radlk.	Caymito	F	Caymito	F	Once a year	Every day	4 days	1 day												
Solanaceae	*Capsicum annuum* L.	Aji Dulce	F	Aji Dulce	F	Every day	Every day	4 days	2 to 3 days												
	Capsicum chinense Jacq.	Aji picante	F	/	/	Several times a week	/	15 days	/												
	Capsicum frutescens L.	Aji Charapita	F	/	/	Every day	/	10 days	/												
	Solanum frutescens L.	/	/	Aji Charapita	F	/	Every day	/	1 week												

Family	Scientific name	Vernacular name	Part	Vernacular name	Part	Use frequency		Storage (time)		Availability											
		P	P	N	N	P	N	P	N	J	F	M	A	M	J	J	A	S	O	N	D
	Lycopersicum esculentum Mill.	Tomate regional	F	Tomate regional	F	Every day	Every day	1 week	4 days												
	Physalis angulata L.	Muyaca	F	Muyaca	F	Once a year	Every day	2 days	2 days												
	Solanum sessiliflorum var. sessiliflorum Dunal	Cocona	F	Cocona	F	Every day	Every day	Ripe: 1 week/Unripe: 2 weeks	4 days												
Sterculiaceae	*Theobroma bicolor* Bonpl.	/	/	Macambo	F	/	Every day	/	1 week												
		/	/	Macambo	S	/	Every day	/	1 week												
	Theobroma cacao L.	Cacao	F	Cacao	F	Every day	Several times a month	1 day	2 days												
	Theobroma grandiflorum (Willd. ex Spreng.) K.Schum.	/	/	Cupasu	F	/	Every day	/	2 days												
Verbenaceae	*Lippia alba* (Mill.) N.E.Br.	Oregano	L	Oregano	L	Every day	Every day	No	1 month												
Zingiberaceae	*Zingiber officinale* Roscoe	Kión	T	/	/	Several times a week	/	1 week	/												
Unknown	Unidentified	Palillo	T	/	/	N.r.	/	1 year	/												

Appendix 8 Plant species with restrictions for consumption in Pueblo Libre

Family	Scientific name	Name	Part	Food type	Restrictions
Amaryllidaceae					
	Allium cepa L.	Cebolla	Tuber	Vegetable	Flatulencia
Bombacaceae					
	Matisia cordata Humb. & Bonpl.	Zapote	Fruit	Fruit	Normally no, but when eaten too much: diarrea
Euphorbiaceae					
	Manihot esculenta Crantz	Yuca	Tuber	Beverage	Flatulencia and not for children (alcohol)
			Tuber	Carbohydrate	Some children: almidon
Fabaceae					
	Cajanus cajan (L.) Millsp.	Frejol de palo	Fruit	Vegetable	Flatulencia
	Inga edulis Mart.	Guaba	Fruit	Fruit	Cold for the children, also flatulencia and diarrea
Musaceae					
	Musa paradisiaca L.	Platano	Fruit	Beverage	Flatulencia
			Fruit	Fruit	Children: not too much because their stomach will hurt
Myrtaceae					
	Psidium guajava L.	Guayaba	Fruit	Fruit	Too much can cause constipation
			Fruit	Marmalade	Too much can cause constipation
Piperaceae					
	Piper nigrum L.	Pimienta	Fruit	Spice	Gastritis
Poaceae					
	Saccharum officinarum L.	Caña de azucar	Stem	Beverage	Not for children (alcohol)
Rubiaceae					
	Coffea arabica L.	Café	Fruit	Beverage	Not when heart problems or for children
Solanaceae					
	Capsicum chinense Jacq.	Aji picante	Fruit	Marmalade	Not for children (diarrea)
			Fruit	Spice	Not for children (diarrea)

Appendix 9 **Plant species with restrictions for consumption in Naranjal**

Family	Scientific name	Local name	Part	Food type	Restrictions
Arecaceae					
	Bactris gasipaes Kunth	Pijuayo	Fruit	Beverage	Not for children
Euphorbiaceae					
	Manihot esculenta Crantz	Yuca	Tuber	Beverage	Not for children
Poaceae					
	Saccharum officinarum L.	Caña de azucar	Stem	Beverage	Not for children
Rubiaceae					
	Coffea arabica L.	Café	Fruit	Beverage	Not for children
Sterculiaceae					
	Theobroma grandiflorum (Willd. ex Spreng.) K.Schum.	Cupasu	Fruit	Beverage	Not for children

Appendix 10 Medicinal plants in Pueblo Libre with their plant part used, symptoms/diseases, ingredients, preparation and application

Family	Scientific Name	Vernacular name	Part	Symptom/Disease	Other ingredients	Preparation	Aplication
Aloaceae							
	Aloe barbadensis Mill.	Sabila	Resin	Acné, inflammations, gastritis	No or water	Fresh material or with water	Drink
Amaranthaceae							
	Alternanthera brasiliana (L.) Kuntze	Lancetilla	Leaf	Respiratory infections, fever, headache	Limones or llanten	Decoction	Drink
Anacardiaceae							
	Anacardium occidentale L.	Marañon/ Cashu	Bark	Diarrhea	/	Decoction	Drink
			Leaf	Diarrhea	/	Decoction	Drink
	Mangifera indica L.	Mango	Bark	Heal abdomen women after giving birth	/	Decoction	Drink
	Spondias mombin L./ Spondias venosa Mart. ex Colla	Uvos	Bark	Vaginal wash, cancer	/	Decoction	Drink
Annonaceae							
	Annona muricata L.	Guanabana	Leaf	Diabetes	/	Infusion or macerate	Drink as tea or as agua de tiempo
Apocynaceae							
	Himatanthus sucuuba (Spruce ex Müll. Arg.) Woodson	Bellacocaspi	Resin	Fractures, dislocation, hernia, ulcers	/	Fresh material	Drink or apply

Family	Scientific Name	Vernacular name	Part	Symptom/Disease	Other ingredients	Preparation	Aplication
	Tabernaemontana vanheurckii Müll. Arg.	Uchosanango (stronger than chirisanango)	Root	Frio, sexual impotence	Chirisanango, clavohuasca, atchunisanango, honey and pollen	Rasp and cook	Drink
Araceae							
	Dieffenbachia cf. Seguine Schott	Patikina	Leaf	All diseases (when doctors do not know)	/	Macerate warm leaves and warm this in fire	Apply
	Dracontium loretense K.Krause/*Dracontium peruvianum* G.H.Zhu & Croat	Jergon sacha	Tuber	Hernia	/	Rasp	Apply
Arecaceae							
	Cocos nucifera L.	Coco	Shell	Menstruations/bleedings	/	Decoction	Drink
	Euterpe precatoria Mart.	Huasai	Root	Kidneys	/	Macerate	Drink as agua de tiempo
Asteraceae							
	Tagetes erecta L.	Rosasisa	Leaf	Throw up or stomach problems children	/	Infusion or macerate	Drink as tea or bathe
			Flower	Throw up or stomach problems children	/	Fresh material: Add to bathing water	Bathe
Bignoniaceae							
	Crescentia cujete L.	Huingo/ Wuingo	Fruit	Prolapse	/	Juice of unripe fruit	Drink

Family	Scientific Name	Vernacular name	Part	Symptom/Disease	Other ingredients	Preparation	Aplication
	Mansoa alliacea (Lam.) A.H.Gentry	Ajos sacha	Leaf	Bathe	/	Decoction	Bathe
			Root	Frio	Water	Rasp and add water	Drink
	Tynanthus aff. villosus A.H.Gentry	Clavohuasca	Bark	Sexual impotence, frio, afrodisiac	Alone or with alcohol, honey and pollen	Decoction	Drink
Cactaceae							
	Opuntia cochenillifera (L.) Mill.	Tuna	Leaf	Faster hair growth, kidneys	/	Rasp	Apply
Caricaceae							
	Carica papaya L.	Papaya	Leaf	Desinfect (wounds)	With salt or with payco, limones, hierba santa and maticu	Cook	Wash wounds
Cecropiaceae							
	Cecropia obtusa Trécul	Cetico blanco	Bark	Kidneys, prostate	/	Macerate one day	Drink as agua de tiempo
Celastraceae							
	Maytenus macrocarpa (Ruíz &. Pav.) Briq.	Chuchuahuasi	Bark	Frio	/	Decoction	Drink
Chenopodicaceae							
	Chenopodium ambrosioides L.	Payco	Leaf	Parasites in stomach	/	Macerate	Drink

Family	Scientific Name	Vernacular name	Part	Symptom/Disease	Other ingredients	Preparation	Aplication
Commelinaceae							
	Callisia aff. gracilis (Kunth) D.R.Hunt	Boasacha	Stem	Fever	/	Peel and squeeze juice out (like caña de azucar)	Drink
Costaceae							
	Costus scaber Ruiz & Pav.	Sachahuiro	Stem	Fever	/	Peel and squeeze juice out (like caña de azucar)	Drink
Cucurbitaceae							
	Cucumis sativus L.	Pepino	Fruit	Fever, headache	/	Rasp so juice comes out	Drink
	Cucurbita cf. ficifolia Bouché	Zapallo	Flower	Sexual impotence	/	Decoction	Drink
Cyperaceae							
	Scleria melaleuca Rchb. ex Schltdl. & Cham.	Cortadera	Root	Eye problems, prostate	/	Decoction	Drink
			Leaf	Eye problems, prostate	/	Decoction	Drink
Euphorbiaceae							
	Croton lechleri Muller Arg./*Croton draconoides* Mueller Arg.	Sangredegrado	Resin	Scars, internal diseases	Cooking water of platano	Fresh material: One spoon cooking water platano and two drops of resin	Drink

Family	Scientific Name	Vernacular name	Part	Symptom/Disease	Other ingredients	Preparation	Aplication
	Jatropha curcas L.	Piñon blanco	Resin	Prolapse, cuts, headaches, bronchitis, vaginal infections, diarrhea, birth control:every morning of menstruations one spoon when woman does not want more children	Water	Fresh material: add some water	Drink
			Leaf	Inflammations	/	Macerate	Drink
	Jatropha gossypiifolia L.	Piñon colorado	Resin	Prolapse, cuts, headaches, bronchitis, vaginal infections, diarrhea, birth control:every morning of menstruations one spoon when woman does not want more children	Water	Fresh material: add some water	Drink
			Leaf	Inflammations	/	Macerate	Drink
	Phyllanthus niruri L./*Phyllanthus stipulatus* (Raf.) G.L.Webster	Chancapiedra	Entire plant	Kidneys	/	Infusion	Drink as tea
Fabaceae							
	Cajanus cajan (L.) Millsp.	Frejoles de palo/Puspo poroto	Leaf	Urinary infections	/	Decoction	Drink
	Copaifera sp.	Copaiba	Resin	Internal and external scars, wounds	Tepid water	Fresh material: Two drops of resin with a little bit of tepid water	Drink
	Dioclea aff. coriacea Benth.	Mashoshillo	Leaf	Abortion	/	Infusion	Drink as tea

Family	Scientific Name	Vernacular name	Part	Symptom/Disease	Other ingredients	Preparation	Aplication
	Senna reticulata (Willd.) H.S.Irwin & Barneby	Retama	Flower	Laxative, kidneys	/	Decoction	Drink
			Leaf	Laxative, kidneys	/	Decoction	Drink
Iridaceae							
	Eleutherine bulbosa Urb.	Piri piri	Tuber	Menstruation/bleeding (pain), snake bites	/	Infusion	Drink as tea
Lamiaceae							
	Ocimum americanum L.	Sharamasho	Leaf	Inconveniences during pregnancy: against flatulence, pain, hot flashes, colics and frio	/	Decoction	Drink
	Ocimum campechianum Mill.	Albaca	Leaf	Malaria	Rosasisa, mucura y culantro	Macerate	Bathe
Loranthaceae							
	Phthirusa micrantha Eichler	Suelda con suelda	Leaf	Dislocations, ulcers	Alone or egg yolk	Macerate	Drink or apply
Malpighiaceae							
	Banisteriopsis caapi Spruce ex Griseb.	Ajahuasca	Entire plant	Laxative, clean/empty stomach, hallocinogenic	With Chamayro	Decoction	Drink
Malvaceae							
	Gossypium cf. barbadense L.	Algodon	Leaf	Colics	/	Infusion	Drink as tea
	Malachra ruderalis Gürke	Malba	Leaf	Headache, urinary infections, fever	Alone or with limones	Drink as a juice or macerate in water	Drink or apply on the head

Family	Scientific Name	Vernacular name	Part	Symptom/Disease	Other ingredients	Preparation	Aplication
Moraceae							
	Artocarpus altilis (Parkinson) Fosberg	Pan de arbol	Resin	Hernia	/	Fresh material	Apply
	Brosimum sp.	Manchinga	Resin	Rheumatism, artritis	/	Fresh material	Drink
	Ficus insipida Willd.	Oje	Resin	Parasites in intestines, anemia, purify the blood	With orange juice	Fresh material	Drink
	Ficus sp.	Renaquilla	Entire plant	Fractures, dislocations, hernia, ulcers	/	Decoction	Drink or apply
			Resin	Fractures, dislocations, hernia, ulcers	/	Decoction	Drink or apply
	Ficus sp.	Zapote renaco	Resin	Fractures	/	Drink (with some water) or apply fresh material	Drink or apply
	Maquira coriacea (H.Karst.) C.C.Berg	Capinuri/ Janchama	Resin	Hernia	Alone or with warm water or egg yolk	Drink fresh material or with warm water, apply with egg yolk	Drink or apply
Myrtaceae							
	Myrciaria dubia (Kunth) Mc Vaugh.	Camu camu	Fruit	Calcium for the bones	/	Concentrated natural juice	Drink
	Psidium guajava L.	Guayaba	Leaf	Fever, diarrhea	Alone or with oregano	Infusion	Drink as tea
			Bark	Fever, diarrhea	Alone or with oregano	Infusion	Drink as tea
Passifloraceae							
	Passiflora acuminata DC.	Granadilla	Leaf	Purify the blood, high blood pressure	/	Infusion	Drink as tea

Family	Scientific Name	Vernacular name	Part	Symptom/Disease	Other ingredients	Preparation	Aplication
Phytolaccaceae							
	Gallesia integrifolia (Spreng.) Harms.	Ajos quiro	Bark	Good luck	/	Fresh material: add to bathing water	Bathe (and drink a little bit)
	Petiveria alliacea L.	Mucura	Leaf	Fever, good luck	Limones	Macerate with limones	Bathe
Piperaceae							
	Piper aff. aduncum L.	Maticu	Leaf	Wounds, inflammations, vaginal infections, rheumatism, headache, gastritis	/	Infusion	Drink as tea
	Piper peltatum L.	Santa Maria	Leaf	Frio	/	Infusion	Drink as tea
Plantaginaceae							
	Plantago major L.	Llanten	Leaf	Respiratory infections (=tos), fever, headache	With limones or lancetilla	Macerate	Drink
Poaceae							
	Cymbopogon citratus Stapf	Hierba Luisa	Leaf	Cholesterol, loose weight	/	Infusion	Drink as tea
	Saccharum officinarum L.	Caña de azucar	Stem	Pain eyes	/	Extract juice from stem	Eye drops
Portulacaceae							
	Talinum paniculatum Ruiz & Pav.	Verdulaga	Leaf	Kidneys	Limon regional	Macerate	Apply
Pteridophyta							
	Phlebodium aereolatum	Cotochupa	Tuber	Prolapse	/	Decoction	Drink

Family	Scientific Name	Vernacular name	Part	Symptom/Disease	Other ingredients	Preparation	Aplication
Rubiaceae							
	Morinda citrifolia L.	Noni	Fruit	Diabetes, constipation	/	Concentrated juice	Drink
	Uncaria tomentosa DC.	Uña de gato	Bark	Cancer	/	Decoction	Drink
Rutaceae							
	Citrus limetta Risso/*Citrus limon* (L.) Burm. f.	Limones	Fruit	Artritis, Rheumatism, calcium for the bones	/	Decoction	Drink
	Citrus paradisi Macfad.	Toronja	Fruit	Cholesterol, high blood pressure, loose weight	/	Fresh material	Drink
Solanaceae							
	Brugmansia suaveolens (Willd) Bercht. & J.Presl.	Toe	Leaf	Colics	/	Infusion	Drink as tea
	Brunfelsia grandiFlowera D. Don.	Chirisanango	Root	Frio	Uchosanango, clavohuasca, atchunisanango, honey and pollen	Rasp and decoction	Drink
	Cestrum sp.	Hierba Santa	Leaf	Fever	/	Macerate	Bathe
	Solanum sessiliFlowerum var. SessiliFlowerum Dunal	Cocona	Leaf	Burns	/	Macerate	Apply creme on burn
Verbenaceae							
	Lippia alba (Mill.) N.E.Br.	Oregano	Leaf	Frio, stomach problems, diarrhea	/	Infusion	Drink as tea
	Verbena litoralis Kunth	Vervena	Leaf	Vomitive, laxative, rabiosa	/	Macerate	Drink

Family	Scientific Name	Vernacular name	Part	Symptom/Disease	Other ingredients	Preparation	Aplication
Zingiberaceae							
	Zingiber officinale Roscoe	Kion	Tuber	Frio	Honey, sanango and pollen	Decoction	Drink
Unknown							
	Unidentified	Abuta	Bark	Diabetes	/	Decoction	Drink
	Unidentified	Palillo	Tuber	Hepatitis, yellow fever	Alone or with leaves of palillo	Macerate	Drink
			Leaf	Hepatitis, yellow fever	Alone or with tuber of palillo	Macerate	Drink

Appendix 11 Medicinal plants in Naranjal with their plant part used, symptoms/diseases, ingredients, preparation and application

Family	Scientific name	Vernacular name	Part	Disease/Symptoms	Other ingredients	Preparation	Application
Acanthaceae							
	Justicia boliviana Rusby	Aire sacha	Leaf	Fever, bronchitis	Water	Macerate	Drink
	Sanchezia macrocnemis (Nees) Wassh.	Arco sacha	Leaf	Inflammations	/	Macerate	Apply externally
Amaranthaceae							
	Alternanthera brasiliana (L.) Kuntze	Lancetilla	Leaf	Laxative, clean/empty stomach	/	Macerate	Drink
Amaryllidaceae							
	Eucharis ulei Kraenzl.	Cebolla sacha	Root	Diet, frio	Alcohol	Tincture	Drink
Anacardiaceae							
	Mangifera indica L.	Mango	Bark	Vaginal wash after giving birth	/	Decoction	Wash
	Spondias mombin L./ *Spondias venosa* Mart. ex Colla	Uvos	Bark	Scars, vaginal wash	/	Decoction	Drink or vaginal wash
	Spondias radlkoferi Donn.Sm.	Taperiba	Leaf	Ligatures	/	Decoction	Wash
Annonaceae							
	Annona muricata L.	Guanabana	Leaf	Fever	/	Infusion	Drink as tea
	Unonopsis sp.	Icoja	Bark	Frio	/	Decoction	Drink as agua de tiempo

Family	Scientific name	Vernacular name	Part	Disease/Symptoms	Other ingredients	Preparation	Application
Apiaceae							
	Eryngium foetidum L.	Culantro	Root	Malaria	/	Decoction	Drink
			Leaf	Pain ears	/	Macerate	Apply externally
Apocynaceae							
	Himatanthus sucuuba (Spruce ex Müll.Arg.) Woodson	Bellacocaspi/Platanocaspi	Resin	Fractures	/	Fresh material	Drink or apply externally
	Tabernaemontana markgrafiana J.F.Macbr.	Uchosanango	Root	Energy	Water	Rasp and macerate	Drink
			Leaf	Energy	Water	Macerate	Drink
Araceae							
	Alocasia indica Schott/	Patikina	Leaf	All kinds of pain	/	Macerate	Bathe
	Xanthosoma sagittifolium (L.) Schott		Resin	All kinds of pain	/	Fresh material	Apply externally
	Anthurium kunthii Poepp.	Trompetero sacha	Root	Frio	/	Tincture	Drink
	Dracontium peruvianum G.H.Zhu & Croat/ *Dracontium loretense* K.Krause	Jergon sacha	Tuber	Pulsario	/	Cut and apply or rasp and drink after decoction	Drink or apply externally
	Monstera dubia Engl. & K.Krause	Pulsario sacha	Root	Frio	/	Tincture	Drink
Arecaceae							
	Cocos nucifera L.	Coco	Fruit	Infections, laxative, serum	/	Fresh material	Drink
	Euterpe precatoria Mart.	Huasai	Root	Kidneys	/	Decoction	Drink as agua de tiempo

Family	Scientific name	Vernacular name	Part	Disease/Symptoms	Other ingredients	Preparation	Application
	Iriartea deltoidea Ruiz & Pav.	Pona	Root	Frio, viagra	Alcohol	Tincture	Drink
Aristolochiaceae							
	Aristolochia aff. acutifolia Duch.	Zapohuasca	Bark	Fractures and tumors	/	Macerate	Apply externally
	Aristolochia cauliflora Ule	Huancahua sacha	Leaf	Laxative, vomitive, cleaning stomach	/	Macerate, put in cloth and squeeze so liquid comes out	Drink
			Root	Laxative, vomitive, cleaning stomach	/	Macerate, put in cloth and squeeze so liquid comes out	Drink
Asteraceae							
	Ambrosia peruviana Willd.	Marco sacha	Leaf	Fever, intestinal inflammations	/	Macerate	Drink
	Clibadium aff. peruvianum Poepp. ex DC.	Rivisacha	Leaf	Rivi	/	Macerate	Apply externally
			Fruit	Rivi	/	Macerate	Apply externally
	Tagetes erecta L.	Rosasisa	Leaf	Malaria	/	Macerate or decoction	Bathe babies in it or drink
Bignoniaceae							
	Crescentia cujete L.	Huingo	Leaf	Ligatures, wash genitals	/	Decoction	Bathe half your body
			Fruit	Bronchitis	/	Rasp meat and squeeze so juice comes out	Drink

Family	Scientific name	Vernacular name	Part	Disease/Symptoms	Other ingredients	Preparation	Application
	Mansoa alliacea (Lam.) A.H.Gentry	Ajos sacha	Leaf	Bathe, artritis, frio, energy, rheumatism => dieta (sin sal, azucar, dulce)	/	Macerate	Drink or apply externally
			Root	Bathe, artritis, frio, energy, rheumatism => dieta (sin sal, azucar, dulce)	/	Rasp and squeeze so juice comes out	Drink
	Tynanthus aff. villosus A.H.Gentry	Clavohuasca	Bark	Frio, hangover	Alcohol	Tincture	Drink
Bixaceae							
	Bixa orellana L.	Achote	Leaf	Kidneys	/	Infusion or decoction	Drink as tea or as agua de tiempo
Bombacaceae							
	Ochroma pyramidale (Cav. ex Lam.) Urb.	Topa	Leaf	Frio	/	Heat above fire	Apply externally
Cactaceae							
	Opuntia cochenillifera (L.) Mill.	Tuna	Leaf	Tumors, inflammations	/	Macerate	Apply externally
Cannaceae							
	Canna indica L.	Ashira	Leaf	Prostate, Urinary infections	With root of Malba	Infusion or decoction	Drink as tea or as agua de tiempo
Caricaceae							
	Carica papaya L.	Papaya	Resin	Laxative, parasites in stomach/intestines	Tepid water	Soak in tepid water	Drink

Family	Scientific name	Vernacular name	Part	Disease/Symptoms	Other ingredients	Preparation	Application
Celastraceae							
	Maytenus macrocarpa Briq.	Chuchuhuasi	Bark	Healing abdomen women after giving birth	Alcohol	Tincture	Drink
Chenopodiaceae							
	Chenopodium ambrosioides L.	Payco	Leaf	Desinfect, wash wounds	/	Decoction	Drink
Clusiaceae							
	Calophyllum brasiliense Cambess.	Lagarto caspi	Resin	Hernia, fractures	/	Fresh material	Apply externally
Commelinaceae							
	Callisia ciliata Pers.	Boasacha	Bark	Kidneys, gastritis, frio, rheumatism, burns	/	Infusion	Drink as tea
Costaceae							
	Costus scaber Ruiz & Pav.	Caña agria	Trunk	Fractures	/	Fresh material: Sap comes out of trunk	Drink
Crassulaceae							
	Kalanchoe pinnata Pers.	Motelillo	Tuber	Good luck	/	Macerate	Bathe
Cucurbitaceae							
	Citrullus lanatus (Thunb.) Matsum. & Nakai	Sandia	Seed	Fever, bronchitis, frio	/	Macerate and squeeze juice out	Drink
	Cucumis sativus L.	Pepino	Fruit	Bronchitis, frio, intestinal infection	/	Fresh or rasp so juice comes out	Eat or drink

Family	Scientific name	Vernacular name	Part	Disease/Symptoms	Other ingredients	Preparation	Application
	Momordica charantia L.	Papailla	Leaf	Pellagra	/	Macerate or infusion	Drink or drink as tea
Cyclanthaceae							
	Thoracocarpus bossectus (Vell.) Harling	Tambishi	Bark	Diabetes, cholera	/	Rasp and decoction	Drink
Cyperaceae							
	Cyperus luzulae Rottb.	Piri Piri	Leaf	Diarrhea	/	Infusion	Drink as tea
	Scleria melaleuca Rchb. ex Schltdl. & Cham.	Cortadera	Root	Kidneys	/	Infusion or decoction	Drink as tea or as agua de tiempo
Erythroxylaceae							
	Erythroxylum coca Lam.	Coca	Leaf	Colics, wash genitals, mask hunger	/	Infusion	Drink as tea
Euphorbiaceae							
	Alchornea cf. latifolia Sw.	Ipururo	Bark	Frio	Alcohol	Tincture	Drink
			Leaf	Frio	Alcohol	Tincture	Drink
	Croton cuneatus Klotzsch	Aji sanango	Root	Frio, artritis, rheumatism	Alcohol	Tincture	Drink
	Croton lechleri Muller Arg./*Croton draconoides* Müll.Arg.	Sangredegrado	Resin	Wounds, cuts, operation wounds, ulcers, stomach problems, vaginal wash	/	Fresh material	Drink with tepid water or apply pure
	Hura crepitans L.	Catahua	Resin	Snake bites	/	Fresh material	Apply with water
			Leaf	Bathe to heal all little wounds on your body	/	Decoction	Bathe

Family	Scientific name	Vernacular name	Part	Disease/Symptoms	Other ingredients	Preparation	Application
	Jatropha curcas L.	Piñon blanco	Leaf	Cool off, fever, headache	/	Macerate	Apply externally or immerse head
			Resin	Wounds	/	Fresh material or with tepid water	Apply externally or drink with tepid water
			Seed	Empty stomach (laxative), vomitive, remove intestinal parasites	/	Fresh material	Eat seed
	Jatropha gossypiifolia L.	Piñon colorado	Leaf	Frio, fever, headache	/	Macerate	Apply externally or immerse head
			Resin	Wounds	/	Fresh material or with tepid water	Apply externally or drink with tepid water
	Manihot esculenta Crantz	Yuca	Tuber	Bathe babies so they calm down	/	Macerate	Bathe babies
			Resin	Acné, sunburned skin, skin fungi	/	Fresh material	Apply externally
	Phyllanthus niruri L.	Chancapiedra	Entire plant	Kidneys	/	Infusion	Drink as tea
	Plukenetia volubilis L.	Sacha inchi	Fruit	Cholesterol	/	Fresh material	Eat
Fabaceae							
	Arachis hypogaea L.	Manhi	Seed	Rivi = piel	/	Macerate	Eat raw or apply externally
	Cajanus cajan (L.) Millsp.	Frejol de palo	Fruit	Diabetes, kidneys	/	Infusion or decoction	Drink as tea or as agua de tiempo

Family	Scientific name	Vernacular name	Part	Disease/Symptoms	Other ingredients	Preparation	Application
	Calliandra angustifolia Spruce ex Benth.	Bobinsana	Bark	Frio	With juice from caña de azucar	Soak in juice of caña de azucar	Drink as agua de tiempo
			Leaf	Frio	With juice from caña de azucar	Soak in juice of caña de azucar	Drink as agua de tiempo
	Copaifera paupera (Herzog) Dwyer	Copaiba	Resin	Wounds, cuts, operation wounds, ulcers, stomach problems, vaginal wash	/	Fresh material	Drink with tepid water or apply pure
	Dipteryx cf. alata Vog.	Shihuahuaco	Resin	Diabetes	/	Fresh material	Drink
	Erythrina amazonica Krukoff	Amasisa	Bark	Wounds/Scars	/	Decoction	Drink
	Inga edulis Mart.	Guaba	Seed	Faster hair growth	/	Macerate	Immerse head
	Leucaena sp.	Pashaquilla	Leaf	Wounds, inflammations of the stomach	/	Infusion or macerate	Drink as tea or apply on wound
	Mimosa bonplandii Benth.	Hierba Vervensosa	Leaf	Rabiosa, high blood pressure	/	Macerate	Bathe
	Senna reticulata (Willd.) H.S.Irwin & Barneby	Retama	Flower	Fever, kidneys, infections	/	Infusion or decoction	Drink as tea or apply externally
			Fruit	Fever, kidneys, infections	/	Infusion or decoction	Drink as tea or apply externally
Lamiaceae							
	Ocimum americanum L.	Sharamasho	Leaf	Colics, good luck, clean/purify body	/	Infusion	Drink as tea
			Petiole	Colics, good luck, clean/purify body	/	Infusion	Drink as tea
	Ocimum campechianum Mill.	Albaca	Leaf	Fungi	/	Macerate	Apply externally

Family	Scientific name	Vernacular name	Part	Disease/Symptoms	Other ingredients	Preparation	Application
Lauraceae							
	Cinnamomum aff. triplinerve (Ruiz & Pav.) Kosterm.	Canela	Leaf	Colics	/	Infusion	Drink as tea
			Bark	Colics	/	Infusion	Drink as tea
	Persea americana Mill.	Palta	Fruit	Dry hair	/	Macerate	Apply externally
Lecythidaceae							
	Couroupita guianensis Aubl.	Ajahuma	Bark	Siso	/	Decoction	Bathe
			Fruit	Siso	/	Fresh material: Cut and apply meat of the fruit	Apply the fruit
	Grias peruviana Miers	Sacha mangua	Bark	Diabetes	/	Infusion	Drink as tea
Loranthaceae							
	Passovia pyrifolia (Kunth) Tiegh.	Suelda con suelda	Leaf	Fractures	/	Infusion or macerate	Drink as tea or apply externally
Malpighiaceae							
	Banisteriopsis caapi (Spruce ex Griseb.) Morton	Ajahuasca	Leaf	Hallocinogenic, Vomitive, laxative, determine which disease you have (doctor of the plants)	With chacruna	Decoction, mash and let it cool off	Drink
Malvaceae							
	Gossypium cf. barbadense L.	Algodon	Leaf	Colics, stomach problems, flatulence	/	Infusion	Drink as tea

Family	Scientific name	Vernacular name	Part	Disease/Symptoms	Other ingredients	Preparation	Application
	Malachra alceifolia Jacq.	Malba	Leaf	Kidneys and headache	With coco water	Macerate with coco water	Drink or immerse head
			Resin	Kidneys and headache	With ashira	Macerate	Drink or immerse head
Meliaceae							
	Cedrela odorata L.	Cedro	Bark	Frio, ligatures	/	Decoction	Drink and apply externally
Moraceae							
	Artocarpus altilis (Parkinson) Fosberg	Pan de arbol	Resin	Hernia, fractures	/	Fresh material	Apply externally with cloth
	Brosimum lactescens (S.Moore) C.C.Berg/	Tamamuri	Bark	Frio, wash genitals, stomach problems, diarrhea, gives energy and heals abdomen women after giving birth	Alcohol	Tincture	Drink
	Brosimum rubescens Taub.	Pali Sangre	Resin	Internal diseases, wounds	/	Fresh material	Drink
	Brosimum sp.	Huayrocaspi	Resin	Tumors	/	Fresh material	Apply externally
	Brosimum sp.	Manchinga	Resin	Cancer	/	Fresh material	Drink
	Ficus insipida Willd.	Oje	Resin	Laxative, parasites in stomach/intestines, anemia	With orange juice, soda or sugar water	Fresh material with orange juice, soda or sugar water	Drink
	Ficus sp.	Kame Renaco	Resin	Healing scars, abdominal ulcers, internal diseases	/	Decoction	Drink
	Ficus sp.	Sacha Renaco	Resin	Healing scars, abdominal ulcers, internal diseases	/	Decoction	Drink

Family	Scientific name	Vernacular name	Part	Disease/Symptoms	Other ingredients	Preparation	Application
	Ficus sp.	Zapote Renaco	Resin	Healing scars, abdominal ulcers, internal diseases	/	Decoction	Drink
	Ficus sp.	Renaquilla	Resin	Stomach problems, fractures, scars	Alcohol	Tincture	Drink
	Ficus trigona L.f.	Renaco	Resin	Healing scars, abdominal ulcers, internal diseases	/	Decoction	Drink
	Maclura tinctoria (L.) D.Don ex Steud.	Insira	Resin	Toothache	/	Fresh material	Apply externally
	Maquira coriacea (H.Karst.) C.C.Berg	Janchama/Capinuri	Resin	Lungs, Hernia, Stomach problems	/	Fresh material	Drink or apply externally
			Bark	Lungs, Hernia, Stomach problems	/	Macerate	Apply externally
	Pseudolmedia laevis J.F.Macbr.	Chimicua	Resin	Stomach problems	/	Fresh material	Drink
Musaceae							
	Musa paradisiaca L.	Platano	Peel	Scars, diarrhea	/	Decoction	Drink
Myrtaceae							
	Myrciaria dubia (Kunth) McVaugh	Camu camu	Fruit	High blood pressure	/	Macerate	Drink
	Psidium guajava L.	Guayaba	Leaf	Diarrhea, infections, frio	/	Infusion	Drink as tea
			Bark	Diarrhea, infections, frio	/	Infusion	Drink as tea
Passifloraceae							
	Passiflora ligularis Juss.	Granadilla	Leaf	Diabetes	/	Infusion	Drink as tea
Phytolaccaceae							
	Gallesia integrifolia (Spreng.) Harms.	Ajos quiro	Bark	Rheumatism, artritis	/	Rasp	Apply externally

Family	Scientific name	Vernacular name	Part	Disease/Symptoms	Other ingredients	Preparation	Application
	Petiveria alliacea L.	Mucura	Leaf	Frio	/	Macerate	Apply externally
Piperaceae							
	Piper aduncum L.	Cordoncillo	Trunk	Bleedings/Menstruation	/	Infusion	Drink as tea
	Piper hispidum Sw.	Maticu	Leaf	Wash wounds, against infections, desinfect	/	Decoction	Drink and wash
	Piper obliquum Ruiz & Pav.	Gajinaso sacha	Root	Diet, frio	Alcohol	Tincture	Drink
	Piper peltatum L.	Santa Maria	Leaf	Heart, frio	/	Infusion	Drink as tea
Plantaginaceae							
	Plantago major L.	Llanten	Leaf	Fever, respiratory infections, bronchitis	/	Macerate	Drink
	Scoparia dulcis L.	Sinchipichana	Leaf	Protect your head from losing hair	/	Macerate and squeeze juice out	Apply with water
Poaceae							
	Axonopus compressus (Sw.) P.Beauv.	Turulco	Root	Diarrhea	/	Decoction	Drink
	Cymbopogon citratus Stapf.	Hierba Luisa	Leaf	Stomach problems	/	Infusion	Drink as tea
	Imperata brasiliensis Trin.	Cashahutsha	Root	Viagra	Alcohol	Tincture	Drink
	Saccharum officinarum L.	Caña de azucar	Stem	Anemia	/	Squeeze	Drink
Portulacaceae							
	Portulaca oleracea L.	Verdulaga	Leaf	Reduce warmth, fever	Alcohol	Tincture	Apply externally

Family	Scientific name	Vernacular name	Part	Disease/Symptoms	Other ingredients	Preparation	Application
Pteridophyta							
	Phlebodium aereolatum	Cotochupa	Tuber	Bronchitis	/	Rasp and squeeze out the juice	Drink
Rubiaceae							
	Coffea arabica L.	Café	Leaf	Bronchitis, fever, astma	/	Macerate or infusion	Drink or drink as tea
	Genipa americana L.	Huito	Fruit	Bronchitis	/	Squeeze	Drink
	Morinda citrifolia L.	Noni	Fruit	Diabetes, frio, old age	/	Decoction	Drink
	Uncaria tomentosa DC.	Uña de gato	Bark	Cancer	/	Infusion	Drink as tea
Rutaceae							
	Citrus limettioides Tanaka	Lima Dulce	Leaf	Kidneys	/	Infusion	Drink as tea
			Fruit	Kidneys	/	Fresh material	Eat
	Citrus limon (L.) Burm.f./*Citrus limetta* Risso	Limones	Fruit	Anemia, energy	With eggs	Make juice with fruit and add egg= tonic	Drink
			Leaf	Fever, Healing abdomen after giving birth	/	Infusion	Drink as tea
	Citrus paradisi Macfad.	Toronja	Fruit	Loose weight, cholesterol	/	Squeeze	Drink
Solanaceae							
	Brugmansia sp.	Toe	Leaf	Witchcraft/Black magic/Bad luck	/	Decoction	Bathe
	Brunfelsia grandiflora D.Don.	Chirisanango	Root	Frio	/	Rasp and juice comes out	Drink
	Cestrum sp.	Hierba Santa	Leaf	Fever	/	Macerate	Immerse head
	Nicotiana tabacum L.	Tabaco	Leaf	Hallucinogenic, vomitive, laxative	/	Decoction, then mash	Drink juice with some water

Family	Scientific name	Vernacular name	Part	Disease/Symptoms	Other ingredients	Preparation	Application
	Physalis angulata L.	Muyaca	Leaf	Desinfect wounds	/	Macerate	Apply externally
	Solanum aff. foetens Pittier ex S.Knapp	Lobosanango	Root	Energy	/	Rasp and squeeze	Drink with some water
			Leaf	Energy	/	Rasp and squeeze	Drink with some water
	Solanum grandiflorum Ruiz & Pav.	Ciucahito	Fruit	Wounds and tumors	/	Cut in half	Apply on the wound/tumor
Urticaceae							
	Urera caracasana (Jacq.) Gaudich. ex Griseb.	Ishanga	Leaf	Gastritis	/	Rasp and squeeze	Drink with some water
Verbenaceae							
	Lippia alba (Mill.) N.E.Br.	Oregano	Leaf	Low blood pressure, colics	/	Infusion	Drink as tea
Unknown							
	Unidentified	Sarsa	Root	Ulcers	/	Infusion	Drink as tea
	Unidentified	Nucñu	Leaf	Tos	With oil	Mash until juice comes out	Drink
	Unidentified	Atchunicaspi	Bark	Viagra, rheumatism, energy	Alcohol	Tincture	Drink
			Root	Viagra, rheumatism, energy	Alcohol	Tincture	Drink
	Unidentified	Huama	Leaf	Witchcraft/Black magic/Bad luck	/	Macerate	Apply externally

Appendix 12 Number and percentage of plant species applied according to a certain method for each plant part in Pueblo Libre

Part	Application	Number of plant species	Percentages
Bark	Bathe	1	9,1%
	Drink	8	72,7%
	Drink as agua de tiempo	1	9,1%
	Drink as tea	1	9,1%
Entire plant	Drink	2	50,0%
	Drink as tea	1	25,0%
	Apply externally	1	25,0%
Flower	Bathe	1	33,3%
	Drink	2	66,7%
Fruit	Drink	6	100,0%
Leaf	Apply externally	6	15,8%
	Bathe	5	13,2%
	Drink	13	34,2%
	Drink as tea	12	31,6%
	Drink as agua de tiempo	1	2,6%
	Wash wounds	1	2,6%
Resin	Apply externally	5	31,3%
	Drink	11	68,8%
Root	Drink	4	80,0%
	Drink as agua de tiempo	1	20,0%
Shell	Drink	1	100,0%
Stem	Drink	2	66,7%
	Eye drops	1	33,3%
Tuber	Apply externally	1	20,0%
	Drink	3	60,0%
	Drink as tea	1	20,0%

Appendix 13 Number and percentage of plant species applied according to a certain method for each plant part in Naranjal

Part	Application	Number of plant species	Percentages
Bark	Apply	4	17,4%
	Bathe	1	4,3%
	Drink	9	39,1%
	Drink as agua de tiempo	2	8,7%
	Drink as tea	5	21,7%
	(Vaginal) wash	2	8,7%
Entire plant	Drink as tea	1	100,0%
Flower	Apply	1	50,0%
	Drink as tea	1	50,0%
Fruit	Apply	5	26,3%
	Drink	8	42,1%
	Drink as tea	2	10,5%
	Drink as agua de tiempo	1	5,3%
	Eat	3	15,8%
Leaf	Apply	16	23,2%
	Immerse head	2	2,9%
	Bathe	6	8,7%
	Drink	19	27,5%
	Drink as agua de tiempo	3	4,3%
	Drink as tea	19	27,5%
	Immerse head	2	2,9%
	Wash	2	2,9%
Peel	Drink	1	100,0%
Petiole	Drink as tea	1	100,0%
Resin	Apply	13	40,6%
	Drink	18	56,3%
	Immerse head	1	3,1%
Root	Drink	15	78,9%
	Drink as agua de tiempo	2	10,5%
	Drink as tea	2	10,5%
Seed	Apply	1	20,0%
	Drink	1	20,0%
	Eat	2	40,0%
	Immerse head	1	20,0%

Part	Application	Number of plant species	Percentages
Stem	Drink	1	100,0%
Trunk	Drink	1	50,0%
	Drink as tea	1	50,0%
Tuber	Apply	1	20,0%
	Bathe	2	40,0%
	Drink	2	40,0%

Appendix 14 Symptoms/diseases divided into groups together with the number of plant species and percentage of plant species for each symptom/disease in Pueblo Libre

Group	Symptoms/Diseases	Number of plant species	Percentage
Fractures	Fractures	4	5,6%
	Dislocations	5	6,9%
	Prolapse (of the abdomen)	4	5,6%
Cholesterol	Cholesterol	2	2,8%
Stomach	Parasites in stomach/intestines	2	2,8%
	Constipation	1	1,4%
	Clean/empty stomach	1	1,4%
	Vomitive	1	1,4%
	Laxative	3	4,2%
	Stomach problems	2	2,8%
	Colics	2	2,8%
	Anemia	1	1,4%
Skin	Burns	1	1,4%
	Acné	1	1,4%
Frio	Artritis	2	2,8%
	Frio	8	11,1%
	Rheumatism	3	4,2%
Internal wounds	Ulcers	3	4,2%
	Internal diseases	1	1,4%
	Heal abdomen women after giving birth	1	1,4%
Calcium	Calcium for the bones	2	2,8%
Infections	Respiratory infections	2	2,8%
	Headache	8	11,1%
	Vaginal infections	3	4,2%
	Inflammations	4	5,6%
	Prostate	2	2,8%
	Kidneys	6	8,3%
	Yellow fever	1	1,4%
	Fever	9	12,5%
	Urinary infections	2	2,8%
	Diarrhea	5	6,9%
	Bronchitis	2	2,8%
	Hepatitis	1	1,4%
	Throw up	1	1,4%
Diet	Loose weight	2	2,8%
	High blood pressure	2	2,8%
Cancer	Purify the blood	2	2,8%
	Gastritis	2	2,8%
	Cancer	2	2,8%
	Diabetes	3	4,2%
Sexual impotence	Sexual impotence	3	4,2%
Rabiosa	Rabiosa	1	1,4%
Bathing	All diseases	1	1,4%

	Bathe	1	1,4%
	Good luck	2	2,8%
	Faster hair growth	1	1,4%
Cuts	Scars	2	2,8%
	Menstruation/Bleeding	2	2,8%
	Hernia	6	8,3%
	Cuts	2	2,8%
Desinfect	Desinfect (wounds)	3	4,2%
	Vaginal wash	1	1,4%
	Pain eyes	2	2,8%
Snake bites	Snake bites	1	1,4%
Pregnancy	Afrodisiac	1	1,4%
	Birth control	2	2,8%
	Abortion	1	1,4%
	Inconveniences pregnancy	1	1,4%
Malaria	Malaria	1	1,4%
Hallocinogenic	Hallocinogenic	1	1,4%

Appendix 15 Symptoms/diseases divided into groups together with the number of plant species and percentage of plant species for each symptom/disease in Naranjal

Group	Symptoms/Diseases	Number of plant species	Percentage
Warmth and cold	Cool off/Reduce warmth	2	1,6%
Hair	Dry hair	1	0,8%
	Hair growth	2	1,6%
Nutrients	Energy	5	3,9%
	Viagra	3	2,4%
Malaria	Malaria	1	0,8%
Blossoming/Floral bath	Good luck	2	1,6%
	Witchcraft/Black magic/Bad luck	2	1,6%
	Determine your disease	1	0,8%
	Clean/purify body	1	0,8%
	Bathe	3	2,4%
Washing/Cleaning	Menstruation/Bleedings	1	0,8%
	Ligatures	3	2,4%
	Vaginal wash	4	3,1%
	Healing abdomen women after giving birth	3	2,4%
	Wash genitals	3	2,4%
Bites	Serum	1	0,8%
	Snake bites	1	0,8%
Fractures	Fractures	7	5,5%
	Burns	1	0,8%
	Tumors	4	3,1%
	Hernia	3	2,4%
Weight loss	Loose weight	1	0,8%
	Diet	2	1,6%
	Mask hunger	1	0,8%
Diseases of the blood	Old age	1	0,8%
	Rabiosa	1	0,8%
	All diseases	1	0,8%
	Headache	3	2,4%
	Low blood pressure	1	0,8%
	Heart problems	1	0,8%
	High blood pressure	2	1,6%
Infections	Intestinal infection	2	1,6%
	Fever	11	8,7%
	Infections	4	3,1%
	Inflammations	3	2,4%
	Desinfect	3	2,4%
Stomach infections	Cholera	1	0,8%
	Diarrhea	4	3,1%
	Pulsario	1	0,8%
	Colics	5	3,9%
	Flatulence	1	0,8%
	Gastritis	2	1,6%

Group	Symptoms/Diseases	Number of plant species	Percentage
	Stomach/abdominal problems	8	6,3%
Intestinal cleaning	Clean/Empty stomach	2	1,6%
	Laxative	8	6,3%
	Parasites in stomach/intestines	4	3,1%
	Anemia	3	2,4%
Detox of the body	Hallucinogenic	2	1,6%
	Hangover	1	0,8%
	Vomitive	4	3,1%
External infections	Skin problems (=rivi)	2	1,6%
	Tooth ache	1	0,8%
	Pain eyes	1	0,8%
	Pain ears	1	0,8%
Accidents	Wounds from operations	2	1,6%
	Cuts	2	1,6%
	Wounds	8	6,3%
	Scars	6	4,7%
Inflammations of joints	Artritis	3	2,4%
	Rheumatism	5	3,9%
	Frio	25	19,7%
Blood infections	Cholesterol	2	1,6%
	Diabetes	6	4,7%
Dermatitis	Pellagra	1	0,8%
	Wash wounds	2	1,6%
	Skin fungi	1	0,8%
	Siso	1	0,8%
	Fungi	1	0,8%
Gynaecological diseases	Ulcers (abdominal)	5	3,9%
	Cancer	2	1,6%
	Acné or sunburned skin	1	0,8%
Urinary infections	Urinary infections	1	0,8%
	Prostate	1	0,8%
	Internal diseases	3	2,4%
	Kidneys	9	7,1%
Bronchial infections	Bronchitis	8	6,3%
	Astma	1	0,8%
	Lung problems	1	0,8%
	Respiratory infections (=Tos)	2	1,6%

Appendix 16 Number and percentage of plant species prepared according to a certain method for each plant part in Pueblo Libre

Part	Preparation	Number of plant species	Percentages
Bark	Decoction	7	70,0%
	Fresh material	1	10,0%
	Infusion	1	10,0%
	Macerate one day	1	10,0%
Entire plant	Decoction	2	66,7%
	Infusion	1	33,3%
Flower	Decoction	2	66,7%
	Fresh material	1	33,3%
Fruit	Juice	4	66,7%
	Decoction	1	16,7%
	Rasp so juice comes out	1	16,7%
Leaf	Decoction	7	19,4%
	Fresh material	1	2,8%
	Infusion	12	33,3%
	Macerate	11	30,6%
	Mash and apply	4	11,1%
	Rasp	1	2,8%
Resin	Decoction	1	7,7%
	Drink	1	7,7%
	Fresh material	11	84,6%
Root	Decoction	1	20,0%
	Macerate	1	20,0%
	Rasp and add water	1	20,0%
	Rasp and decoction	2	40,0%
Shell	Decoction	1	100,0%
Stem	Extract juice from stem	3	100,0%
Tuber	Decoction	2	40,0%
	Infusion	1	20,0%
	Mash until juice comes out	1	20,0%
	Rasp	1	20,0%

Appendix 17 Number and percentage of plant species prepared according to a certain method for each plant part in Naranjal

Part	Preparation	Number of plant species	Percentages
Bark	Decoction	7	31,8%
	Infusion	5	22,7%
	Macerate	2	9,1%
	Rasp	2	9,1%
	Soak in juice of caña de azucar	1	4,5%
	Tincture	5	22,7%
Entire plant	Infusion	1	100,0%
Flower	Decoction	1	50,0%
	Infusion	1	50,0%
Fruit	Cut in half	1	5,3%
	Decoction	3	15,8%
	Fresh material	5	26,3%
	Rasp so juice comes out	1	5,3%
	Infusion	2	10,5%
	Macerate	3	15,8%
	Make juice with fruit and add egg= tonic	1	5,3%
	Rasp meat and squeeze so juice comes out	1	5,3%
	Squeeze	2	10,5%
Leaf	Decoction	9	14,1%
	Decoction and mash	2	3,1%
	Heat above fire	1	1,6%
	Infusion	19	29,7%
	Macerate	25	39,1%
	Macerate and squeeze juice out	2	3,1%
	Mash until juice comes out	1	1,6%
	Rasp and squeeze	2	3,1%
	Soak in juice of caña de azucar	1	1,6%
	Tincture	2	3,1%
Peel	Decoction	1	100,0%
Petiole	Infusion	1	100,0%
Resin	Decoction	4	14,8%
	Fresh material	2	7,4%
	Macerate	1	3,7%
	Fresh material	18	66,7%
	Soak in tepid water	1	3,7%
	Tincture	1	3,7%

Part	Preparation	Number of plant species	Percentages
Root	Decoction	4	21,1%
	Infusion	2	10,5%
	Macerate, put in cloth and squeeze so liquid comes out	1	5,3%
	Rasp and juice comes out	1	5,3%
	Rasp and macerate	1	5,3%
	Rasp and squeeze	2	10,5%
	Tincture	8	42,1%
Seed	Macerate	2	50,0%
	Macerate and squeeze juice out	1	25,0%
	Fresh material	1	25,0%
Stem	Squeeze	1	100,0%
Trunk	Fresh material	1	50,0%
	Infusion	1	50,0%
Tuber	Decoction	1	20,0%
	Fresh material	1	20,0%
	Macerate	2	40,0%
	Rasp and squeeze out the juice	1	20,0%

Appendix 18 Pile-sorting of medicinal plants in Pueblo Libre

Grupo 1	Grupo 2	Grupo 3	Grupo 4	Grupo 5
Retama	Kion	Rosasisa	Ajos Sacha	Zapallo
Frejol de palo	Palillo	Payco	Suelda con suelda	Pepino
Zapote renaco	Jergon Sacha	Mucura	Abuta	
Mango	Piri Piri	Sachahuiro	Granadilla	
Ajos quiro		Cortadera	Ajahuasca	
Malba		Cotochupa	Clavohuasca	
Patikina		Sharamasho	Renaquilla	
Maticu		Lancetilla	Uña de gato	
Piñon		Llanten		
Huasai		Hierba Luisa		
Noni		Chancapiedra		
Guayaba		Cocona		
Camu Camu		Oregano		
Oje		Hierba Santa		
Wuingo		Vervena		
Papaya		Tuna		
Guanabana		Sabila		
Coco		Verdulaga		
Marañon/Cashu		Caña de azucar		
Toronja		Albaca		
Sangredegrado				
Limones				
Copaiba				
Cetico blanco				
Uvos				
Chuchuahuasi				
Pan de arbol				
Chirisanango				

Grupo 1	Grupo 2	Grupo 3	Grupo 4	Grupo 5
Ucho sanango				
Capinuri/Janchama				
Manchinga				
Bellacocaspi				
Toe				
Algodon				

Appendix 19 Pile-sorting of medicinal plants in Naranjal

Grupo 1	Grupo 2	Grupo3	Grupo 4	Grupo 5	Grupo 6	Grupo 7	Grupo 8	Grupo 9	Grupo 10	Grupo 11
Sandia	Chancapiedra	Motelillo	Marco sacha	Palta	Tabaco	Toe	Camu Camu	Mango	Huingo	Cordoncillo
Retama	Malba		Cebolla sacha	Guaba	Ishanga	Huama	Oregano		Huito	
Limones	Achote		Gajinaso sacha	Sinchipichana	Huancahua sacha		Hierba Vervensosa		Café	
Hierba Santa	Huasai		Toronja		Turulco		Catahua		Nucñu	
Llanten	Lima Dulce		Sacha inchi		Guayaba				Pepino	
Guanabana	Cortadera		Chimicua		Piri Piri					
Verdulaga			Taperiba		Papaya					
			Cedro		Ajahuasca					
			Jergon Sacha		Oje					
			Frejol de palo							
			Tambishi							
			Shihuahuaco							
			Sacha mangua							
			Granadilla							
			Uña de gato							

Grupo 12	Grupo 13	Grupo 14	Grupo 15	Grupo 16	Grupo 17	Grupo 18	Grupo 19	Grupo 20	Grupo 21
Rosasisa	Lobosanango	Caña de azucar	Rivisacha	Patikina	Piñon blanco	Amasisa	Aji sanango	Ciucahito	Sarsa
Papailla	Uchosanango		Manhi	Insira	Piñon colorado	Platano	Topa	Janchama	Canela
Culantro			Ajahuma	Ocuera	Caña agria	Algodon	Pulsario sacha	Pan de arbol	
			Albaca	Coca	Arco sacha	Renaquilla	Trompetera Sacha	Suelda con suelda	
			Yuca	Charamasho	Tuna	Uvos	Santa Maria	Zapohuasca	
					Muyaca	Sacha Renaco	Icoja	Huayrocaspi	
					Copaiba	Renaco	Ipururo	Bellacocaspi	
					Sangredegrado	Zapote Renaco	Chirisanango		
					Lagarto caspi	Kame Renaco	Bobinsana		
					Payco		Tamamuri		
					Maticu		Chuchuhuasi		
					Pali sangre		Cashahutsha		
					Coco		Ajos sacha		
					Ashira		Pona		
							Mucura		
							Clavohuasca		
							Atchunicapsi		
							Noni		
							Boasacha		
							Ajos quiro		