

ETHNOBOTANICAL KNOWLEDGE ACQUISITION AMONG TSIMANE' CHILDREN IN  
THE BOLIVIAN AMAZON

by

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(Under the direction of Brent Berlin)

ABSTRACT

This dissertation is concerned with the acquisition of ethnobotanical knowledge, defined here as local knowledge about plants accumulated across generations. Ethnobotanical knowledge is highly valued for the role it plays in facilitating human survival over generations, its contribution to material culture, its role in conservation of biological diversity, nutrition, health, and agriculture. The process of ethnobotanical knowledge survival depends upon its transmission from one generation to another.

To explore the issue of ethnobotanical knowledge acquisition, this dissertation focuses in the relationship of Tsimane' children with their socio-environmental conditions. The Tsimane' are an indigenous group traditionally of horticulturalists and hunter-gatherers located in the Department of Beni, Bolivia. The Tsimane' are going through continual environmental and socio-cultural changes providing a rich case for this examination; they have historically had low

contact with western society, are highly autarkic, and still depend highly in forest resources for their livelihood. This work explores through history, ethnography, and quantitative ethnobotany how Tsimane' children acquire ethnobotanical knowledge.

In order to explore how ethnobotanical knowledge is acquired, this work tested parent-children relationship and children's individual characteristics with their children's ethnobotanical knowledge. Initial hypothesis of this dissertation stated that ethnobotanical knowledge held by Tsimane' children is positively associated to the same sex parent, this due to traditional gender division in work. I also hypothesized that children's demographic characteristics, namely gender, age, and household, influence ethnobotanical knowledge acquisition. These hypotheses were tested with ethnobotanical knowledge tests carried out with 59 children and 39 adults, who were these children parents'. The tests were carried out using dry herbarium specimens as visual aids for prompting information about plants.

Ethnographic evidence regarding ethnobotanical knowledge acquisition in Tsimane' children shows that social relations are fundamental for gaining their expertise. Quantitative findings show that mother, instead of same sex parent contributes more strongly for children's ethnobotanical acquisition, regardless of children sex. Results also show a strong influence of household and age in children's learning about plants; gender does not show a strong relationship with ethnobotanical knowledge acquisition among children.

INDEX WORDS: Tsimane', traditional environmental knowledge, ethnobotany, cultural transmission, informal learning, ethnography of childhood, Amazon, Bolivia.

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## **DEDICATION**

To the memory of my father, José Dolores Martínez, who lovingly introduced me to Anthropology, History, and Botany through our other shared passion: reading.

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## INTRODUCTION

*“In most human societies children become competent adults without the help of institutionalized teaching: there are no schools, no syllabus, no appointed teachers”*

*Atran and Sperber, 1991: 39*



Figure 1.1. Tsimane' siblings going to harvest corn near their house.

The transmission of non-genetic traits is a foundational issue in the study of culture (Boyd and Richerson 1985; Cavalli-Sforza and Feldman 1981). Classic anthropological studies of cultural transmission focused on the transmission and acquisition of values and attitudes as part of enculturation (Edwards 1982; LeVine 1970; Mead 1930; Whiting 1963; Whiting 1941; Whiting and Child 1953; Whiting, et al. 1966). More recently, another important topic has been the position of learning in the evolution and foundation of culture (Atran and Sperber 1991; Cavalli-Sforza and Feldman 1981; Hirschfeld and Gelman 1994; Ingold 1999; Kropotkin 1904; Lave and Wenger 1991; Mead 1964).

The work here presented is concerned with the acquisition of ethnobotanical knowledge, defined here as local knowledge about plants accumulated across generations. Although ethnobotanical knowledge is highly valued for its many adaptive, cultural, and cognitive contributions, specific characteristics of its transmission and intergenerational flow are still missing in its study (Zarger and Stepp 2004).

Childhood is pointed out as a pivotal stage when ethnobotanical knowledge is acquired (Hunn 2002; Stross 1973; Zarger 2002). Previous works have mostly focused on the depth of children's knowledge, and there is a new trend towards looking at the actual acquisition process (Cruz Garcia 2006; Eyssartier, et al. 2008; Lozada, et al. 2006; Setalaphruk and Price 2007; Wyndham 2004). Informal processes and experiences are highlighted for its acquisition.

### **Scope of this dissertation and fieldwork**

In order to study ethnobotanical knowledge acquisition, this dissertation focuses on the relationship of Tsimane' children with their socio-environmental conditions. The Tsimane' are an indigenous group of horticulturalists and hunter-gatherers located in the Department of Beni,

Bolivia, and currently living in scattered communities along riverbanks and logging roads (Figure 1.2).

In this examination, I pay attention to factors that have been previously identified as contributing to variation on ethnobotanical knowledge, such as age, gender, distance to major towns, and income source (Heckler 2002; Reyes-García, et al. 2007; Ross 2002; Zent 2001). Since the Tsimane' are going through continual environmental and socio-cultural changes they provide a rich case for this examination.

I initially expected to have positive significant relationships between a child and their same sex parent, because Tsimane' division of labor, as other traditional societies, is based on gender. Findings show that mother, instead of same sex parent is the one that contributes more strongly from both parents for children's ethnobotanical acquisition. Results also show a strong influence of household and age in children's learning about plants.

Different stages of this dissertation work were carried out in several Tsimane' communities. Initial free-listing exercises were carried out in Altagracia, San Ramón, Cara Cara, Ivasichi and Arenales in July and August 2007. I initially lived in the community of San Antonio where I carried out participant observation, and tested methodological aspects of this research from August to mid December 2007. From mid December 2007 to June 2008 I lived in Ivasichi and Collected data through knowledge tests and participant observation. I Collected plants in both of the communities where I lived, with permission of the Great Tsimane' Council and the National Herbarium of Bolivia. The Great Tsimane' Council also approved and endorsed the selection of the communities for this research. A meeting was carried out in each community to show the work that I was interested on carrying out, and preliminary results were also shown in

community meetings. I had the continuous support of the Tsimane' Amazonian Panel Study (TAPS) members throughout the development of this research for permits and logistical issues. The research was approved by the University of Georgia Human Subjects Institutional Review Board on March 29<sup>th</sup>, 2007, project number 2007-10521-3, with two re-approvals for continuous data gathering and data analysis. Names have been changed for privacy concerns.

### **Language and orthography**

During the time of this research I acquired a working level in Tsimane'. I had a local Tsimane' interpreter/assistant in each community where I carried out my work; they helped me to learn the language, mostly in informal ways. We had the help of a Tsimane-Spanish dictionary draft created by missionary Guillermo Gil. In January 2008, I received the visit of three researchers not knowledgeable of Tsimane', and I was able to interpret simple conversations from Tsimane' to Spanish. My interactions with children were mostly in Tsimane', since none of them were fluent in Spanish. I am grateful to them, especially in Ivasichi, because they were willing to offer their help in my Tsimane' learning through their drawings of vocabulary and their enthusiasm to correct my pronunciation.

Through this text, Tsimane' words are bold, and terms from regional Spanish are underlined; scientific names are italicized. For Tsimane' words I am using the New Tribes Missions spelling. The following sketch, developed by Gill (Gill 1981), outlines the equivalent English sounds for the Tsimane' spellings:

#### **Vowels:**

*i* as in **finish**

*u* as in **foot**

*o* as in **more**

*e* as in **enter**

*ä* is a lower central nasalized vowel (with no equivalent in English)

*a* as in **palm**

**Consonants:**

*p* as in **spin**

*p*<sup>^</sup> as in **pin** (aspirated)

*t* as in **tapir**

*ty* as in **charity** but palatalized

*c* as in **scar**

*ĉ* as in **car** (aspirated)

' glottal stop

*b* as in **baby**

*d* as in **duck**

*dy* as in **Jack**

*ts* as in **tsetse** but pronounced smoothly

*ch* as in **Cherokee**

*f* as in **father**

*s* as in **safe**

*sh* as in **shadow**

*v* as in **wife**

*m* as in **mother**

*n* as in **now**

*ñ* like Spanish **niño**

*r* as in **right**

*y* as in **yellow**

*j* as in **house**

### **On the structure of this dissertation**

Chapter 1 provides a historical overview of the Tsimane' focusing in historical factors, particularly on their increased contact with National Bolivian society. Chapter 2 looks at cultural, environmental, and livelihood characteristics of the Tsimane', as well as changes that have occurred in these aspects, and the consequences these have for the way knowledge is passed down. Chapter 3 gives an ethnographic account of Tsimane' children growing up. This includes their increased responsibilities acquired with age and the expansion of their geographical areas. Increased cultural changes in their society also transform children's experience regarding their plant knowledge acquisition. Furthermore, I give a description of the schooling Tsimane' children are immersed into, which is not contextualized for their natural or social environment.

Chapter 4 reports a quantitative study on children's ethnobotanical knowledge, measuring their plant use and identification ability, as well as their parent's. I draw inferences based on these tests to understand how knowledge is linked between generations and children's and how personal and environmental factors influence their ethnobotanical knowledge acquisition.

Chapter 5 concludes summarizing and remarking on the importance of including traditional environmental knowledge on school curriculum. For the purpose of reader's orientation in the geographical area where this work was carried out, I provide the map below.

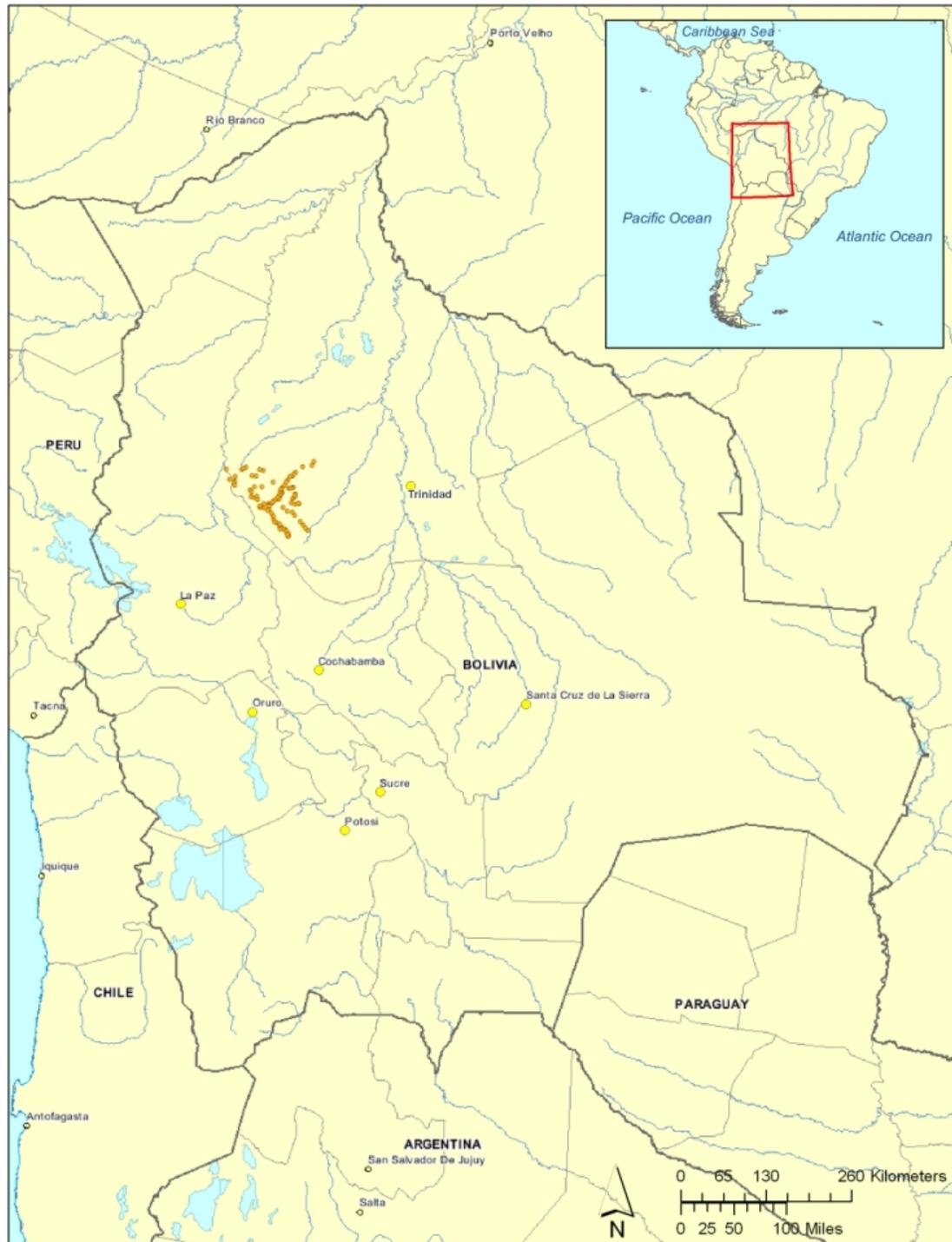


Figure 1.2. Map of Bolivia with main cities and Tsimane' communities.

## CHAPTER 1: TSIMANE' CONTEXT FOR CULTURAL CONTACT



Figure 2.1. Tsimane' teenagers transport a load of roofing material, **caj'tafa** (jatata) (*Geonoma deversa*) downriver in the Maniqui River. This is one of the forest products commonly used for trading with outsiders.

*“La Chimanía es un hermoso territorio, habitado por un pueblo digno de un mejor futuro que el de convertirse un día en el siervo borracho de los mestizos, para que una vez más el aguardiente termine venciendo y humillando al pueblo” (Nordenskiöld 1922: 127 (Riester 1993)*

*“The Chimanía (Tsimane' area) is a beautiful territory inhabited by an honorable people who deserve a better future than that of becoming one day the drunken servants of the mestizos, so once again liquor ends up defeating and humiliating the people” (translation by author)*

## Location and linguistic relations

The Tsimane'-numbering an estimated population of 8000 (Huanca 2006)- have historically lived in the Territorio Indígena Tsimane', in the banks of the Maniqui river, tributary of the Mamoré river (Metraux 1948) (Figure 1.2). On the southwest, the territory borders Santa Ana de Yacuma, and on the east San Ignacio de Moxos. Their neighbors are: the Tacana people (Tacanan family) on the northwest, the Movima (isolated language) on the northeast, the Ignaciano or Moxeño people (Arawakan family) on the east, the Yuracaré (isolated language) on the southeast, and some Aymara (Aymaran family) on the southwest (Fabre 2005). Smaller Tsimane' populations live in the Territorio Indígena Parque Nacional Isiboro Sécura, Territorio Indígena Multiétnico, and Territorio Indígena Reserva de la Biosfera Pilon-Lajas. Currently, some Tsimane' are moving outside of these traditional lands to the area of Ixiamas, in the department of La Paz, aiming at settling in areas where they can find better resources (Huanca 2006).

The Tsimane' are closely related to the Mosekene (also called Mosekén). The Mosekene occupy different territory than the Tsimane', living in the Bopi river, a southwestern tributary to the Beni river, and the Quiquibey river into the localities of Reyes, Covendo, Santa Ana and Muchanes. The Summer Institute of Linguistics (2009) and Fabre (2005) consider the Tsimane' and Mosekene as the same language, and classify it as an isolated language of lowland Bolivia. Adelaar (Adelaar 1991) considers them two different languages but closely related. The Tsimane' call themselves **chätidye'**, which means "relative" in the local language and call the Mosekene *mochene*. Although they identify each other as two different indigenous groups, they seem to communicate without problem (Gil 2002) and their cultures resemble each other (Huanca 2006). The Mosekene are more acculturated than the Tsimane', which is evident in their

fluency in Spanish nowadays. Historical reports in 1886 by Cardús (Cardús 1886) to Father Hugolino Gorleri, imply that these groups are related but the Mosecene are getting “civilized” (“they got out of the woods” Cardús 1886: 159), while the Tsimane’ are reported as “savages”.



Figure 2.2. Principal areas of the Tsimane’ indigenous territory (2009) in relation with the Bolivian territory. Map courtesy of Danitza Flores-Earls.

### **Brief history of colonial era contact in the region**

As noted by Chicchón (1992) and Huanca (2006), some early accounts of the first western contact in the area traditionally occupied by the Tsimane’ do not specifically mention which indigenous groups they are referring to, or refer to them as the *Churimanas*, a term that is believed to be used for the Tsimane’, but it is not clear whether these two indigenous groups are the same people (Altamirano 1979). Prior spellings to the word *Tsimane’* are *Chimán* and

*Chimane*, a name that has been used since the second half of the 19<sup>th</sup> century for this group. The new spelling was done by the New Tribes mission after the 1950s.

The Tsimane's first registered contact with the Spanish was in 1621 through the Franciscan priest Gregorio de Bolívar, who attempted and failed to Christianize and settle the Tsimane' into missions (Metraux 1948). During the 1600s several religious groups worked in the lowlands; mainly the Jesuits founded several missions in the Bolivian Amazon, including San Francisco de Borja, which has been the main point of trade and western contact for the Tsimane' since 1691.

In the historical accounts, the indigenous peoples that initially lived in the San Borja Mission are the Churimanas. For some authors (Aldazábal 1988; Castillo 1988; Pérez-Diez 1989), the differences that can be observed between the Tsimane' and the Mosekene are rooted in the successful *missionization* of this last group in the 17th century (Ellis and Aráuz 1998). Missionization might not be the only factor in differentiation between the Tsimane' and the Mosekene. It is possible that during pre-European contact the Mosekene were conquered by the Inka; they also had a close association to the highlands evidenced in some Mosekene speaking and understanding of the Aymara language (Metraux 1948). In addition, they traded salt with the Moxos people throughout the Jesuit times, and with the establishment of Franciscan missions in their area they monopolized trade and power (Denevan 1980).

Father de Bolívar tried, as most missionaries of his time, to get the Tsimane' to settle by giving them gifts, an approach that had worked for other indigenous groups in the area, such as the Moxos, who were easily gathered into missions. However, the Tsimane' didn't seem to feel obligated to stop their semi-nomadic way of life simply by having received these gifts, and continued to move from place to place (Chicchón 1992). The unsuccessful settlement of the

Tsimane' into reductions<sup>1</sup> made a big difference for their further economic and cultural developments when compared with other close indigenous groups.

The San Borja mission lasted until 1767 when the Jesuits were expelled from the Americas and the mission was abandoned (Daillant 1994). Nordenskiöld (Nördenskiöld 1922 (2003)) points out that the Jesuits had been efficient in taking care of a limited sector of the Tsimane' in a paternal way and avoided their exploitation as laborers, but did not allow for solutions to the further problems that appeared later. The mission was reestablished in 1780 when the political administration of the Bolivian lowlands was centered in Santa Cruz. Missionaries were sent back to San Borja (Huanca 2006). Dominicans and Franciscan friars founded in the Maniqui River several unsuccessful missions. In contrast to the Jesuits, the new priests did not have the same commitment to indigenous indoctrination and used their labor for personal gain, taking advantage of the indigenous peoples through violent methods. This bad administration, along with epidemic diseases like chickenpox and aggressive slaving parties coming from Santa Cruz, forced indigenous people living in the missions to return to the forest (Chicchón 1992; Jones 1995) or move to other settlements, like San Ignacio de Moxos, a nearby larger village where they had contact with Reyesano and Mojeño indigenous groups (Bogado Egüez 1993; Rea 2004).

During colonial times, importance was placed on the physical state of the missions and the introduction of crops such as rice, sugarcane, and citrus, with the hopes that having food available in gardens and domestic animals would deter indigenous peoples from going into the forest, considered a “savage” activity. The Tsimane', Yuracaré and Sirionó people of the

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<sup>1</sup> Colonial missionary system for organization of the indigenous people; consisted of concentrating and settling indigenous peoples in one given location, called *reducciones* (literally to ‘reduce’).

Bolivian Amazon were specially considered “marginal” or “savage tribes” compared to the more sophisticated groups of the region like the Moxos, who relied heavily in agriculture for their livelihoods (Steward 1948).

Tsimane’ social organization and widespread use of forest resources did not allow the successful establishment of continuous missions (Chicchón 1992; Ellis 1996; Nördenskiöld 1924 (2001)). Chicchón (1992) points out two factors for the unsuccessful reduction of the Tsimane’: their social organization that lacked a centralized figure and their extensive use of natural resources, which did not allow them to stay in one place for a long time. Huanca (2006) adds three more factors that prevented the Tsimane’ association with permanent missionaries: first, Tsimane’ were able to flee because their traditionally small kin family units enabled them to move easily; second, Tsimane’ were cautious of getting involved with the missions because prior contacts had brought them diseases associated with white outsiders, and third, the Tsimane’ shaman’s role in that period might have also prevented their conversion to Catholicism. In contrast, the Moxos people, close geographically to the Tsimane’, did get established in missions, facilitated by their centralized leadership and sedentary settlement pattern due to their subsistence agriculture (Chicchón 1992).

Although during colonial times Tsimane’ contact with missionaries was intermittent, it dramatically affected their culture and environment. As in many other indigenous societies, missionaries disapproved of ritual practices and condemned drinking native beer (**shocdye’**, an alcoholic beverage made from corn, cassava and/or plantain), although it was at the heart of the Tsimane’ culture (Barnadas 1984; Daillant 2004). The new colonial order brought the introduction of new crops such as rice and sugar cane (Reyes-García 2001) as well as cattle, iron tools, and fire arms which changed the natural environment (Huanca 2006). The missionaries’

introduction of cattle is remarkable because it is opposite of the indigenous peoples' ways of getting their food, which is hunting and gathering. Cattle became feral, and spread over the natural savannas of Beni, causing much harm in the area. The selective exploitation of fine woods that began in this time, such as mahogany (*Swietenia macrophylla*), has continued until today.

### **Republican era**

The Republican era (since 1825) is recognized as the beginning of extractive activities in the Beni province, with the exploitation of vanilla (*Vanilla sp.*), quinine (*Cinchona calisaya*), cocoa (*Theobroma cacao*) and especially rubber (*Hevea brasiliensis*). Most of these activities took place in the north of Beni department. Thousands of indigenous peoples of the Beni were taken to work in slavery conditions for Bolivian nationals in Northern Beni, Madeira river, and Acre (currently Brazilian territory). These indigenous peoples were committed to continuous work by means of "el enganche" or "el habilito", a debt peonage system in which indigenous peoples were induced to sign contracts and given "pay advances" in the form of manufactured goods and food which were debited to worker accounts. The companies' plans were such that the workers' expenditures and pay advances would always exceed income, creating a permanent negative balance for the worker, which was passed on to his survivors upon death (Jones 1995).

Since rubber and other resources of economic interest were not abundant in the land where the Tsimane' have traditionally inhabited, it lacked interest for entrepreneurs (Nordenskiöld 1922, Chicchón 1992). This might have helped the Tsimane' in avoiding the "enganche" economic activities during the rubber boom. Also, the traditional dispersed pattern of settlement among the Tsimane' prevented them from being recruited by outsiders as laborers to work in northern Beni (Reyes-García 2001). Therefore, the Tsimane' did not suffer the influence

of this economic system, which dramatically changed the livelihoods of other indigenous groups in the Beni department.

*Tsimane' in the Republican era and the dynamics of San Borja*

One last attempt to catholicize the Tsimane' took place in the second half of the 19<sup>th</sup> century, in 1854 (Huanca 2006) with the establishment of the mission of San Pablo in the Maniqui river. According to oral traditions Collected by Huanca (2006) and interviews by Nördenskiöld (1922), the priest that came to settle that mission separated men and women, prohibited several cultural practices like the drinking of native beer and tried to manage it as a *reducción* system with forced labor, harsh punishments, and sexual abuse. Infuriated by this condition, the Tsimane' assassinated the missionary in 1862 (Nordenskiöld 1922, Cardús 1886). This situation brought unrest and confrontation with the Mosetene from nearby missions, who, according to oral history accounts, invaded Tsimane' territory to avenge the priest's death (Huanca 2006).

Both the little attention of the national government towards the indigenous Amazonian peoples and territory as well as the Tsimane' resistance to the missionaries (passive at the beginning and became active) allowed for little western contact to their society. Hence, the Tsimane' people in comparison with other indigenous groups of lowland Bolivia did not receive as many religious missions and other kinds of contact in the Republican era (Riester 1993).

San Borja gets some economic importance only after the foundation of the Department of Beni (Huanca 2006). An influx of white settlers in the San Borja area (Jones 1995) as well as Lebanese immigrants (Rea 2004) was received in 1912, after the rubber boom ended due to cheaper exploitations in Asia by the British and Dutch, leaving cattle ranching as the growing economic activity in Beni. Rea (2004) states that migrants became prosperous selling imported

goods and later as cattle ranchers. On the other hand, Huanca (2006) points out that a good part of their prosperity is due to taking possession of lands and feral cattle, as well as to the exploitation of indigenous peoples in small ranches.

The town of San Borja had major economic and social changes especially after the construction of its first airport in 1936 (Bogado Egüez 1993). The combination of cattle raising and air transportation permitted the continuous linking of the Bolivian lowlands and highlands. At that time, the highlands were significantly more densely populated due to the exploitation of the mines in Andean cities like Oruro and Potosí. The air connection delivered beef by plane to the highly populated mining towns, and governmental programs partly subsidized these sales. This exchange also allowed for the availability of manufactured goods in the Amazonian region. Increased trade and urbanization changed the dynamics of the town forever; however, indigenous peoples in the area continued to have low contact with the rest of the nation (Huanca 2006).

Cattle ranchers began to develop agricultural production. Both cattle raising and agricultural activities relied heavily on indigenous peoples' labor. During the 1930s, the Tsimane' began working as ranch laborers, and became entangled in the debt peonage system. This system damaged indigenous peoples in several ways, particularly, by the levels of violence that were common in the treatment of the workers; physical abuse of indigenous and mestizo (camba<sup>2</sup>) people was institutionalized. Rea (2004) illustrates this point:

*“In that time, for any little thing people would get in (jailed) for 24 hours; the Tsimane', after receiving one or two arobas (measure of 25) of whippings, they would get open wounds in their buttocks and they (authorities of the town) would put salt and*

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<sup>2</sup> I will keep using this term through the text to refer to white and mixed heritage lowlanders. Gustafson (2006) points out that this term used to be used derogatorily to refer to indigenous peons, but nowadays is a marker of regional identity.

*lemon so that the wounds would heal.*” Nelita de Guiteras, interview in 1998, in Rea (2004) (translation by author).

A common thread in testimonies from Tsimane’ elders are the exploitative economic systems working against the indigenous peoples in the cattle ranches. In this same era, alcohol began to be increasingly available because it was beginning to be produced in the ranches and used as payment for the Tsimane’. I was told in the community of Ivasichi, in an interview about this epoch:

*“When I was young, Fernando, a borjano<sup>3</sup>, came to cultivate this land. He brought many **chätidye** to work with the rice at the farm, many of them. He brought them from upstream and downstream, but all of them left. He would bring clothes, that he used to pay with, and machetes when the men had worked for a long time. He also used alcohol for payment, a bottle of alcohol for a day worked.”* Encarnación, interview 2-17-08

It is common to hear that ranchers promised cash payments that the workers never obtained, and workers getting paid with valued commercial goods that symbolized increased westernization, like shoes and clothes, which they did not use before, or goods that had been obtained from the missionaries before. Due to this treatment, Tsimane’ opinion of their historical interactions with ranchers is bad (Huanca 2006).

At the same time, the Tsimane’ began trading non-timber forest products for tools and weapons, which had been acquired from the missionaries in earlier times, and now were acquired through debt peonage. Some important non-timber forest products were quinine bark and panels

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<sup>3</sup> Word used to refer to people from San Borja, either of white or mixed heritage.

made of woven palm (*Geonoma deversa*), used for thatching roofs both in the countryside and in many urban dwellings in Beni. This last renewable forest good continues to be a factor in the articulation of the Tsimane' with the regional economy (Byron 2003).

Associated with cattle ranching and commercialization of beef in this period were skins and peltry trade, which were flown out of the Amazon in the same planes used to commercialize meat (Jones 1990). This was mostly in the Moxos province and in the River Apere area. This trade was monopolized by some six merchants, who, like in other trade transactions described before, exchanged manufactured goods in unfair terms with the indigenous population. The trade became credit, where most households were indebted to the merchants. As debt grew, hunting expanded as indigenous people tried to reduce the debt. Jones (Jones 1980) reports on the unjust prices that the merchants would negotiate especially with the Tsimane', who used to live in more isolated conditions than other indigenous groups in the area, and therefore would get even worse deals than the other ethnic groups. The exchange with the Tsimane' would give the trader a gross profit of more than 320 percent.

Extensive hunting for pelts resulted in indigenous peoples having to go further into the forest in order to find edible animals, threatening the traditional food supply (Jones 1995). Nowadays, the few game that are easy to find are the squirrel monkey (*Saimiri sciureus*) and the porcupine (*Coendou bicolor*). The Tsimane' diet has expanded even to animals that they were prohibited to eat as part of their cultural norm, like the capybara (*Hydrochaeris hydrochaeris*), changing their cultural traditions (Huanca 2006).

Another consequence of peltry trade was the widespread use of guns which revolutionized local hunting. Indigenous peoples had traditionally hunted with bows, arrows,

spears and dogs (Jones 1995). Although commercial game hunting was prohibited in 1975, hunting and pelt smuggling is not uncommon nowadays (Stearman and Redford 1992).

### **The new Bolivian Republic: reforms of 1953**

The 1950s was a landmark both for the Tsimane' and for Bolivian history. There was an important land reform of 1953, which began the transformation of power relationships in the western side of Bolivia. The reform attempted to get rid of large estates (*latifundio*), a successful endeavor in the Andean region. On the other hand, in the eastern side of the country it legalized the large cattle ranch owners in the Beni region, obtaining titles on the land they occupied, but excluding the indigenous peoples of land rights (Jones 1995, Byron 2003). The particularities of this reform in the Beni and the growing demand for beef in the highly populated mining cities in the Andes, increased deforestation and resources competition between whites and indigenous peoples, as well as demand for cheap labor. By the 1950's, many Tsimane' were meeting their basic needs trading with white settlers, and merchants from San Borja started canoeing exclusively to trade with the Tsimane' (Huanca 2006).

The revolutionary reforms of 1952 recognized the status of citizen for indigenous peoples and women, conceding the right to vote, getting rid of feudal systems that worked against indigenous peoples (mostly in the highlands) and giving opportunities for education. This was the perfect setting for the reemergence of the missionaries' work. The missionaries' appearance in the lowlands was welcomed by the government, in part because of official objectives to provide indigenous peoples with their newly acquired rights focused in the highly populated Andean region (Huanca 2006). Furthermore, I hypothesize that since the lowlands traditionally had lower governmental presence, it was easier for the government to leave the job of

acculturation and the new indigenous rights in hands of the missionaries, resulting in the initial indigenous awareness of belonging to Bolivian society.

Missionaries became established permanently in the Tsimane' territory in the early 1950s. Priests from the Redemptorist congregation (catholic) founded Misión Fátima (upper Maniqui River), and the New Tribes Mission (Protestant) established in the San Borja area (Chicchón 1992). Although both missions are dedicated to Christian indoctrination, their approach is different. The Catholic mission was interested in the process of empowering the community, especially against traders and other encroachers. On the other hand, the Protestant missionaries emphasize religious learning and education in the native language (Huanca 2006).

The Redemptorist Catholic missionaries settled in the community of Cara Cara (across the river from Ivasichi) after having had contact with Tsimane' and Mosekene in Covendo. However, they moved their settlement upriver in order to be closer to more Tsimane' people and out of contact of cattle ranchers and traders who were hiring Tsimane' as workers. The mission was reestablished upriver in 1957, and was named Misión Fátima de los Chimanes; it was headed by Father Martín Bauer (Byron 2003, Reyes-García 2001, Huanca 2006). According to Fresard and Moreno (Fresard and Moreno 1999) at the beginning the mission had a population of 25 families, that doubled when more Tsimane' families moved in a few years later.

Deep economic and cultural changes occurred with the Redemptorists' arrival. The missionaries aimed immediately to ensure economic sustainability for the mission, which they tried to accomplish by clearing 50 hectares of forest for cash crops such as cacao and coffee (Chicchón 1992, Huanca 2006). With the idea of empowering the Tsimane', the missionaries established an elementary school. They were interested in enhancing Tsimane' health, and built a

small clinic in the community. Finally, they also wanted the Tsimane' christianization (Huanca 2006).

Tsimane' traditional spirituality was animistic, believing in spirits that own the river, the forest or animals (Riester 1976). Although there is a strong Christian influence today, the belief in these "owners" of nature is still apparent. The Redemptorist missionaries wanted to get rid of this faith gradually at the same time they intended to protect Tsimane' rights (Huanca 2006).

According to Tsimane' narratives, when Father Bauer first approached people in the area of Misión Fátima, there were Tsimane' that approved the outsider's presence and others that rejected him. Like their ancestors did before, the group that rejected him fled into the forest to avoid contact (Huanca 2006). Father Bauer in 1957 applied for the Tsimane' the same method the colonial missionaries used in approaching Amazonian indigenous peoples: giving away gifts. As illustrated in an interview to an older Tsimane': "The *pá'e* (priest) began to give all sorts of gifts and even lard. In such a way he "*amansó*" (tamed) people" (Huanca 2006:91).

Infrastructure was constructed in the mission hoping to improve Tsimane' wellbeing: a clinic, a store for manufactured goods, school, and a landing strip, used for bringing goods from San Borja (Riester 1993). The establishment of this infrastructure carried out by the Tsimane', who for the first time got paid in cash instead of the unfair barter used in the past by the cattle ranchers and traders. This approach showed that the priest wanted to grant the Tsimane' some freedom to choose what they wanted to buy (Huanca 2006).

Father Martín Bauer was received well by the community in part because he did not try to change some important customs, particularly the drinking of native beer, which is one of the core Tsimane' cultural practices (Daillant 2004). The Priest tried to get rid of the trading system the Tsimane' had with some merchants. However, the mission did not influence the Tsimane' living

outside the geographical area of Misión Fátima (Chicchón 1992, Reyes-García 2001) and since 1997, when Father Bauer died, the mission has not have any impact outside of its immediate geographical area (Reyes-García 2001).

The other religious group working for the Tsimane' conversion since 1954 is the Evangelical New Tribes Mission, based in Sanford, Florida. This group is a branch of the Summer Institute of Linguistics (SIL). SIL came to Bolivia with an invitation from the government according to agreements with the Ministry of Peasant and Agricultural Affairs. SIL's purpose was to improve the quality of social and spiritual life of different ethnic groups through scientific research of native languages, especially those present in the Amazonian area (Tobías Paz 2000).

SIL's religious branch -New Tribes Mission- aimed specifically at carrying out missionary work improving educational, moral and health situations among indigenous populations. Part of their objectives was also to bring new opportunities so that indigenous groups would be deterred from participating in unfair trade and making the integration into national life easier (Tobías Paz 2000). In their work with the Tsimane', the missionaries established residence among the group, learned the language and culture for evangelization purposes in order to translate the Bible and produce religious and educational material using the Tsimane' language (Chicchón 1992).

The missionaries earned the respect of the Tsimane' people by showing interest in the local way of life, language, and showing respect towards shamans. Remembering the first contacts with this missionary group, a Tsimane' elder says:

*“When the missionaries arrived they did not hate the **cocojsi'** (shaman). They wanted to learn our language and customs. The **cocojsi'** was staying with us, and the missionaries*

*had to observe our customs to see how we lived. There were good and bad **cocojsi'**, but the missionaries didn't say anything about it. **Chätidye'** were converted into Christians, and later they preached to the **cocojsi'**. **Cocojsi'** and missionaries used to visit each other, and they did not fight. Today there is still a **cocojsi'**” (Huanca 2006:116).*

The fact that the missionaries carried out the task of translating the bible at the same time kept producing school materials in the native language earned the missionaries the respect and appreciation of the Tsimane'. Their work in bilingual education is definitively one of the most evident ways in which the mission has been effective. In the beginning of their work in the lowlands, SIL founded a school for bilingual indigenous teachers in Riberalta, Beni. This school worked from 1973 to 1984, and it had the purpose of training members from different indigenous groups, including the Tsimane', (Huanca 2006). Education for indigenous groups in the lowlands was in the hands of missionaries and private groups like these until 1985 (Castro 1997). The scope of their approach for training teachers and teacher assistants included both principles of teaching and preaching the gospel in Tsimane' (Huanca 2006). In the formation of bilingual teachers, the mission contributed economically by paying the salaries of most of them. In this way, preaching, teaching, and the prestige of earning a steady income became highly interconnected for the group of Tsimane' leaders who eventually became teachers.

New Tribes Missions founded a multiple purpose facility called Centro Horeb, named in honor of the biblical mountain mentioned in Exodus. This center is located 3 km from San Borja, where they kept training Tsimane' bilingual teachers, to avoid sending them to study in Riberalta (Tobías Paz 2000). The Horeb center works as an active focal point for Tsimane' issues. During the year, they teach periodically short courses on educational and religious issues for teachers and teacher assistants.

Other reasons why Tsimane' value the missionaries' work is because of the availability of healthcare in the Horeb center. Medical assistance is partially paid by patient's kin in the form of labor for the center (Reyes-García 2001). A radio station is also located at Horeb center. This station broadcasts programs mostly in the Tsimane' language for evangelization and social purposes related to community wellbeing and education. Being the only source of information in the native language, this radio station became a big part of Tsimane' daily lives and regarded as very popular and useful. It is customary in this station to send messages from one community to another announcing relatives about possible visits they might receive or informing about social events happening in different Tsimane' communities.

#### *The Gran Consejo Tsimane'*

An area where New Tribes mission has had a strong impact, has been in their firm attitude against the abusive system commonly practiced by the river traders and colonists towards the Tsimane'. This brought the missionaries confrontations with ranchers, loggers, and other traditionally powerful groups in the region. The missionaries had an important responsibility in the foundation of the Gran Consejo Tsimane' (Great Tsimane' Council, GCT) in 1989. This was created to represent the Tsimane' voices in the awakening of conservation and logging interests in their ancestral territory (Chicchón 1992), which is analyzed in a section below.

The GCT's board members are criticized nowadays both by Tsimane' and Borjanos for being highly acculturated in the Bolivian society, as illustrated for their continual travelling and showing off of material goods and therefore, not totally representing the Tsimane'. The board of directors of the GCT has access to modern goods and services that allow them to distinguish themselves from the rest of the Tsimane', clearly showing the recent social stratification within

the group (Byron 2003). Furthermore, many Tsimane' question the fact that the members of the board of directors have not changed since its creation, although they also question whether there are younger Tsimane' that can take these positions.

Borjanos have a low opinion of the GCT organization because of the exclusive use of funding for the Tsimane' communities. The strong links that the council has with the missionaries, who are perceived as highly paternalistic, has also brought criticism regarding the independence of the organizations' decisions.

In the description of the meeting where the GCT was formed, Chicchón (1992) stresses the paternalistic approach from different officials who were invited. They congratulated the missionaries on their efforts for helping to incorporate the Tsimane' into "civilization". Rea (2004:68) compiles part of the speech given by the President of the Civic Committee of San Borja when the GCT was founded:

*"We want everyone to participate of the same things like the civilized people. The land is granted through the country's laws, so that you have your own territory, we do not want to take you to an area where you will be prisoners, we do not want to have you in a corner where you might die, because that would be making you savage again, where you live, that is where your lands will be granted, your own and communal land, and whoever does not want to live on it can go out of it, but do not sell it, since the land is sacred for him, and nobody can bother you, **because you are Bolivian citizens**" (Rea 2004:68, translation by author, emphasis added).*

It is perceived that the Tsimane' do not know how to take advantage of their land because they do not know how to work, that they are not ready for modern life, and that they do not contribute to the local economy (Rea 2004).

The GCT has contributed to Tsimane' citizenship registration which has granted them their right to vote. It is known that the politicians approach in a friendly way the Tsimane' during electoral campaigns. During this period, politicians give away goods such as food and medicines in order to influence their voting decisions. However, the actions that have been taken by the GCT have not alleviated the poverty in which most Tsimane' live (Rea 2004). Although there are several aspects of the GCT perceived as questionable, it is currently the only organization that unites and voices the indigenous Tsimane' concerns in front of higher organizations.

### **New colonization, forestry processes, and ethnic awareness in Beni**

Two events that occur since the 1970s have changed forever the socio-economic and land dynamics of the area of the Tsimane': the lowlands' neo-colonization and exploitation, and the indigenous social movements for land rights recognition. The GCT foundation occurred at the juncture of forestry management processes in Beni and increased ethnic awareness among indigenous peoples of Eastern Bolivia.

The Corporación Boliviana de Fomento (CBF) with the economical support of the United States Agency for International Development (USAID), changed the colonization process of the lowlands in the 1970s and 1980s. This program of "directed colonization" aimed at diminishing demographic pressure in the Andean region as well as opening the agricultural frontier in the lowlands (Jones 1995). Colonization of the lowlands was especially encouraged by the nationalization of tin mines in the highlands, the opening of the road between Trinidad and San Borja with its consequent rise in prices of lands around it, and drought in the 1980s in the highlands (Reyes-García 2001).

In 1974, the Bolivian government approved a plan to relocate miners and landless peasants from Quechua and Aymara indigenous groups (commonly referred to as *collas*). They

were moved from the Andean highlands to the Ballivián province of the Beni department, between the Beni and Maniqui rivers, in the ancestral Tsimane' territory (Chicchón 1992). In 1980, under the idea of an empty, pristine Amazon, the National Institute of Colonization brought the first group of colonists to the area of Yucumo. This institute had planned to have 84 settlements or nuclei, each of them consisting of 40 lots of 25 hectares each (Navia 1988).

In the process of settlement, the colonists were accompanied by a topographer and given some working tools and food supplies. These Andean colonists did not have enough technical assistance for their move to the lowlands (CIDDEBENI 1994). No distinctions were made between plots regarding the soils' natural characteristics, or the lands suitability for agricultural or forestry purposes (Robinson 1995). There were no land areas established for the native indigenous peoples and the Colonization Institute did not implement programs for their economic development (Castillo 1988). Lands around newly constructed roads were invaded and cultivated mostly with rice by the colonists, who had little experience in tropical farming. Due to their failure in crop cultivation, many colonists families migrated to other colonization nuclei and began in the cattle ranching business or turned to hardwoods extraction (Chicchón 1992).

Andean colonists were able to keep expanding their territories in the lowlands in part counting on the advantage of their cultural and historical background of working in groups and living in a hierarchical society that has been successful at resisting colonialism. Also, their acculturation into national Bolivian society, gave the highlanders experience dealing with lawyers and the national Bolivian system, while the Tsimane' lacked this kind of experience. The principle of land as a means to accumulate wealth was present in the *colla* mindset, and not in the Tsimane' who did not regard land as a source of economic wealth. Land rights were a new concept for the Tsimane', who were not aware of national laws, duties and rights, and have never

been organized as a group. These factors made them less able to fight back the colonists in competing for land. Dealing with the *colla* colonists made the Tsimane' aware of valuing the forest not only in terms of their livelihoods, but also for its economic significance (Huanca 2006).

Some significant consequences for the Tsimane' came about when some of the colonists changed their source of income from agriculture to timber trade and hired Tsimane' men as logging workers. The colla had established this trade with urban areas in La Paz, where they had contacts. They earned experience in chainsaw timber logging previously in the Alto Beni area. Rea (2004) collects in this interview the impression of a San Borja entrepreneur about the Andeans timber trade:

*“The timber trader has always been the colla, he is the owner of the truck, that comes with some little money to buy in place to sell in the market of La Paz. The “paisanos” (highlanders) are the ones that manipulate the locals and encourage them with money in order to get anywhere and to take hold of the trees.”* Interview with timber entrepreneur in San Borja, Rea (2004:106, translation by author)

The logging business problems suffered by the Tsimane' were not only caused by colla traders, but also from bigger logging firms. None of them has granted benefits to the Tsimane' for the exploitation of their forest and it is not possible to assess the quantity of timber extracted since neither communities nor agencies keep a record of these figures (Huanca 2006).

#### *Logging and conservation*

Parallel to the process of neo-colonization in the lowlands and always under the idea of the richness of the Amazon, 1970s saw the rise of logging companies that began to exploit fine woods from the Tsimane' territories. At the same time, the Bolivian government, supported by

German scientists, carried out a forestry inventory (Tobías Paz 2000). In 1978 the Bosque de Chimanes is declared the “Reserva de Inmovilización Forestal” (RIF). According to this land status, extraction of timber was prohibited while studies for the classification of the land as Permanent Production Forest or Protected Forest status were being made. The Tsimane’ forest was studied in terms of forestry purposes, and not for ecological or social endeavors (Lehm and Kudrenecky 1997).

In 1982 the Beni Biological Station (BBS) was created within the Reserve in an area of 135 000 hectares; it was reassessed by UNESCO as a Man and Biosphere Reserve in 1986, when the presence of indigenous peoples was recognized (Chicchón 1992). In 1987, within the framework of the debt-for-nature-swap, the BBS was provided with a trust fund of \$250 000 and legal protection for its management. The BBS was known internationally because as part of the swap, Conservation International acquired \$650 000 of the Bolivian external debt at a discounted price of \$100,000 (Anderson 2005). Meanwhile, as part of a conflictive process, two logging firms that were exploiting the forest exerted pressure for the change of the RIF to “Permanent Production Forest, which would allow the continual extraction of timber (Lehm and Kudrenecky 1997).

Under this new status, 579, 000 hectares of the Tsimane’ Forest were given to seven logging companies for forestry exploitation. There never was any assessment of the conflicts and consequences that the indigenous population could suffer from these exploitations, such as environmental changes and abuses, especially towards the non-acculturated indigenous peoples (Reyes-García 2001). Tsimane’ villages that had been formerly very isolated got abruptly integrated into market economy when their members were hired by logging companies (Alvarado 1996).

*Land tenure and indigenous identity*

*Creemos nosotros que lo que pedimos no es tierra de la luna, es tierra de Bolivia. Debemos tenerla también nosotros, los indígenas orientales (...) nosotros, ¿qué somos? ¿Somos extranjeros para no poder pedir territorio y dignidad?* Ernesto Noé, President of Central de Pueblos Indígenas del Beni (CPIB). Speech in La Cumbre, La Paz, sept 18 1990. File at CIDDEBENI, Trinidad.

*We believe that what we are asking for is not land from the moon, it is land from Bolivia. We should also have it, the indigenous peoples for the eastern area. (...) we, who are we? Are we foreigners so as to not be able to ask for territory and dignity?*

(Translation by author)

Because the abusive situation and the suffering different traditional populations of Beni lived, indigenous peoples organized themselves into the Central de Pueblos Indígenas del Beni (CPIB). In 1990, with the support of different environmental and indigenous oriented organizations, there was a protest rally known as the “Marcha por el Territorio y la Dignidad” (Rally for Territory and Dignity) that aimed to give importance to indigenous peoples’ integral view of the forest. In this remarkable demonstration, hundreds of indigenous peoples from the lowlands marched for 32 days the 650 kilometers between Trinidad, the capital of Beni, to La Paz, the capital of the country (Lehm and Kudrenecky 1997).

This march was a landmark to recognize the indigenous Amazonian groups, because most urban people in the country were unaware of the diversity of indigenous groups living in the lowlands. This was the first time the indigenous peoples from the lowlands in Bolivia expressed elements of what is called now “multicultural citizenship” (Molina, et al. 2008). On

one hand, they were showing their adhesion to national politics, on the other, they were demanding recognition as different cultures, showing their willingness to be part of the national politics while keeping their identity as indigenous peoples (Molina 1997). They showed themselves as people who know the forest and thus, as natural resources stewards, let the country know that the exploitation of the Amazon and associated problems should be major issues for all Bolivian nationals.

The Tsimane' participation in this protest rally was very low, apparently because the GCT was not willing to coordinate actions with the organizers of the rally. However, the Tsimane' and other indigenous groups obtained the benefit of a supreme decree recognizing their land as an indigenous territory, now called *Territorios Comunitarios de Origen* (TCO). After this decree, the indigenous organizations obtained support for the physical delimitation of their territory. As a positive outcome of this movement, new laws were made protecting the new territories from outsiders' encroachment (although in reality encroachment is still happening despite of the laws). Another positive result was the time limit to the logging companies which allows them to exploit the forest until 2011, when those concessions will go to the indigenous communities (Lehm and Kudrenecky 2007).

#### *Impact of Colonization for the Tsimane'*

The process of internal colonization of the Bolivian lowlands, continued the pattern of displacement of the local indigenous peoples, ignoring their rights and reducing the extension of their ancestral territory (Tobías Paz 2000). Consequently several problems arose including cultural, ecological, and land conflicts that threatened Tsimane' means of survival and changed their livelihoods strategies. The colonization and exploitation of the ancestral Tsimane' territory

brought several problems, noticeably cultural, ecological, and land conflicts already pointed out, that are related to one another.

With the neo-colonization, traditional Tsimane' land were transformed to construct roads and plantations, and even Tsimane' local names for places in the forest were changed. Logging extraction has extended roads into the forest, creating a belt of ecological damage around them. Natural resources such as wild game and fish, that the Tsimane' relied on to survive became scarce due to demographic pressure (Rea 2004). The introduction of nontraditional methods to exploit the resources, such as the use as dynamite for fishing, also became apparent.

Land tenure has been especially a conflict point between the Tsimane' and outsiders. The Tsimane' have a strong sense of territoriality, evidenced in their worldview and their livelihoods which use the forest resources in an extensive way. Tsimane' are well aware of their dependence on the forest, but without notion of private property (Byron 2003). Although it is not common for the Tsimane' to denounce encroachments, The GTC has done some occasional interventions when they have been asked, such as negotiating with *colla* settlers on borders for colonization (Huanca 2006).

### **The new indigenous force in the time of Evo**

Indigeneity in Bolivia has risen as a privilege marker in the wake of the new government under Evo Morales, an aymara born who got engaged in politics in a Quechua colonization area (Albro 2006). His election in December 2005 has been an important component in the increasing social and political conditions for recognition and acceptance of indigenous identity (Canessa 2007).

Indigenous issues are prioritized and its recognition has been rapidly assumed in substantive ways. The studies for the implementation of legislature that takes into account the plurality of cultures within Bolivia is an example of this new approach. This new order also

shows great adoption of icons of the highlands such as the coca leaf and wiphalas (flag of indigenous nationalism) as national symbols; both the symbolic and the practical approaches to indigenous issues by Morales' government are regarded as highly *colla*-centric, favoring mostly the indigenous peoples from the highlands (Albro 2006).

At the juncture of Bolivia's first government presided by an indigenous person and the prioritization of indigenous problems in its administration, the colonists of colla cultural background in the lowlands increasingly show themselves as indigenous peoples, whereas in recent years they would have identified themselves as campesinos (peasants) (Canessa 2007). Being indigenous is transformed from a criterion of exclusion for power relations in national politics to a criterion of inclusion. However, in reality the lowlands indigenous peoples who have been called "tribus selvícolas" ("wild tribes" Forestry legislation 1974), or "marginal ethnic groups" (Colonization Law 1996) are still excluded from representation of the new power order. On the other hand, the *colla* in the lowlands identify themselves with the new president, and are aware of the new opportunities that might arise at this new political juncture.

The very much needed recognition of the lowlands' indigenous population rights required a radical action, the "Rally for Territory and Dignity" (Flores, et al. 2002). In the wake of the new government, further leadership coming from the lowlands indigenous peoples is needed so that they can have their share of power in the new political system. This will only be possible with sustained political experience from the organizations that represent the different Amazonian indigenous peoples, which will require increased education.

### **Chapter Summary and Conclusions**

The Tsimane' people had historically less contact with outsiders than other geographically close Amazonian groups. During the colonial era-in the first encounters with

outsiders- the Tsimane' dealt intermittently with missionaries who were not able to break their semi-nomadic traditional way of life and were unsuccessful to settle them down into missions. This was in part due to the Tsimane' social organization of highly mobile small family groups that lacked a centralized figure, their extensive use of natural resources over the territory, their experience with outsiders' diseases, and the shaman's collision with Catholicism.

Although Tsimane' contact with missionaries was less frequent than that of nearby indigenous groups, it affected their culture and environment dramatically. Ritual religion and traditional social practices, such as drinking native beer, were prohibited. The new colonial order brought the introduction of new crops, cattle, iron tools, and fire arms which changed the natural environment and the indigenous peoples' livelihoods forever.

In the wider space of economic development activities in the Amazon, the Tsimane' were able to avoid the rubber boom and associated activities, although after its fall, they began to feel the pressure of the Amazonian frontier expansion with the influx of whites coming from rubber areas into their territory and the economic development of the town of San Borja. Cattle ranching became an important economic activity that relied heavily on indigenous peoples' labor.

Although San Borja was increasingly linked to the rest of the country, the indigenous peoples did not have this opportunity, and with the beginning of development in town, they were confronted with a system of exploitation, physical and economic abuses. The development of the town also gave the opportunity for the Tsimane' to be integrated to the local economy, trading non forest timber products for new manufactured goods. Depletion of natural resources and its effect in the Tsimane' is more obvious at this time, when traditional edible game became more difficult to find.

The 1952 reforms in Bolivia legalized land tenure for ranch owners in the Amazon and increased the competition between whites and the aboriginal population for land. The reforms also brought new legal rights to the indigenous peoples and the reemergence of missionaries work in the Amazon. The missionaries worked for continual acculturation of the Tsimane', provided education, an alternative religion, health facilities, and some protection for their rights. At the same time, supporting the Gran Consejo Tsimane', the missionaries provided a means to voice Tsimane' concerns in the time of new development projects that began in Beni.

Among the most important issues opposing with Tsimane' interests are the recent colonization of the Amazon by highland colonists, an unorganized process promoted by the government under the principle of a pristine, rich Amazon that could support more people moving into the area. The historical experience that the Andean colonists had, both in dealing with governmental issues and their background as traders, helped them win legal battles against the Tsimane' and allow them to continue the encroachment and exploitation of the forest.

Projects aiming at intensive logging of the Tsimane' territory have also undermined the Tsimane' interests. These projects did not take into account the indigenous populations' opinion on the use of their ancestral territory. This internal colonization process has brought several cultural, ecological, and land conflicts against the Tsimane'. Villages that used to be very isolated started to increase their contact with market economies changing their socio-cultural circumstances.

Conflicts within the indigenous territories in Beni accelerated their concern for the recognition of their citizenship and land rights, which was demanded through the "Rally for Territory and Dignity". This demonstration allowed the indigenous peoples of the lowlands to gain recognition in the wider political space of the country. It resulted to the time limit to the

concessions to logging firms until year 2011 and recognition of the land as indigenous territories and eventually its demarcation. However, encroachments still exist in the Tsimane' territory, to the point that some interventions have been done by the GTC.

Most recent developments in Bolivia, particularly the election of Evo Morales, are related to the new increased political and social power associated with being indigenous. The new government has taken a strong position on its priorities regarding indigenous issues. However, it is highly criticized for its preference towards the highlander indigenous peoples. For lowland indigenous peoples, to gain further political position in the new order, there is a need to increase leadership in their organizations, that should come from their sustained political experience.

## **CHAPTER 2: TSIMANE' CULTURAL AND NATURE RELATIONSHIPS**

In order to understand the setting in which Tsimane' children acquire traditional environmental knowledge, it is necessary to appreciate the socio-cultural and environmental conditions where the Tsimane' carry out their livelihoods. In this section, I will give an overview of the communities where my work was carried out. I will also briefly describe the sociocultural organization, natural environment, productive activities. For these descriptions, I draw in my ethnographic observations and in previous socio-environmental research carried out among the Tsimane in the last two decades (Apaza 2002; Byron 2003; Chicchón 1992; Daillant 1994; Ellis 1996; Huanca 1999; Pérez 2001; Piland 1991; Reyes-García 2001).

### **Sociocultural organization**

#### *Settlement and mobility*

The Tsimane' have been considered by outsiders as a nomadic culture. Traditionally, the Tsimane' settlement pattern was of isolated clusters close to river banks, composed of around five households with kinship nexus (Daillant 1994; Riester 1976), rarely numbering more than 50 individuals (Piland 1991). This pattern is currently uncommon due to increased market integration and missionaries' influence, among other factors already discussed in chapter 1.

Current community settlement patterns are closely linked to the foundation of schools in the villages, as it has been the case of other Amazonian groups (Heckler 2002; Zent 2001). For the Tsimane', this pattern consists of three to eight related extended families living in the same area (Reyes-García 2001).

Communities ancestrally settled are uncommon or impossible to find, and the Tsimane' sense of community is a product of traditional *sóbaqui*, the periodic visit to extended relatives outside of their area, which can have any duration from months to days (Ellis 1996). *Sóbaqui* is usually combined with productive activities such as fishing, hunting, gathering, and the tending of agricultural fields in other communities.

### *Kinship System*

The Tsimane' traditionally practice Dravidian cross-cousin marriage (Daillant 1994), so that unions are done between one's mother's brother's daughter or son, or father's sister's son or daughter (called *fom*) (Chicchón 1992; Daillant 1994). Although not all adults were comfortable to talk about whether they were married to their *fom* –probably because it is a custom discouraged by the missionaries- I was able to witness two teenage marriage unions that followed these rules in a culturally correct way in Ivasichi, a community where I carried out most of my fieldwork. This pattern of marriage is eroding, though; Byron (2003) reports the lack of marriageable partners for several males in the isolated village of Yaranda.

The newly married couples initially take matrilocal residence (Chicchón 1992; Huanca 1999), and eventually move their house close to the husband's parents. Some sororal polygyny has been reported (Huanca 1999; Reyes-García 2001; Rioja Ballivián 1996), although the proportion for the whole Tsimane' population is only 3%, according to a survey conducted by Godoy in 1996 (Godoy, pers. comm. in Reyes-García 2001). Although these marriages are highly discouraged because of the Christian influences, during my stay I observed two of these unions in Ivasichi.

*Political organization: The sense of community and authority*

As most aspects of Tsimane' life, their sense of community authority has also changed through the years as a consequence of integration into local economy and missionary work. As mentioned in chapter one, there is traditionally no centralized political structure among the Tsimane'. However, in the past two decades, as a result of the formation of the GCT, it has been necessary to elect local leaders (corregidores) in the communities, initially to represent village interests in larger meetings and to mediate with national authorities. The need for this kind of organization and elections was not obvious to most of the Tsimane', as illustrated in this interview to the president of the Great Tsimane' Council, Jorge Áñez:

*“Before, the Tsimane' brothers did not have this organization; with the creation of the Council we have organized community by community, **but it is not that we have imposed this**, ...but the first thing we do is to visit the community, have meetings with them, talk to them, explain them what all this is about, and the benefits that the organization meets. Once they understand and see the need for organizing, then they elect their authorities”* (Emphasis added, translation by author) Interview on 6/9/99 by Aparecida Tobías to Jorge Áñez, president of the Great Tsimane' Council (Tobías Paz 2000)

Personal traits of these elected officials must include mastery of Spanish language to the level of being able to decipher official documents, willingness to represent their community in front of local authorities, and occasional travel outside their communities if they are required to do so. The corregidores tend to be young men with links to the missionaries through their interest in the study of the Bible, or with blood links to the GCT board members. They are likely to

participate in other activities associated to the camba culture, such as taking part on the Tsimane' soccer team<sup>4</sup>.

Although traditionally elder Tsimane' have had little coercive power (Piland 1991), they have been highly respected. The recent emergence of the corregidores has changed this traditional power relationship, since these young men are getting opportunities their elders did not have before. These openings are not limited to the corregidor, but to other young men with the characteristics mentioned.

The community of Ivasichi –where I carried most of my work- provides an example for this kind of new young authority. It is customary to have meetings for religious purposes on Sundays, which are directed by young men who have regularly taken religious courses with the missionaries. Despite their perceived young age, there is a sense of respect towards them for their ability to comment the Bible, their higher education and their Spanish skills. Thus, educational, political and the religious factors go hand in hand for the transformation of power relations within the Tsimane'. Now the Tsimane' are getting transformed into a society where some members get new opportunities and local prestige through acculturation and political participation (Byron 2003). This trend might eventually change the paths in which traditional knowledge is transmitted and distributed, since the prestigious young men that have new opportunities into national society have preferences towards non-Tsimane' knowledge (Reyes-García 2001).

### **Tsimane natural environment**

Tsimane' inhabit their traditional territory in the banks of the Maniqui river. The forests in this area classified from wet and moist in the upper Maniqui river (Holdridge et al. 1971), to

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<sup>4</sup> This team competes in the San Borja league with good results.

gallery forests in the lower Maniqui extending to the Moxos savanna (Piland 1991). The wet subtropical territory has elevations of 500 m.a.s.l., where the climate favors high diversity of canopy trees of economic interest, such as *Swietenia macrophylla*, and *Terminalia oblonga*. Another important resource in these forests are patches of the palm *Geonoma deversa*, whose leaves are woven into thatching material.

The environment in the savanna region lies in elevations between 150 and 250 m.a.s.l. These areas are botanically less diverse, and are characterized for the severe lack of gradient -5 to 30 cm per kilometer (Chicchón 1992)- and soils impermeable to water, which makes the area easily flooded (Piland 1991). In this region, grasses (*Poaceae*) and sedges (*Cyperaceae*) predominate, as well as generalist species like *Hura crepitans* (**conófoto**) and *Attalea phalerata* (**manai**). Slips of gallery forest and patches of forests known as islas, spread through the area. When this ecosystem is flooded, (January-March) this is the only vegetation that can be seen; in April, when the waters begin to retreat, small ponds appear and can disappear completely with the dry conditions that will come in June (Jones 1995).

The climate in the territory is divided in wet and dry seasons, which can be extreme. The wet season begins in October and lasts until April; during the time of this research, the average monthly rainfall for the wet season was 188.4 mm. The dry season usually extends from May to September; for the time of the study it had a monthly average of 62.8 mm. The annual accumulated precipitation was 1860.4 mm. A graphic view of the rainfall seasonality can be observed in graph 1. The average annual temperature was 26.7° C, with extreme temperatures of 35.6°C and low of 11.1°C.

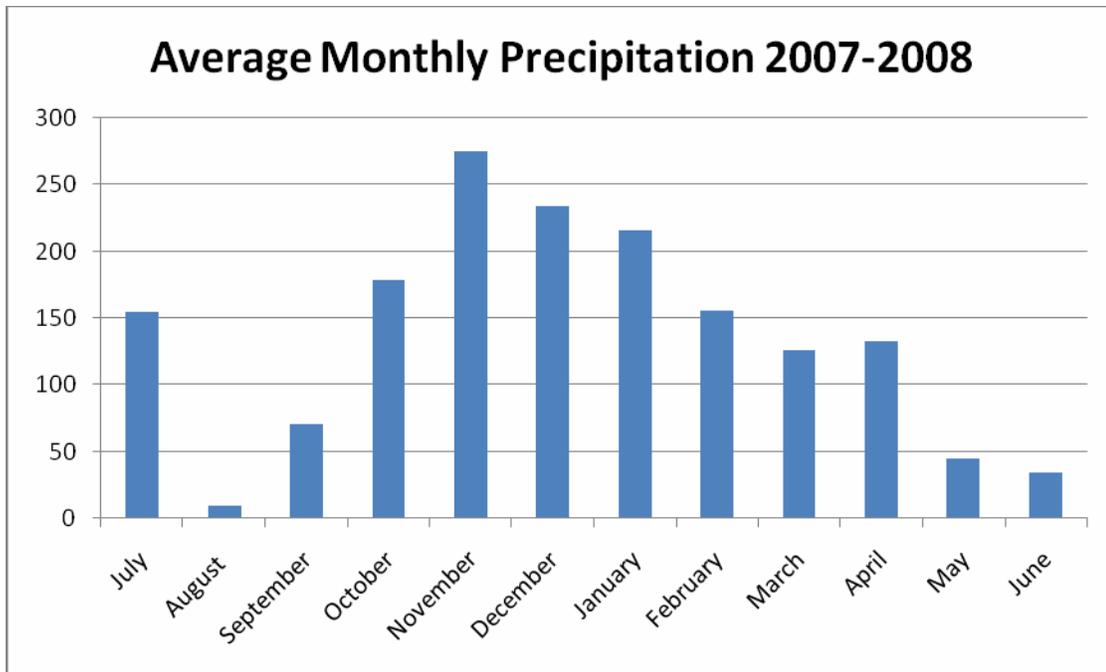


Figure 3.1. Average monthly precipitation (mm) in San Borja for the year months of July 2007 to June 2008..

Regionally, it is important to note the importance of the extreme low temperatures that occur seasonally, locally known as **tyi'mu** (or surazo, in regional Spanish), which are a consequence of Artic winds. These winds can reach speeds of 60 km/h, and affect deeply the activities that are carried out in the communities. Tsimane' tend in this time not to carry out much of the regular outdoor activities, classes at school get canceled, and people stay close to their fire pit at home.

### **The communities for this study**

The Tsimane' live in approximately 100 villages spread in the environment previously described. The communities where I lived during my field work are San Antonio (from July to mid December 2007 for initial pilot testing) and Ivasichi (December 2007 to June 2008 and consequent short visits for most data collection). I chose these communities under the guidance

of the Tsimane' Amazonian Panel Study. Here I give a brief description of some relevant geographical and socio-economical conditions of these communities.

*San Antonio*



Figure 3.2. map of the community of San Antonio. (Courtesy of Max Guêze)

This community lies on the lower Maniquí river (14°48'771, 66°39'8066), 10 km NE from San Borja. There are 58 households on both sides of the river, with 192 inhabitants (including some highly mobile households). This community can be reached by car or motorcycle in one hour during the dry season; during the wet season it can almost only be reached by foot, which takes 3 hours.

San Antonio lives under several pressures: first, from cattle ranchers, due to the natural savanna environment that borders in the western side; second, from outsiders who own farms in

the north (a plot that is under dispute); third, they have the influence of the *camba* community of Santa Elena, which is located some 30 minutes away by foot.

San Antonio is a much acculturated village when compared to other Tsimane' communities. They are more heavily influenced by the regional camba culture and Spanish language. There are five non-Tsimane' households identifying themselves as of mixed camba-Yuracaré heritage, who are fluent in Spanish. There is also a longer tradition of teaching in Spanish in this school than in others.

Because of its closeness to San Borja and cattle ranches, San Antonio's men tend to live and work as wage laborers outside of the community, and return home periodically for few days at a time. Other aspect changing the dynamics of the community is that, at the time of research, nine young Tsimane' were working for different research projects as interpreters. Their households receive a better and steadier source of income than if they are agricultural wage laborers, and therefore, they can introduce in the community goods inaccessible to the rest of the population, which brings tension to the community about these families' higher status.

Another consequence of their closeness to San Borja is that San Antonio receives short term visits from researchers and aid groups often; during my stay, there was an average of one visit per month by outsiders conducting different surveys and research. This seems to be another source of tension among the population; on one hand, some people have the perception that outsiders come with "too many questions to answer", and that participants do not get anything in exchange. Other Tsimane' believe that collaborating in research is good because it can be beneficial for their livelihoods and general wellbeing in the long run.

## *Ivasichi*

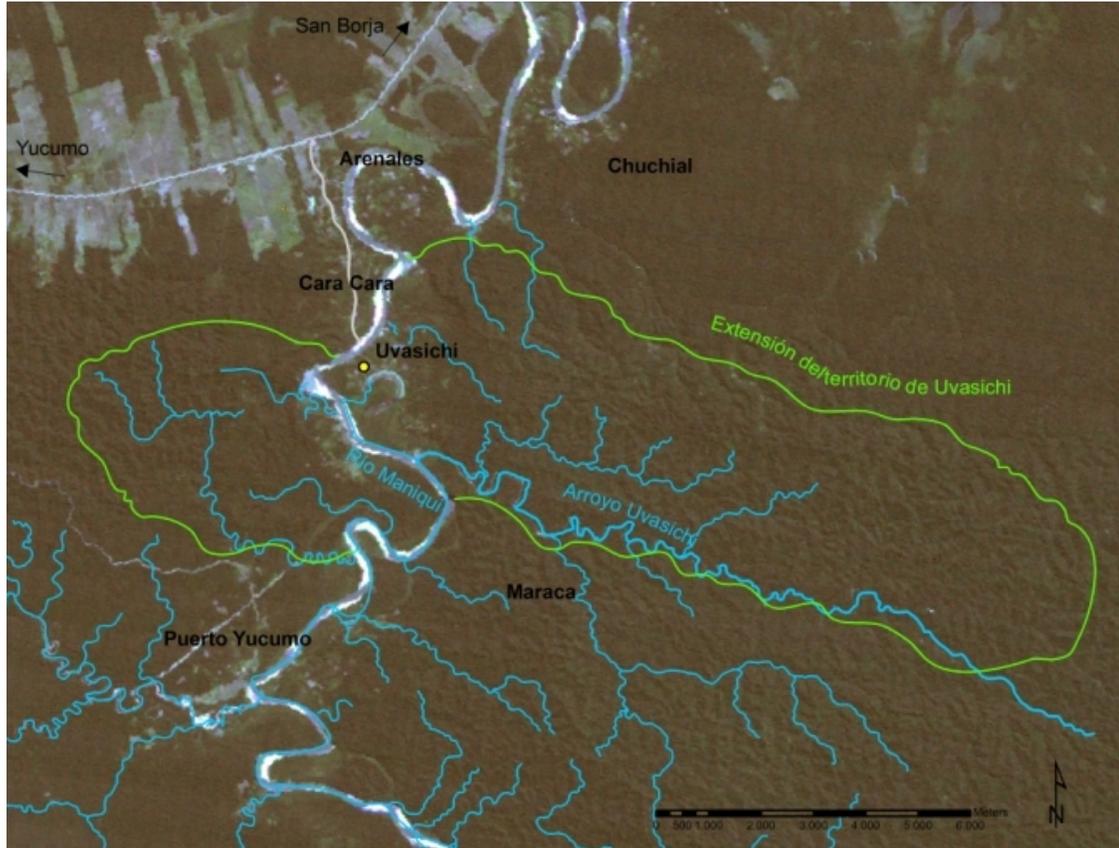


Figure 3.3 Map of Ivasichi and nearby communities. (Courtesy of M. Guêze).

This community lies in the upper Maniqui river (15°11'050, 66°54'510). It is located at 48 km from San Borja and 15 km from the *colla* settlement of Yucumo. It limits to the North and East with the Maniqui river, and to the South and West with secondary forest and the community of Maraca. There are 29 households in the community, with a total of 147 inhabitants. All the families living in Ivasichi are Tsimane'.

Ivasichi is geographically and culturally more isolated than San Antonio. Getting to this village from San Borja requires first a trip by the main San Borja - Yucumo road, then by a secondary path to the Maniqui river, and finally crossing the river to reach Ivasichi. In the dry

season the trip on the roads takes an hour and fifteen minutes, and crossing the river can take 20 minutes, depending on the conditions of the river and the abilities of the canoe driver. During the wet season, this same trip takes three hours because cars cannot use the secondary path connecting the San Borja-Yucumo road to the river. In this case, it is necessary to walk the path for an hour and a half and then engaging in the trip to San Borja, which is slower because of the slippery condition of the San Borja-Yucumo road in this season.

There are fewer economic opportunities taking the Tsimane' away from their community in this village, and at the time of this research, most men in the community were living their households and participating in the tending of their agricultural fields. However, extractive logging activity is common, and several Tsimane' deal with loggers to work for them for day wages. Only one Tsimane' household owned a chainsaw, and the members of this extended family could negotiate timber directly with the loggers.

### **Tsimane' Production Systems**

The use and manipulation of natural resources by indigenous peoples is a recurrent topic in anthropological work (Conklin 1954, Rappaport 1968, Balee). Subsistence activities in the local environment are embedded in a complex web of traditional environmental knowledge (Posey 2002). Although there are variations from place to place within the same culture, and the ethnobiologist is very conscious about them (Berlin 1992), there is also a pattern shared of knowledge that characterizes societies (Kroeber and Kluckholm 1952). In order to find these patterns, the anthropologist has to not only ask direct questions, but also draw inferences based on observed behavior during participant observation.

In this section I give a brief description of pivotal traditional subsistence activities among the Tsimane', namely agriculture, fishing, hunting, and gathering. Although it is difficult to make generalizations that fit all communities and households, I center on patterns that I consider that are shared, unless otherwise noticed.

### *Agriculture*



Figure 3.4. Field being burned for shifting agriculture purposes.

The Tsimane' practice swidden agriculture, which is recognized as an integrated system of subsistence (Raintree & Warner 1986). Although to the untrained eye this system can seem chaotic, it is adaptive for the conditions of many indigenous peoples (Conklin 1954, Rappaport 1968). Shifting avoids the emergence of plagues found in recently cropped areas. The preparation of agricultural plots is done so that they are not next to each other, but dispersed

within natural forest galleries. Ecologically, this practice makes sense because subsequent regeneration is faster than if they were to prepare several adjacent plots (Huanca 1999).

Afterwards, fallow can be reused after five years of its abandonment. For a complete analysis of Tsimane' swidden fallow management see Huanca (1999).

Agricultural labor is carried out with the help of the whole family, with some gender separation in the different tasks. For example, men tend to be the ones in charge of burning and preparing the field, and women and children help later on with the cleaning of debris from the area. Women own their own agricultural plots, which are usually closer to their house than their husbands' plots. The area of plots owned by females tends to be smaller than the males, and its product is more related to household consumption than to commercial activity. After a swidden agricultural plot has been producing for a couple of years, it can be used to plant semi-domesticated fruit trees such as limes (*Citrus limetta*) and peach palm (*Bactris gasipaes*). These modified habitats are rich in cultigens and protected plants, and Tsimane' return to these places for gathering.

Piland (1991) reports 90 plant species cultivated as edible crops, medicinal, and fish poison. Their main staples are plantain (*Musa balbisiana*), rice (*Oryza sativa*), cassava (*Manihot esculenta*), and corn (*Zea mays*). Huanca (1999) points out that plantain, cassava and corn are necessary not only for food, but also a pivotal resource to make native beer. The conspicuous social consumption of native beer is culturally necessary for leisure time, and also to pay back to visitors, such as relatives in **sóbaqui**.

In the communities where research was done, rice and corn tend to be sold in the local market. At the beginning of 2008, rice was of special importance in the communities where research was carried out since the market prices were rising in comparison to previous years.

Gardens around the houses are another source of Tsimane' subsistence. Although there is no intensive household gardening among the Tsimane', they protect species of interest that grow spontaneously in their yards, such as different fruits, medicinal plants, and fish poisons. The contribution of gardens to household consumption is in average 8% (Reyes-García 2001). An analysis of Tsimane' traditional agricultural practices is given by Piland (1991).

### *Hunting*



Figure 3.5. Preparation of **mijmama** (*Melanosuchus niger*). This specimen was hunted in Ivasichi by an adolescent and given as a gift to his future mother in law. Children from the household observe meat preparation carefully, attracted by the animal's appearance.

Hunting is an activity that lies in the heart of Tsimane' culture, joining several economic, social, and diet factors. Although males are the ones that engage traditionally in hunting trips, Huanca (pers. comm.) claims that Tsimane' women traditionally play an important role in this activity because they encourage their husbands and male relatives to go hunting, since lacking meat in any of their main meals is regarded as the pinnacle of poverty for the Tsimane'.

Although I estimate that households in the more acculturated community of San Antonio had less hunted meat in their diet than in Ivasichi, I saw more parties of women hunting in San Antonio. Women hunting trips do not extend as long nor as far as the males', and they seem to get lower yield because the abundance of fauna is decreasing in the secondary growths they visit. Women tend to get back to their house within the same day, probably to keep with their household responsibilities and also to avoid forest's spirits (**O'pito**) that are believed to appear later during the afternoon.

Female engagement in hunting activity can be explained because more men are working outside the community of San Antonio, so women must take the responsibility of providing protein to their house. The female hunting parties consistently used dogs and machetes instead of bows and arrows or fire guns. Dogs are especially helpful for finding certain game animals, like **shatij** (*Agouti paca*), but not for the location of monkeys (Gurven, et al. 2006). Detailed descriptions of hunting technology, yields, and game comparison among the Tsimane' can be found in Apaza (2002) and Chiccón (1992).

During my research, I did not observe as much hunting as I expected in Ivasichi, probably because during the period of time I lived there (December 07-June 08) the agricultural work was the priority in most households since the price of rice was high, and they were

obtaining meat from bartering this rice. Extensive research time would be necessary to conclude whether this is a trend or if it was just a temporary adjustment.

Game hunted represent around from 12% to 19% of household consumption, depending on acculturation factors (Reyes-García 2001). For the Tsimane', most mammals are edible; some of the most desirable game to hunt are peccaries (**mumujñi**: *Tayassu tajacu*, *Tayassu pecari*), tapirs (**shi'**: *Tapirus terrestris*), deer (**ñej**: *Mazama Americana*, *Mazama gouazoubira*; **bachona**: *Blastoceros dichotomus*) and spider monkeys (**odo'**: *Ateles paniscus*). However, these animals are hard to find, and it is more common to hunt less desirable prey, such as rodents like squirrel (**bäcäj**: *Sciurus sp.*) and capybara (**otó**: *Hydrochaeris hydrochaeris*). Remarkably, this last species used to be taboo for eating, but nowadays is increasingly consumed and even raised.

### *Fishing*

Fishing is pointed out as the most secure way of obtaining protein for the Tsimane' (Chicchón 1992; Pérez 2001). Fishing can be practiced daily year round, Tsimane' communities have several water sources where fish can be found, it is almost certain that at least small fish will be caught.

Tsimane' have developed several technologies for fishing, which include fish poisoning, fishing with hooks, and nets. These technologies are used depending on the season and the specific place where to fish. For example, fishing with hooks and canes is the most common technology used during the rainy season; also -for safety concerns- in this season it is preferred to fish in smaller streams and ponds than in the river (Reyes-García 2001). During the fish migration season (dry season), it is better to fish with higher yield technologies like the use of nets or fish poisoning combined with bows and arrows instead of hooks. Fish poisoning requires the preparation of either **conófoto** (*Hura crepitans*), **vashi** (*Serjania tenuifolia*) or **chitó**

*(Tephrosia vogelii)*. Although I asked several times, it is not evident that there is a strong preference towards any of these toxins, and their use seems to depend on which one is available. According to several Tsimane', all of these plants have the property of “getting the fish drunk” (**shu'qui**). Detailed description of fishing technologies and yields are found in Chicchón (1992) and Pérez (2001).



Figure 3.6. Tsimane extended family participating of fishing. Men extend a net while their wives use machetes to try to get the catch that did not get into the net.

As other subsistence activities among the Tsimane' fishing is both an economic as a social activity associated with several realms of knowledge. Fishing in both of the communities

where I worked was a continuous task practiced by men, women and children, with some gender differentiation in the specific chores to carry out during the catch.

Fishing can become a big event, where food can be prepared on the spot, and surplus fish is preserved by smoke or salt for future consumption. Children have an underestimated contribution in this daily activity. While they claim that they are practicing with their hooks and lines, they contribute to their domestic daily consumption with the small fish they catch. This can be sometimes the only protein source there is available in a household.

### *Gathering*

Gathering contributes to the variety to Tsimane' traditional diet, adding different products available throughout the year, as well as it can be a source of products appreciated for their market value. All Tsimane' participate in gathering, usually simultaneously as part of another activity such as agricultural work, hunting, or –in the case of children- playtime. Old fallows, forest and savanna islands environments are the chief locations for carrying out gathering activities.

The gathering of wild plants is an important custom among the Tsimane', taking place during the whole year. Close to the households there are rich agro-forestry systems, where gathering occurs for firewood, medicine, and some semi-domesticated edible plants (**manco**: *Mangifera indica*; **jiji**: *Chrysophyllum sericeum*; **tsocon**: *Rheedia acuminata*, among others). Intermediate fallows can be further away and less rich in edible species, but these are the places where there are *patches* –high populations- of plants of interest, and the place for collecting certain wild edible fruits (e.g. **tyutyura**: *Mauritia flexulosa*), and other special products like dyes (e.g. **itsi**, *Picramnia* aff. *sellowii*), roofing materials (**cajtafa**: *Geonoma deversa*; **manai**: *Attalea phalerata*), and plants used for ritual purposes (e.g. **tyi**, *Genipa americana*). For detailed

information on gathering, see Reyes-García (2001). Gathering of wild edibles are of especial importance for children's acquisition of ethnobotanical knowledge, and will be discussed in chapter 4 from this perspective.



Figure 3.7 Tsimane' father and son collect **manai** (*Attalea phalerata*) leaves, used as roofing material.

Another product Collected by Tsimane is honey (**coroma**), appreciated both for household consumption and for its value for bartering or selling in town. The camba appreciate the quality of Tsimane' honey, and regard it as superior to other commercially available varieties

of this product. I saw that when available in San Borja, Tsimane' honey was more expensive than the industrialized kind.

Collection of wild fauna alive is also an important practice, which I saw more commonly in the community of San Antonio. This kind of collection is done for trade with the camba. Different kinds of parrots (*Forpus xanthopterygius*, *Ara* sp.) have a wide market in town. The offer of wild fauna is especially high during the annual celebrations in San Borja (October 10<sup>th</sup>), that all Tsimane' try to attend. Entire families can walk for several days to participate marginally in the *fiestas*; having a light weight item to sell or barter during the festivities provides an easy way to get cash, necessary for enjoying the festivities.

### **Chapter Summary and Conclusions**

The Tsimane' have traditionally lived as a semi-nomadic group united by kinship links. Sedentary settlement is a recent introduction, adopted nowadays by most of the population. **Sóbaqui**, the traditional visit to relatives living far away, gives the Tsimane' a sense of community and connection within extended family. It also allows them to take advantage of the different ecological settings for productive activities.

Kinship relations in this population are very intricate. Cross cousin marriage is traditionally practiced among the Tsimane', although it is highly discouraged by Christian influence; ethnographic evidence shows that there are still young Tsimane' practicing it. There are also reports of sororal polygyny being practiced, although in very low proportion.

The Tsimane' traditionally lacked leaders, but their elders were highly respected. Sociopolitical organization is changing for this group not only as a consequence of settlement, but also as part of the Gran Consejo Tsimane' aims of having local organizers (corregidores) in each community to represent village interests at higher levels. Leadership positions require

education and Spanish skills that older Tsimane' do not have. The introduction of the Corregidor figure has had an impact in power and prestige relations in the communities, since these young men get opportunities as a consequence of their acculturation.

The rich environments that constitutes the traditional Tsimane' territories are wet and moist forests as well as savannas. The climate in the region is seasonal between rain and dry seasons, marked by extremes. The temperatures can also vary radically and affect the way Tsimane' carry their daily activities. The natural conditions allow thorough use of natural resources, namely by productive activities such as hunting, gathering agriculture, and fishing. These livelihoods, joined to the particular social organization of the Tsimane', result in wide traditional environmental knowledge.

Swidden agriculture is traditionally practiced by the Tsimane', both for providing their homes with staple foods, and for trade in the local market. Fishing is a secure way of obtaining food for the Tsimane'. Several technologies are used depending on the season when it is practiced. Gathering is another traditional activity that makes use extensively of their territory. It widens the traditional Tsimane' diet, and also gives the chance to collect goods that can be sold or bartered. Hunting, an activity heavily associated with men, seems now taken by women in more acculturated communities. However, their yields may not be very high due to decreased fauna and shorter trips than the ones men take. The Tsimane' extensive use of their natural resources makes interlacing of traditional activities a regular relationship.

All members of Tsimane' families participate in these activities, with gender differentiation within the tasks. Patterns associated to traditional activities have transformed as a consequence of environmental and social change. Influences by outsiders, in the form of encroachment or the push to learn Spanish, are part of the conflictive relationships pressures that

Tsimane' live nowadays. These changes have consequences in the way ethnobiological knowledge is passed down.

### CHAPTER 3: TSIMANE' CHILDREN LEARNING



Figure 4.1. Tsimane' mother and children harvesting *cãñere* (*Ochroma pyramidale*, Bombacaceae). Children get the opportunity to help in this task, carried out in areas close to the community. The cottony part of the flower is used in the fabrication of mattresses. This product was sold to intermediaries for around \$4 US per *arroba* (12 kilograms).

Children gain traditional knowledge through lived experience. The specific conditions of each community, the cultural influences from outsiders, the economic situation, and environmental context must play an important role in the manner and the kind of knowledge that children acquire and their personal decisions. In this section I address through a child-guided ethnography, the learning context in Tsimane' communities focusing in the villages of Ivasichi

and San Antonio, where most of my doctoral research was carried out. The learning environment of other Tsimane' communities might be different due to their specific conditions.

### **Tsimane' children socio-environmental interactions**

Social interactions are important in the acquisition of any kind of traditional knowledge. A recurring topic in the studies of transmission of traditional environmental knowledge is the vertical transmission of knowledge and skills (Hewlett and Cavalli-Sforza 1986a; Hewlett and Cavalli-Sforza 1986b; Lozada, et al. 2006; Ohmagari and Berkes 1997; Ruddle and Chesterfield 1977). Mothers and grandmothers have received special attention when it comes to the specific transmission of plant knowledge (Cruz Garcia 2006; Lozada, et al. 2006). The contribution of siblings and other actors in children's lives, cannot be ignored (Zarger 2002).

Here I describe some of the most important interactions in Tsimane' children's lives chronologically, contextualizing these relations in their natural environment. I am dividing these stages according to the local words used for different children's life stages: first, they are called *joijno* (baby) until they can walk; then, the word *miquis muntyi* (literally "little people") is used for children in general until approximately age 10; after that, they are called *nanas* (for females) and *nanat* (for boys).

Although rites of passage among the Tsimane' marking the end of a stage and the beginning of the other do not exist, it is evident that there are differences both when seen from the kids' perspective or the adults'. Children tend to gather within their same age group; also, they are given increased responsibility according to their age regarding the activities they help with, until they reach the age to form their own family.

*Jojno'in*



Figure 4.2. Tsimane' mother carrying out household chores. The “package” hanging is her baby, who is sleeping in a traditional **ashaba'** sheet.

Babies are taken care of mostly by their mothers, who receive the help of female relatives for household work when she is recovering from childbirth. A set of taboos are to be followed so the baby does not get sick, one of them is that the parents should not have sex (Chicchón 1992). If a baby gets sick the father is to blame of irresponsibility for sleeping with other women, and to be rejecting the just born. Another taboo refers to babies vulnerability to forests spirits. Very young babies' skin is dyed with the fruit sap of **tyi** (*Genipa americana*, Rubiaceae), acquiring a blue tonality. I was told that since the baby acquires a dark skin tonality, bad spirits get confused

about the location of the newborn so his soul does not get stolen; this custom also has the property of making the baby's skin "stronger".

Babies are usually kept in a hanging hammock, traditionally made of **ashaba'**, or from a regular manufactured blanket hanging in the house. It is customary not to take babies out of the household environment because the **O'pito**, spirit of the water, can harm them (Chicchón 1992). If for any reason they have to be taken into trips, it is necessary to avoid the places where the **O'pito** usually prowls. It is also necessary to carry a torch in front and burn tobacco at the back of the traveling party to deter the bad spirits presence. While I was in Ivasichi, a baby died after his family had taken a trip to collect fruits; his death attributed to the **O'pito** spirit, and partially to the parents for not having observed the customs to deter the spirit from following them.

*Miquis muntyi*



Figure 4.3 Tsimane' girls playing with dolls made by themselves.

Smaller children -under the age of 7- tend to stay close to home and to their mother, and are not allowed to wander around on their own; however, it is not uncommon for them to go off with older children fishing or visiting nearby relatives in their same community.

Children are socialized into their gender roles at an early age, although Tsimane' appreciate learning the activities that traditionally correspond to the opposite sex (Daillant 2004). In this way, girls take the responsibility of caring for their siblings or other relatives (cousins or younger extended relatives), but it is not uncommon for boys to take care of their younger siblings if they are asked to do so. It is important to highlight that in my experience, although sibling care can be a source of amusement for the caretaking party because the smaller ones are good playmates, it is also regarded by adults as a very serious activity. The only episodes I witnessed in the communities of parents' scolding their children in a harsh way, were related to negligence while taking care of younger children.

Boys are allowed to wander away from their houses more than girls; everyday contact with nature for boys goes further in their geographical setting than their female peers. Boys are entertained in making and trying their own bows and arrows, or using slingshots to knock down birds; these activities can take them away of their nearby household environment, providing even more opportunities for acquiring environmental knowledge. It is expected that girls carry out activities more fully responsible in household help and less in playing, which seems to be a regular cross cultural pattern (Lancy 1999).

Daily household chores usually linked with females include fetching water from the river or the well, getting firewood, collecting seeds for necklaces and making them, weaving, and cooking. On the other hand, productive activities linked to boys include fishing in the river. Chicchón (1992) points out that the fishing activity carried out by children was usually

downplayed by the Tsimane' when she carried out her fieldwork. She realized children had a great contribution to the household diet because these fish were sometimes the only food some families had for breakfast. However, children regarded fishing as a recreational activity with the only importance of practicing their skills.

Spending time looking for wild or semi-domesticated edible plants (**jiji**: *Chrysophyllum sericeum*, Sapotaceae; **mito**: *Vitex cymosa*, Verbenaceae; **manai'**: *Attalea phalerata*, Arecaceae; **catsare**: *Acrocomia aculeata*, Arecaceae; **coti**: *Psidium guineensi*, Myrtaceae; **vishiri**: *Inga sp*, Fabaceae-Mimosoideae; **ijsita**: *Pseudolmedia laevis*, Moraceae) in nearby roads and communal areas is a common practice, both for groups of boys and girls. This activity provides a combination of food provisioning and a source of play (**macmadye**) in the process, since the climbing of trees can be amusing both for the participants and the observers. The product of this activity is often consumed on the spot; only a fraction of these fruits make it into the settlement.

Other sources of recreational activities include make-believe games. I was able to see girls creating imagined households and household objects with items from surrounding nature, and from man-made materials. Since Tsimane' buy few manufactured goods (Godoy, et al. 2007), and children have little say on what their parents buy, children have few toys bought in town. An illustration from my journal makes the point of the creation of toys with objects found in the local environment (See Figure 3.3):

*November 5<sup>th</sup>, 2007*

*I had a very interesting time playing with dolls with some neighbor girls. First, they were not really dolls, but stems from a plant (**shuru'** *Gynerium sagittatum*, Poaceae); they make "hairs" with a machete and then dress them and put flowers on their hairs. The clothes were made both from cloth and plastic wrappings from different*

*bottles. They were also able to make pots and pans with old tuna cans. They even started the fire for the dolls' meal! The dolls eventually left in a canoe made of banana bracts...the girls said the dolls had to go **sóbaqui** (visiting) their relatives in Chacal, a nearby community.*

Traditionally at this age, it was common to take children in hunting and gathering expeditions into the forest. Women and children would not go further than their traditional camp (*pascana*), where they were expected to wait for the men to bring wild edible game. Although I never witnessed any episode of this kind in the communities where I lived, Huanca (pers. comm.) is aware that Tsimane' living in more distant communities still practiced these expeditions some ten years ago. It is important to highlight that the reason why these excursions were not carried out when I conducted my fieldwork might be because they require the continuous presence of men, and since most of them work for outsiders or intensively in their agricultural fields in the study communities, this activity is not carried out anymore. Also, the distance necessary to travel in order to find edible game is reported to be longer than before.

*Nanas and nanat*



Figure 4.4 Tsimane' mother weaving a traditional bag (*sarai*). The daughter keeps close observation of the process.

At this age (over 10 years of age) Tsimane' parents expect their children to be more fully engaged in productive activities, still helping with the chores previously mentioned, but also gaining individual responsibility in activities like fruit gathering, help in the agricultural fields, and taking care of animals. Both boys and girls can be owners of domestic animals such as pigs and chickens, being responsible of them and making decisions like when to slaughter or whether to sell their animals or chicken eggs.

Some activities and skills that girls are expected to have learned at this age include making manioc beer (**chocdye**) or weaving traditional bags (**sarai**). The skill and mastery that children develop for these activities are dependent on their own interest and aptitude, as well as

the frequency in which they get to practice them with their transmitters. As expected, these activities were less frequently observed in San Antonio, the community closer to San Borja.

Gathering of fruits continues in this age group, and now they are allowed to wander into nearby fields further away from home than the areas they frequented at younger ages. Often, groups of siblings go to nearby places that they claimed that belonged to their relatives but that currently they do not actively manage. At this age, parents can send their children in groups unaccompanied by adults in organized excursions to old fallows specifically aiming at gathering certain seasonal fruits (cocoa: *Theobroma cacao*, grapefruit: *Citrus* sp.) and bringing them home, contributing to their family livelihood and chores. Their companions in these endeavors are siblings or other related children in their same age group.

The products of these gathering trips can be used by the whole extended families. Some of these products can be sold after being processed (e.g. cocoa paste) or they can be transformed into culturally important items, which is the case of beer made of citric fruits. Children contribute in this way to their household economy.

As a **nanat** or **nanas**, children constantly go collecting plants that grow further into the forest, if they have the chance of going with at least one adult. Some of these plants do not grow nearby nor in the fallows that they are allowed to go at earlier ages; such as in the case of the wild edibles **bejqui** (*Hymenaea courbaril*, Fabaceae-Caesalpinoideae) and **tyutyura** (*Mauritia flexuosa*, Arecaceae). Thanks to these activities, the geographical area where children acquire knowledge and the actors involved in this process keep expanding. Learning ethnobotanical knowledge involves informal interaction with different knowledge holders of different levels (for example, peers and adults). The process requires repeated observation, involvement and hands

on experience. Different aspects of knowledge, not only practical, are gained in this holistic process.



Fig 4.5 Tsimane' siblings bringing cocoa fruits (*Teobroma cacao*) to their house in traditional woven bags (**sara'i**).



Figure 4.6. Tsimane' extended family eating cocoa fruit previously brought by the family children. The seeds were processed to make chocolate paste and sold to an intermediary.

Gathering wild fruits might come as a side chance from the occasion of going to help in main activities such as collecting non-timber forest products such as **cañere** (*Ochroma pyramidale*) or honey, or if they go to collaborate in agricultural labor in fields that require walks into forest areas, since some plots are located in the middle of the forest. The purpose of this fruit collection can be to consume edible fruits, as well as plants used for toys or for ornaments. This fragment from my journal illustrates one of these incidents:

September 25<sup>th</sup>, 2007

*My translator and I were practicing Tsimane' when, at some point during the lesson, she found out that my neighbor was going to the woods, so we ran to catch up with her. We had to cross one of those bridges made of just a thin tree trunk over the water, and I fell down without any consequence, since I fell in the dry area.*

*Then I could see my neighbor coming from the woods and then I realized that she was actually in a canoe, and that what I thought were woods, was actually water, a swamp full of aquatic plants (**tsique'** in Tsimane', Spanish: bajío). She came through in a canoe, picked us up, and then both women began to paddle. When there was no more water, we walked through the woods and ended up in a place where her daughter and nephew were; they were looking for **cañere** (a tree which fruit they take the cotton-like part). They will sell the cottony part during the fiestas [celebrations] in San Borja [nearby market town]. The kids were busy looking also for a certain vine which fruit they use to make a toy: a small canoe (some 25 x 5 cm). The boy (14 years old) would use a knife on the outer layer of the fruit, which has a leathery cover with small thorns and give it to the little girl (six years old). She was saving them into a canvas bag. I saw her later in the river with her sister playing with the little canoes.*



Fig 47. Children playing at bathing time with **pene'** (*Pithecoctenium crucigerum*, Bignonaceae) fruits, which are used as toy canoes.

Older **nanas** and **nanat** (13-15 years old) are expected to be more fully engaged in productive activities such as agricultural labor, and to have more refined skills; especially for girls in weaving bags (**sa'rai**) and boys in hunting and increasingly as wage laborers. It is also around this age that kids stop attending school, either because they have already finished their fifth grade, or because they get discouraged from attending because they are “bigger” than the rest of students. The direct interaction with adults seems to drop in this age group, and there is an increased trend and strive for independency and skills refinement. They also prefer to be seen as caretakers of younger kids, instead of playmates, as they did before. This distance from older and

younger cohort might be due to the fact that during this time, or shortly after this life stage it is the common age in which Tsimane' usually get married. Showing that they have refined knowledge and skills, especially in the case of boys, gives them a grown up, productive adult image as a good provider. At this age, even if they are single, boys and girls can own their own agricultural field, for which they are fully responsible.

Tsimane' teenagers increasingly face the pressure of Bolivian national culture contact. In terms of their choices of recreational activities, these are different than their parents'. It is more common nowadays for them to get compact discs in town of fashionable music, such as cumbias or Brazilian forro, which can get loud in the households' CD players. Researcher Victoria Reyes-García, who visited while my fieldwork was carried out, noticed how fast clothing had changed among the Tsimane', and that she had not seen girls wearing pants when she was carrying out her work, eight years before; after this comment it was evident to me that it was definitely a new trend among younger Tsimane'.

Tsimane' teenagers are aware about the repercussions of the choices they must make soon, which is especially true for boys. At this early age they are increasingly working as wage laborers, especially for loggers. It is also at this age that they see the importance of learning Spanish, which is instrumental for the communication with possible employers.

From ethnographic evidence, it can be said that Tsimane' learn Spanish principally outside schools, through dealings with non-Tsimane' visiting their villages. For instance, exchange with traders, loggers, or cattle ranchers are means of getting and improving Spanish skills. Another way of improving in Spanish ability are the local radio stations. There seems not to be conflict between learning Spanish and learning traditional environmental knowledge. Since

Spanish skills are attained in an opportunistic realm, they neither help nor hinder local knowledge.

Although teenagers are aware of the few economic opportunities they have besides working for wage labor, the mastery of Spanish is regarded nowadays as important for the case of getting a chance to become a teacher or teacher assistant or, in recent times, a research assistant for different projects in the area. Education opportunities beyond the fifth grade are a very recent option, and are still not taken seriously since the fruits of education require a longer term view than what the Tsimane' are traditionally used.

Changes that have appeared with increased integration into market economies tend to blend the young Tsimane' with the local Bolivian culture. The effect these changes have, especially in their economic choices, will have consequences in further transmission of Tsimane' traditional knowledge. Previous findings show that occupations that take the Tsimane' out of their villages and their environment, such as wage labor, are negatively associated with ethnobotanical skills, while economic activities such as farming and hunting, associate positively to ethnobiological knowledge (Reyes-García, et al. 2007). Continuing the trend of working for outsiders will likely decrease the possibility of transmitting ethnobiological knowledge to their future children.

### **Schooling among the Tsimane'**

As mentioned in the first chapter, Tsimane' have constantly had contact with formal schooling since the mid 1950s, when missionaries were granted the responsibility by the Bolivian government of educating remote native Amazonian populations while preaching Christian teachings (Castro 1997). Traditionally, children's educational instruction has taken place in village schools counting on one Tsimane' teacher per school, most of them trained by

the missionaries. However, governmental authorities have also tried to improve schooling in Tsimane' villages, partly motivated by the increased population in the schools.



Fig 4.8 Tsimane' children drawing at a school activity in San Antonio.

Over the last two decades, there have been changes worth mentioning affecting Tsimane' education. First, there have been governmental efforts increasing school coverage in Tsimane' villages by adding more teachers and by opening new schools. Nowadays, about 60% of Tsimane' communities have an elementary school covering the first five grades. No Tsimane' village has a middle school or a high school, although four villages close to the town of San Borja (including both villages where I resided, San Antonio and Ivasichi) have an education

program for adults where Tsimane' with elementary schooling can earn a high-school diploma by attending classes one week a month.

Second, to promote bilingual education, the State has increased the number of non-Tsimane' teachers in Tsimane' villages, with the rationale that non-Tsimane' teachers could complement Tsimane' teachers by teaching in Spanish, especially to older children.

Unfortunately, non-Tsimane' teachers receive little training in multicultural education, so -as other outsider professors in indigenous communities- they lack understanding of indigenous culture, history, and political affairs (Castagno and Brayboy, 2008). Although Bolivia is recognized as a multicultural country, non-Tsimane' teachers are not knowledgeable of the native culture and language. Their lack of understanding is evident in teacher's complaining and discouragement about children getting absent of class to carry out farm chores, or visits to relatives in distant villages, activities that are at the core of their traditional culture.

I was told by non-Tsimane' teachers how upsetting it was for them dealing with the Tsimane' parents that do not get involved in the education of their children and do not endorse teacher's scolding. The teacher's argument was that if a child was chastised at school by the teacher, it was for a good reason, but the parents' -instead of supporting the teacher's view- would encourage the child not to attend school again, if that was the kid's desire. This behaviour could be regarded as typical for the Tsimane', who have always lacked a centralized authority, and do not usually reprimand their children unless they consider that there is serious justification to do so (e.g. endangering siblings' safety). The frustration stemming from being disciplined is translated into resistance on the students' part. The teacher, who has worked in several Tsimane' communities, told me that the reasoning for the Tsimane' behaviour was that "*estos niños son silvestres, y así quieren seguir*" (these children are wild, and that is how they want to keep

being). With this phrase, it was evident the perpetuation of negative stereotypes from the camba towards the Tsimane’.

Similar to other cultures who increasingly get involved in market economies (Hunn 2002), formal education in view of the non-indigenous teacher is a way of “getting the Indians to stop being Indians”, and their only source of salvation from their traditional way of life, which is deemed as backwards. From my informal interactions with Tsimane’ parents, I noticed that formal education is regarded as necessary, especially for the acquisition of arithmetical skills, which are increasingly considered necessary to get better deals with traders. It is good that children keep going to school as long as it does not interfere with acquired responsibilities, especially when they are teenagers. Regarding the presence of non-Tsimane’ teachers, there are mixed opinions, with some parents expressing that it is good to have non-Tsimane’ teachers because they help children with their Spanish, and others saying that they do not want them in the community because children would learn either way from a Tsimane’ teacher, so a non-Tsimane’ teacher is seen as an unnecessary presence.

In a similar way that the non-Tsimane’ teachers lack contextualization of their teaching style with cultural characteristics of the Tsimane’, the educational materials available in the local schools are not properly set in their framework for the many issues -both environmental and cultural- faced by the local population. Most of the printed materials developed by the missionaries are targeted to basic mathematical abilities and literacy. Although these aids might include some plants and animals, they tend to focus on introduced domestic species, such as citrus or chickens. No emphasis is made on wild animals or plants, or in ecological relationships that can be taught in the formal educational circumstances. The educational materials developed by governmental institutions also lack local contextualization, since they are focused in

highlander culture. Last, since its appearance in Tsimane villages, schooling has served the purpose of getting the local population familiarized with national Bolivian society; therefore, activities and materials at schools are highly loaded with national symbols which are seen only in this setting and have little relevance for their daily life.

#### *New educational programs*

In 2006, at the juncture of the new Bolivian government led by Evo Morales, a program was launched in an attempt to redistribute economical wealth from new national taxes. This subsidy, called the “Juancito Pinto bonus”- an annual donation of about \$25 US to students who complete an academic year in a public school (Stefanoni 2007)- aims at encouraging and increasing elementary school attendance (Barie, 2007). Among the Tsimane’, where the average yearly per capita income is \$332, or \$0.90 per day (Godoy et al., 2007) and where about 50% of the population are children, the economic subsidy has encouraged parents to enrol their children for school at earlier ages than they did before its existence. In this society, where keeping track of children’s exact age is relatively new, and with the presence of this economical stimulus, I estimate that children as young as four year old are beginning to attend elementary school. Although it is a stimulus to get children to attend school, the quality of education they are obtaining is not different than before.

Another new program present in the Tsimane’ community is called “Yo sí puedo” (“Yes, I can”). It consists of an audiovisual program used in Cuba and Venezuela and promoted in other developing countries to encourage adult literacy (Ortega, et al. 2006; Steele 2008). The course relies on audiovisual and other forms of learning methods to promote literacy focusing on adults, while stressing background topics such as civic education and hygiene (Ortega, et al. 2006). The president made the announcement at the beginning of the program, in 2006, that it had the

purpose of declaring an “illiterate free” country; the government declared this status in December 2008 (Smink 2008).

As part of the new program, Tsimane’ communities were equipped with TV and VCR sets powered with solar panels, a powerful, novel feature instrumental in popularizing the program -since the communities have never had electricity- and encouraging the Tsimane’ to attend the video classes. However, the program has only been adjusted for the indigenous and peasant populations of the highlands and it is fully taught in Spanish. Considering that fully bilingual education is recent among the Tsimane’ and that most adults -even if they attended school as children- have been taught only in their native language, the Spanish only focus of this new literacy program puts them behind in their learning endeavour, and how much the students learn out of this program is debatable.

#### *The development of culturally responsive schooling*

How can Tsimane’ schooling improve so that lasting changes are evident for the generations to come, and that children can acquire academic skills and traditional knowledge at the same time? An answer to this question is found in the scholarship of Culturally Responsive Schooling. First, it is known that teachers’ values, attitudes and beliefs about the students’ culture are basic for successful education in indigenous communities (Yagi 1985). Therefore, teachers’ characteristics are definitely important for schooling in indigenous communities. In order to serve students from traditional societies in an effective way, it is necessary that the teacher be informal, to give up authority and show respect for the children (Yazzie 1999).

Second, several studies suggest that expecting and encouraging high standards from indigenous students helps them in their success (McCarty 1993; Rhodes 1994), while having low expectations of students has a negative effect on their development (Chrisjohn, et al. 1988;

Hornett 1990). Luckily, at least in the community of San Antonio, close to San Borja, Tsimane' children have had the chance of participating in contests (e.g. gardening) and winning awards at regional level competing with students from indigenous and non indigenous background, making them confident of their abilities.

Last, another teachers' characteristic desired for the improvement of schooling in indigenous communities is the respect and value for local community and culture, to the point of eventually becoming bicultural professionals. It is important to highlight that this is a character that requires a long time and effort in order to develop (Castagno and Brayboy 2008). In view of the rapid teacher substitution rate that I observed in the communities due to bureaucratic reasons, (there was a change of three different non-Tsimane' teachers in four months in Ivasichi), it is very difficult to assert whether it will be possible to have teachers more involved in valuing the indigenous culture, which in their particular case also requires the mastery of the language, since few Tsimane' are bilingual in Spanish. Valuing Tsimane' culture on the teachers' side will be possible when they are fostered to appreciate it, and face their personal prejudices, as well as overcoming the bureaucratic issues of staying in one community in a more stable manner.

#### *Community involvement in education*

The support of community members towards the schooling process is also necessary in order to have a successful educational development. Scholars advise that community elders, parents, and other adults should be invited to play a part in culture based education initiatives, and to be regarded by teachers as equitable associates in children instruction (Demmer and Towner 2003; Klug and Whitfield 2003; Noley 1992; Skinner 1999). Among the Tsimane', in the case of the village of Ivasichi, they were willing to collaborate in several occasions in communal efforts to have their school built (see Figure 4.9). However, I never saw that parents

were asked any other kind of help more than their labour for the improvement of their children's physical school.



Figure 4.9 Tsimane' parents helping carry cement from the local "port" to the school construction site in Ivasichi. This voluntary work was done with the aim of having the school repaired before the rainy season.

If Tsimane' parents are asked gradually to participate in their children's educational process, and are guided in the process of providing input on schooling, there might come a time when they are actively engaged and in control of their schools and construct a relevant curriculum. Now might be a good juncture for the beginning of this process, since changes might

arise in education after the retirement of the local missionaries in June 2008. In order to have a process of this kind running it would be good to articulate political efforts both with governmental and local (Tsimane') leaders.

### **Chapter Summary and Conclusions**

Social interactions are important for acquiring traditional knowledge. I have described - from an ethnographic standpoint- social interactions relevant in their environmental context that are important for the learning of traditional knowledge among the Tsimane'.

Tsimane' children are surrounded by social actors that help in the process of their knowledge acquisition, such as their mothers and siblings. During their growth, Tsimane' children are granted responsibilities that also function as learning opportunities for their development. One of these responsibilities is their contribution to their household, which can also serve as source of recreation, like in the cases presented of fruit gathering and fishing activities.

Increased age and acquired responsibilities also give children an opportunity to expand the geographical area of their interaction with nature. In this way, the older they get, the more opportunities and possibilities they have to know and learn about environments further away from their houses.

Parents have distinct expectations from boys and girls, so that they get acculturated into their gender roles at early ages. However, the Tsimane' appreciate someone being able to carry out traditional activities of the opposite sex. Both boys and girls seem to have similar opportunities for helping in collecting fruits and plants when necessary. Increased cultural contact with national society seems to discourage learning of more traditional activities such as traditional weaving and making native beer.

Although there is no rite of passage marking the coming of adolescence, it is evident this age group tries to differentiate from their elders and the younger generation. Tsimane' youth increasingly faces the pressure of market economy and must confront different decisions that will affect their future. Boys especially face the reality of their limited job opportunities which might take them out of their communities and further from their local knowledge; this is especially true when considering the limited education available in the communities.

Local schooling among the Tsimane' is still limited to the fifth grade. However, several changes have occurred with the intention of improving the availability and quality of Tsimane' education, such as increased coverage, increased programs aiming at adults, the economic stimulus to increase children's school attendance, and the increased hiring of non-Tsimane' teachers with the idea of enhancing bilingual education.

Non-Tsimane' teachers tend to teach in a decontextualized way; this point is amplified by the lack of aids in the classroom that are relevant for the rich Tsimane' natural and social environment.

Directions for advancing the quality of schooling so that it goes hand in hand with local environmental knowledge, include working with non-Tsimane' teachers to improve their personal qualities so they become culturally sensitive to the local population; asking them to encourage students to strive for the best; and encouraging respect for the local community.

Tsimane' schooling can also improve with the local community involvement. In order to begin this process, it is necessary that indigenous peoples are regarded by the teachers as contributors to their children's education as well. The gradual participation of Tsimane' parents can eventually empower them to have further control of their schools and what their children are

being taught. Political efforts are necessary to carry out this process, which can be especially plausible with the recent changes in missionaries influence among the Tsimane’.

## **CHAPTER 4: ETHNOBOTANICAL KNOWLEDGE TRANSMISSION**

Anthropologists have a long history of studying ethnobotanical knowledge – defined here as local knowledge about plants accumulated across generations. Ethnobotanical knowledge has been documented in many parts of the world (Alcorn 1984; Berlin, et al. 1974; Conklin 1954). The role of ethnobotanical knowledge has been stressed in facilitating human survival over generations (Conklin 1954) and its contribution to material culture (Balick and Cox 1997). Researchers have also shown the contribution of ethnobotanical knowledge to conservation of biological diversity (Davis 1997; Laird 2002), nutrition (Johns 1990), health (Berlin and Berlin 1996; Etkin 2000), and agriculture (Brush 2000). Last, it has been argued that ethnobotanical knowledge influences the way people look at the world (Berlin 1992; Medin and Atran 1999), contributes to cultural diversity (Maffi 2001), and gives people a sense of belonging and cultural identity (Balee 1994).

Despite awareness of the importance of ethnobotanical knowledge, little is known about how people acquire, accumulate, and transmit it (Zarger and Stepp 2004). Studies on have centered on adults rather than on children (Medin and Atran 1999), which leaves us with an incomplete picture about the dynamics of how this important type of knowledge flows across generations. Children's ethnobotanical competence is a basic part of the shared system of traditional knowledge, which is an inherited body of knowledge accumulated over generations (Berkes 1993). Although there is a long history of studies on cultural acquisition and learning among children in traditional societies (Hirschfeld 2002; Lancy 1999; Mead 1930; Super 1991;

Whiting 1963; Whiting 1941; Whiting and Child 1953), there is little research on how children acquire ethnobotanical knowledge (Medin and Atran 1999; Waxman 1999)

For the purpose of investigating ethnobotanical knowledge acquisition and variation, the Tsimane' bring an excellent case for this study. The Tsimane' hold extensive knowledge of the plants on their environment (Reyes-García, et al. 2007), they interact extensively with fallow and primary forests, children account for approximately 50% of their population, and logistically, I had the support of the Tsimane' Amazonian Panel Study.

### **Objectives**

The central aim of this study is to look into the transmission of ethnobotanical knowledge and the influence of individual characteristics in this kind of knowledge; it specifically measures ethnobotanical knowledge in the form of naming ability and plant use knowledge among Tsimane' children and their parents. A central topic is how children's and parents' knowledge relate. I initially expected to have positive significant relationships between a child and their same sex parent, because Tsimane' division of labor, as other traditional societies, follows sex lines. I also took into account the influence of household in ethnobotanical knowledge.

Other objectives of this work are elucidating the influence of age and children's own gender on ethnobotanical knowledge variation. I expected age to play a role in children's ethnobotanical expertise. I did not expect significant differences in children's knowledge based on gender since from my prior experience with the Tsimane' I had notice both boys and girls knowledgeable about plants.

### **Methods for Data collection: Preliminary studies**

I conducted preliminary research in the Tsimane' territory in the summer of 2006 aiming to test the methodology for the dissertation fieldwork. I traveled to Bolivia through the National Science Foundation Summer Field School in Methods for Data Collection in Cultural

Anthropology. During this field school, I pilot tested surveys on ethnobotanical knowledge of children and adults willing to participate in the communities of Yaranda and San Juan de Nápoles. I asked six expert Tsimane' informants to free list non-cultivated plants that grow in their yards and communal areas (e.g., forests). From the plants most frequently named by the informants, I chose at random four plants and seven uses. I used the plants to carry out a knowledge test among all the children (n=47) between the ages of 5 and 12 in two villages and their parents. I limited the sample to ages 5 to 12 because prior research suggests that this might be the time when people acquire most of their theoretical ethnobotanical knowledge (Stross 1973).

I split ethnobotanical knowledge into a theoretical (or passive) and a practical (skill) component. The theoretical knowledge test for children consisted of asking the questions: "what can [\_\_\_; part of plant] of [\_\_\_; name of plant] be used for?". The question is theoretical because it simply probes a person's passive or theoretical knowledge of a topic. Then I asked a question about self-assessed skills in using the plant (e.g., "Have you ever used [\_\_\_ ; name of plant] for [\_\_\_ ; particular use]?"). The test of adult's knowledge consisted of the same questions plus the following: "how do you prepare or use this plant?". A Spanish-Tsimane' translator asked the questions. Children and adult's answers were scored based on their match with expert informants' answers.

I used ordinary least square (OLS) regressions to estimate the association between children's ethnobotanical competence scores and their parents' or siblings scores. First, I regressed children's theoretical knowledge against their mother's and father's (separately) theoretical knowledge while controlling for two covariates at a time (children's age and gender or household size and village). I re-estimated the regressions with children's ethnobotanical

theoretical knowledge as a dependent variable and parental skills (rather than parental theoretical knowledge) as an explanatory variable. I did not include more covariates because of the small sample. None of these relations were statistically significant at a 95% confidence interval. I attribute the lack of statistical significance to the small size of the children sample (N=47). However, the sign of the coefficients showed that there was a positive relation between parents' and children's knowledge.

### *Lessons learned*

Thanks to this pilot test, I was able to learn the importance of using visual stimuli for my future research. Lacking such stimuli for this pilot test, I might have obtained different responses due to possible inconsistencies between plant and common name associations. Also, I valued the importance of different approaches when working with children versus working with adults. While my tests of ethnobotanical knowledge worked relatively well among adults, they were difficult with children, who were too shy to answer in my presence; this might have been, in part, because they were not familiar with me, since I had not spend much time in the communities when I performed these tests. This problem was overcome by having a Tsimane' interpreter with whom the children felt comfortable, carry out the test alone with the child. During the pilot test I saw the importance of being fluent in Tsimane'. During my dissertation fieldwork I was able to master a good working level of Tsimane' as part of the process of building rapport and getting the children comfortable with my presence.

### **Dissertation fieldwork**

Data for this dissertation came from fieldwork conducted in the Tsimane' territory in the communities of Ivasichi and San Antonio from July 2007 to September 2008. The study protocol was approved by the University of Georgia Institutional Review Board for research involving

human subjects. The Gran Consejo Tsimane' president, Jorge Añez, approved the study, and individual oral consent was obtained from every participant.

### *Initial exercise*

With the purpose of having a complete picture of the wild flora of the area, the initial step for this work was a freelisting exercise carried out in the communities of Ivasichi (distance to a main road 1.5 hours), Arenales (distance to road 15 min), Cara Cara (distance to road 30 minutes), Altagracia (distance to road 1 hour) and San Ramón (distance to road 1 hour). In these communities I selected 20 informants (four per community, two males and two females) that - based on ethnographic information- were known to have detailed knowledge of the local flora of the area. With the help of a Tsimane' translator I asked them to mention (freelist) the wild plants they knew through the question "Can you tell me all the plants you know that grow in the wild?" Using ANTHROPAC software (Borgatti 1996), I constructed an index of item saliency (Smith 1993) with the information provided by these twenty informants. This index is a weighted average of the inverse rank of an item across multiple freelists, so each list is weighted by the number of items there are on it. The plants with very low naming frequency (mentioned only 2 times or less, or mentioned only in one community) were not used for further analysis. These results were divided in three levels (high, middle, and low saliency), based on natural breakpoints in the frequency on the list. I selected 25 plants from each of the different levels of difficulty at random. The list with plant names from all informants had 320 different plants (see Annex).

After this exercise, I went back to the same communities to conduct semi structured interviews about these 75 plants with these same 20 informants; due to logistical reasons, I was able to find again 16 of these informants instead of the initial 20. The interview was conducted

with the help of a written guide of topics (see Annex 1): uses of the plants, preparations, and ecological setting in which a plant is found. Other information that informants volunteered was also recorded.

#### *Preparation of visual stimuli*

A critical point for the research presented here was the preparation of the visual stimuli. With the help of my translator and a Tsimane' assistant knowledgeable about plants, I was able to collect a total of 103 valid botanical specimens, which included most of the plants that I had used for the semi-structured interview. These collections were made in the communities of San Antonio and Ivasichi. In San Antonio, I had one male elder independently verify the Tsimane' name that my collaborators had given me; in Ivasichi I had three (two females, one male) elders help me in the task of verifying the names.

The specimens initially Collected were pressed and dried in the field in a drier fueled with firewood, since it was not possible to use an electric drier because the communities lacked electricity. This firewood drier was not successful in its endeavor since many of the specimens developed fungi, or the fruits were damaged by the heat to the point of being valid for botanical identification. For further collections, I put alcohol directly into the specimens, pressed them, and tried to get them into the herbarium within a week, where they were further treated in a standard herbarium drier<sup>5</sup>. All of the specimens Collected were identified and deposited at the Herbario Nacional de Bolivia at the Universidad Mayor de San Andrés (UMSA) in La Paz (LPB). Palms were excluded from the collection due to the logistical problems for collecting them. For the plants that I was unable to collect due to scarcity or lack of botanically valid

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<sup>5</sup> I very much thank the expertise and assistance of biologist Juan Pablo Ticona on giving a solution to this urgent problem.

specimens, I used previous dissertations about Tsimane' ethnobotany (Huanca 1999; Reyes-García 2001) as references for their scientific name.

#### *Pilot testing of visual stimuli material*

In order to avoid methodological inconsistencies that contribute to variable results (Ellen 1979), the quality of the visual stimuli used to evaluate ethnobotanical knowledge needs to be assessed (Berlin 1992). To ensure the quality of the data Collected for this research, I pilot tested the materials that I used as stimuli for the assessment of ethnobotanical knowledge. For this purpose, I used 27 plants selected from the master list, 9 of them from each difficulty category. This exercise was carried out in the community of San Antonio with 28 children (ages 5 to 15, 16 males, 12 females) and 20 adults (seven males, 13 females). For this exercise I asked the participants to identify the plants, showing them in the newspapers that had been used for their collection. Although the both children and adult participants were able to identify the plants, I realized that showing the specimens in the newspaper was very distracting -especially for children- because they would pay attention to the newspaper printings. The lack of printed material in everyday life made the children deviate from the actual task of recognizing the plants. After this experience, further identification tests were made with mounted herbarium specimens.

#### **Ethnobotanical knowledge tests**

##### *Plants used for ethnobotanical knowledge test*

I have transcribed here the Tsimane' names, followed in parenthesis by their scientific name and scientific family in parenthesis. The number after the parenthesis indicates the Smith's S (maximum =1) which shows the saliency of each plant. The order shown here is by Tsimane' alphabetical name. A complete list of the plants elicited and their saliency is shown in the Annex.

**Ashaba'** (*Poulsenia armata*, *Moraceae*) 0.306: The bark of this tree has been traditionally used to manufacture fabrics for clothing and bed mats among the Tsimane' as well

as other indigenous groups (DeWalt, et al. 1999; Duke and Vásquez 1994). In Ivasichi it was not uncommon to see baby hammocks made of **ashaba'**, and both children and adults volunteered information about how they had seen their elders making the fabric of this bark. In San Antonio, the more acculturated community, children were more familiar with it because they had seen the fabric made for the San Borja fiestas on October 10<sup>th</sup>, when some Tsimane' sell clothes made of **ashaba'**. Making the clothes requires cutting the bark, smashing it, washing it and leaving it on the sun to dry it. The wood can be used for firewood; the fruit is edible.

**Bojno'ta** (*Muntingia calabura*, Elaeocarpaceae) 0.131: the fruits are edible, specially consumed by children. The timber is used for firewood. The outer bark can be made into rope used mostly to tie poles in construction.

**Conófoto** (*Hura crepitans*, Euphorbiaceae) 0.581: big tree from the forest; parrots like **Iva'** (*Ara sp.*) eat the fruit. This tree is used by the Tsimane' and other indigenous groups to poison fish by taking out the sap, mixing it with dirt, and then taking the mud balls to be diluted in the river for fish poisoning. Caution is advised when cutting this tree because the sap can be dangerous if it gets in touch with eyes. Wood used for canoe carving. It is also used for construction, especially for planks.

**Coroi' coroi'** (*Miconia prasina*, Melastomataceae) 0.07: Slender tree found both in the forest, savanna, and in anthropogenic intervened areas. Birds eat the fruit. People can also eat the fruit although is reported to be not very flavorful. When the tree has a straight shape it can be used in construction as roof support pole.

**Coti** (*Psidium guineense*, Myrtaceae) 0.048: This was described by the main informants like a slender tree common in the pampa and also in the road sides of the community. Edible fruit, associated with birds. Like in other cultures (Duke and Vásquez 1994), the Tsimane' make

a tea with the leaves or the bark that is used against diarrhea. It is also edible, although it was reported by the expert informants with phrases such as “children eat it”. Some expert informants also reported that the **napo'** (mestizo people) use it to make marmalade, but not the Tsimane'.

**Ere'** (*Petiveria alliacea*, Phytolaccaceae) 0.195: This is a small herb, growing in areas close to the communities such as paths and also in the forest. The stem and roots are scraped and smelled to calm down flu symptoms. The leaves can also be boiled and used to bathe babies that have difficulties sleeping.

**Ibijqui** (*Garcinia gardneriana*, Guttiferae) 0.512: tree found mostly in anthropogenic environments. The fruit is reported as edible.

**Ijsita** (*Pseudolmedia laevis*, Moraceae) 0.303: tree found in anthropogenic environments and forest, with lots of branches present. The fruit is small and red, wild animals and birds eat it. People -mostly children- eat it. The wood is used for house construction and for firewood.

**Juparety cas** (*Cordia tetrandra*, Boraginaceae) 0.073: tree that grows in areas close to the communities and also in the forest. Birds make their nest in the branches and eat the fruit; it has many branches. It is used as firewood.

**Mujpe** (*Ficus adhatodaefolia*, Moraceae) 0.126: Tree found in the forest and in some anthropogenic areas. The sticky sap can be warmed and used as glue; this glue is mostly utilized to make bird traps that are put in rice plantations. The wood can be used as firewood.

**Odo' odo'** (*Abuta grandifolia*, Menispermaceae) 0.037: Tree growing mostly in the forest. It has small edible fruits, which are consumed mostly by children.

**Ojme'ro** (*Paullinia cuneata*, Sapindaceae) 0.084: vine from the forest, with round fruit. Different monkeys (nocturnal monkey and chichilo) eat it; it is edible for people too, especially for children.

**Papac** (*Crotalaria incana*, Fabaceae-Papilionoideae) 0.033: small shrub growing close to the river's beach. It attracts birds and butterflies. Children use the seed pods for playing because it emits a sound when it is moved.

**Pere'pere'** (*Himatanthus sucuuba*, Apocynaceae) 0.147: This is a tree found both in anthropogenic disturbed areas as well as in the forest; worms live in its leaves, and it used for firewood.

**Pf'sere** (*Annona sp*, Annonaceae) 0.052: Tree growing close to the community and also in the forest. It has a fruit like cherimoya, edible by people and monkeys such as chichilo. The wood can be used as firewood.

**Rojroj** (*Leonia crassa*, Violaceae) 0.092: tree from the forest (**därä**); used for firewood. Fruit is eaten by different mammals such as melero (*Eira Barbara*, Mustelidae), tejón (*Nasua nasua*, Procyonidae), guasó (*Mazama gouazoubira*, Cervidae). The round fruit can be rubbed on hens to improve their ability to lay eggs.

**Shojno** (*Acalypha benensis*, Euphorbiaceae) 0.052: This is a shrub that is found growing in nearby areas and in the forest. Mammals like guaso and anta (*Tapirus terrestris*, Tapiridae), eat the leaves. It is used as firewood when dry. The sap is used as medicine for skin diseases, put directly into the affected area.

**Titij** (*Ficus insipida*, Moraceae) 0.447: This is a big tree from the forest. Birds, mammals like guasó, and different monkeys like chichilo and manechi (*Alouatta seniculus*) eat the fruit. Sap is used as medicine against intestinal parasites (**oya**) mixing it with cold water; this medicine reported by main informants like "better than doctors' medicine". Wood also used for canoe carving.

**Tsimac** (*Solanum sp.*, Solanaceae) 0.054: Shrub with thorns in the leaves, found in anthropogenic environments. Birds eat the fruits; people use it for firewood.

**Vapi** (*Guarea guidonia*, Meliaceae) 0.389: Tree found in the forest; some monkeys like nocturnal monkey and chichilo (*Aotus sp.*, and *Saimiri sciureus*, Cebidae) make their nests in this tree. Its timber is used for carving canoes, house construction, and firewood.

**Vashi** (*Serjania sp.*, Sapindaceae) 0.03: this woody vine is reported to grow in the forest, and it is used for fish poisoning. The procedure to use it is to cut the vine in pieces of approx. 0.5 meters, take some 30 of the pieces into the river and smash the pieces into the water until the sap comes out of the plant. It is said popularly among the Tsimane' that it has the ability to "get the fish drunk".

**Vayuna** (*Zanthoxylum egnellianum*, Rutaceae) 0.011: Tree found in the forest, birds tend to nest on it. People use it for firewood.

**Ve'pi** (*Cupania cinerea*, Sapindaceae) 0.255: tree found both in the forest and savanna and in anthropogenic intervened areas. It is used for construction (tirantes and horcones) due to its sturdiness, and for firewood.

**Veya** (*Duguetia spixiana*, Annonaceae) 0.074: Tree growing in the forest; chichilo and birds eat the fruit. The timber is used for construction.

### *Subjects sample*

Further data were Collected in the community of Ivasichi, in all the households that had children as well as other households without children but were subjects wanted to participate (n households=27). The sample included all the children in the community over 6 years of age willing to participate and with their parents' consent (n=59), as well as their parents (27 mothers,

24 fathers). Eight children in the sample did not have a father, and were excluded from the analysis that required father's related data.

#### *Ethnobotanical knowledge assessment*

I conducted a test using 27 herbarium specimens, mounted and laminated with a clear plastic cover in the form of a travelling herbarium (Berlin, et al. 1990), which were shown one by one. After a few interviews I removed from the sample three plants that were not eliciting any information from the informants. The specimens were shown following the same order for every participant in order to avoid biases from one participant to another. With the help of my Tsimane' assistant, I arranged the specimens in sets of three plants, so that the first plant shown was not difficult to recognize, moving to a slightly more difficult plant and following an increasingly difficult one, and then coming back to an easy level of difficulty. The objective of this was to draw the subjects into the task, so that they would not get discouraged at the beginning by the difficulty of the exercise.

Through my Tsimane' interpreter, I asked the subjects individually: "what is the name of this plant?", and "is it used for something?" I recorded these answers, along with other information, in Spanish. The first interviews I carried out were with the adults; the purpose of conducting these tests first with the adults was to let them to know what kind of questions their children would be asked.

#### **Children's ethnobotanical knowledge**

##### *Setting for the elicitation of children's knowledge*

After I carried out the ethnobotanical assessment with almost all of the adults in the village, I asked children to participate, inviting first the older children who I knew better from my interactions with them. After a few tests with children, I realized that there were further

differences in conducting the tests with them versus the tests I had already performed with adults.

On the strengths, I realized I had an advantage in having employed as my research interpreter, a young man from the community who had been the teacher's assistant the previous year. Because of this, his calm personality and the good relation of his family with the community, children were familiar with his presence and with him asking questions.

On the other hand, I realized that the physical setting was important to get children comfortable talking during the test. The interviews with adults had been carried out in my house, sitting at my table; I realized it was better to change this physical arrangement for the children. The only place in Tsimane' communities where one can find tables and chairs is the local schools; having the children sitting on a chair by my table gave an environment of formality that they related to school, which could be stressful. I decided to conduct the children interview with both the participant and me sitting down on mats in the floor (see picture below), which is more approximate to the way their houses are set, and also to give a relaxed, less serious environment.

Another source for variation was the children's conceptual focus paying more attention to one salient feature (spines, for example), ignoring other morphological differences between two plants (cf. Stross 1973). Less common was the issue of sound similarity between names, which might have also occurred if the children had seen the plants in the wild.



Figure 5.1. The author conducting knowledge tests with a participant.

In the following table I show some of the common mistakes done by children, in order of occurrence, and the likely causes for these mistakes:

Table 4.1. Examples of mistakes committed by children on the identification of plants.

Possible biological and cultural cause	Example	Botanical family
Shared botanical family and uses; culturally considered <b>pendye'</b> (companion plants)	<b>Tsocon</b> ( <i>Rheedia acuminata</i> ) and <b>ibijqui</b> ( <i>Rheedia gardneriana</i> )	Guttiferae (Clusiaceae)
	<b>Titij</b> ( <i>Ficus insipida</i> ) and <b>mujpe</b> ( <i>Ficus adhatodaefolia</i> )	Moraceae
Shared salient morphological characteristics (e. g. thorns)	<b>Tsimac</b> ( <i>Solanum grandiflorum</i> ) and <b>arara</b> ( <i>Urera laciniata</i> )	Solanaceae and Urticaceae
Shared morphological characteristics (e. g. similar fruit) and uses (e.g. edible)	<b>Doto</b> ( <i>Trema micrantha</i> ) and <b>bojnota</b> ( <i>Muntingia calabura</i> )	Ulmaceae and Elaeocarpaceae
Name sound similarity	<b>Ve'pi</b> ( <i>Cupania cinerea</i> ) and <b>vapi</b> ( <i>Guarea guidonia</i> )	Sapindaceae and Meliaceae

## Results

Two different scores –one for use, another for identification- were assigned both for children and adults, using as the answer key the answers that I elicited from knowledgeable adults in the initial freelisting exercise (Sternberg, et al. 2001). I have divided the results into two sections: the analysis of factors related to children’s knowledge (gender, household, and age), and the relationship of the parents’ knowledge to their children’s knowledge.

### *Gender*

An ANOVA test was done to look at the relationship between gender and their scores for both tests. Results in both tests ( $p=0.276$  identification,  $p=0.272$  for use score) show that there are no differences based on gender for either of the scores children obtained.

### *Age*

Age has a strong positive relationship with children’s tests scores. Age can explain 47% of the identification score and 49% of the uses score obtained by children (Figures 4.2 and 4.3).

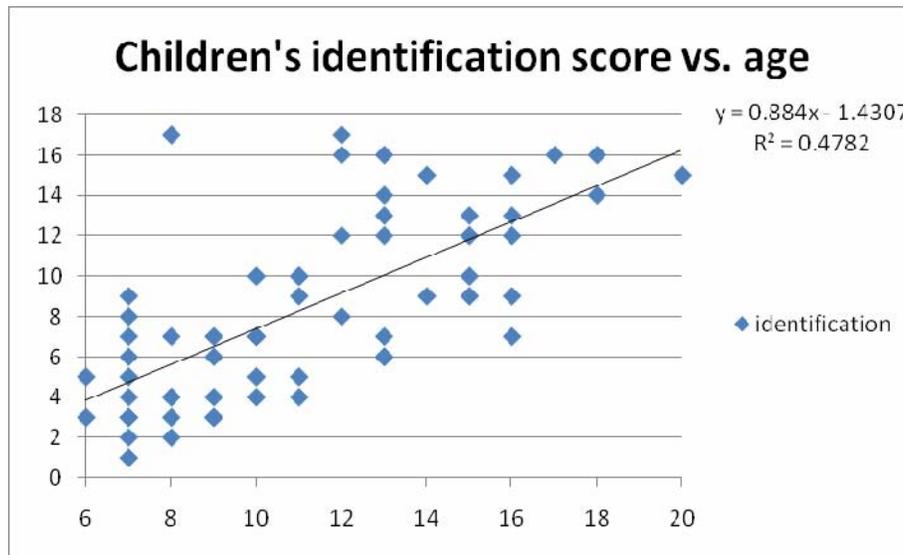


Figure 4.2. Scatter plot of children’s identification score (out of 24 correct) by age.

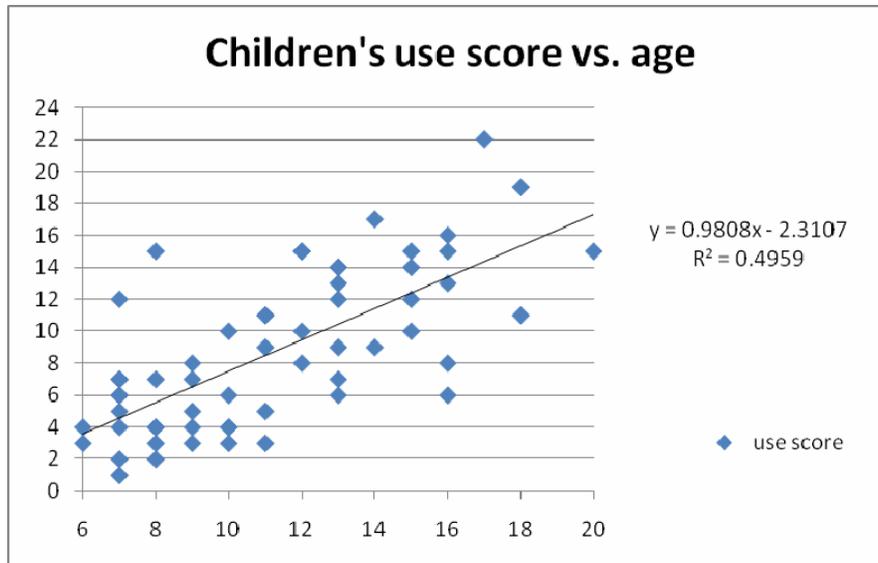


Figure 4.3 Scatter plot of children's use score (out of 40 correct) by age.

I also conducted an ANOVA test aiming at looking whether there is variation in the children's scores according to age groups. For this test, use and identification scores were analyzed separately, and they were divided into an age group consisting of the children under ten years of age (N=29) and another group for the children 11 and up (N=30). I decided to take this age as the break point because of the emic categorization that the Tsimane' make regarding these two age groups, having different terms for these two groups. The results show that there is a significant difference in the way children from the two age groups responded ( $p < 0.001$ ), for both identification and use score. Due to the small sample size I did not look for cohort or effects within household. A Pearson analysis showed that age has a positive correlation both with identification ( $r=0.380, p < 0.001$ ) and use score ( $r=0.403, p < 0.001$ ).

#### *Household*

An ANOVA test by household showed that the results the children obtained in the use score show more variance by household ( $p=0.029$ ), than the identification score ( $p=0.079$ ). Although

only the use score  $p$  value is significant, both tests show low  $p$  values, fitting a pattern for variation in both tests.

*Correlations analysis*

I conducted Pearson’s correlations aiming at analyzing possible associations within children and between parents and children. In order to show these results, I begin with the correlations of knowledge within children, and then show the results of the correlations between children’s and parents’ use and identification knowledge using the entire group data. Last, I split the scores for further analysis by children’s gender and the different tests.

Table 4.2 contains a definition and summary statistics of the variables used; table 4.3 contains the Pearson correlation results.

Table 4.2 Definition and descriptive statistics of variables used in Pearson correlations.

Variable	N	Definition	Mean	Std. Deviation
<b>Outcome variables</b>				
Identscore	59	Children’s score in test of plant identification. Subjects were asked to name the 24 plants they were shown.	8.45	4.57
Usescore	59	Children’s score in test of plant uses. Subjects were asked to name the 40 possible uses of the 24 plants they were shown.	8.66	4.98
Momident	59	Subjects’ mother’s score in identification test	14.90	4.95
Dadident	51	Subjects’ father’s score in plant identification test	16.00	4.69
Momuse	59	Subjects’ mother’s score in plant use test	28.80	16.62
Daduse	51	Subjects’ father’s score in plant use test	15.76	6.31
Age		Children’s age, in years	11.18	3.57
Sex		Sex of the subject, male=1		

Table 4.3. Pearson correlation results for the whole group (N=59).

		Identscore	Momident	Dadident	Usescore	Momuse	Daduse
Momident	Correlation	.212	1.000				
Dadident	Correlation	-.085	.603**	1.000			
Usescore	Correlation	.926**	.201	-.126	1.000		
Momuse	Correlation	.927**	.198	-.127	1.000**	1.000	
Daduse	Correlation	-.102	.658**	.758**	-.076	-.075	1.000

\*. Correlation is significant at the 0.05 level (2- tailed).

\*\* . Correlation is significant at the 0.01 level (2-tailed).

#### *Use and identification correlations within subjects*

From the descriptive statistics it can be inferred that children's identification score is proportionally higher (8.45 of 24 possible correct plants) than the use score (8.66 of 40 possible correct uses). From the Pearson's correlations it can be inferred that children's data show that there is a strong correlation between identification and use test ( $r=0.926$ ,  $p < 0.001$ ).

#### *Children's and parents correlations*

Data analysis of the whole group of kids shows that both scores -identification and uses- bear a positive relationship with mother's scores, significantly with the mother's use ( $r=1.000$ ,  $p < 0.001$ ). In the case of fathers and children's relationship, the tests bear a negative relationship (although non-significant). I decided to further look into this relationship splitting the data by gender.

Table 4.4 Pearson correlation results for girls

	Identscore	Momident	dadident	Usescore	momuse	daduse
Momident Correlation	.030	1.000				
Dadident Correlation	-.410*	.439*	1.000			
Usescore Correlation	.912**	.085	-.339	1.000		
Momuse Correlation	.913**	.082	-.342	1.000**	1.000	
Daduse Correlation	-.423*	.560**	.688**	-.299	-.301	1.000

\*. Correlation is significant at the 0.05 level (2- tailed).

\*\* . Correlation is significant at the 0.01 level (2-tailed).

### *Girls*

#### *Correlations with mothers*

Results for the identification test for girls show a positive, non significant relationship with mother's score in the same test ( $r=0.030$ ,  $p =.875$ ), while there is a significant positive relationship with the mother's use score ( $r=0.913$ ,  $p <0.001$ ). In the case of girls use score, the results follow the same trend: there is a positive non significant relationship with the mother's identification score ( $r=0.085$ ,  $p=0.661$ ).

#### *Correlations with fathers*

The girls identification score correlations with their father's scores is negative both when associating the girls' identification score with the father's score in the same test ( $r=-0.410$ ,  $p =0.042$ ) and when relating it with the father's use score ( $r=-0.423$ ,  $p =0.035$ ). The girls' use score

was negatively associated with their father's use ( $r=-0.299, p=0.147$ ) and father's identification score ( $r=-0.339, p=0.098$ ), at non-significant levels.

Table 4.5 Pearson correlation results for boys

	Identscore	Momident	Dadident	Usescore	Daduse	Momuse
Momident Correlation	.361	1.000				
Dadident Correlation	.184	.748**	1.000			
Usescore Correlation	.935**	.283	.049	1.000		
Momuse Correlation	.937**	.281	.049	1.000**	1.000	
Daduse Correlation	.160	.746**	.797**	.097	.099	1.000

\*\* . Correlation is significant at the 0.01 level (2-tailed).

### *Boys*

#### *Correlations with mothers*

Using pair wise Pearson correlations, I found that a boy's ability to identify plants correctly bears a positive association with his mother's score in the same test, but not significantly ( $r=0.361, p=0.050$ ). The identification score for boys is positively correlated with the mother's use score in a significant way ( $r=0.937, p < 0.001$ ). The use score for boys is positively correlated with the mother's identification test ( $r=0.283, p=0.130$ ) and significantly with the mother's score in the same test ( $r=1.00, p < 0.001$ ).

#### *Correlations with fathers*

Although all of the boys-fathers' correlations are positive, they are not significant. The identification correlation with their fathers' score in the same test is  $r=0.184, p=0.368$ . The

identification relation with the father's use score is 0.160,  $p=0.435$ . Regarding use score, the results are  $r=0.097$ ,  $p=0.638$  for the correlation with the father in the same test, and  $r=0.049$ ,  $p=0.812$  for the boys use-father's identification correlation.

## **Discussion**

For both boys and girls, although both tests scores are highly correlated, their identification score is higher than their use score, which is consistent with our previous findings on ethnobotanical knowledge among Tsimane' adults (Reyes-García, et al. 2009). An interpretation of this result is that naming is an easier and initial ability in the acquisition of ethnobotanical knowledge, while practical knowledge, such as uses of the plants, need a higher participation and interest in order to learn (Setalaphruk and Price 2007). The acquisition of use knowledge, as it is the case of ethnobotanical skills (practical dimension of knowledge) is not always gained at the same time and, as shown in other cases, it might continue during adulthood (Hewlett and Cavalli-Sforza 1986a; Ohmagari and Berkes 1997).

Other studies have found this unequal relationship between two different dimensions of knowledge; Ladio and Lozada (2004) found among the Mapuche of Northwestern Patagonia that people knew significantly more about edible plants than actually consume those plants. Similar results are found in another study that compared knowledge use and observations on the use of *Dypsis fibrosa* (Arecaceae) in Eastern Madagascar (Byg and Baslev 2001). The authors found no correlation between a subject's knowledge of plants, as elicited in surveys, and the actual extent of use of the plant resources by the same individual.

### *Factors in the variation and acquisition of knowledge*

Age is the dominant factor that seems to contribute in acquiring ethnobotanical knowledge. It makes a difference in the way children are responding to the tests administered.

There is a significant difference from one group to another in their scores (older vs. younger children), which can be attributed to the accumulative pattern of plant learning. There is no significant difference between boys and girls on the way they respond to the tests. This finding emulates results obtained in other studies of these kind with children (Hunn 2008; Setalaphruk and Price 2007). This fact reflects that both boys and girls have a similar experience with the plants used for the test. Household also contributes to the variation in ethnobotanical knowledge, which is especially important for use scores. This result can be interpreted in as a reflex of variation from one household to another on how to use a plant which is pictured in the children's responses.

#### *Parental relationships*

I had initially hypothesized that the main contributor to children's knowledge would be their same sex parent due to the traditional division of labor among the Tsimane'. Findings show that mother, instead of same sex parent is the one that contributes more strongly from both parents for children's ethnobotanical acquisition.

Mothers have positive relationships both with boys and girls, and her use score has a positive significant association with children's in both of the tests that were performed. The correlation of children's identification scores with their mothers' use score shows an interesting relation that can be interpreted as follows: mother's correct cultural use of a plant is a powerful way in which children can learn both to identify and to use plants.

Father's knowledge, on the other hand, has no significant relationship with their children's scores; when the data are analyzed split by sex, there is even a negative relationship with daughters. This finding is consistent with recent results with adult data (Reyes-García, et al. 2009), where we found that a mothers' and daughters' ethnobotanical knowledge and skills are

closely correlated, but that father's ethnobotanical knowledge is not associated to his son's skills. The association of children's and maternal knowledge meshes as well with previous empirical findings (Cruz Garcia 2006; Eyssartier, et al. 2008; Hewlett and Cavalli-Sforza 1986a; Lozada, et al. 2006), where the mother is identified as the primary transmitter of ethnobotanical knowledge.

This relationship can be interpreted in light of Tsimane' traditional culture, where both boys and girls spend significant amounts of time with their mothers. Although traditionally the Tsimane' travel to the forest to hunt in kinship groups, women and children are expected to stay in a camp while men are hunting in the primary forest. Furthermore, shifts in traditional culture are contributing to the discouragement of these hunting and gathering expeditions through several means, including radio announcements and preaching by the teachers/spiritual leaders. Tsimane' are partly discouraged with the argument that families should not spend much time into the forest, otherwise children miss classes at school, a trend found in other Amazonian groups (Heckler 2002).

In addition, Tsimane' men are reluctant to take children into the forest, due to the dangers the forest holds for children and also because hunting opportunities can be lost for the noise children can make (Reyes-García, et al. 2009). Nowadays, the relationship with fathers might be especially less close with children because many males work with loggers or cattle ranchers outside of the communities, therefore, both the time devoted to traditional activities and the time they spend with children are diminished. Also, as it is the case in other Amazonian societies, such as the Piaroa in Venezuela (Heckler 2002), there is a decline on family traditional trips to the forest with the increase in distance that must be traveled in order to find resources of interest.

The results might show a gender difference in the way men answer the questions, which does not necessarily have a relationship with whether they know the uses of the plants, but it is a contextual factor (Ellen 1979). In the process of completing the test, male participants seemed not to mention uses that they might have considered that I already knew. Two points are important to highlight: first, I had already spent around eight months in Tsimane' communities when these data were gathered; informants might have assumed I had expertise with certain uses because they are associated to feminine labor; second it is possible that the plant use test was biased towards plants that had uses more associated with feminine endeavors, and that might be the reason men thought I already knew these uses. It also seems to be the case that in general conversations about plants, men were more inclined to volunteer uses that they might have thought I did not have any expertise on, such as house building woods, which is traditionally a sphere of knowledge related to males.

### **Chapter Summary and Conclusions**

There is a long tradition of studying ethnobotanical knowledge in Anthropology. It is highly appreciated for its adaptive value in indigenous people's livelihoods and for understanding cognitive relations. Ethnobotanical studies have centered in knowledgeable adults, which hinders our understanding of its acquisition. In order to contribute to understanding how ethnobotanical knowledge is passed down, it is necessary to conduct research with children.

I conducted this research in order to look into the transmission of plant traditional knowledge and how it is influenced. I measured plant naming ability and use knowledge among Tsimane' children and their parents. I hypothesized that there were positive significant relationships between a child and his/her same sex parent. I also looked at factors like age, household and gender in children expertise about plants.

I used 24 plant specimens -with different cultural importance- botanically identified and mounted as visual stimuli to elicit plant names and use knowledge. In this exercise I had the participation of 59 children over age six, and their parents.

Results show that children's use and identification score are highly correlated, although the scores are higher in identification than in use score, showing that naming is an easier ability to acquire, and that plant identification and use learning do not necessarily occur at the same time. Gender does not influence the way children responded to this exercise. Age, on the other hand, is an important factor in both scores of ethnobotanical knowledge. Household seems to have a more significant weight in children's use answer than in their identification score.

Correlations with parents dismiss the initial hypothesis that children's knowledge would have a significant correlation with their same sex parents' knowledge. Results show a general pattern of strong positive correlation between mother's use of plants and their children's score in use and identification test, regardless of children's gender. This can be interpreted in light of the amount of time that these children spend with their mothers. Furthermore, cross culturally, mothers are recognized as the main transmitters of ethnobotanical knowledge.

Fathers, on the other hand, show no significant association neither with boys or girls. This is especially important with increased changes in the communities where men tend to work outside of their villages. Also, these results might show a gender difference in the way men answer the questions, as a contextual factor. While answering the test to a female researcher, participants did not seem to mention in depth uses more proximate to the female realm of knowledge, since they might have thought I was already knowledgeable about those uses; and they were more willing to share their expertise on plant knowledge related to the male sphere. Different results might arise if the same exercise is carried out by a male researcher.

## CHAPTER 5: CONCLUSION



Figure 5.1. Mother and daughter engaged in weaving. This opportunity allows the girl practicing her skills and receiving occasional instruction, while taking care of her little sister.

Tsimane' children learn ethnobotanical knowledge as part of a continuous experiential process where acquisition is framed by social and environmental conditions. Replication of behaviour, observation and unplanned instruction are fundamental in this context (Atran and Sperber 1991).

Tsimane' earn increased responsibility in their households with age. As these responsibilities increase, children have the opportunity to enlarge the geographical range where they carry out their activities, from areas very close to their home at the beginning, to old fallows and the forest as they grow up. These new environments enhance their opportunities to gain knowledge about plants.

Ethnographic evidence regarding Tsimane' children ethnobotanical knowledge acquisition shows that social relations are fundamental for gaining their expertise. These important social interactions are embedded in Tsimane' identity characteristics like the *sóbaqui*, extended visits paid to their relatives in different villages. Remarkably, this cultural characteristic is directly linked to the traditionally extensive use and management of their environmental resources, and is highly discouraged by outsider's influences (Ellis 1996).

In the case of children, it is necessary to highlight the importance of gathering of wild edible fruits as a task that combines in a culturally sensible way their contribution to household economies, the expansion of geographical area for their activities, and the social interactions with children and adults from whom they can learn.

Environmental and socio-cultural changes have transformed within a few generations traditional activities patterns for the Tsimane'. The ecological conditions of their traditional territory have changed dramatically due to the combination of continuous logging, cattle ranching, and outsiders' encroachment. As it is the case in other Amazonian societies, there is a decline on traditional family trips to the forest with the increase in distance that must be traveled to find resources of interest. These transformations have consequences in the way ethnobotanical knowledge is acquired.

Socio-cultural conditions have also changed radically in a short time. From a society that lacked centralized leadership, the Tsimane' have to accept the sudden push to adopt local representatives, such as the corregidor figure. These leadership positions require education and Spanish skills that older Tsimane' do not have, which has an impact in the way traditional prestige is perceived. These tensions undermine the willingness to transmit traditional knowledge in general, since it is regarded as not as useful as "modern" knowledge. For instance, learning traditional activities such as weaving and making native beer is generally appreciated, but in more acculturated communities it is rare to see children getting engaged in these kinds of tasks. This condition takes its toll in the process of ethnobotanical knowledge transmission.

In the same way that Tsimane' adults move between the national Bolivian society and their traditional culture, children are also caught between these two clashing systems. This is evident in schools. Local schooling among the Tsimane' is highly decontextualized, lacking aids or activities in the classroom that are relevant for the rich Tsimane' natural and social environment.

### **Findings on ethnobotanical knowledge tests**

Specific findings on this research show that children's age has a very influential role both in their ability to identify plants and in their knowledge about their uses. The household to which children belong also show an important relationship to their tests scores, especially to their use knowledge, showing that differences in the way they score, and probably in the way they learn, can depend on the household to which they belong. Gender does not play a significant role for knowledge scores, which might indicate that there is equal opportunity to have interaction with plants.

Findings from ethnobotanical knowledge tests show interesting relationships between children's scores and their parents'. The initial hypothesis -that there were positive significant relationships between a child and his/her same sex parent- was dismissed. Consistent with other studies, children knowledge is consistently related to mother's knowledge regardless of their own sex (Cruz Garcia 2006; Hewlett and Cavalli-Sforza 1986a; Ohmagari and Berkes 1997). This finding can be interpreted in light of the amount of time that these children spend with their mothers.

Fathers, on the other hand, show little association in their knowledge to their children's. This can be explained by men's reluctance to take children into the forest due to dangers in the forest for children, and also because hunting opportunities can be lost for the noise children can make (Reyes-García, et al. 2009). Nowadays, children relationship with fathers might be especially distant because many men work as wage laborers outside of the communities, therefore, both the time devoted to traditional activities and the time they spend with children are diminished.

### **Further directions**

As mentioned in the first chapter, education among the Tsimane' is very much needed for their empowerment to defend their rights. This educational process needs to be done in a culturally sensitive way. Despite 50 years of being exposed to schooling, Tsimane' still have low academic skills. In order to have schooling that is both sensitive and relevant to the needs of this population, it would be necessary to include local environmental knowledge in their curriculum.

Tsimane' seem to have good disposition towards helping in logistical school activities if they are asked. Asking in a culturally correct way for their contribution towards children

education is something to consider seriously in order to have relevant schooling. At the same time, teachers' awareness and appreciation of indigenous worldviews and the skill to adjust their teaching for these students are of pivotal importance for successful indigenous schooling (Agbo 2001). Encouraging non-Tsimane' teachers to become culturally sensitive is the other part of this process, so that both parts act on equal grounds.

In order to have equal participation in this process, it is needed to increase grassroots Tsimane' leadership. Control of the local schools can only come with political empowerment, which can appear at the juncture of lower missionary influence and the new indigenous power discourse in the current government.



Figure 6.2. Tsimane' girls play make-believe household chores.

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## ANNEX

List of Plants mentioned by informants sorted by Smith's *S. Ident.* indicates a plant that has not been botanically identified.

Common Name	Smiths	Genus species	Family	Identifier
Tsocon	0.594	<i>Garcinia gardneriana</i>	GUTT	Collected
Siyamo	0.584	<i>Cedrela odorata</i>	MELI	Reyes-García
Conojfoto	0.581	<i>Hura crepitans</i>	EUPH	Collected
Vojshina	0.558	<i>Ceiba pentandra</i>	BOMB	Collected
Cotison	0.54	<i>Terminalia oblonga</i>	COMB	CR, Huanca
Bucuj	0.517	<i>Ficus paraensis</i>	MOR+	Collected, Reyes-García, Huanca
Ibijqui	0.512	<i>Garcinia gardneriana</i>	GUTT	Collected
Manai	0.508	<i>Attalea phalerata</i>	AREC	Huanca
Bejqui	0.47	<i>Hymenaea courbaril</i>	FAB+ -Caesalpinoideae	Collected, Huanca, Reyes-García
Shejsherena	0.465	<i>Sloanea sp.</i>	ELAC	Huanca
Cojma	0.463	<i>Pouteria torta</i>	SAPO	Reyes-García
Titij	0.446	<i>Ficus insipida</i>	MOR+	Collected
Yajdyadya	0.433	<i>Calophyllum brasiliense</i>	GUTT	Collected, Reyes-García
Sequej	0.432	<i>Licania britteniana</i>	CHRY	Reyes-García
Na Fa / Nafua	0.43	<i>Anandeanthera macrocarpa</i>	FAB+ -Mimosoideae	Collected
Tsanaj	0.416	<i>Cecropia membranacea</i>	MOR+	Collected
Tamtac	0.408	<i>Galipea longiflora</i>	RUT+	Collected, Reyes-García
Moco	0.406	<i>Spondias mombin</i>	ANAC	Collected, Reyes-García, Huanca
Cajpa	0.399	<i>Erythrina poeppigiana</i>	FAB+ -PAPI	Collected, Huanca
Cam	0.398	<i>Otoba parvifolia</i>	MYRC	Reyes-García
Vapi	0.389	<i>Guarea guidonia</i>	MELI	Collected
Na Me	0.385	<i>Inga sp.</i>	FAB+ -Mimosoideae	Huanca
Quiruru	0.356	<i>Cecropia sp.</i>	MOR+	Collected

Co Shi	0.342	<i>Schizolobium amazonicum</i>	FAB+ -Caesalpinoideae	Collected, Huanca
Chura	0.341	<i>Swietenia macrophylla</i>	MELI	Reyes-García
Shaj	0.328	<i>Ident.</i>	X	x
Vambason	0.313	<i>Aspidosperma rigidum</i>	APOC	Collected
Yacani	0.31	<i>Phyllanthus sp.</i>	EUPH	Collected
Copaiva	0.305	<i>Copaifera reticulata</i>	FAB+ -Caesalpinoideae	Collected
Ashaba	0.304	<i>Poulsenia armata</i>	MOR+	Collected, Huanca, Reyes- García
Ijsita	0.303	<i>Pseudolmedia laevis</i>	MOR+	Collected
Vueij / Vaij	0.302	<i>Bactris gasipaes</i>	AREC	Reyes-García
Shara	0.301	<i>Acacia polyphylla</i>	FAB+ -Mimosoideae	Collected
Shepi	0.301	<i>Petiveria alliacea</i>	PHYT	Collected
Tutyi	0.301	<i>Xylopia benthamii</i>	ANNO	Collected
Väväij / Vavaij	0.295	<i>Clarisia racemosa</i>	MOR+	Collected, Reyes- García
Jajru	0.281	<i>Jessenia bataua</i>	AREC	Reyes-García
Cajnere	0.281	<i>Ochroma pyramidale</i>	BOMB	Huanca, Reyes- García
O'ojvi	0.272	<i>Vernonia brasiliana</i>	COMP	Collected
Sima	0.27	<i>Ficus killipii</i>	MOR+	Reyes-García
Vepi	0.255	<i>Cupania cinerea</i>	SAPI	Collected
Batin	0.252	<i>Anandenanthera macrocarpa</i>	FAB+Mimosoidae	Martínez- Rodríguez
Cajtafa	0.252	<i>Geonoma deversa</i>	AREC	Huanca
Oveto	0.252	<i>Uncaria guianensis</i>	RUBI	Huanca, Reyes- García
Tavo Tavo	0.244	<i>Casearia sylvestris</i>	FLAC	Huanca, Reyes- García
Mu	0.243	<i>Heliocarpus americanus</i>	TILI	Huanca, Reyes-

				García
Oba	0.24	<i>Ceiba pentandra</i>	BOMB	Reyes-García
Ava Ava	0.233	<i>Prokia crucis</i>	FLAC	Huanca
Shibo	0.233	<i>Astrocaryum murumuru</i>	AREC	Huanca, Reyes-García
Chira	0.229	<i>Ident.</i>	x	Huanca
Ñejñej	0.228	<i>Hasseltia floribunda</i>	FLAC	Collected
Tiribu	0.227	<i>Cheiloclinium cognatum</i>	HIPR	Collected
Cavaquis	0.225	<i>Terminalia sp.</i>	COMB	Reyes-García
Shuru	0.224	<i>Gynerium sagittatum</i>	GRAM	Reyes-García
Tyej	0.222	<i>Ident.</i>	x	Huanca
Chij	0.205	<i>Triplaris americana</i>	POLG	Collected, Huanca, Reyes-García
Vishiri	0.2	<i>Inga marginata</i>	FAB+ -Mimosoideae	Collected, Huanca
Ere'	0.195	<i>Petiveria alliacea</i>	PHYT	Collected
Pa Nej	0.192	<i>Genipa americana</i>	RUBI	Huanca
Macha	0.186	<i>Amburana caerensis</i>	FAB+ -PAPI	Reyes-García
Itsi	0.184	<i>Picramnia aff. sellowii</i>	SIMA	Collected, Huanca, Reyes-García
Chujna	0.182	<i>Ident.</i>	x	x
Tyutyu Ra	0.178	<i>Mauritia flexouosa</i>	AREC	Huanca
Cojno No	0.17	<i>Igna tomentosa</i>	FAB+ -Mimosoideae	Collected, Reyes-García, Huanca
Bojbori	0.157	<i>Lindernia crustacea</i>	SCRO	Reyes-García
Cajna	0.155	<i>Bactris riparia</i>	AREC	Reyes-García
Chorecho	0.155	<i>Aniba canelilla</i>	LAUR	Collected, Reyes-García
Chorechoson	0.154	<i>Aniba sp.</i>	LAUR	Reyes-García

Perej Perej	0.147	<i>Himatanthus sucuuba</i>	APOC	Collected
Sivii	0.147	<i>Salix humboldtiana</i>	SALI	Huanca, Reyes-García
Doto	0.145	<i>Guazuma ulmifolia</i>	STER	Collected
Bitire	0.144	<i>Guatteria sp.</i>	ANNO	Huanca
Queshespe	0.143	<i>Cordia sp.</i>	BORA	Collected
Tojyo	0.143	<i>Ident.</i>	x	Huanca
Ojdo	0.142	<i>Ident.</i>	AREC	Huanca
Tserac Tserac	0.14	<i>Calyptranthes aff. speciosa</i>	MYRT	Huanca
Paya	0.139	<i>Heliconia episcopalis</i>	MUS+	Collected
Sijta	0.137	<i>Tessaria integrifolia</i>	COMP	Reyes-García
Mito	0.134	<i>Ident.</i>	RUBI	Huanca
Joyo	0.132	<i>Sterculia sp.</i>	STER	Collected, Huanca
Bojno Ta	0.129	<i>Muntingia calabura</i>	ELAC	Collected, Huanca
Yuyujna	0.126	<i>Cordia nodosa</i>	BORA	Huanca
Tunenes	0.124	<i>Calycophyllum spruceanum</i>	RUBI	Collected
Mujpe	0.123	<i>Ficus sp.</i>	MOR+	Collected, Huanca
Jiji	0.119	<i>Chrysophyllum sericeum</i>	SAPO	Reyes-García
Shiquity	0.119	<i>Ident.</i>	FAB+ -PAPI	Huanca
Shonoj	0.118	<i>Tapirira guianensis</i>	ANAC	Huanca, Reyes-García
Cayaya	0.117	<i>Hippocratea volubilis</i>	HIPR	Collected
Ororona	0.117	<i>Carica sp.</i>	CARI	Collected
Sipicu	0.115	<i>Ident.</i>	x	x
Movai	0.11	<i>Pourouma cecropiifolia</i>	MOR+	Huanca, Reyes-García
Birina	0.107	<i>Casearia sp.</i>	FLAC	Huanca
Cujtyuji	0.104	<i>Abarema sp.</i>	FAB+ -Mimosoideae	Reyes-García

Vinaj	0.103	<i>Stylogyne cauliflora</i>	MYRS	Collected, Huanca, Reyes- García
Dabaj Dabaj / Dabajdabaj	0.102	<i>Trichilia rubra</i>	MELI	Reyes-García, Huanca
Tso Vety	0.102	<i>Carludovica palmata</i>	CYCL	Reyes-García
Chafuj	0.101	<i>Virola sebifera</i>	MYRC	Collected, Huanca
Apajjniqui	0.1	<i>Pera benensis</i>	EUPH	Reyes-García
Dororo	0.1	<i>Ident.</i>	x	Huanca
Shajquiba	0.099	<i>Mayna odorata</i>	FLAC	Collected
Tsero Tsero	0.096	<i>Ident.</i>	x	x
Mase / Mace	0.093	<i>Pourouma sp.</i>	MOR+	Huanca, Reyes- García
Faj Faj	0.092	<i>Sloanea guianensis</i>	ELAC	Reyes-García
Shishi Butu	0.09	<i>Alibertia pilosa</i>	RUBI	Huanca, Reyes- García
Shivajtuqi	0.085	<i>Ident.</i>	x	Huanca
Vojpina	0.085	<i>Ident.</i>	x	x
Bujtyu Bujtyu	0.084	<i>Hirtella sp.</i>	CHRY	Reyes-García
I Nishu	0.084	<i>Inga</i>	FAB+ -Mimosoideae	Huanca
Ma Nere	0.084	<i>Euterpe precatoria</i>	AREC	Huanca, Reyes- García
Ojme Ro	0.084	<i>Paullinia cuneata</i>	SAPI	Collected
A Fare / Afare	0.08	<i>Pouteria reticulata</i>	SAPO	Collected, Huanca, Reyes- García
Shaba	0.079	<i>Hirtella bullata</i>	CHRY	Reyes-García
Ca Jisi/ Cajisi	0.078	<i>Ident.</i>	x	x
I Seji / Iceji	0.077	<i>Guazuma sp.</i>	STER	Collected
Co Cope	0.075	<i>Bactris sp.</i>	AREC	Huanca, Reyes-

				García
Shaba Shaba	0.075	<i>Selaginella haematodes</i>	SELL	Collected
Tara Tara	0.075	<i>Licania brittoniana</i>	CHRY	Collected
Ca Ij	0.074	<i>Ident.</i>	x	Huanca
Chip	0.074	<i>Sida santaremensis</i>	MALV	Collected
Veya	0.074	<i>Unonopsis floribunda</i>	ANNO	Collected
Juparety Cas	0.073	<i>Cordia sp.</i>	BORA	Collected
Fuj Fuj	0.072	<i>Ceiba sp.</i>	BOMB	Huanca
Coroi Coroi	0.07	<i>Miconia sp.</i>	MELM	Collected
Dyincava	0.07	<i>Momordica charantia</i>	CUCU	Collected
Yivava	0.07	<i>Ident.</i>	x	x
Pan Dyej Pan Dyej	0.069	<i>Prestonia sp.</i>	APOC	Huanca
Vetere	0.067	<i>Acacia sp.</i>	FAB+ -Mimosoideae	Huanca, Reyes-García
Coneij / Conei / Canao	0.066	<i>Thevetia peruviana</i>	APOC	Collected, Reyes-García, Huanca
Ocoya	0.066	<i>Pseudobombax sp.</i>	BOMB	Collected
Tsi Mac	0.065	<i>Solanum sp.</i>	SOLA	Collected
Sheyejye / Sheye Sheye	0.063	<i>Guarea macrophylla</i>	MELI	Reyes-García
Vijri	0.061	<i>Ident.</i>	AREC	Huanca
Shepi Ys	0.06	<i>Mansoa alliacea</i>	BIGN	Reyes-García
Cuna / Cu Na	0.059	<i>Inga sp.</i>	FAB+ -Mimosoideae	Huanca
Vujvuri / Vujvu Ri	0.059	<i>Ident.</i>	LAUR	Huanca
Bane	0.058	<i>Lasiacis divaricata</i>	GRAM	Reyes-García
Japa Ya	0.058	<i>Ident.</i>	EUPH	Huanca
Naba Ba	0.057	<i>Pterocarpus sp.</i>	FAB+ -PAPI	Reyes-García
Biruruc	0.056	<i>Acroceras sp.</i>	PANG	Reyes-García
Chirimoya / Chirimuyi	0.056	<i>Ident.</i>	x	Huanca
Dyadyaya	0.053	<i>Ident.</i>	x	x
Chomi	0.052	<i>Ident.</i>	x	Reyes-García

Pimi	0.052	<i>Pseudolmedia laevis</i>	MOR+	Huanca
Pise Re	0.052	<i>Duguetia spixiana</i>	ANNO	Collected
Shojjno	0.052	<i>Acalypha macrostachya</i>	EUPH	Collected
Jijison	0.051	<i>Pouteria sp.</i>	SAPO	Huanca
Itava	0.05	<i>Ident.</i>	x	x
Jacaranda	0.05	<i>Ident.</i>	x	x
Joroson	0.05	<i>Guarea cf. guidonia</i>	MELI	Huanca
Yujyo	0.05	<i>Alsophila cuspidata</i>	PTEP	Huanca
Arara	0.049	<i>Urera laciniata</i>	URTI	Huanca, Reyes-García
Cinini	0.049	<i>Ident.</i>	x	x
Cocomaj	0.049	<i>Ident.</i>	x	Huanca
Shashuch	0.049	<i>Ident.</i>	x	Huanca
Shu U	0.049	<i>Ident.</i>	x	x
Teteson Tetesi N	0.049	<i>Pourouma sp.</i>	MOR+	Reyes-García
Coti	0.048	<i>Psidium guajava</i>	MYRT	Collected, Reyes-García, Huanca
Mujpere	0.048	<i>Sapium sp.</i>	EUPH	Huanca
Ono Ono	0.048	<i>Abuta grandiflora</i>	MENI	Collected
Chijto	0.045	<i>Ident.</i>	x	x
Pomo	0.045	<i>Pseudolmedia macrophilla</i>	MOR+	Huanca, Reyes-García
Shobo	0.045	<i>Ident.</i>	x	Huanca
Shovovos	0.045	<i>Ident.</i>	x	Huanca, Reyes-García
Shushoy	0.045	<i>Ident.</i>	x	Huanca
Yadada	0.045	<i>Allophylus cf. punctatus</i>	SAPI	Huanca
Yararas	0.045	<i>Ident.</i>	x	x
Opospere	0.044	<i>Heliconia sp.</i>	MUS+	Huanca, Reyes-García
Shoco Shoco	0.044	<i>Ident.</i>	x	x

Naqui	0.042	<i>Ident.</i>	x	x
Cashcaria	0.041	<i>Cinchona cf. officinalis</i>	RUBI	Reyes-García
Shivapi	0.041	<i>Ident.</i>	x	x
Tsini Tsini	0.041	<i>Macfadyena uncata</i>	BIGN	Huanca
Tapi	0.04	<i>Thoracocarpus bissectus</i>	CYCL	Reyes-García
Tsajfa Fa	0.04	<i>Ocotea aff longifolia</i>	LAUR	Huanca, Reyes-García
Chufadai	0.039	<i>Ident.</i>	x	x
Fu U	0.039	<i>Trichipteris procera</i>	CYAT	Reyes-García
Pishi Pishi	0.039	<i>Mouriri myrtilloides</i>	MELM	Huanca, Reyes-García
Queru Quere	0.039	<i>Ormosia nobilis</i>	FAB+ -PAPI	Reyes-García
Quijtsi	0.039	<i>Phyllanthus acuminatus</i>	EUPH	Reyes-García
Vi Si	0.039	<i>Protium aracouchini</i>	BURS	Huanca
Vu Ei	0.039	<i>Bactris gasipaes</i>	AREC	Reyes-García
Surij	0.038	<i>Monotogma cf. laxum</i>	MARN	Huanca, Reyes-García
Tajibo	0.037	<i>Tabebuia heptaphylla</i>	BIGN	Reyes-García
Cuta	0.036	<i>Astronium fraxinifolium</i>	ANAC	Reyes-García
Iyo Po	0.036	<i>Ident.</i>	x	X
Jarabisa	0.036	<i>Ident.</i>	x	X
Oyoj Oyoj	0.036	<i>Urvillea sp.</i>	SAPI	Huanca, Reyes-García
Pacaya	0.036	<i>Inga sp.</i>	FAB+-Mimosoideae	Huanca
Co Cop	0.035	<i>Casearia sp.</i>	FLAC	Huanca
Nati	0.035	<i>Ident.</i>	x	X
Cami / Ca Mi	0.034	<i>Ident.</i>	x	X
Coropan	0.034	<i>Ident.</i>	FAB+ -PAPI	Huanca
I Fo	0.034	<i>Bixa orellana</i>	BIX+	Collected
Nejquitamo	0.034	<i>Ident.</i>	x	X

Shuru Cogoye	0.034	<i>Ident.</i>	x	X
Shuru Shuibus	0.034	<i>Ident.</i>	x	X
Siamoson	0.034	<i>Cedrela sp.</i>	MELI	Reyes-García
Binca	0.033	<i>Passiflora triloba</i>	PASS	Reyes-García
Caucho	0.033	<i>Ident.</i>	x	X
Cayon	0.033	<i>Anacardium occidentale</i>	ANAC	Reyes-García
Opoye	0.033	<i>Ident.</i>	x	X
Papac	0.033	<i>Crotalaria incana</i>	FAB+ -PAPI	Collected
Ton	0.033	<i>Guadua sp.</i>	GRAM	Collected
Tye	0.033	<i>Cecropia membranacea</i>	MOR+	Reyes-García
Cocos	0.032	<i>Aegiphila integrifolia</i>	VERB	Collected
Sejsame	0.032	<i>Senna cf. alata</i>	FAB+ -Caesalpinoideae	Huanca
Tsaruj Tsaruj	0.032	<i>Marliera sp.</i>	MYRT	Huanca
Ca Ij Ca Ij	0.03	<i>Ipomaea sp.</i>	CONV	Huanca
Caijcani	0.03	<i>Smilax sp.</i>	SMIL	Huanca
Co Mori	0.03	<i>Prestonia robusta</i>	APOC	Huanca
Soro	0.03	<i>Cecropia sciadophylla</i>	MOR+	Reyes-García, Huanca
Tubuij	0.03	<i>Gouania adenophora</i>	RHAM	Huanca
Vashi	0.03	<i>Serjania sp.</i>	SAPI	Collected, Huanca
Yiraras	0.03	<i>Ident.</i>	x	X
Maraca	0.029	<i>Citrus sinensis</i>	RUT+	Reyes-García
Omin Dye	0.029	<i>Ident.</i>	MOR+	Huanca
Vatira	0.029	<i>Ident.</i>	x	x
Vishi Vishi	0.029	<i>Neea cf. spruceana</i>	NYCT	Huanca
Cotyij Cotyij	0.028	<i>Maclura tinctoria</i>	MOR+	Reyes-García
Ijtapa Shi	0.028	<i>Ident.</i>	x	Huanca
Ivaj Ivaj	0.028	<i>Piper pelatum</i>	PIPE	Huanca
Jityi	0.028	<i>Ident.</i>	x	x

Mara Jitity	0.028	<i>Inga edulis</i>	FAB+ -Mimosoideae	Reyes-García
Mo Cam	0.028	<i>Ident.</i>	x	Huanca
Pujpushu	0.028	<i>Ident.</i>	x	x
Vina	0.028	<i>Ident.</i>		
Virui	0.028	<i>Inga sp.</i>	FAB+ -Mimosoideae	Huanca, Reyes-García
Chujuju	0.027	<i>Ident.</i>	x	x
Doshiri	0.027	<i>Lippia sp.</i>	VERB	Huanca
Puniposon	0.027	<i>Symphonia globulifera</i>	GUTT	Reyes-García
Cuj Na	0.026	<i>Ident.</i>	x	x
Patsi Re	0.026	<i>Desmodium adscendens</i>	FAB+ -PAPI	Huanca, Reyes-García
Mono Mono	0.025	<i>Dendropanax arboreus</i>	ARAL	Huanca, Reyes-García
Shuru Shuru	0.025	<i>Ixora peruviana</i>	RUBI	Huanca
Vara I Vara I	0.025	<i>Siparuna decipiens</i>	MONI	Huanca
Yaraj Yaraj	0.025	<i>Ident.</i>	AREC	Huanca
Chuchu Chuchu	0.024	<i>Ident.</i>	x	x
Shabaji	0.024	<i>Ident.</i>	CAPR	Huanca
Ya Tyi	0.024	<i>Ident.</i>	x	Huanca
Cucush	0.023	<i>Mimosa sp.</i>	FAB+ -Mimosoideae	Reyes-García
So Rocaj	0.023	<i>Pouteria cf. torta</i>	SAPO	Huanca
Vayuna	0.022	<i>Zanthoxylum sp.</i>	RUT+	Collected, Huanca, Reyes-García
Vijyo	0.022	<i>Ident.</i>	x	x
Ajmo	0.021	<i>Pourouma minor</i>	MOR+	H, Reyes-García
Yeij	0.021	<i>Ident.</i>	x	x
Bajna	0.02	<i>Gossypium barbadeense</i>	MALV	Reyes-García
Bui Si	0.02	<i>Entada sp.</i>	FAB+ -Mimosoideae	Reyes-García, Huanca

Mapuri	0.02	<i>Ricinus communis</i>	EUPH	Reyes-García
Boboch	0.019	<i>Ident.</i>	x	Huanca
Chuchujbi	0.019	<i>Gurania sp.</i>	CUCU	Huanca
I Fare	0.019	<i>Ident.</i>	x	x
Bibi	0.018	<i>Ident.</i>	x	x
Novei	0.018	<i>Celtis schippii</i>	ULM+	Huanca, Reyes-García
Shemu Shemu	0.018	<i>Ident.</i>	x	x
Upuyu	0.018	<i>Piper glabratum</i>	PIPE	Huanca
Urujcha Chaco	0.018	<i>Ident.</i>	x	x
Boco Boc	0.017	<i>Ident.</i>	x	x
Totoij	0.017	<i>Ident.</i>	x	Huanca
Vatisira	0.017	<i>Ident.</i>	x	x
Bese	0.016	<i>Trophis sp.</i>	MOR+	Huanca
Jere Dyis	0.016	<i>Inga sp.</i>	FAB+ -Mimosoideae	Huanca
Merique Merique	0.016	<i>Ident.</i>	x	x
Bacaj Bacaj / Bucuj Bucuj	0.015	<i>Inga steinbachii</i>	FAB+ -Mimosoideae	Reyes-García
Mii mii	0.015	<i>Ident.</i>	x	x
Undye	0.015	<i>Anthurium sp.</i>	AR++	Huanca
Bicaquis	0.014	<i>Citrus aurantium</i>	RUT+	Reyes-García
Bu A	0.014	<i>Costus scaber</i>	ZING	Reyes-García, Huanca
Condye	0.014	<i>Ident.</i>	x	x
Oteti	0.014	<i>Ident.</i>	ORCH	Huanca
Chadye Chadye	0.013	<i>Cordia sp.</i>	BORA	Huanca
Choo	0.013	<i>Ident.</i>	x	x
Marava	0.013	<i>Ident.</i>	x	x
Opaj Opaj	0.012	<i>Heliconia sp.</i>	MUS+	Huanca
Vicoi	0.012	<i>Cordia sp.</i>	BORA	Huanca
Chuchus	0.011	<i>Ident.</i>	x	Huanca

Do Nej Do Nej	0.011	<i>Cedrela sp.</i>	MELI	Huanca
E Ejtsere	0.011	<i>Ident.</i>	x	Huanca
Popots	0.011	<i>Ident.</i>	x	Huanca
Saute	0.011	<i>Zingiber sp.</i>	ZING	Reyes-García
Basho	0.01	<i>Ident.</i>	x	Huanca
Ijmereca	0.01	<i>Myrcia sp.</i>	MYRT	Reyes-García
Paruj	0.01	<i>Ident.</i>	x	x
Vonare	0.01	<i>Ident.</i>	x	x
Dyararas	0.009	<i>Ident.</i>	x	x
Ibam Ta	0.009	<i>Galipea sp.</i>	RUT+	Huanca
Itison	0.009	<i>Picramnia latifolia</i>	SIMA	Huanca, Reyes-García
Vereyo	0.009	<i>Ident.</i>	x	x
Bibisa	0.008	<i>Ident.</i>	x	x
Cot Tuji	0.008	<i>Ident.</i>	x	x
Pucucus	0.008	<i>Iryanthera juruensis</i>	MYRC	Huanca, Reyes-García
Pupuj	0.008	<i>Alchornea sp.</i>	EUPH	Huanca
Voty	0.008	<i>Ident.</i>	x	x
Jivin	0.007	<i>Scleria melaleuca</i>	CYPE	Collected
Ta	0.007	<i>Ident.</i>	x	Huanca
Vada Ca	0.007	<i>Passiflora sp.</i>	PASS	Huanca, Reyes-García
Yeson	0.007	<i>Ident.</i>	x	x
Catare	0.006	<i>Ident.</i>	x	x
Manco	0.006	<i>Mangifera indica</i>	ANAC	Reyes-García
Ponison	0.006	<i>Ident.</i>	x	x
Sicdye Sicdye	0.006	<i>Ident.</i>	x	x
Yomomo	0.006	<i>Ident.</i>	x	x
Yujpuru	0.006	<i>Ident.</i>	x	x

Yujpuru	0.006	<i>Ident.</i>	x	x
Boro Boro	0.005	<i>Ident.</i>	x	Huanca
Chaimo	0.005	<i>Ident.</i>	x	x
Done	0.005	<i>Ischnosiphon sp.</i>	MARN	Huanca
Jechei	0.005	<i>Ident.</i>	x	x
Motoi Motoi	0.005	<i>Amaranthus spinosus</i>	AMAR	Reyes-García
Ij Ahas	0.004	<i>Ident.</i>	x	x
Irivadyes	0.004	<i>Ident.</i>	x	x
Moco Jiti	0.004	<i>Ident.</i>	x	x
Poshe Poshe	0.004	<i>Ident.</i>	x	x
Siribay	0.004	<i>Marliera sp.</i>	MYRT	Huanca
Sivacho	0.004	<i>Ident.</i>	x	x
Vai Si Ma	0.004	<i>Hirtella aff. Racemosa</i>	CHRY	Huanca, Reyes-García
Visaru	0.004	<i>Ident.</i>	x	Huanca
Pinana	0.003	<i>Croton sp.</i>	EUPH	Huanca
Poco	0.003	<i>Ident.</i>	x	x
Cava Vas	0.002	<i>Desmodium sp.</i>	FAB+ -PAPI	Huanca
Idyeni	0.002	<i>Passiflora triloba</i>	PASS	Huanca, Reyes-García
Ishi Ishi	0.002	<i>Ident.</i>	x	x
Punchi	0.002	<i>Ident.</i>	x	x
Vejshuj / Vejchuj	0.002	<i>Ident.</i>	x	Huanca
Yun	0.002	<i>Ident.</i>	x	x
Muru Muru	0.001	<i>Mayna sp.</i>	FLAC	Reyes-García
Nu Bubu	0.001	<i>Paullinia cf. alta</i>	SAPI	Huanca
Robo Robo	0.001	<i>Mikania sp.</i>	COMP	Huanca
Tuni	0.001	<i>Ident.</i>	x	x
Quetyet	0	<i>Ident.</i>	x	x