Environmental Governance and Implications of Small-scale Logging: the case of the Indigenous groups in the Ampiyacu Basin in the Northeastern Peruvian Amazon

by

Carolina De la Rosa Tincopa, B.S.

Thesis

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

Master of Arts

The University of Texas at Austin

August, 2009

Environmental Governance and Implications of Small-scale Logging: the case of the Indigenous groups in the Ampiyacu Basin in the Northeastern Peruvian Amazon

Approved by
Supervising Committee:

Kenneth R. Young

Bjorn Sletto

William E. Doolittle

Gregory Knapp

Dedication

This work is dedicated to my parents, Pedro and Rosa for their support, devotion and caring love for their nine children, and to the people living in the forests.

Acknowledgements

This research was undertaken with the financial support of the Ford Foundation fellowship. Without such generous funding, this study would not have been possible. I would also like to acknowledge the *Instituto del Bien Comun* (IBC) for their help with logistics so I could conduct the field work. I am particularly grateful to Dick Smith, Jomber Chota-Inuma, and Aldo Villanueva for their friendship and assistance. I am also immensely grateful to the people in the Ampiyacu for sharing their knowledge and thoughts about the timber extraction with me.

In addition, I would like to express deep gratitude to Ken Young, who patiently guided me trough the academic world in the U.S. for his support and caring advice. I would also like to thank Bjorn Sletto for his multiple contributions to improve this research. I also wish to thank Gregory Knapp and William Doolittle for their support and for serving on my committee, and Ingrid Haeckel and Mario Cardozo for the review of this manuscript.

Finally, I am indebted to my husband, Manuel Mavila, and daughter, Ariadna Mavila, who patiently supported me in the highs and lows of this research and endured my absences from many family activities. In addition, I thank my parents, Pedro and Rosa, who instilled in me a love for my country, my culture, and people.

August 2009

Environmental Governance and Implications of Small-scale Logging: the case of the Indigenous groups in the Ampiyacu Basin in the Northeastern Peruvian Amazon

Carolina De la Rosa Tincopa, M.A.

The University of Texas at Austin, 2009

Supervisor: Kenneth R. Young

Abstract

Small-scale logging by indigenous people in Amazonia remains little studied despite the importance of this activity to forest communities and its relevance to the implementation of conservation initiatives. Previous studies in the region have given an overview of small-scale logging and the role of local institutions in the management of timber resources. This study provides insight into the local institutions that govern the use of timber resources and the timber extraction practices of indigenous communities in Amazonia.

Timber extraction was examined through a regional case study of indigenous people along the Ampiyacu River, an affluent of the Amazon near Iquitos, Peru. An analysis of the actors within and outside of the Ampiyacu Basin involved in timber harvest and the local institutions for regulating access to forest resources provides the context for examination of local arrangements in small-scale logging. Detailed

information about local institutional arrangements was collected through a mixture of qualitative methods, including archival research, focus groups, structured interviews, and direct observation. An analysis of timber practices and the sustainability thereof in extraction areas for the 13 villages of the region allowed a characterization of small-scale logging practices and revealed the most relevant factors in timber extraction strategy and economics. Local arrangements were explained by policy, proximity to an urban market, and access to funding. Most loggers are poor, earning less than $ 496/year in cash, although income levels varied widely within type of funding. The higher income loggers are specialists who log more than the permissible quota and have greater access to funding. Timber was the central economic activity of all local residents. The implications of these findings are discussed for local arrangements and future research on small-scale logging by indigenous peoples of Amazonia.

Table of Contents

List of Tables

List of Figures

Chapter One: Introduction

For many indigenous groups, forests and trees are the major sources of livelihood and economic growth (Coomes 1992, Ostrom 1999b, Alavapati and Zarin 2004, Scherr, White and Kaimovitz 2004). As a result, forest residents have developed institutional arrangements for controlling access to forest resources. Nevertheless, public policy and the market influence society's norms, subsequently influencing how logging is carried out (Smith et al. 2006). Logging is one of the most important market-oriented activities of indigenous groups living in the Amazon. Indeed, since the 1970s, logging has become the primary source of income for locals in the Ampiyacu region in the northeastern Peruvian Amazon (Benavides et al. 1996).

The Peruvian government's recognition of indigenous communities has not guarded them from the external conservation and market interests that are often present. The communities addressed in this study are close to an important regional market, Pebas, and are only a 4-hour motorboat ride away from the city of Iquitos, the most populated city of the Peruvian Amazon. This fact has contributed to the development of the current local arrangements of access to forest resources. Studying the institutional arrangements in the Ampiyacu River Basin allows an analysis of the role of local and external factors on the local system of use of resources. At the basin scale, particularities at the different levels of decision-making in timber extraction are important local variables. External factors that set the context for the local system are market penetration and national policies regarding indigenous communities.

At the national level, the new forestry law in Peru prioritizes zoning in permanent production forests (PPF) and promotes forest management in forest concessions (Hidalgo 2003, Galarza and La Serna 2005). Although new policies for timber extraction in communal forests have been implemented, poor understanding of local mechanisms and their implications for timber harvesting remains prevalent. As a result of state governance failures (Smith et al. 2006), the political organization in the Ampiyacu Basin, the Federation of Native Communities of the Ampiyacu (FECONA), has established internal mechanisms and developed local rules to restrict the access of illegal loggers and outsiders who come from Pebas, Iquitos and other urban centers of the Peruvian Amazon.

The demands for land by indigenous groups have resulted in the creation of conservation areas and different legal mechanisms for indigenous people to gain access to their traditional land, as well as an alternative way to stop the encroachment by outsiders. For example, the regional government recently granted local communities in the Ampiyacu Basin access to a conservation area resulting in the creation of the Regional Conservation Area of Ampiyacu-Apayacu. In order to determine the future use of this new protected area, the categorization process under the regional system will result in territories currently under communal title having to share a mosaic of areas where local residents can exploit timber and other natural resources.

Consequently, communities of the Ampiyacu Basin may have the opportunity to become involved in a management scheme where local regulating mechanisms influence decisions on land allocation and resource management. Therefore, timber extraction and

its social and environmental repercussions are key issues in analyzing the long-term viability of this new conservation area, where the indigenous federation has an important role in achieving the sustainability of the initiative. The hypothesis is that certain conditions must exist in local communities in order for them to 1) become involved in a management scheme, and 2) strengthen local institutions on land allocation and resource management.

Community forms of governance appear invisible in everyday practices of local resource use (Agrawal 2007). Informal institutional access and control constitute flexible and ecologically adaptative forms of resource extraction. Moreover, variations in forms of governance in vast areas of forest land under state control have received less attention, focusing only on how variations in institutional arrangements shape resource use (Agrawal 2007). Indeed, the understanding of local mechanisms of governance is often weak (Watts 2000).

Future Research based on the strengths and limitations of local systems to effectively drive policies is important for the future understanding of self-governance of forest resources (Ostrom 1999b). Local involvement in policy regulation can diminish the impact of laws and improve market regulation and development plans. Involving locals in democratization processes can make forestry markets fairer. Changes in how governance takes place as well as changes in forest supply and demand offer new opportunities for low-income producers (Scherr et al. 2004).

Currently, large-scale logging activities and their implications for Amazonian forests are the focus of much research. The majority of this work has focused on large-scale timber industries and their overexploitation of a small number of high-value species (Pinedo-Vasquez et al. 2001) and commercial logging as one of the causes of deforestation (Nepstad et al. 1999, Gibson, McKean and Ostrom 2000a, Sierra 2001, Asner et al. 2005). Less well studied, but certainly not less important, are the social characteristics and environmental implications of small-scale timber activities carried out by indigenous people in the Amazon.

Research in the Amazon has ignored differences in scale of timber harvesting; consequently, the different levels of producers have been overlooked (Pinedo-Vasquez et al. 2001). Generalizations based on large-scale industry have diminished the role that small-scale producers play in forest management. Thus, there exists a regional variability in which small-scale producers constitute an important segment of the domestic timber market (Sierra 2001). Moreover, local populations are the best allies to protect Amazon forest resources; traditional systems embedded in invisible technologies exist but they have not been well studied (Padoch and Pinedo-Vasquez 2006).

Extractivist economies have been part of Amazon history and timber extraction has not been an exception. In fact, small-scale producers have been the most significant part of the timber commodity chain (Pinedo-Vasquez, Zarin and Jipp 1992, Sierra 2001). Even though timber companies have the potential to improve the quality of life of rural low-income populations, most companies follow the economic logic of benefits

maximization through lower costs of production (Nepstad et al. 2004.). Under these circumstances, small producers cannot be in the position to negotiate with companies, for instance, towards higher timber prices.

There exists much concern about the social and environmental effects of small-scale logging in the tropics. Important aspects that determine these effects include the impacts of timber harvesting practices and the factors that influence these current practices. In this study, these aspects were analyzed to evaluate the effects of local institutions in small-scale logging. An analytical framework was used to describe small-scale logging, particularly in terms of indigenous regulation systems, and focus on the characteristics of local arrangements in the extraction areas of the Ampiyacu River Basin.

The hypothesis was that the implementation of the forestry law and the presence of markets influence institutional arrangements, and consequently, families' decision-making regarding timber extraction. The overall research objective of this study was to analyze the local regulations that control logging and the characteristics of harvesting practices in local communities in order to understand:

1) Local and regional actors related to timber extraction in the Ampiyacu Basin.
2) How local arrangements that control access to timber resources work.
3) How timber-harvesting practices occur in this area.

Positionality

I am very interested in the interaction between people and forests, both in ecological and social terms, and especially how different perceptions inform these interactions. Often, dominant perceptions of forests and social relationships limit the right of people, especially indigenous communities, to use their resources for their own benefit. I am also interested in local organizations, especially how these are marginalized despite the goals of decentralized governance in the Peruvian constitution. This thesis has emerged from my dual interests in local governance and the interactions between people and forests. Specifically, my personal perspective on the use of forest resources is oriented towards strengthening local initiatives and efforts in natural resource management. I believe that local residents are the main stakeholders and that their participation is vital to ensure the conservation of natural resources. I also consider it important to analyze local initiatives in forest resource management use in order to implement more participatory, equitable and effective policies.

I have a background in forestry and tropical forest management, but I have since moved on to pursue more empirical, academic interests in nature-human relationships. Since I started my career, I have always worked on issues related to natural resources use and development, in very isolated rural areas inhabited by indigenous peoples. These experiences increased my interest in understanding not only the ecologic dynamism of the forests, but also the social dynamics among forest dwellers. As a forester, I developed

an ability to relate successfully with people living in forested areas, and I learned to understand their perceptions and their way to relate with outsiders.

My interactions with indigenous peoples are informed by my positionality as an educated Peruvian female. During parts of my childhood I grew up in rural areas of the Andes, but mostly I was raised in Lima, the capital. Additionally, I am a native Spanish speaker and am therefore able to communicate with the mostly bilingual (Spanish and various indigenous languages) community members.

As a female educated in Lima, it has been necessary to deal with and navigate cultural differences, especially when working in rural areas where people have different cultural backgrounds and contexts. During my first visit to one of the indigenous villages in the Amazon, many years ago, I experienced a difficult encounter with an indigenous leader. I was taking pictures of a meeting in an indigenous village when suddenly the leader called me outside. He then asked me to take care of a woman who was sick in the village. During this visit, I was part of a team of foresters and I had been put in charge of the first aid travelers' kit. Since he knew I had access to the first aid kit, the leader asked me to examine the woman and provide her with medicines. But I refused his request, answering that I was not a doctor and could not proscribe medicines for her. When I said that, the leader looked daggers at me. I explained to him again that I was not a doctor and didn't have sufficient knowledge to prescribe medicines. Still, his interpretation of my answer was that I did not want to share the medicines and that I was an ungiving and ungenerous person.

This incident made me realize my attitude was wrong and that my answer to him was inappropriate, given the local context. I had responded as I would have in Lima, and had not understood that the indigenous people's perspective on medicine and sharing was very different. I have never forgotten this experience. It has helped me navigate other complex social situations in the indigenous communities in this region. I have learned that it is most important to never promise anything you are not in a condition to deliver, and that you under no circumstances should lie. I have learned the importance of being open and aware of different ways of approaching social relationships and knowledge production, and the necessity of maintaining honest and friendly relationships with everybody.

My previous work in the study area was as a Natural Resources specialist in the Instituto del Bien Comun (IBC), a Peruvian NGO. I have studied timber extraction in the 13 communities located in the Ampiyacu basin since 2004, and have also participated in the creation and promotion of the Ampiyacu-Apayacu Regional Conservation Area. Because of my long periods spent living in indigenous communities in the Ampiyacu basin, I decided to focus my work on generating the socio-economic base-line information regarding the use of forest resources. I also realized indigenous groups in the forests have extensive knowledge of issues regarding timber extraction, and this also motivated me to do my research in this region.

During the past five years, I established strong connections with indigenous leaders, community members, loggers and federation representatives, and I am well

known among the indigenous groups of the Ampiyacu basin. I have developed strong, personal feelings for this region and its people because I have worked there for so long. However, I have avoided developing close friendships with any person or group in particular. Instead, I consider all of them my friends and I believe this feeling is mutual. Because of our different cultural backgrounds, I have experienced good and bad moments during my work. However, I have learned many life lessons that have made me understand better how indigenous people see life and nature, and this has shaped my own way of seeing my own life. For instance, I have learned the importance of personal relationship and that inanimate, material things are less valuable in our lives.

In the following chapter, the Literature Review, the relevant work on forest governance and community-based forest management is discussed along with the emerging trends in institutional arrangements studies. The literature on forest governance and forest management will provide the necessary framework for understanding the contribution of this study. The study area chapter that follows provides an historical overview of forest resources in the Peruvian Amazon and in the region as well as information on the biophysical and sociopolitical setting for this study. In the methodology chapter, secondary data about local institutional arrangements collected through a mixture of qualitative methods as well as the methods used in the collection of environmental variables are explained in detail. Chapters five, six, and seven present the results of the study. Chapter five details the different actors involved in timber extraction in the Ampiyacu Basin. Chapter six describes the institutions and interactions among

actors organizing access to timber resources. Chapter seven describes each of the stages in timber extraction operations and evaluates the performance of these operations in the study area. The discussion chapter analyzes the findings in the general context of forest management, and concludes with suggestions for future resource use in the area of study, and the implications for applying the results of this study in a broader context of institutional arrangements and forest management.

Chapter Two: Literature Review

Complex forms of control over access to forest resources in indigenous territories and the unequal power relations among the State, timber companies and indigenous communities affect the long-term sustainability of forest-base resources. The theoretical framework for this study, based on indigenous people literature, explores governance and community-based forest management and subsequent implications for the sustainability of resource use by indigenous communities in the Amazon.

Community-based institutional arrangements

A considerable amount of research about forests and governance has been produced using common property theory (Gibson, McKean and Ostrom 2000b, Agrawal 2007). Initial studies focused on collective action and common property, as well as on the characteristics and conditions under which a common pool of resources occurs (Ostrom 1999b). Furthermore, globalization influences the creation of new modalities of governance systems (Agrawal 2007, Klooster 2000). According to Agrawal and Lemos (2007), globalization has lead to hybrid modes of environmental governance in which communities play a key role. Communities provide unique information to help solve complex problems that distant state agencies often do not possess, and may provide equitable allocation of benefits from forest resources.

Much of this research has concentrated on identifying the variables that account for the success of collective action at the local level (Ostrom 1990, Wade 1988). At higher levels, little research exists on the role of factors such as on market integration and state policies, or of collective action (Agrawal 2003). Among local variables, even the role of important factors such as heterogeneity among users is poorly understood (Ostrom 1999a). Heterogeneity among users exists along different dimensions and only recent comparative research has helped to identify the relevant dimensions and their potential impact on collective efforts to use common resources (Molinas 1998, Varughese and Ostrom 2001, Poteete and Ostrom 2004). The role of heterogeneity of common-pool resources in collective action is also poorly understood, especially in tropical forests since much of the theory has developed around water and fisheries.

MacCay and Acheson (1987) point out the complex contextual factors influencing any dynamic between the rights and access of various social entities. This argument for common property management is supported by examples of co-management strategies. The concept of property takes on different meanings at different scales and is one among many variables that determine who gets to use or consume what resources (McCay and Acheson 1987, Ribot and Peluso 2003, MacPherson 1978). MacPherson (1978) identifies the misconception of property as an important concern, and defines property as not things, but the right in or to things, suggesting the need for a new concept of property. Further, the differentiation between *access* and *property* on the basis that one incorporates the concept of "bundle of powers", while the other incorporates the notion of

"bundle of rights" and entitlement, determines who obtains benefits from what resources at what time (Ribot and Peluso 2003).

Access theory provides a deeper understanding of dynamic processes and relationships of access, which is defined as the ability to benefit from, for instance, natural resources. McCay and Acheson (1987) showed case studies demonstrating that traditional societies provide different and unexplored ways to maintain the commons. In the use of common resources, a considerable theoretical and empirical body of research in political ecology has demonstrated that it is possible for individuals using a common resource to act collectively to avoid the tragedy of the commons (1968, Ostrom 1990, Bromley and Feeny 1992, Baland and Platteau 1996).

In political ecology, institutions have been considered as the starting point to link heterogeneous local users and biologically differentiated environments (Watts 2000). Institutions are considered to be the actors or players gathered for a particular purpose (Peet and Watts 2004). According to Peet and Watts (2004), institutions can be formal or informal. Implying necessarily forms of governance linked to the social interaction to organize and control resource extraction. Leach et al. (1999) approaches institutions in another way, linking institutional design and performance with entitlements to conceive environmental entitlements as the benefits obtained from resources, over which people must have legitimate control for their subsistence.

Mehta et al. (1999) links institutions with uncertainty. The author states that when institutions and uncertainty are analyzed jointly, it is necessary to understand institutions

not only as rigid mechanisms (e.g. game rules), but also as the space of social interaction, negotiations, and questioning in which actors are heterogeneous. Moreover, institutions emerge in temporal and spatial scales of social relationships. In natural resource management, institutions are not only utilitarian and they cannot be separate of life, beliefs, and everyday practices. Thus, in natural resource management, institutional arrangements occur without distinction among the formal and informal or the local and State endorsement.

Some approaches emphasize the ways and implications of governance. According to Watts (2000), governance implies participation, exercise of power and authority. The author points out the meaning of people's participation and representation in how power is exercised. Thus, environmental governance implies the multiple meanings of institutionalized practices to gain access to and control resources. Ongoing analyses in community-based forest management consider that governance refers to the participants in decision-making, procedures, rules by which decisions are made and consensus reached, as well as the mechanisms that ensure decision-makers are held responsible for their actions (Menzies 2007). According to Cronkleton et al. (2008), environmental governance refers not only to policies for conservation but also involves political, organizational and cultural frameworks to coordinate and control resources.

A significative amount of literature has been produced discussing community-based forest management. In many cases forests have been traditionally managed as collective or common property for several generations. Many studies point out the

negative economic impacts and other effects policies have had on rural populations and their environments (Zerner 2000, Hecht 2004). In addition, some studies analyze how state perceptions of nature have lead to conservation policies that affect negatively local communities and their use of resources (Neumann 2000). The theoretical foundations for community-based approaches, local control and benefits, were essential prerequisites for successful conservation. Thus, community and social forestry gained attention by those pursuing sustainable management of forest resources.

The community-based forest management system (CBFM) sets the framework for the extraction of forest resources by indigenous people. While common pool resources and users are various, only certain forest products are extracted, usually by community members who take control of the management of their forest resources (Menzies 2007). According to Smith (2005), CBFM requires that a group of people share the investment, benefits, decisions, and responsibilities for the same forest resource. This group may consist of certain families within a community, of all the families within one community, or of several individuals from different communities within a geographic region. Therefore, in this context, community is a group of people that share a geographic space and existing resources.

The overexploitation of natural resources is often more related to state development interventions than local arrangements (Robbins 2004), resulting in a process of marginalization wherein communities are politically and socially disempowered (Zerner 2000). Overexploitation of natural resources increases with the intervention of

the State and creates land conflicts, especially between communities on one side, and the State and powerful economic interests on the other (Robbins 2004). As Fairhead (2001) points out, the natural resource of a community becomes a target for outside interests, leaving the community only with the negative externalities resulting from the exploitation of the resource.

In community-based forest management (CBFM), institutional arrangements can empower local resource users (Menzies 2007). The author emphasizes the recognition of local users as being not only governed subjects but also part of the governing in the forest. However, local arrangements can be fragile and need to be anchored in wider national institutions of accountable governance. Thus, in a governance scenario the ability of users to exert regulatory influence can be seriously compromised if they do not have the power to control offenders and take punitive actions. For instance, having the ability to levy fines and seize the products of illegal logging.

Successful stories of collective action and community forestry management in the tropics show that communities organize to avoid forest resource depletion by outside agents and exert not only resistance but also develop institutions for forest management (Tucker 2004, McGrath, Peters and Mota Bentes 2004, Menzies 2007). CBFM is ideally considered as sustainable management of natural resources, highlighting the conditions that bring about effective practices and leading to the most fair and equitable stewardship of resources. However, communities often have had little or no control over local or national government decisions and actions (Menzies 2007). The government actions in

turn often have had generally negative effects on CBFM initiatives. These actions tend to move contrary to many of the community's customary rules for the use and management of forest resources. Government policies also tend to exclude communities from forest resources, denying access to traditional lands (Neumann 2000, Robbins 2004).

The ecology of logging

Literature on the ecology of logging frames timber extraction in terms of sustainability and the most recent definitions of forest management imply sustainability. The international tropical timber organization (ITTO) includes the social and economic dimensions of timber extraction and defines forest management in terms of sustainability. ITTO (2009) defines sustainable forest management (SFM) as: "The process of managing forest to achieve one or more clearly specified objectives of management with regard to the production of a continuous flow of desired forest products and services without undue reduction of its inherent values and future productivity and without undue undesirable effects on the physical and social environment" .

Some authors point out that the concept of sustainable forest management is an ambiguous term. Bowles et al. (1998) argues that in general, forest management is oriented to obtain a continuous production of timber, and more extensively focused as a mechanism that prevents the loss of biodiversity. This definition is of vital importance since it maintains that timber harvest could have devastating effects in the structure and natural composition of natural forests and their biodiversity. In this context, Bowles et al.

(1998) suggests that with the exception of plantations almost any forestry operation is sustainable. Indeed, some authors consider that sustainable forestry is rare in Amazonia (Sears and Pinedo-Vasquez 2004).

Some authors consider that the different conditions required to put into practice sustainable forest management make its implementation unsuccessful. Alavapati and Zarin (2004) consider that sustainability per se implies a set of fashion regulations that impede their implementation. Thus, limited resources and the challenge of changing policies are the principal reasons to see sustainability as inapplicable. Moreover, limited research capabilities and training opportunities obstruct effective management strategies, which in the Neotropical context is a serious problem. In that sense, sustainable forest management has to be framed beyond the performance of logging operations and continuity of timber production. According to Cochrane et al. (2004), a larger context is necessary. For instance, to analyze forest disturbances it is essential to consider the entire landscape matrix. In this context, people should be included in the management to fracture the interactions and possible synergies among fire use, forest fragmentation, and selective logging.

On the other hand, logging refers to the process of harvesting timber. It can imply forest management while timber extraction may not. Conventional logging involves short-term forest supply in which neither governmental control nor management plans may exists (Pearce, Putz and Vanclay 2003). According to Rice et al. (1997), logging as typically operated in the tropics rapidly harvests a few species of the most valuable

commercial trees. The number of species is variable, ranging from one (e.g. mahogany) to 80 (in places where a wide number of species are in demand). Moreover, timber companies generally have no interest in the sustainability of their operations.

Rice et al. (1997) point out that conventional logging provides high returns and incurs less damage to forests than forest management systems. The author argues that severity of damage to forest relates to the intensity and duration of extraction and the extent of the extraction area. Indeed, Sears and Pinedo-Vasquez (2004), found that timber management in smallholder production differs from conventional logging practices in Amazonia. These differences are due to the scale of logging operations and the management practices used, as well as the number of species harvested, diversity of species, and the use of silvicultural treatments.

Large-scale logging is nevertheless one of the main threats in the Amazon (Nepstad et al. 2004.). It initiates a chain of fire-mediated events that cause additional forest displacement. For some authors, selective logging is also considered destructive for tropical forests (Oliveira et al. 2007, Pereira et al. 2002). One of their arguments is that when a tree is cut and falls down, it can damage remaining trees (Verissimo et al. 1992). Asner et al. (2005) point out that, “Selective logging causes widespread collateral damage to remaining trees, subcanopy vegetation, and soils.” On the other hand, low impact techniques can help to diminish damage to the ecosystem. Some authors agree that years of experience practicing in timber extraction have given loggers expertise in less damaging logging practices (Sears, Padoch and Pinedo-Vasquez 2007). According to

Uhl et al. (1991), reduced impact techniques, if carried out correctly, diminish not only damage to the remaining trees, but also reduces logging waste (Uhl et al. 1991). In addition, the use of reduced impact techniques can cause less damage in the forest structure, therefore, diminishing forest clear cutting.

Unmanaged selective logging can increase forest flammability (Uhl et al. 1997, Nepstad et al. 1999). Nepstad et al. (1999) show that logging, as much as fires, increases forest flammability. The authors argue that it permits the exposure of sunrays to the non-vegetated forest floor and this could increase the likelihood of fires. However, Nepstad et al. (1999) conclude that in order to lessen these effects, loggers must implement reduced-impact techniques as a way to diminish the probability of fire, as well as have effective strategies to avoid forest fires.

Selective logging can indeed initiate a series of events that degrade the forest and diminish its ecological and economic value (Asner et al. 2005, Nepstad et al. 1999). Nevertheless, selective logging does not cause the same level of damage as deforestation. According to Putz (2004.), reduced-impact logging refers to conventional, realistic steps to be taken when logging. Specific procedures include measurements before and after harvesting, building and safeguarding of forest paths, cutting down trees in a certain direction, eliminating lianas. Consequently, this practice is frequently considered a sustainable alternative to other types of logging, especially in contrast to complete deforestation, in which large patches of the forest are clear-cut, leaving a wasteland without vegetation (Johns, Barreto and Uhl 1996). Moreover, according to Sabogal et al.

(2004), impacts from timber extraction generally occur to the vegetation, soils, and hydrological regimes, although recent studies also mention impacts on fauna due to hunting (Bennett and Robinson 2000).

Timber extraction and game effects

Species of fauna often become rare because of hunting, habitat destruction and contamination in an area. After habitat destruction, the second most common cause of recent extinctions has been excessive hunting. In tropical forests, hunting by local populations has rarely resulted in species extinctions; nevertheless, this has been changing as the forest inhabitants adopt modern techniques of hunting and are influenced by the market (Bodmer, Eisenberg and Redford 1997). Moreover, timber extraction has a direct negative impact on animal populations since it alters the habitat and floral composition of the forests, removing places of rest and diet utilized by mammals and birds. Bennet and Robinson (2000) indicate that the illegal hunting that usually accompanies timber activities impacts the structure and density of fauna populations.

In general, timber extraction is considered to have caused two types of impacts on fauna. One type of impact is caused by the logging, falling, bucking and timber transportation activities, which affect the forest composition and structure. The other type of impact is caused by hunting by logging crews, which affects the size and structure of fauna populations. Timber extraction in tropical forests causes an increase of hunting pressure on fauna species. Although logging reduces the relative abundance of some

species of fauna inside a biological community, the extracted forests can also favor the presence of other species. Thus, deer and peccary (*huanganas* and *sajinos*) populations benefit from the secondary vegetation produced by logging activities and they can increase in number following timber extraction (Naughton-Treves 2002).

Nevertheless, access to forest by forest trails and the presence of people that consume bushmeat for their subsistence may increase hunting. Consequently, this event significantly increases the hunting rate and diminishes the probability of sustainable hunting (Bennett and Robinson 2000). Studies conducted by Gonzales (1999) on the effects of hunting on cracid populations (family Cracidae, class birds) around 49 rural centers and in the interior of the Pacaya Samiria National Reserve indicate that there were no significant differences in the abundance of the evaluated species among the areas of intense hunting and areas in the interior of the protected area. Moreover, the author points out that cracid do not tolerate high hunting rates and their populations may be reduced because of a continuous hunting. In consequence, it is necessary to set an optimum rate of hunt for these species. Furthermore, these birds will better withstand a determined level of hunting if hunting zones are established surrounded by areas where hunting is not permitted.

Bush meat is a typical part of the diet for the personnel that compose logging crews. Hunting diminishes the costs of logging operations since it provides subsistence to loggers at very low costs. This type of hunting can diminish the availability of hunting resources for local residents, above all of those species which are long-lived and have

greater intergenerational periods as well as low intrinsic rates of reproduction. This is the case for the large primates and the tapir, although it is not for artiodactyls (deer, huanganas and sajinos) and large rodents of the genera Agouti and Dasyprocta (Mittermeier 1987, Bodmer, Fang and Ibanez 1988). In general, large primates (Cotos, Maquisapas, Choros and Machin) are sensitive to any hunting pressure, with population reductions of up to 97% outside of natural areas protected as a result of the extensive hunting (Terborgh, Emmons and Freese 1986).

Chapter Three: Study Area

The Ampiyacu River is a minor tributary of the Amazon River located in the Northeastern region of the Peruvian Amazon (Figure 1). Situated on the left bank of the Amazon River, the Ampiyacu River is 8 kilometers upstream of the town of Pebas and 60 kilometers north of Iquitos, the largest city in the Peruvian Amazon (INEI 2008). The Ampiyacu River basin is densely forested and sparsely populated in the lower parts. It includes thirteen indigenous communities located along the Ampiyacu and its tributaries, the Yaguasyacu and Zumun Rivers. There are no roads that connect the Ampiyacu basin to Pebas or Iquitos. All the transportation between these areas is carried out by boat. A trip to Pebas takes 15 minutes by *peque peque*, a small motor boat, while a trip to Iquitos takes one day.

The Ampiyacu River area was selected for study because the entire region has been involved in conservation initiatives in order to protect indigenous territory and contiguous areas from outsiders. Like most indigenous lands in Peru, the Ampiyacu region is governed by a political organization, the Federation of Native Communities of the Ampiyacu (FECONA). This organization has developed internal mechanisms to restrict access to illegal extractors that come from Pebas, Iquitos and other cities of the Peruvian Amazon. In addition, this region was declared a Regional Conservation Area of Ampiyacu in 2007, an initiative that originated from local people's efforts to stop the encroachment of outsiders (Ordenanza regional 024-2007-GRL-CR).

Biophysical Characteristics

Location and Climate

The Ampiyacu region covers 40,151 hectares of Peruvian Lowland Tropical Forest located in northeastern Peru. Its boundaries are formed by the Algodon and Yaguas rivers to the north and the Amazon River to the south, including two important tributaries: the Yaguasyacu and Zumun rivers (Instituto Nacional de Desarrollo 2005). The Ampiyacu River Basin itself is roughly 2,919 km² in size and extends from the borders of the Algodon and Yaguas River in the north, to the Amazon River in the South (from 2º 49" 15' to 3º 15" 52'S and 72º 10" 05' to 71º 05" 48'W) (Instituto Nacional de Desarrollo 2005). The elevations in this region range from 120 to 250 meters above sea level and the mean annual precipitation ranges from 2,407 to 3,000 mm. The mean annual temperature is 26 ºC and humidity ranges from 82 to 93% (Pitman et al. 2004, Duivenvoorden et al. 2001).

Hydrology and Physiography

The Ampiyacu River basin is located in Pebas district, Ramon Castilla Province, Loreto Department (Instituto Nacional de Desarrollo 2005). This river has as tributaries the rivers Yaguasyacu, Sabalo, Airambo, Zumun, and Supay as well as many streams and lakes. The Ampiyacu River originates in the division with the Algodon River, and it is classified as a black water river covering 186 kilometers from north to south east, flowing

into the Amazon River close to Pebas (Instituto Nacional de Desarrollo 2005). In this basin, the dry season takes place from June to December and the rainy season takes place from January to May. In the rainy season the higher level of water allows the navigation of medium-sized boats, while in the dry season travel is limited to light boats (Instituto Nacional de Desarrollo 2005).

The Amazonian landscape, geology, soils, and rivers are the result of geological processes that have occurred over the last 18 million years. The processes deposited sediments, whose origin and composition were directly connected to the tectonic processes of evolution of the Andes range. In addition, weathering and denudation have shaped the physiography of the current landscape (Kalliola and Paitán 1998). In the area of study, the physiography has a more or less uniform appearance due to the large extensions of *low hills* that conform more than 70% of the landscape (Huerta 2005). However, two other zones can be distinguished as large patches: the *flooded terraces* and the *swamp* association of the *Mauritia flexuosa* palm generally present in the lowland Amazon.

Huerta (2005) identified eleven physiographic units in the region limited by the Ampiyacu, Apayacu, and Putumayo rivers: *low terraces*, *low flood terraces*, *low hydromorphic terraces*, *medium terraces*, *medium hydromorphic terraces*, *high terraces*, *high dissected terraces*, *high hydromorphic terraces*, *bottom of valley*, *low hills*, and *medium hills.* According to this analysis, the dominant physiography in the Ampiyacu River basin is *low hills*, which covers roughly three fourths of the total surface. The

varied topography of *low hills* can reach 80 meters above the river's level and present slopes that vary from 10 to 70% (Duivenvoorden et al. 2001). Characterized by a system of hills with different degrees of steepness, *low hills* are commonly adjacent to *medium terraces* and rarely contiguous to *low terraces*. These physiographic patterns have their origin in the depositional processes, lithologically constituted by sediments of the Pebas formation (Kalliola and Paitán 1998). Generally, this type of physiography is located in high parts of tributaries and their streams in this basin.

The *low terraces* landform type is second largest in the study area, covering 5.22% of the total surface. They are distributed as small patches along tributaries that drain the Low Hills in this area and located adjacently to the Low flooded Terraces. Considered land of recent fluvial origin, this formation is located in the stationary river beds that have limited drainage. As a result, these areas remain flooded most of the year but show only slight erosion (Huerta 2005).

Vegetation and Biodiversity

The lowland Amazon forest is shaped by the dynamic of its rivers, which creates a clear distinction between upland (or *terra firme*) and floodplain areas. According to Kalliola and Puhakka (2003), the vegetation in these lands varies in relation to climatic variations and soils, which are significant conditions causing differentiation among the vegetation types. Thus, vegetation in *terra firme* based on soils presence can be

categorized in two types: white sand vegetation and silty-clayey vegetation (Kalliola and Paitán 1998).

Huertas (2005) has identified ten different types of forest in the zone of study: *Aguajales, low terraces forest, low flooded terraces, moderate terraces forest, high terraces forest, high dissected terraces forest, gallery forest,* and *low hill forest*. The types of forest that dominate in the zone are *low hill forest, low terraces forest* and *aguajales*. *Low hill forest* covers 70% of the Ampiyacu basin. These forests are extensively distributed in the southern and the northern part of the region. The landscape in this region is shaped by a vast extension of low hills forest with small patches of floodplain or swamps. The forest in the Ampiyacu basin exhibits the typical structure of Amazon lowland. Forest canopies reach up to 25 or 30 meters and emergent trees can reach additional 15 to 20 meters. The vegetation has a uniform aspect, although upland forests are distinguished from the low and moderately dissected terraces. In imperfectly drained areas, the presence of palm swamps or aguajales in 10% of the landscape is common, located in dispersed patches along the Ampiyacu River and tributaries (Pitman et al. 2004).

According to Pitman et al. (2004), the most diverse botanical families in the Ampiyacu are Fabaceae (86 species), Lauraceae (45 species) and Chrysobalanaceae (38 species). The most diverse genera are *Licania*, *Eschweilera* (Lecythidaceae), *Pouteria* (Sapotaceae), *Inga* and *Tachigali* (Fabaceae), *Virola* and *Iryanthera* (Myristicaceae). The Peruvian Institute of Natural Resources conducted a tree inventory in 1996 that

showed similarities. However, families such as Palmaceae, Leguminosae, Myristicaceae, Lecythidaceae, Moraceae and Sapotaceae had the highest ecological importance index.

The *low terraces forest*, which is distributed as patches located along the rivers of the Ampiyacu basin, covers almost 6 % of the total surface. According to INRENA (1996), this type of forest develops higher canopies and hosts greater successional stages when along rivers than when located on the meander plain. Some dominant species in this forest are Capirona (*Calycophyllum* sp.), Catahua (*Hura crepitans*), Lagarto (*Calophyllum* sp.), Cumala (*Virola* sp.), Tangarana (*Triplaris* sp.), Requia (*Guarea* sp.), among others.

The *aguajales* cover a surface of 5.4% of the area and are distributed as small patches among the *low hill* and *terrace forest*. This zone shows a great variety of swampy forests grouped as *aguajales* due to the dominance of palm species such as *Mauritia flexuosa*, the "aguaje" (Pitman et al. 2004). These swamps develop in zones with flat topography or in zones flooded most parts of the year. They are maintained by the overflow of rivers and by rain in areas with bad drainage or obstructed runoff (Huerta 2005). According to the biological inventory of the Ampiyacu, Apayacu and Putumayo regions, the floral composition reflects the intersection of numerous regional flora found commonly in the Colombian region, but registered as relatively rare in the forests of Loreto. The Field Museum (2004) estimated a total of 2,500 to 3,500 tree species grow in this region, making it one of the highest in tree richness in the planet.

The fish species diversity of this region is also considered to be one of the highest of the Peruvian Amazon, with approximately 450 species. It is much superior to other areas evaluated (i.e. Putumayo: 310 species; Yavarí: 240; Tambopata – Candamo: 232; Manu: 210). The great diversity of species of this area means it has enormous potential as a genetic resource pool, a source of hydrobiological species for ornamental use and human consumption. The mammal abundance and diversity registered for the Ampiyacu, Apayacu and Putumayo regions by scientists of the Field Museum of Chicago (2004) highlight notable records and emphasize as an important conservation target the headwaters of the Ampiyacu and Yaguas rivers due to their excellent state of conservation and to the unusually high abundance of tapirs and primates.

Social characteristics and timber extraction in the Ampiyacu

Demography and Site history

According to the Amazon Native Communities Information System (SICNA 1998), the area is inhabited by the ethnic groups Bora, Huitoto, Ocaina and Yagua. These four groups live separated and distributed in 13 native communities along the Ampiyacu River, and the tributaries Yaguasyacu and Zumun (Table 1). The population in the basin is 1,428 people distributed in 291 families. The area of land titled by the State is considerably smaller than that of the traditional lands used for subsistence and income generation by these villages.

The recent history of the indigenous groups in the Ampiyacu Basin is similar to that elsewhere in Amazonia (Smith, Benavides and Pariona 2004). The rubber boom affected the entire region in the early 1880s. At that time, almost all indigenous populations living in the study area were forced to exploit resources from the forest through a system of debt peonage to provide rubber to the Amazon Rubber Company. Subsequent to the collapse of rubber extraction and settlement of the native Bora, Huitoto and Ocaina in the Ampiyacu Basin, these groups continued selling products from the forest to merchants for 25 years. In the middle of the 1980s, these groups experienced a brief period of economic wealth, selling raw materials such as Coca leaves to the Colombian cartels (Benavides et al. 1996).

The beginning of hardwood extraction in the region dates back to the 1970s, a period in which timber companies established sawmills in the city of Iquitos and surrounding towns such as Pebas (Benavides et al. 1996). Over the past 10 years, the great demand for species such as tropical Cedar (*Cedrela odorata*) and current demand for Cumala (*Virola* sp.) have been accelerating timber extraction in the Loreto Department (Tello, Quevedo and Gasché 2004). In the Ampiyacu Basin, small-scale producers who carry out this activity by selecting two to three commercial species harvest the majority of timber. The extraction practice is manually operated and performed along principal rivers and tributaries of the Ampiyacu Basin.

The area enclosed by the Amazon and the Ampiyacu rivers in Peru is the homeland to various ethnic groups. Originally, Yaguas and other smaller groups that have

since disappeared inhabited the Ampiyacu basin. In the 1930s, Ampiyacu was occupied by two rubber *patrones*, the Loayza brothers, who were former managers of the Peruvian Company Casa Arana. They transferred hundreds of indigenous people of the ethnic groups Bora, Huitoto and Ocaina from Igaraparaná (Caquetá River, Colombia) to the Ampiyacu basin. These groups had already been exploited in rubber plantations in Colombia. Afterwards, they served as labor for the extraction of rubber, rosewood, animal skins and other products (Benavides et al. 1996, Hvalkof 2000). The influx of workers at that time created three settlements, later to develop into the native communities of Brillo Nuevo, Puerto Izango and Pucaurquillo. In 1976, the indigenous populations of these regions were given title to the land by the State.

The Ocaina, Huitoto and Bora groups lived in settlements called *malocas*, large circular houses dispersed in the forest that could shelter between fifty and two hundred people. A *maloca* was inhabited by the "cell" of a patrilineage: the father, his wife, the children, the wives of the children and their children. The members of a "cell" were considered the maloca owners. Often the “orphans” or ordinary people who were incorporated into the maloca as allies of the owners also inhabited a maloca. In addition, there could be found prisoners of war, considered individuals of a third category, who lived in the maloca for a certain period of time, at least until they were killed and consumed ritually (Benavides et al. 1996).

The Bora and Huitoto of the Ampiyacu basin have an extraordinary rich culture, which they have maintained in spite of historical cultural and physical aggression from

the West. The most visible expression of these cultures is through the traditional festivals organized for the *curacas* of the communities, who are considered religious and political leaders of the clans and patrilinajes and nowadays are the guardians of their traditions. In these festivals, through songs and dances, *curacas* recreate myths of interchange between man and nature, important values for sustainable management of the environment. The exchange between the organizers of the festival and the guests symbolizes the exchange of goods produced by man and goods produced by nature. The organizers offer products of agriculture (e.g. cahuana, cassava, sweet yucca) and guests provide products from nature (e.g. game, fish, and fruits) (GEF, PNUD and UNOPS 1997).

The timber activity in the Ampiyacu region

During the 1970s, a period in which timber harvesting initiated in the Ampiyacu, companies installed sawmills on the outskirts of Pebas and started working with intermediaries. A process of contracting work for later delivery of timber called *habilitacion* still prevails in the Ampiyacu region (Benavides et al. 1996). This system was introduced by the "patrones" to indigenous societies. The "patrones" took advantage of the relations of traditional exchange and indigenous values of reciprocity and generosity in order to obtain economic returns (Benavides et al. 1996: 54). By means of this procedure, the patrones provide goods (soap, ammunition, batteries, salt, kerosene, and so forth) in advance, and the local people commit to deliver a determined quantity of forest products in a specific period. The goods for locals were overpriced and the prices

of the forest products were underestimated, creating a debt peonage cycle (Bedoya and Bedoya Silva-Santisteban 2005).

This system is still used as a mechanism for recruiting labor for forest extraction activities. Under this modality of work, some indigenous people have also been using such mechanisms among their own people, with the purpose of recruiting labor for the removal of hardwood like tropical Cedar (*Cedrela* sp.) (Benavides et al. 1996). Currently, *habilitacion* in the study area follows the same pattern of "hooking" people by means of overpriced consumer goods in exchange for the delivery of a particular quantity of valuable timber. In addition, the intermediary often alters the real measures of the logs extracted, taking advantage of the local people's unfamiliarity with the measurement system. Although it is true that the wood prices are set by the local market based on national demand, the intermediary deliberately underestimates the price paid to the indigenous people during transactions.

The different periods of timber extraction activity in the Peruvian Amazon have strongly influenced the subsistence economy of local residents in the Ampiyacu basin, especially since the early 1980s. During the 1980s, local people used to live mainly from coca leaves, shiringa, yute, or rice. In addition, a few locals participated as labor force recruited by *habilitadores* (patrones) for the extraction of Lupuna (*Ceiba* spp.). During the 1990s and beginning of 2000s, patrones continued with the activity, adding Cedro (*Cedrela* sp.). However, some local residents meanwhile began logging by themselves, forming their own crews. In addition, local residents realized that they could perform this

activity without depending completely on a patron, as well as earn some cash to send their children to school (Curaca of Brillo Nuevo, communication personal).

Political Settings

The Peruvian Forestry and Fauna Law: the legal framework for communal forest

At the national level, the Forestry and Fauna Law 27308 (FFL) targeted large areas of "uninhabited forest" for the creation of 25 million hectares of national forest with the objective of promoting favorable conditions for forest management (Galarza E. 2005, Hidalgo 2003, Smith et al. 2006). The Peruvian Constitution determined that forest resources are State property (Constitucion Politica del Peru 1993). Moreover, this new policy reform classified forests into production and reserve forests, native communities, peasant communities and natural protected areas. In addition, it incorporated concessions for Permanent Production Forests (PPF) as a mechanism of access to timber resources.

The Forestry law 27308 and its regulation enacted in 2000 and 2001 respectively are the current legal framework for timber extraction in communal forests of titled indigenous communities in the Peruvian Amazon. The national forest types include *production forests* (permanent or in reserve), *forests for future use* (plantations, secondary forests, areas of forest recovery), *protection forests*, *natural protected areas*, *communal forests in indigenous communities, forest on peasant lands*, and *local forests.*

In the Peruvian Amazon, the forests in indigenous territories are called communal forests and are titled as part of indigenous land. According to the Peruvian law of

comunidades nativas (1978), the indigenous titled land is sub-classified into agricultural land and communal forest land. The agricultural type is granted into a communal property, and the communal forest type is granted as a transfer-in-use contract. The communal forest is titled by the State to the *comunidades nativas;* however, these forests continue being State property. Although this contract allows the use of the communal forest for commercial and subsistence purpose, these forests remain State property (Figure 2). The State bases this procedure on the fact that forest resources are of the public domain and so cannot be transferred as property. The transfer-in-use contract is a legally binding mechanism that assures the perpetuation of communal property, as long as the contract neither establishes the compliance of specific requirements for its validity nor expiration dates.

The Federation of Native Communities of the Ampiyacu (FECONA)

FECONA includes the thirteen villages settled along the Ampiyacu and Yaguasyacu rivers in the district of Pebas, province of Ramón Castilla in Loreto Department. Its headquarters is the community of Pucaurquillo, which is 15 minutes upstream of Pebas, the district capital. The communities are composed mostly of groups of Huitoto, Bora, Ocaina and Yagua, although it also counts settlers that may self-identify as Cocamas, Ticunas and Quechua. FECONA was formed in August of 1987. After being recorded in the Public Registrations of Maynas, FECONA was affiliated with AIDESEP, which is the indigenous federation at a national and international level. Its

board of directors is comprised by eleven people serving a three year term that can be extended for only one additional term.

The main objectives of FECONA are the defense of the territory and the natural resources, the promotion of educational services and health, and the control and search for alternative crops to coca leaves (Chirif 2006). The federation has obtained important achievements in issues related to the defense of the territory and natural resources. In 1990, with the support of the regional office of AIDESEP in Iquitos (ORAI), they achieved land titles for new communities and the enlargement of others. They also managed to slow down the attempts of several small timber industries and illegal loggers to exploit resources belonging to the communities.

The Regional Conservation Area of Ampiyacu and Apayacu

In 1988, FECONA established internal mechanisms to prohibit access to the forest by illegal loggers that came from Pebas, Iquitos and other cities of the Peruvian Amazon. These efforts had some initial success. However, since they did not receive the approval of State regulatory dependences (e.g. the Natural Resources Institute -INRENA, Department of Fisheries), the indigenous federation lacked the legal authority to exercise effective control in the areas located outside of the communal territories. For that reason, since 1991 FECONA has claimed these territories from the State in order to establish a communal reserve covering the totality of the Ampiyacu Basin. Two other indigenous federations also took up this initiative: the Federation of Yagua People of the Apayacu

and Orosa rivers (FEPYROA), and the Federation of Native Border Communities of the Putumayo, including Bora, Huitoto, Quichua, Yagua, Cocama and Ocaina (FECONAFROPU). They jointly proposed the creation of a communal reserve that would benefit 21 native communities and would cover the totality of the Ampiyacu and Apayacu and part of the Putumayo Basins.

Before forests were designed as PPF by the Forestry law in 2001, these three indigenous federations supported by the Instituto del Bien Comun, a Peruvian NGO, presented a proposal to the government in order to declare their combined territory as the Zona Reservada Ampiyacu-Apayacu and Medio Putumayo (ZRAAMP). This was a novel way to stop the encroachment of outsiders who exploit forest and aquatic resources (Smith et al. 2004). The proposed total area was nearly two million hectares and was composed of communal territories already granted a legal title by the Peruvian State. In addition, the proposed area will be compound by a complex of areas where natural resources, including timber, can be exploited. At least one communal reserve for the communities in each watershed and a strictly protected area in the central part that would protect the sources of the various rivers and serve as a refugia for the restoration of aquatic resources that are used downstream (Pitman et al. 2004).

However, the negotiation of the establishment of this area between the organizations involved and the government occurred in the middle of the decentralization process in Peru in 2004, which thereby complicated the creation of the Reserve Zone. Since then, the claim has been pursued regionally, instead. Different alliances among

national and international organizations promote the creation of the Regional Conservation Area of Ampiyacu and Apayacu in December of 2007. The interest of the regional government of Loreto in promoting development initiatives in the Amazon motivated this organization to establish relationships with conservation organizations that fund and promote local initiatives. The new conservation area includes only a small part of the area initially proposed. The process of categorization of this new protected area under the regional system, necessary to determine the future use of this newly created area, will result in currently titled communal territories having to share a mosaic of areas where timber and other natural resources can be exploited. Thus, in the Ampiyacu basin, this new protected area under Loreto's regional system will result in a mosaic of areas: the currently titled communal land, the respective requested extension, and the Regional Conservation area of Ampiyacu (Figure 3).

Table 1. Villages located in the Ampiyacu basin

Village	Population	Families	Titled land	Land in use	Land extension	Land in use extension.	Land demarcated	Date
SANTA LUCIA DE PRO	146	37	320.8000	1296.8000	0.0000	0.0000	1617.6000	OCTOBER 1996
BETANIA	119	19	247.0000	330.4640	0.0000	0.0000	577.4640	OCTOBER 1996
BORAS DE PUCAURQUILLO	209	48	1395.3552	0.0000	0.0000	848.6500	2244.0052	OCTOBER 1996
HUITOTOS DE PUCAURQUILLO	199	43	466.8252	0.0000	262.8000	994.9500	1724.5752	OCTOBER 1996
HUITOTOS DE ESTIRON	75	12	990.8786	0.0000	609.8000	0.0000	1600.6786	OCTOBER 1996
NUEVA ESPERANZA	108	21	1766.0000	392.8000	0.0000	0.0000	2158.8000	OCTOBER 1996
ESTIRON DEL CUZCO	138	25	3462.8000	0.0000	0.0000	0.0000	3462.8000	OCTOBER 1996
TIERRA FIRME	65	13	1451.4475	0.0000	0.0000	0.0000	1451.4475	OCTOBER 1996
NUEVO PORVENIR	12	3	7989.6900	2312.5000	0.0000	0.0000	10302.1900	OCTOBER 1996
NUEVO PERU	76	12	1944.0000	676.8000	0.0000	0.0000	2620.8000	OCTOBER 1996
PUERTO ISANGO	54	14	2157.4835	0.0000	0.0000	0.0000	2157.4835	OCTOBER 1996
BORAS DE BRILLO NUEVO	192	33	3518.9422	0.0000	1256.8000	510.4000	5286.1422	OCTOBER 1996
BORAS DE COLONIA	35	11	2503.2000	1910.4000	0.0000	0.0000	4413.6000	OCTOBER 1996
	1428	**291**	**26218.7222**	**6919.764**	**2129.4000**	**2354.0000**	**39617.5862**	

Source: SICNA, IBC 1998

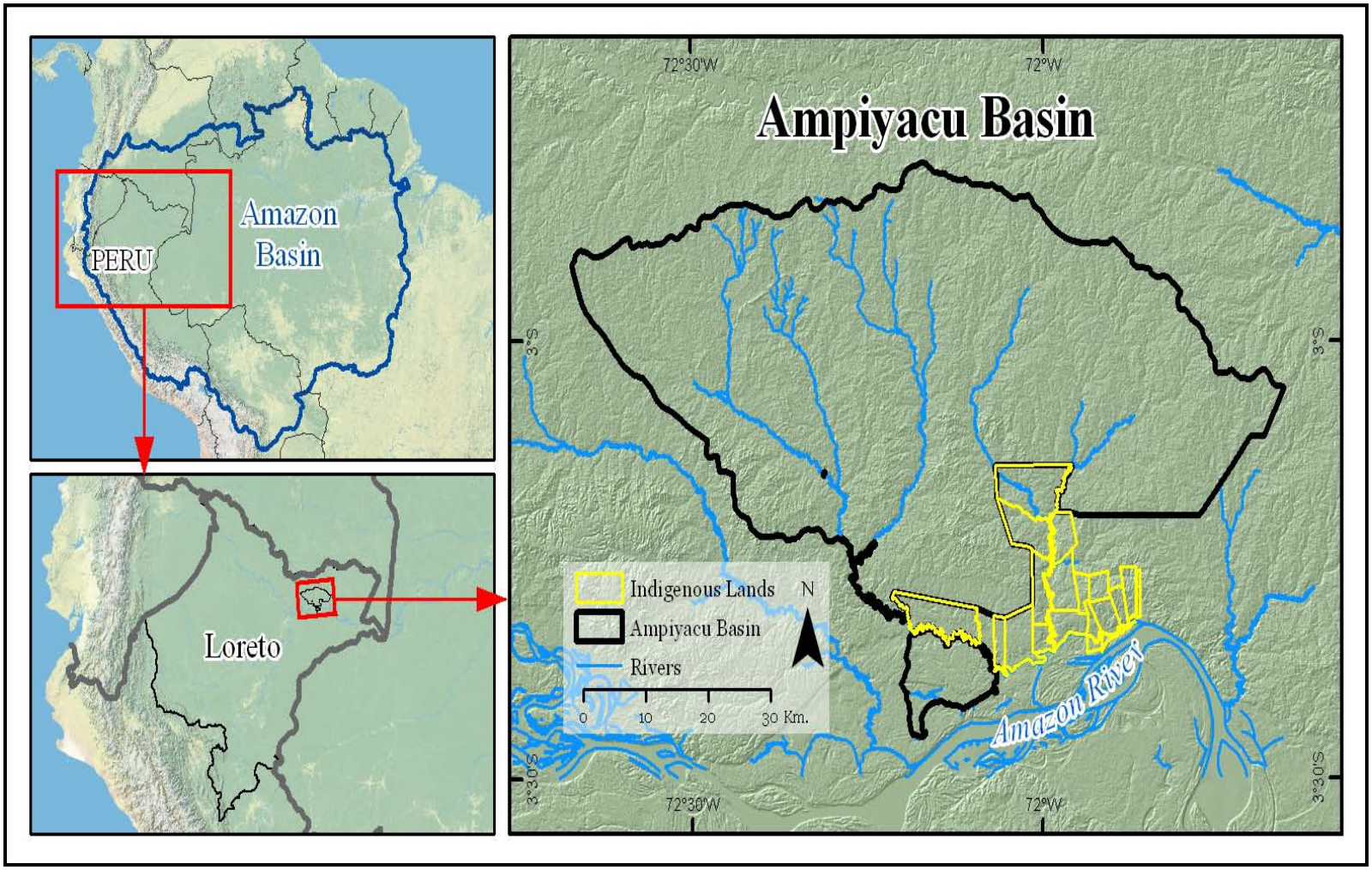


Figure 1. Map of the research site, the northern of the Peruvian Amazon

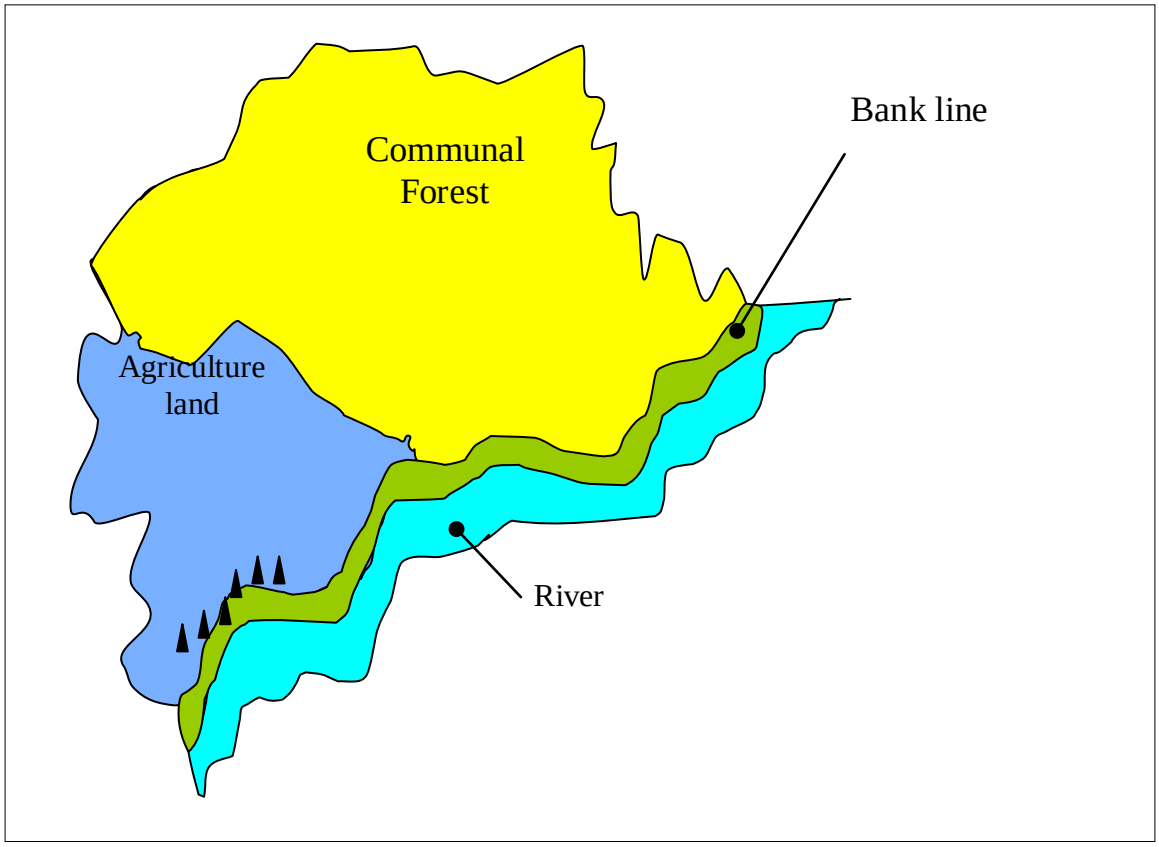


Figure 2. Indigenous territories classification

Source: Figure adapted from Pedro Tipula, IBC.

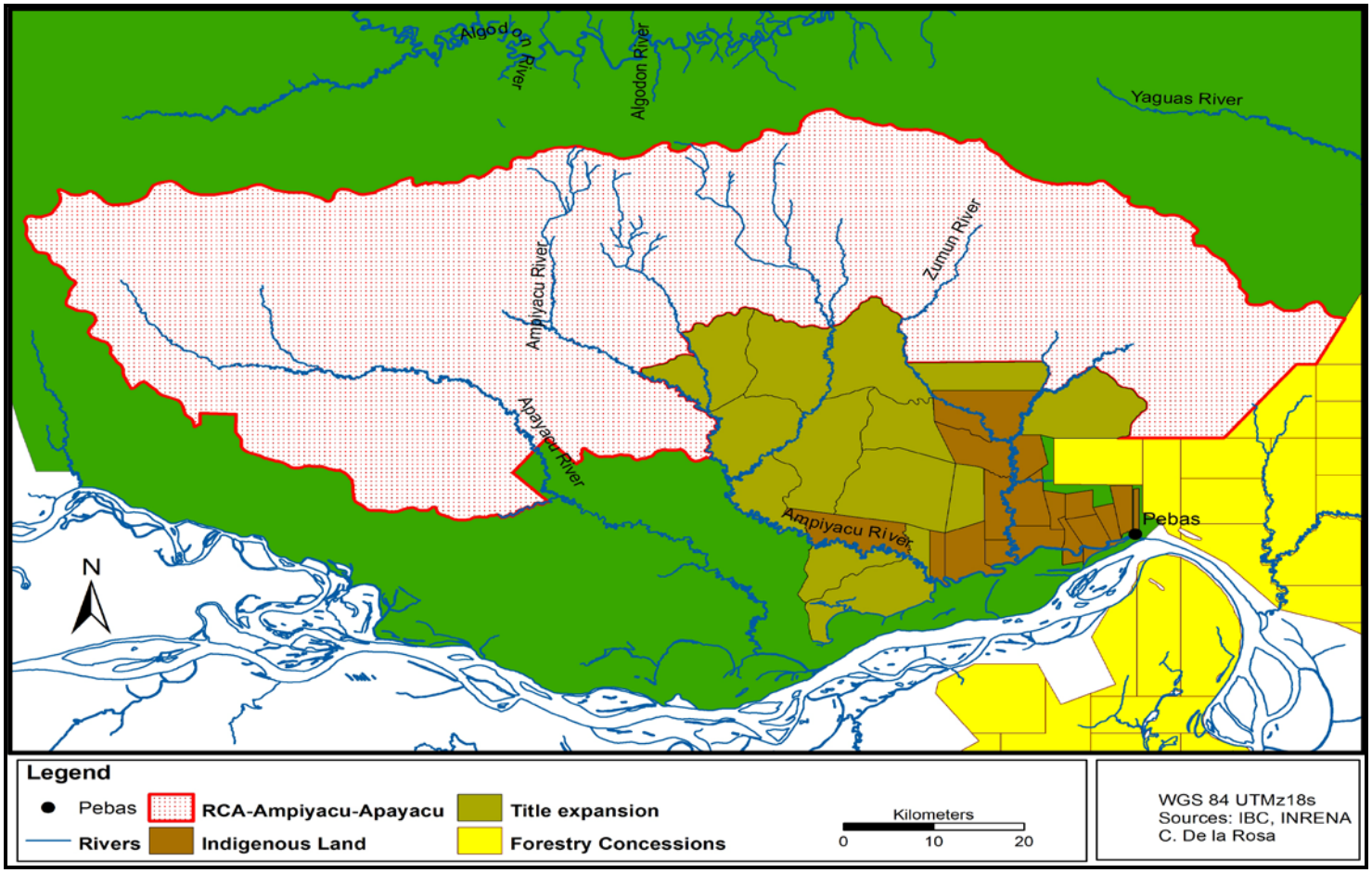


Figure 3. Complex of areas in the Ampiyacu Basin

Chapter Four: Methods

Methods of data collection

This study seeks to analyze the local regulations that control logging and the characteristics of harvesting practices in local communities. Initially, detailed information about socially-embedded local institutional arrangements was collected through a mixture of qualitative methods to understand: 1) Local and regional actors related to timber extraction in the Ampiyacu Basin, and 2) How local arrangements that control access to timber resources work. The field research was conducted for three months from mid-June to the end of August 2008. The units of analysis in this study are Ampiyacu basin's local residents involved in timber extraction and communal and indigenous federation leaders. Important actors outside of the basin are also part of the study (i.e. intermediaries, government institutions, and NGOs). Finally, the author translated all of the transcripts from focus groups and interviews.

First, informal conversations were held in communities, Pebas and Iquitos with people linked to timber extraction, including local authorities, government officials, and intermediaries. Informal conversations, guided by open-ended questions, were held with elder leaders and local residents about the factors that have been causing changes in indigenous federation rules since its creation in 1987. These conversations with key informants contributed significantly to learning the factors that have driven the policies of

the indigenous organization over time. Specific questions about the creation of the *pases*, use of the money received for timber fees, and conflicts in the basin were asked.

Second, archival research was one of the most important methods in this study to analyze the circumstances of timber extraction in the basin. Archival research was undertaken to understand the process of creation of the indigenous federation and its mechanism of timber extraction in the Ampiyacu basin. Written documents used by the indigenous federation and communities that provide information about timber extraction mechanisms were reviewed in detail with permission of local authorities. The *libro de actas* and *pases* were very useful materials for the study. The *libro de actas* resulted in a very rich source to start the analysis. Every political organization of indigenous groups in Peru is required to have a *libro de actas* that registers their agreements and concerns about local mechanisms of organization in a particular territory. During this research, the *libros de actas* from 2005 to 2007 were reviewed. Previous *libros de actas* had been lost by the preceding administrations. Only information from events directly and indirectly related to timber extraction was considered for the study. Accordingly, four *libros de actas* of FECONA were reviewed, obtaining specific information about changes in the rules, restrictions, penalties, accusations and agreements. In the Ampiyacu Basin, the *libro de actas* stores the minutes of the special assemblies of the indigenous federation.

The *libro de actas* describes the purpose of each meeting as well as the agreements produced from the deliberations among local residents. It records the comments of each communal representative, the *junta directiva* of FECONA, and the

congressional delegates. The administrative performance of the current FECONA's *junta directiva* is also registered. Another important archival source in the study area was the *pases*. The timber permits granted by FECONA, called *pases*, were reviewed for information about the number of people who have worked in timber extraction in the basin since 2006. The *pase* is a document that includes a communal authorization and a sketch map of the area of extraction. The communal authorization provides the name of the logger, the name of his/her village, and the date of the permit. The Instituto del Bien Comun (IBC) generated a database of loggers for the years 2006, 2007, and 2008 from these documents. The table registering information of the name of the logger, the name of his/her village, and the georeferenced location of the logged areas was provided by IBC. Finally, it is important to indicate that each *pase* contains hand-written notes that provide information about the number of round-timber logs that remained in the forest. Thus, from these notes, it was possible to estimate the percentage of loggers that harvested timber at rates over the permissible quota of extraction. In addition, this table reported the number of people by village involved in timber extraction during recent years, which assisted in the selection of loggers to be interviewed.

Third, focus groups were used to collect information about the arrangements for the selection of extraction areas, common conflicts in the timber activity, and perceptions of the local system. Thirteen open questions were asked, facilitating the identification of the struggles that the FECONA administration has been facing in recent years. In addition, the use of open-ended group interviews facilitated a better understanding of the

social dynamics and the intrinsic relationships among stakeholders. In each of these meetings, the people were grouped by the same community and were asked the same open questions. In addition, information about the number of families involved in logging was obtained in these meetings. Families involved in timber activity were selected from the *padron de comuneros* (residents list). The focus groups involved local residents from the thirteen villages but they were hosted in the three main communities of the Ampiyacu basin. The villages of Brillo Nuevo, Esperanza, and Pucaurquillo were selected based on the number of people that live in each village; these places are the most populated and also have better infrastructure. In addition, the location of these villages was convenient to ensure an effective representation of participants from each community in the basin. The one-day meetings took up to eight hours.

Finally, open-ended Individual Interviews were conducted in the thirteen communities of the Ampiyacu basin. In order to characterize the local system production and assess the patterns of practice of small-scale timber producers, detailed interviews were conducted about the local system arrangements, the production system and logging practices. For the selection of respondents, the record of timber permits for the season 2007-2008 was used. This record indicated that 95 dwellers harvested timber in this logging season. The selection of interviewees was done by stratified sampling; from the total of dwellers involved in timber extraction, 35 were selected. At least one logger from each of the 13 villages was selected for the interview. Thus, 24% of dwellers that worked in logging in the Ampiyacu basin were interviewed. The definition of logger considered

for this research is the small producer, man or woman, who worked harvesting timber during the 2007-2008 logging season.

The questionnaire with 31 questions covered the following aspects: the levels of organization and mechanisms of access for timber harvesting, sources of financing, logging practices, and levels of production. Interviews were conducted on the local system arrangements, the production system, and the logging practices in order to estimate the production and assess the patterns of practice by small-scale producers in timber extraction. First, for the characterization of the timber activity, information on organizing ways of access to forests resource was researched. Thus, information on the quantity and type of labor used to access the forest resources, the years of experience in this activity, the type of funding, and the volume of timber was collected. Second, for the extraction practices, information about the pre-extraction activities and equipment used for the logging, dragging, and opening of paths was registered. Information on the steps of timber harvesting was also collected (e.g. exploration or "mateado", logging, transport). In addition, information on the techniques employed to guarantee the sustainability of the activity (e.g. tree seedbed care, natural regeneration) was compiled. The third factor to evaluate was the economic importance of the commercial timber harvesting as a means to have a notion of local perceptions of the benefit of this activity. For this topic, information related to production, investment, timber prices, income levels and production costs were compiled.

Methods of data analysis

In the current areas of timber harvesting, data about the impact of this activity were collected, measuring environmental variables such as cleared areas, and soil and water conditions on forest trails in order to understand how timber-harvesting practices occur in this area.

A selection of loggers was made with the objective of evaluating the logging practices in their areas of extraction. To visit the extraction areas, a random selection of loggers from a list was made. The table of loggers was imported into Arc Map 9.3 Software, allowing the selection of loggers under three criteria: first, loggers located in areas with more *pases* concentration. Second, loggers located outside titled communities. Finally, loggers located in those areas that ensured data collection during the field research season (level of water). Thus, 35 loggers were selected to be visited in their respective extraction areas. However, adverse weather and the broad distribution of loggers made it feasible only to visit 12 different areas of extraction during 38 days in the Ampiyacu's basin headwaters.

Twelve extraction areas (EA) were covered to evaluate the impact in the exploited forests. The extraction areas are the current places where local residents were logging trees. Extraction areas in the Ampiyacu River and Supay, Airambo and Sabalo tributaries were evaluated. Once in the forest, two informants guided the collection of data in these areas, and in some cases, the loggers selected were working at the same time of the visit.

They guided the team to the extraction areas of selected loggers. The loggers' camps were used as a base of operations from which we visited the areas of the selected loggers. In these camps, I shared space with timber workers of some loggers that still were working in their areas. This was the perfect opportunity to observe a normal day in the lives of the workers and share stories about the activity.

The estimation of extractive areas was done according to the streams in which each selected logger worked. A buffer radius was established according to loggers' interviews, in which they mentioned that due to practical reasons they did not harvest further than 500 meters from the creek or stream. Therefore, a radius of 500 meters on both sides of the streams was surveyed, recording all the stumps found. This buffer was confirmed using GIS and the areas of each logger calculated (Figure 4). The length of the streams covered varied from 1,000 to 7,500 meters. In most cases the number of stumps recorded for a logger represented only one part of the total amount that they completed in the season. Generally, loggers were found working in creeks and streams that drain to main rivers. Only in a few cases were loggers found dragging logs directly to the main rivers.

The area of clearings was calculated by means of an adaptation of the stump visit method (Hernandez 1999, Yalle 2004). This consists of the evaluation of stumps and the remaining trees in the impacted area and covers the pathways used for the dragging of logs after the trees' harvesting. This methodology was adapted to collect data of the stump location, identification by common name of the tree, diameter, trunk width, the

crown width and the length of the fallen tree (See Form 2 appendix). In the extraction areas, the clearings were calculated measuring the trunk width, the crown width and the length of the fallen tree. The area of clearings was calculated based on the total length and average clearing widths. The length was estimated from the distance between the stump and the crown of the fallen tree. The clearing width was obtained from measurements of the crown and the trunk width. The crown width was measured and the trunk width was estimated from the stump diameter. The formula to obtain the size of clearings is the following:

$[(d1+d2)/2]*L = Scl\ (m^2)$

Where:

d1 = trunk width

d2 = crown width

L = Length

The value obtained for each evaluated clearing was projected to the entire area considered as the EA. Obtaining a total value of clearings by fallen trees.

$[((Scl*Tc)/EA)]/100$ = % extraction area impacted by clearings

Where:

Scl = Size of clearings (m^2)

Tc= Number of trees cut (total)

EA = Extraction area estimated (ha)

Icl = Impact by clearings

In the areas where trees were removed, pathways were measured for soil damaged. For this analysis, the soil variable was included to determine the percentage of the extraction areas impacted by forest pathways. For this analysis, data of the length and width of forest pathways was registered in Form 3 (See appendix). Next, the impacted area due to forest pathways operation was calculated using the following formula:

$(\sum$ Forest pathways /EA)*100 = % extraction area impacted by forest pathways.

Where:

Ft = area of forest pathways (ha)

EA = extraction area (ha)

Ift = forest pathways impact

During the survey of forest pathways and streams used for the transportation of logs, the removing of obstacles from the water courses was evaluated. The water courses were classified in terms of percentage of obstacles present. The water courses conditions are registered in Form 3 (See appendix). Once the percentage value was obtained, the water courses were evaluated, classifying them as is presented in Table 2.

Transects along streams were used to measure forest condition in these areas. The length of the streams covered varied from 1,000 to 7,500 meters. Due to the variability in the number of harvested trees and their distribution in the forests, the team followed trails up to 7.5 kilometers per day in each zone to reach the number of trees that is profitable for a logger to exploit.

From the information supplied by the 35 loggers interviewed, the weighted average volume harvested per species was calculated for the logging season 2007-2008. To calculate this value for each logger, the number of logs per species logged in a logging season and the average numbers of logs per tree of these species were obtained from the questionnaire (See Form 1 appendix). In addition, the weighted average volume of timber was calculated for the members of Cedrela, Virola, Simarouba, Ceiba and a small group of species classified as “others” from the 146 stumps recorded. Next, the average volume per log of the four species was calculated. Finally, the average volume by log was multiplied by the number of logs removed by each of the 35 interviewees. Thus, the average volume logged in cubic meters per one trip in a logging season was calculated.

Net proceeds of this activity were estimated based on the average volume of timber that each logger said he had removed in a logging season. Having the volume logged per interviewee and the average price of the species exploited, the average income of loggers could be estimated. Operating costs such as salaries of workers and expenses in supplies were obtained from the questionnaire.

Table 2. Water courses classification

Indices	Condition	Observation
1	Good	When water drain without any difficulty through the channels, There is no obstruction.
2	Regular	When in less than 50% of water courses are observed branches or waste from fallen trees that obstacle the normal water flow, but there is no obstruction or flooding.
3	Bad	When in more than 50% of water courses is obstructed by tree branches or waste and there is flooding

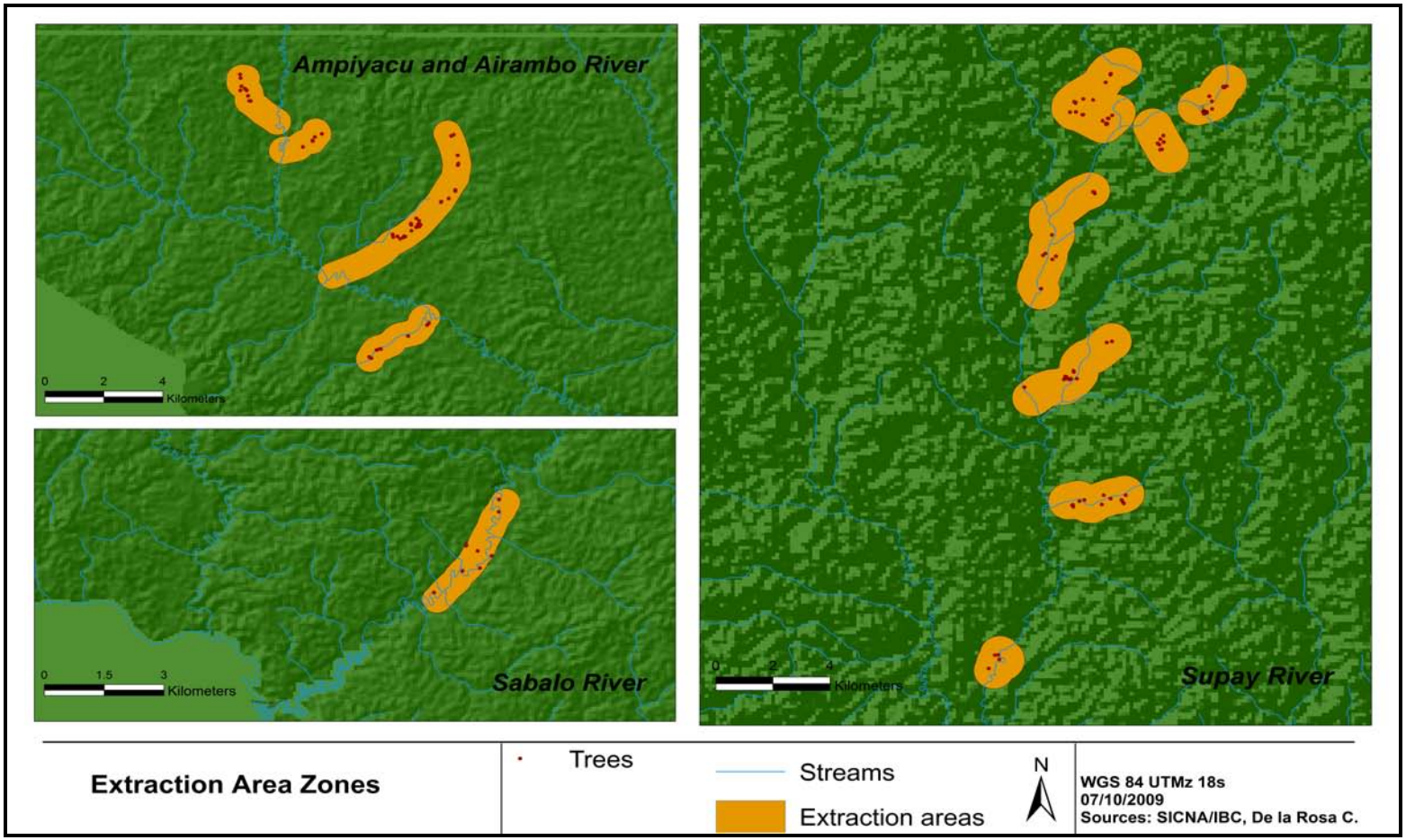


Figure 4: Extraction areas buffers

Chapter Five: Actors of the timber governance system

The actors inside the Ampiyacu basin related to timber extraction

Local actors

A summary of the local actors inside the basin who have direct participation in the timber extraction system is shown in Table 3. These actors are classified according to their level of interaction in the system based on this analysis.

Each family's clan in a community has a respected leader and includes his family members, such as his wife, sons, daughters, grandchildren, sons-in-law and daughters-in-law. Family clans can be characterized according to their years of experience in timber extraction and the level of diversification of their income sources. Since timber extraction by locals started in the 1990s, two different generations of loggers has distinguish in the basin.

The first generation of loggers, the specialists, are the clans with more than five years of experience working independently in timber extraction. They typically remove around 150 logs per season. All of the specialists worked as part of the labor force with mestizo logging contractors in the 1980s and 1990s. As a result, they developed many skills in the field, as well as close relationships with some contractors who are settled now in Pebas. These families are funded by the contractors (*habilitadores)* who lead them into a cycle of debt in order to attain the necessary equipment and materials for harvesting timber.

The second generation of loggers, the opportunists, consists by those clans with less than five years of extraction experience. This group removes less than 100 logs per season. Members of these clans work as a *montaraz* or workers along with the specialists in timber *logging crews.* This group opportunistically works along streams with high numbers of commercial trees in order to make more money. The opportunists are not as skilled in the field as the specialists, nor do they own their own equipment. However, they do have access to funding. Most of the teams of opportunists are members of the same family. For instance, the team may include a father that works with his son, parents working with their two children and so on.

The Community authorities, *junta directiva*, are a group of members from the community elected by the a*samblea comunal* to represent its interests. It consists of a chief (the *presidente comunal*), a second-in-command, a secretary, a treasurer, and one or more spokespeople. This institution is recognized as the local authority for resolving conflicts about timber resources harvested from the communal territory. The traditional authorities, called *curacas*, and the indigenous teachers from this area are also important actors in the agreements and decision-making at community level. They participate regularly in the meetings that discuss timber issues in their communities as well as in the congresses conducted at the basin level.

The basin authorities, the indigenous federation's *junta directiva* consists of 11 members that govern the thirteen communities for a term of three years. The members exist in a hierarchy influencing the level of responsibilities and participation of each

member. The federation *junta directiva* is considered a unit wherein each member has a set of particular tasks. The president is the legal representing body of the federation, who coordinates closely with the vice president and the *mujer lider* in activities of organization with the thirteen communities in the basin. In addition, a number of administrative bodies, called secretaries, make up this *junta directiva*. Each secretary is in charge of resolving the issues and concerns of his or her respective administration in the basin. Since its creation, the federation has been managed principally by the president and vice president, but over time the secretaries have begun to participate more in the decisions.

The indigenous federation is formed by the following secretaries: treasurer, secretary of minute book and archives, secretary of titled lands, secretary of education, secretary of agriculture and natural resources, secretary of handicrafts, secretary of justice, secretary of health, and spokesperson. In addition, since 2006 the control posts of Brillo Nuevo and Nuevo Porvenir are considered new secretaries or dependencies of the federation. The tasks of each of these secretaries are distributed in rough agreement with their titles. For instance, the health secretary is in charge of coordinating health campaigns with the deputy major in Pebas. Timber is the major responsibility for the secretary of agriculture and natural resources, who coordinates the granting of timber permits and the payment of fees with the president, vice president and treasurer. Other tasks of importance of this secretary are the local arrangements regarding the Ampiyacu Conservation Area.

Table 3. Local actors inside the basin related to timber extraction

Level	Actors	Description
Family clans	Community members interested in work with timber extraction.	Main decision makers in timber extraction.
Community	Community *Junta directiva* Curaca Indigenous teachers Mujer lider	Communal authorities in charge of organizing the participation of clans during the logging season and responsible for representing community interests to the federation.
Basin	FECONA *junta directiva* Control post coordinators Mujer lider	Main decisions makers that control access over forest resources at the basin level.

Organizational structure of local actors

The local forest governance system in the Ampiyacu basin presents a hierarchy of organizations represented by formal and informal institutions at family, community and basin level (Figure 6). Each level embodies a self-regulating mechanism that leads to the decision-making process. However, these decisions are taken in respect to the hierarchical structure of the entire system. The communal level is a formal level of organization involved in the regulation of timber and other forest resources within the jurisdiction of a titled territory. Finally, another level of coordination in the basin is the federation FECONA, which by means of mechanisms such as congresses involve residents and authorities in agreements about timber extraction. The indigenous federation is the highest level in the hierarchy and is the institution that regulates and

controls access to timber at the basin level. Thus, this institution represents the decisions of the thirteen communities in the Ampiyacu basin.

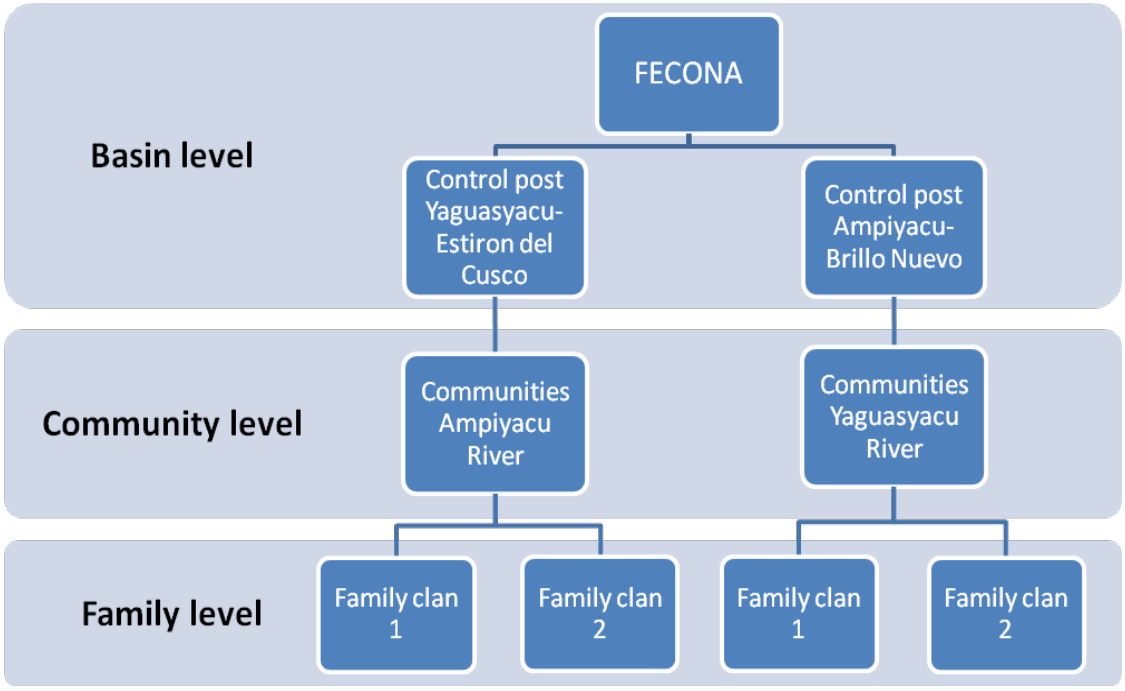


Figure 5. Organizational structure in the Ampiyacu Basin

The actors outside the Ampiyacu basin related to timber extraction

Local actors

Local actors can be located inside the basin (IBC coordinator) or outside in the closest town, Pebas (*habilitadores*, timber companies, INRENA, merchants). The local actors are considered those that have direct influence in the timber extraction and in consequence influence most the institutional arrangements in the basin. Basically, some of them provide technical and financial support for the organization of timber extraction (IBC) and others influence through formal laws (INRENA) and funding (habilitadores). The regional actors are those that influence indirectly in the local arrangements in timber extraction; however they have relevance in the formal laws for timber extraction in the basin (INRENA, Regional government). A list of these actors is provided divided into local and regional level (See Table 4).

The Contractors "habilitadores" are the intermediaries located in Pebas that use the *habilitacion* system maintaining some previous characteristics. An increasing number of small business people and merchants settled in Pebas are funding timber extraction. In addition, big and medium size timber companies with offices in Pebas buy and fund the timber extraction in the study area. Even some indigenous schoolteachers are involved in timber extraction; they invest small amounts in timber extraction. These conjunctions of actors are the financial providers for almost all timber activity conducted in the basin by local residents.

A few of the “old patrons” were established in Pebas. They now manage several small businesses and are medium size timber concessionaires for the surroundings of Pebas. They have a variable number of crews in charge of removing timber from the Ampiyacu areas. These crews are composed mostly by people from Pebas and nearby areas who have some experience in timber harvesting. The participation of Ampiyacu residents in these crews is very low. However, according to loggers, more local residents have recently been getting funding due to the presence of an important timber company office in Pebas.

Most of the timber removed from Ampiyacu supplies the timber production of a timber company. According to loggers, three fourth of them provide timber to TRIMASA while the rest supply small concessionaires (e.g. ANIDOLLY, Paco Gutierrez), merchants and timber buyers in Pebas. However, the presence of timber buyers in this area is low, due to the presence of TRIMASA and small concessionaires funding the timber activity in this zone. Even some merchants in this region supply TRIMASA with timber.

Illegal loggers are groups of people from different parts of the Peruvian Amazon who remove timber from indigenous lands and open access to areas in order to earn a livelihood. In the basin a small number of illegal loggers exist who use the cover of night and shortcuts to gain entry to the headwaters of the basin looking for timber. The illegal loggers operate in two ways to get access to resources in the basin. First, they deceive local residents in order to obtain timber permits from their communities, for example, the

2005 to 2007 extraordinary assembly reports denounce illegal activities and mention problems with outsiders that took advantage of communities' residents in order to illicitly obtain timber permits. A guideline appearing in the actas mentions that, "*Aquellos comuneros que apoyen foraneos deberan acercarse a la oficina de la FECONA para ver su situación y evitar ser enganhados o sino la federación no va dejar trabajar a esos comuneros*" ("local residents supporting requests for timber permits by outsiders must go to the federation office to avoid future problems; if not the federation will prohibit the entrance of this group to the Ampiyacu basin"). The other way that illegal loggers gain access to forest resources is through marriage with indigenous women.

Table 4. Local actors outside the basin related to timber extraction

Level	Actor	Description
Local/Pebas	Contractors "*habilitadores*"	Big and medium forest concessionaires in Pebas that buy timber and funding timber extraction of Ampiyacu and Pebas residents. Also, different type of merchants settled in Pebas that provide goods in exchange of timber.
	Timber Buyers	Outsiders that buy timber in the region.
	Illegal Loggers	Groups of people that work illegally in the headwaters of the basin. Outsiders from different regions of the Peruvian Amazon, principally, Pebas and Pucallpa residents.
	IBC Coordinator	Provide technical support in the entitlement and land regularization. Recently organizing timber permits with FECONA and INRENA. And local capacity regarding the conservation area.
	INRENA Pebas	INRENA administrative and control office of timber permits and its transportation to Iquitos, the local market.

Regional actors

The regional actors are considered those that have some influence in the management of forest resources in the area of study (See Table 5). These actors have indirect influence on the local system. Some of them provide technical and financial support in assessing issues regarding the management of resources in the Regional Conservation Area Ampiyacu-Apayacu (IBC) and others provide influence through formal laws (e.g. INRENA, GOREL).

Table 5. Regional actors outside the basin related to forest resources

Level	Actor	Description
Regional/Iquitos	Organización Regional de pueblos indígenas del Oriente-ORPIO (ex ORAI) office	Coordinate issues regarding the conservation area, the entitlement and land regularization with FECONA.
	Instituto del Bien Comun -IBC Iquitos	Technical and financial support of activities in issues regarding the conservation area.
	Instituto Nacional de Recursos Naturales-INRENA Iquitos	Evaluation of management plans and grant timber permits to communities.
	Gobierno Regional de Loreto-GOREL	Coordination of the new conservation area with FECONA and partners.

Chapter Six: Governing access to timber resources

Local arrangements for access to timber resources

There are several informal institutions governed by traditional norms that involve members of all ages and both sexes. The base level of organization is the family clan. Each clan represents a level of decision-making that responds to the particular interests of its members. In addition, within a clan, members interact on a reciprocal basis. In this context, a family is a group of related people that shares resources in a geographic space. Traditionally, clans share resources obtained from the forest. In the case of timber, these institutions not only share resources from the forest but also share information about the places stocked with commercially valuable trees. In addition, the clans help each other with the extractive activities of removing timber from the forest.

The intermediation among the family and basin level of organization is at the community level. The communities represent formal institutions operated by law and governed by an *asamblea comunal* and a *junta directiva*. The *asamblea comunal* is the mechanism that serves as the chief governing body and it guarantees the participation of all of its members in community decisions. The members are all the residents listed in the *padron de comuneros*.

The federation represents a formal institution governed by a *junta directiva* and the *congreso.* The *congreso* is the mechanism by which decisions are made and it guarantees the participation of the thirteen member communities. The *congreso* is also

conducted by its own *junta directiva* selected by the entire congress for each assembly event. This *junta directiva* moderates the discussion and works to obtain unanimous decisions. It is comprised by a president, a secretary, and a vocal, and an indigenous member is designated as moderator.

The *congreso* has two assembly modalities: the general assembly, which organizes the submission of accounts and checks the accountability of the current directive, as well as the election of a new federation *junta directiva*; and the ordinary assembly, which convenes for the modification of statutes and oversees the elaboration of the annual plan. In addition, the congress evaluates the administration performance of the current FECONA's *junta directiva* (Figure 13).

In 2005, FECONA introduced the *pase*, a timber permit, as a mechanism of access to timber resources and as a means of verification of this activity by the federation. The *pase* gives Ampiyacu residents the right to access timber outside their territories in the open-access forest contiguous to their communities. The particularities of *pases* have been changing since they were created in 2005. In the same congress, the quota of extraction per family was changed, and a fee per *pase* was created. In the ordinary congresses, held annually, discussions focused on these two fundamental points as well as on the conservation area. To achieve compliance of these agreements, the federation has designed a series of rules and obligatory sanctions for the entire basin.

Many congresses were held to discuss issues about the implementation of their proposal of a communal reserve. Thus, an agreement in the congress of 2005 established

the prohibition of illegal loggers within the limits of what was the proposed "Zona Reservada Ampiyacu, Apayacu y Medio Putumayo-ZRAAMP". As a result, control posts were established in the principal communities, with Pucaurquillo as the headquarters and sub-headquarters in the communities of Brillo Nuevo and Estiron del Cusco.

After the revision of different documents that explain the norms and rules that guide the timber activity in the basin, it was found that rules exist for the use of both inside and outside titled forest. In addition, these rules guide the behavior of local actors who interact dynamically according to the level of governance.

Levels of interaction among local institutions and mechanisms used to access forest resources

Interactions among mechanisms operate dynamically and occur at different levels (See Figure 6). In contrast with unwritten rules, written rules have guided norms for the use of forest resources at family, communal and basin levels, where the interaction between these levels and their institutional mechanisms consolidate the access to forest resources in the basin (See Figure 7).

At the community level, each member of a clan may request a communal authorization in the communal assembly. All interested dwellers request the use of the area near a stream already visited, whether the area is inside or outside of the communal territory. As a first step, the dwellers of the Ampiyacu mark trees to harvest (*Mateado*) in the forest. It is mandatory to provide information on the number of trees (estimated volume of round timber) and a sketch map of the area to be worked. In addition, in the

communal assembly, they request the stream or area to be evaluated. This request should be accompanied by the sketch of the location and the authorized quantity of round timber per family (Figure 8). The regulation at the communal level is developed by means of communal assemblies that generally are carried out every two months. At this level, a formal procedure is initiated that allows each resident in the basin access to timber, the process that is described next.

The families interested in work with timber are recorded in the communal *libro de actas.* The communal authorities issue an assembly minutes that is signed and sealed by the president and secretary. From this document, the communal authorization is issued registering the date, the community's name, the expected tree volume, and the stream's name (Figure 9). The next step after receiving the communal authorization is that the applicants pay a fee for the timber permit to the respective coordination posts of FECONA, which then authorizes the extraction of the timber from the basin.

At the basin level, the FECONA and coordination posts issue the timber permit called *pase*. The *pase* is the document with which the extractor starts the timber operations. This document allows each family to harvest a quota of timber of different commercial species. This *pase* records the date, the name of the resident, the name of his/her community, species, quota, as well as the name of the stream where the applicant works (Figure 10). The FECONA and coordination posts provide a receipt for the payment of the timber permit. These receipts are enumerated for accountability purposes and record the date and the amount paid to the federation.

The rules and sanctions in timber extraction

In the study area rules exist inside and outside the titled territories. The rules inside the communal territories are defined in the *libro de actas*. Some communities have *libro de actas* registering certain agreements about forest resources, fees, and quotas, as well as defining sanctions in cases of disobedience. In the communal assembly, rules and sanctions are created, as well as ways to reach agreements on harvesting timber. They are revised, modified and written down in the minutes book of each community. These rules have a general structure, establishing quotas, fees and sanctions in case of disobedience. First, according to regulation, the rules authorize each resident to harvest trees of different species inside the communal territory. Second, they establish that the permissible quotas are 50 round-timber logs of *Virola*, and 20 round timber logs of *Cedrela*. Third, the timber permit fee is paid to the legal representing body of the community, in this case the *presidente comunal*. If the applicant works in an area that is located inside the communal forest, the payment goes to the community's authorities. This fee is only for species such as *Cedrela* spp. and *Virola* spp. (0.67 and 0.33 US$ respectively per round-timber log) and there is no receipt given for this transaction.

In contrast, the rules outside the titled territory can be sub classified as unwritten and written rules. Unwritten rules are the basis of day-to-day interactions between clans in a community. In the timber season, the clans decide on their participation in the timber activity. Thus, at the clan level people organize according to unwritten mechanisms and tacit agreements that regulate timber activity and clan relationships. According to several

conversations with leaders, timber extraction arrangements are multiple and dynamic. However, some tacit rules and agreements among clans of the communities are constant.

First, each group marks their trees and claims the nearby streams where these trees are located. To put it differently, all those interested in harvesting timber in a season may have their trees already marked in the forest (this part is explained further in the next chapter). Second, access to streams is determined on a first-come, first-serve basis. The action of marking trees helps people know that a particular tree already has an owner who is working in that stream. Third, the arrangement of *ramales* (or streams) is coordinated among members of the same clan first, and then it is coordinated with the rest of clans in the community. Within a clan, members share information on the locations where they found the trees to cut. These streams are divided evenly among all of the clan members; in this manner, each member has a stream to work with. Thus, it is possible to find all the members of a clan working relatively closely to each other in a determined zone. Generally, relatives work in the same stream and in some cases; they work in different branches of the same stream. Fourth, a leasing of streams (called *ramales*), when it occurs between local residents, is also considered a tacit agreement among clans. This action is called a "leasing of streams" due to fact that the remaining standing trees from a stream are sold by the person who first marked those trees in the forest. This is considered an acceptable mechanism to secure access to timber for those local residents that have not marked trees in the forest. This group of people can lease the stream from those families that still have a stream with standing trees.

The written rules to access resources outside the titled territories are described in the Federation's *libro de actas*. According to FECONA's *actas*, the following characteristics were found in the revisions of written rules: first, the residents of any of the thirteen communities along the Ampiyacu basin, men or women, have the right to request a permit to harvest timber. Second, outsiders are prohibited from harvesting timber in the basin even if they are indigenous people. The federation verifies the residency of petitioners and the location of their stream before issuing any permit. In addition, the leasing of streams or standing trees to outsiders is regulated as a prohibited activity in the basin. Third, at present a permissible quota per family has been set at 100 round-timber logs of timber per logging season. Local residents can harvest up to one hundred round timber logs of different species, such as members of the genera *Cedrela*, *Virola*, *Ceiba*, and *Simarouba*. Moreover, in those cases in which loggers exceed their quota a fee per species must be added. The fee per species is as follows: per *Cedrela* spp. or *Ceiba* spp., 0.67 US dollars, and per *Virola* spp. or *Simarouba* spp., 0.33 US dollars.

Finally, a fee payment of 50 Soles (US $16.7) for the *pase* must be paid. If the logging area is outside the communal territory, in the open access forest denominated by the Forestry law as a *forest of permanent production* contiguous to the community's territories, the fee is paid to the indigenous federation's *junta directiva* and a receipt is issued for this transaction. The *pase* can be reused until the resident meets the permissible quota (100 round timber logs). Local residents can use each permit until the total quota has been met during a season. Permits are requested during the months of

January and February and are valid until August. Consequently, if the total amount of the permit is not used, it can be reused until the quota is fulfilled, but only until August. Otherwise, all the documentation must be renewed to request another permit for the following year. The *pase* can be used only for the transportation of timber in logs form. Transporting the wood as planks or blocks is prohibited. This norm has its basis in the national regulation, which indicates that the timber cannot be processed in the forest using chain saws due to the quantity of timber waste. Moreover, it is obligatory for each Ampiyacu resident to show the *pase*, the communal resolution, and the receipt to the relevant control post to be able to transport the timber to the town of Pebas.

The majority of sanctions are addressed and elaborated in the congresses. Although the *actas* of congresses provide details of the necessary documents to request timber permits, only very general statements about the sanctions in case of disobedience to rules are described. It mentions that in case of a rule violation, FECONA will block timber operations. In case of noncompliance, the timber is confiscated from local residents in different proportions: 50% of the round timber if the resident collaborates in the process, otherwise 100% of the round timber in case of resistance occurring during the confiscation. Local residents that repeat the same violation will not be allowed to apply for a permit in the future and cannot operate timber activities during an undefined period.

In addition, in the case of logs extracted by outsiders, a confiscation of the timber occurs, called *pietaje* by local people. This rule considers the confiscation of 50% of logs

of the illegal loggers. In addition, in case of reoccurrence, 100% of logs must be confiscated. In addition, residents of the Ampiyacu basin participating in illegal operations, or whose documents are not in order, are also charged with a 50 % fine over the number of logs removed from the forest. Therefore, some restrictions about participation in timber activities exist in cases in which people are found to be involved in any kind of forgery (e.g. signature, documentation), prohibiting them to work during a season as a punishment. In the congresses, local dwellers are encouraged to work properly. This means they should request a permit from the federation each time that they work at harvesting timber.

Controlling illegal logging in the Ampiyacu Basin

The control of access to timber resources at the basin level is focused on stopping the encroachment of outsiders as well as controlling the harvest quota each logging season. The rules discussed in the congresses determine the quota and prohibit timber harvesting by outside people. In the control of this activity, the federation has implemented two sub-headquarters in the communities of Brillo Nuevo and in Estiron del Cusco, where the timber permits are also issued and fee payment can be carried out (Figure 11). The group in charge of the sub-headquarters verifies that loggers have met the requirements of timber extraction, such as the communal authorization, the *pase* and the receipt of the fee payment. Subsequently, the sub-headquarters inspect the number of round timber extracted.

The people in charge of these posts are local residents, who control access to forests on a rotating basis (Figure 12). The role of these guards is to identify an outsider's entrance to the respective rivers and notify FECONA. Each of these control posts has a radio for communication. Furthermore, control posts inform in congresses the number of *pases* granted, the income from them, and the list of people working in each area.

Another control mechanism over timber resources was established to organize the use of resources in order to protect the newly created Regional Conservation Area in the Ampiyacu headwaters. Local residents agreed in the last congress to stop their timber activities in June of 2008 until obtaining a timber permit from INRENA. The reason behind this decision was that communities wanted to improve their organization and the validity or recognition of their system. They believe that work with communal permits granted by INRENA will improve the legality of their system. However, the mechanisms of control and regularization to stop the exit of logs from the basin are not yet clear for the federation's junta *directiva*. The federation leaders reported that, "*Nosotros estamos preocupados por que no sabemos como actuar este finales de Junio que vence plazo de sacar Madera*" ("we are worried because we do not have a clear idea of the rules that should apply after the closing date of timber permits in June").

Illegal extraction is controlled and denounced by the control posts in the communities of Brillo Nuevo and Estiron del Cusco. The control post detects illegal activity when round timber is transported out of the basin without any documentation. In addition, local residents report illegal timber extraction in the basin during congresses in

which coordinators of these posts report illegal operations carried out by locals and outsiders.

Moreover, according to conversations with people, the extraction of timber in planks is growing in the basin. It is a very common practice utilized by outsiders. During my period of fieldwork in the basin, outsiders were observed transporting *balsas* (rafts) of timber in planks. One of these outsiders was interviewed, mentioning that he came from Pucallpa where he was working with Mahogany for a timber company in the Tamaya River earning 1,200 Soles per month (US $400). He currently is living with a woman from the community of Betania.

> "*Yo trabajo solo con mi mujer, tengo mis 40 trocitas de Cedro, Cumala y Lupuna en Huarambillo por Agua Blanca, ya casi cerca al Algodon. Yo trabajo bien arriba pa sacar los cedros que todavía quedan a unos metros, por que la mayoría de cedros que estaban en los lados de las quebradas ya fueron señorita. Y lo que queda esta más adentro, pero asi manual no sale, es demasiado trabajo, ahora por eso lo estamos sacando en tablas. Ahorita en una de las quebradas hay uno que esta tableando su cedro pa salir. Nosotros entraremos en Octubre – Noviembre pa salir en Navidad, será mi navidad pues*"
> ("I work alone, he says, only with my wife; I logged 40 round-timber logs of *Cedrela*, *Virola* and *Ceiba* in the Huarambillo stream close to Agua Blanca, a very close area to the Algodon River. I work in the headwaters harvesting the last easy *Cedrela* trees that I can find along the rivers, because the rest of *Cedrela* trees are very far and manually are impossible to harvest. That is why I am taking out the timber as planks and some other groups of outsiders are doing the same. I still have timber in that stream and we will come back in October-November to take out all my logged trees by Christmas. So, it will be my Christmas gift").

National regulation and the access to timber resources

For the commercial exploitation of their forests, the indigenous communities should request special permission from INRENA just like any private owner with

forested land. Article 11 of the Forestry Law 27308, indicates that timber permits are offered for commercial and industrial use of forest in private property. Article 12 of the same law indicates that indigenous communities should include a Management Plan prior to using timber resources for commercial or industrial purposes. This plan is to be approved according to regulation of the same law. Article 43, Chapter III of the Forest Code in the Forestry Law points out that communal forests are those inside the territory recognized by title. Very importantly, it also indicates that forest concessions are not offered to third parties in the case of indigenous lands.

The mentioned regulation, in Sub-Chapter VII "About use of forest in peasant and indigenous territories" includes five articles explaining the different types and requirements for using timber and non-timber resources from forests inside the communal territory. In a systematic way, these five articles express that:

- Any type of forest resource use inside the indigenous territories only proceeds following the express request of the community.
- The request for use of forest resources in communal territories should be accompanied by a certified copy of the minutes of agreement to carry out this use.
- The existing forests inside indigenous lands are recognized as communal forests and the use of resources is permitted according to a management plan.
- The commercial use of timber (and non-timber resources) in indigenous territory is subject to a required permit.

- The subsistence forest use by dwellers, their family, or community, as well as for traditional uses, repair and construction of dwellings, canoes, and other domestic elements, which are not destined to commercialization, do not require permission or authorization.

In light of the aforementioned regulations, it is inferred that indigenous communities should include permission from INRENA for the commercial use of forest resources inside the areas that have been yielded to them in transfer-in use by the Government and that form part of their titled land. In order to acquire forest permits, communities are required to do paperwork, pay a $166 fee, and present a forest management plan signed by a Forester. In the management plan it is necessary to specify the areas of extraction, species, and volume, practices to transport the timber and the negative impacts and mitigation plan occasioned by use of the forests. Thus, to obtain this permit, a forest management plan approved by INRENA is required.

This system has been used widely by timber companies to gain access to timber resources from communal forests and areas adjacent to the villages (Bedoya and Bedoya Silva-Santisteban 2005); however, the negative externalities of this mechanism have a negative effect on communities and forests resources. Since 2002 in the Ampiyacu basin the largest villages have signed contracts with timber companies in order to obtain permits from the INRENA. Indeed, five timber permits have been granted to three villages for extraction in their *Communal Forests* (Table 6). These permits (sponsored by the company) allow companies to have total access to indigenous territories for

harvesting a specific volume of timber under mechanized practices. In all the cases documented in the Ampiyacu villages, companies refused to abandon indigenous land after they had extracted the volumes agreed upon. Thus, once the extraction quota had expired, companies expanded their activities to the contiguous forest surrounding the extraction area. In these cases, companies were ousted by a collective action of settlers and government authorities (Curaca of Brillo Nuevo, personal communication, 2008). Furthermore, as was previously explained, the communal timber permit is requested from INRENA by the intermediary or contractor. The intermediaries include a person, a forest engineer, who coordinates with the *presidente comunal* to obtain the legal documents from the community. This person also prepares the management plan. After revising hundreds of these management plans, it was found the Management Plan elaborated by the engineers is simply copied reproduced many times. The mitigation plans for different places are the same exact copies and only change the area, volume, date, and the name of the community.

Timber permits in communal forests

In August 2006, changes in the terms of reference for the timber extraction in communal forest were made to the Forest Law 27308 implemented in 2001. The norm 232-2006-INRENA was approved by means of which the reference terms of Forest Management Plan for the low, medium and high scale commercial use of forest in indigenous territories were created. The terms of reference, oriented to establish norms

for commercial use of forest resources in the communal forests, were approved after a participatory process at the regional level in which governmental officials, international cooperation, civil society and indigenous organizations participated. The process was headed by the Forest office (IFFS) of INRENA and occurred in different meetings in Amazonia cities such as Iquitos, Pucallpa, and Madre de Dios. The regulation divides forest use into three levels:

- Low-scale commercialization, stipulating that the community should carry out the use in direct form (without third-party participation) and that the volume of use should not be greater than 650 cubic meters annually per community. It permits neither the utilization of tractors nor other heavy machinery for dragging species such as tropical Cedar and Mahogany. The practices should be carried out respecting the minimum diameter and leaving 10% of trees as seed sources for regeneration.
- Medium scale commercialization, indicating that the volume of use should not exceed 2,500 cubic meters annually by a community. This applies to those communities whose productive forests are less than 5000 hectares. The administrative division of the forest can be performed by means of blocks that can be used every five years. The formulation of a Forest Management Plan is required and should be prepared by a forestry engineer registered as a consultant in INRENA.

- Large-scale commercialization terms of reference apply to those indigenous communities and/or those peasants' productive forests that are greater than 5,000 hectares. A Forest Management Plan (PGMF) elaborated by a forestry engineer registered as a consultant in INRENA is required. The intensity of use is regulated by the normative 117-2003-INRENA-IFFS and the PGMF should include an Annual Operating Plan (POA).

Assessing the access to timber resources

Rules and mechanisms in the area

Once clans have marked the trees and have obtained funding for logging operations, two situations can occur. In situation one, after loggers get their communal authorization, they pay for the *pase* in FECONA offices. In situation two, after the loggers get the communal authorization, they start harvesting timber without paying the fee to FECONA. In this case, loggers make arrangements at the control post later for the mobilization of logs to Pebas. In both situations, loggers count with communal authorization before entering into their extraction areas.

According to the permit's records of the 2007 logging season, fewer than 30% of the permits exceeded the permissible round timber quota. In addition, 40% of the permits used the total amount of permissible round timber quota, and 30% of the permits harvested less than the permissible quota. In addition, the maximum and minimum number of round timber logs found per permit was 210 and 25, respectively.

As the federation points out, the number of families working with timber has been increasing in recent years (Figure 11). According to the record of permits granted in 2005, there were none granted to women. However, records of 2006 show that four women were given permits, and this number doubled in the *zafra* for 2007. Table 7 shows the number of families involved in timber activities at the basin level, where 49.8 % of families harvested timber in 2007. Table 7 also shows the participation of villages and loggers in organizational mechanisms such as communal assemblies and congresses for decision-making. Through focus groups, it was found that villages and loggers have agreements in communal assemblies and congresses. It also has been documented in past congresses that the thirteen villages participate in these agreements. The agreements about timber extraction consist of the creation of mechanisms that guarantee the functioning of the local system. As part of the agreements mechanisms were established such as permits or authorization for timber extraction, the payment of fees, the permissible quotas, and the creation of control posts to controlling illegal operations.

Regarding these mechanisms regulating timber extraction in the villages, 85% of the villages carry out communal assemblies and agreements to regulate logging in the Ampiyacu basin. Most of the villages (92%) comply and follow agreements established in meetings (Table 7). In the case of the interviewed loggers, a high percentage of them (91%) mentioned that they are involved in the communal meetings and congresses. Nevertheless, most of these loggers (60%) do not perform their activities in complete accordance with agreements (Table 7). However, it was indicated in the focus groups that

the residents who did not participate in communal assemblies because they were already working in the forest regularize the payment of their permits to FECONA after their harvesting operations. For example, some loggers said that "*algunos de nosotros no hemos pagado aun por nuestros permisos, por que no tenemos saldo pa eso*" ("Some of us are in debt for our permits because we do not have enough money to pay for it").

In another case, as an outsider married with women from the village Boras de Pucaurquillo, a man reported that "*muchos de nosotros pagamos por nuestros permisos, pero sacamos la madera que necesitamos pa pagar nuestros gastos sino como*…" ("We get permits and pay fees but we cut the timber that we need to solve our financial problems"). According to another outsider, the *Pucalpino* (native of Pucallpa city) married to a woman from the village of Betania, local residents do not remove enough trees to make feasible the payment of fees: "*la gente aca saca poco, 100 a 130 trocitas, que con las justas alcanza pa pagar las multas a la FECONA, o la comunidad, de ahi lo que queda, el saldo, ya no es mucho, un sencillo. Por eso, la cosa es sacar 300 o 400 ahí ya puedes recuperar tu inversión, sacando o trabajando solo yo ya estoy ganando más que cuando trabajaba pa Venado*" ("People here harvest from 100 to 130 round timber, scarcely enough to cover FECONA or community fees that leaves a debit balance that is nothing. For that reason, the idea is to harvest 300 or 400 round timber in order to recuperate our investment, as in my case, that working alone I am obtaining better income than working with Venado timber company").

Even though in the congress of 2005 local residents discussed the suspension of timber activity for the year 2005 to 2006, it was not until the congress of 2007 that a suspension of timber operations was established, starting June 2008. This meant that local people had to finish all their operations and remove all the previously harvested wood before June 30, 2008. Local residents mentioned that it was the third modification that had been made to this agreement during the last few years. Finally, people agreed to stop the timber operations on June 1, 2008; however, local residents changed the deadline again to June 30, 2008. At the time of the fieldwork, (July 2008) the timber activity was continuing; outsiders and local residents were still removing timber in the forest waiting for the last rain. In addition, rafts were transporting timber from the headwaters of the Ampiyacu to Pebas in July; three rafts were observed transporting approximately 30 to 40 planks each.

Wide variations were observed in the collection of fees for timber extraction by the federation. According to the *actas*, in 2005 the total fee collection from permits was 1,668 Soles (US $556), where 1,176.80 Soles (US $392.27) were used to solve emergencies of the people in the basin, principally of the residents that live close to the federation and coordination posts. Commonly, this money is received as loans for families from different communities, loans that will not be returned to the treasurer. In 2006, the collection increased six times the last year to 9,366 Soles (US $3,122) from which the amount of 6,163 Soles (US $2,054) was used in administrative expenses, leaving 3,203 Soles (US $1,068) as a credit balance for the next administration. Costs

such as gas and food are considered administrative expenses. In the 2007 administration the collection from *pases* dropped tremendously in relation to the previous year. The collection was only 1,490 Soles (US $497).

The fines appear to serve as a mechanism to increase the income of collections of the federation. The last year the treasurer reported that the amounts of contributions from local residents were less while the fines paid by outsiders were higher. It appears as if local residents are diminishing their contributions. However, the fines paid by outsiders are not registered in the accounting book. These quantities are only mentioned in the *actas* when the congresses occurred. For instance, the case of an agreement to fine an outsider with 1,000 Soles (US $333) because he removed timber from the basin. The outsider paid this quantity to members of the *junta directiva.* In addition, there is a report about two contractors that gave FECONA a Yamaha motor 15 HP to move their round timber to the control post in the community of Pucaurquillo. This case denounced by local residents reveals not only the negotiation of FECONA with outsiders when timber confiscation occurred, but also the participation of the representative of INRENA-Pebas in these negotiations.

Identification of conflicts in the implementation of local arrangements

The *acta* of the congress registers the conflicts that occurred between local residents and FECONA due to timber resources. The group that coordinates the congress registers the accusations pertaining to money received by these members in the

FECONA's *libro de actas*. As a result, many conflicts about arrangements between these groups are registered in the Federation's *actas*. Some others were mentioned in the focus group, in the discussions about sanctions in case of irregularities. In general, in the focus group local residents accused FECONA about irregularities in permit collections and for receiving money from outsiders.

According to some accusations, FECONA allowed access to outsiders with whom financial arrangements are made. Outsiders paid from 500 to 1,000 Soles (US $167 to 333) or provided them with material things for their access to the logging operations. Consequently, when corruption occurred the control posts did not take any action because they realized that financial arrangements were already made with FECONA.

The management of fee collections has been causing conflicts due to the inexperience of the *junta directiva* with managing money. FECONA files all the permits granted and their respective receipts for accountability purposes. However, the accounting and use of the money is not clear in the records registered in the books, since only the total amount of expenditures is given, but not the detail of the investment of these collections.

Conflicts of coordination among secretaries on performance of their respective duties were also noted. These conflicts cause contradictory messages in the governing of timber resources. People in charge of the control post mentioned that "*Nosotros estamos pensando en actuar y frenar a estos foráneos en nuestros puestos por que la FECONA nos está quemando. Antes ya lo hemos hecho solo que avisamos a FECONA y ellos*

arreglaron con ellos y dejo pasar su Madera" ("we are organizing to take steps against outsiders. Once we stopped the entrance of foreign groups and informed FECONA about it, and FECONA made financial arrangements with them allowing them to take the confiscated timber, in this manner discrediting the role of control posts in the basin"). Also they pointed out that "*muchas veces hemos detenido extractores de Brillo Nuevo cuando se pasan de las 100 trozas y avisamos por radio a FECONA pa que tome cartas en el asunto y estos arreglaron con multas y ahí queda pes.……sin sanción diferente a multas*" ("Many times we stopped loggers from Brillo Nuevo when they harvest more than one hundred of logs and let FECONA know by radio, but FECONA solved the problem only with fines and that is it").

Conflicts among local residents generally occurred because the permissible quota was exceeded and the logs disappeared from communities. The local residents and authorities can recognize those groups that exceed the quotas of timber. In all these cases, loggers explained that this occurred because some part of their timber was lost in the transportation operation and they need more timber to supply what was lost.

The only document that registers accusations made by local residents against the *junta directiva* of FECONA is the *libro de actas* of the federation. In each congress the *junta directiva* of FECONA is questioned about the performance of its members. As was mentioned above, each congress is conducted by its own *junta directiva* created to moderate a congress. The *junta directiva* of the congress receives all the accusations against the members of the *junta directiva* of the federation. In addition, FECONA's

junta directiva has the opportunity of explain and justify the irregularities and oral accusations.

It was observed that the parts in conflict look for the local institutions to solve conflicts. The FECONA is the institution that resolves conflicts in timber extraction in the basin. The mechanisms of solution to conflicts among local residents were solved in a meeting between the local resident, his/her contractor, and members of the *junta directiva*. In contrast, problems with outsiders were solved between members of the *junta directiva* and the outsider. However, INRENA in Pebas may participate in any kind of arrangement among the parts.

Local perceptions of local arrangements for timber extraction

From open conversations with local residents, community and federation leaders and authorities, a variety of perceptions on the institutional arrangements appear to exist in the Ampiyacu basin. The difference between perceptions depends of the level of organization of these actors.

Local residents perceive that there is corruption at different levels of institutional arrangements that it needs to be resolved immediately. They considered that incorrect management of collections is made by the federation's *junta directiva*. Many of them doubt transparency in the management of the money. In addition, local residents stressed the importance of strict sanctions against *presidentes comunales* and FECONA leaders. They considered that a "hard hand" should be implemented in order to not only revoke

them from their positions in case of corruption, but also to charge them with legal accusations before the judge in Pebas. Moreover, they also indicated that some past FECONA's *juntas directivas* governed effectively in the application of the norms and sanctions in the basin as well as the decentralization of the power in the basin with the creation of headquarters. In addition, their positive perception about the federation is the work that the *Mujer lider* (leader women) does to improve the coordination between FECONA and communities. Commonly, the *Mujer lider* has a very active role to organize and keep informed communities in activities that involve some benefits for local residents, for instance, scholarships and training for young people. In addition, they provide information about government loans for production of *Sacha Inchi* (*Plukenetia volubilis L.*).

Indeed, the communal authorities considered that members of FECONA's junta directiva obstruct the functions of the control posts when they allowed logging by outsiders. Authorities considered that the majority of families in the basin respect the existing agreements and people in the control posts control the documentation for the transportation of the logs. They pointed out that when families exceed the permissible quota, guards stop their timber extraction and notify FECONA. Moreover, according to conversations with community leaders, FECONA is criticized because of a corrupt *junta directiva*. They think that the negative feelings of local residents are about those members of the *junta directiva* involved in acts of corruption with outsiders. Also, this negative perception about FECONA is related to the role of the control posts, and the

way in which FECONA undermines their authority of control within their territory.

To be sure, the coordinators of the control posts also perceive that FECONA obstructs their activities when they decide to allow access to outsiders. The coordinator from the control post of Brillo Nuevo also stated that,

> "*Nosotros, las sub sedes no realizamos ninguna acción de vigilancia por que ya vemos que hubo arreglo con FECONA. Nosotros nos sentimos atados de manos ante esta situación ya que provoca líos en nuestra comunidad. Nosotros tenemos acuerdos con extractores de nuestra comunidad los cuales estan molestos por la desigualdad, por que ellos son controlados y los foraneos no, por que ya arreglaron con dirigentes de FECONA y nosotros aca no sabemos como actuar*" ("We feel tied up due to this situation, because it provokes chaos in the community due to coordination of activities and agreements with loggers in that community who are uncomfortable with the inequalities in the control of their activities while outsiders have freedom to act in the basin due to financial arrangement with FECONA and they do not know how to act in these situations").

On the other hand, local residents indicate that FECONA cannot continue granting *pases*. Some of them doubt the legality of the local system, and they also consider that obtaining permits from INRENA would resolve the problem of timber extraction in the basin. Local residents feel that the local resource system is considered illegal by the office of INRENA in Pebas, since the current areas of extraction are located outside of the indigenous land in the areas required as titled land expansion.

It was found that local residents of the Ampiyacu hope to organize and resolve timber issues in order to receive better benefits from timber extraction. As the *presidente comunal* of Nueva Esperanza pointed out, "*los comuneros de Esperanza estamos de acuerdo con frenar la extracción este 30 de Junio hasta que salgan los permisos de INRENA o hasta que se reordene todo el trabajo a favor de todos*" ("Villagers from

Esperanza agree to stop the timber extraction on June 30 until getting INRENA permits or even until reorganizing all the system and making it more favorable for the majority of the population").

On the other hand, according to conversations with current FECONA leaders about the financial sanctions and fees per timber permits, they considered these mechanisms as the only way to face illegal activities and to improve control over timber resources. For them, the fines to outsiders are justified because they can use those funds for projects in the communities and improve the organization and control of the timber activity in the basin. The Natural Resources Federation leader mentioned that "*Esas multas y pagos por pases se necesita por que asi nosotros podemos realizar coordinaciones con nuestras bases, visitandolas. Tambien hay que hacer pagos pa obtener los documentos legales de la FECONA, necesitamos registrarla*" ("The fee payment is justified, we need to make arrangements with the communities and visit them. Also FECONA needs the money to record the legal documents about the organization in the Peruvian Public Records").

FECONA leaders consider that not having documents recognizing them as a federation is a disadvantage that limits their participation in projects at local and regional levels. Although the federation was created in 1987, it needs to register the new statute created in 2005, which established norms and rules of forest resource management in their territories. FECONA must also register its participation in the future co-management of the conservation area in the Ampiyacu. One leader indicated that,

> "*Los comuneros estaban trabajando bien porque ya había sido creada la reserva y también mientras creían que las ampliaciones saldrían, pero al mencionárseles que no deben dar por hecho esa negociación con el PETT, a partir de ahí, de ese momento la gente ha perdido la confianza y seguridad, así que ellos dejaron de cuidar esas áreas y le entraron a la madereada*"
> ("Ampiyacu residents were working hard because of the creation of the conservation area while they thought that territorial expansion would be approved by the government. However, since then they were told not to take for sure the negotiation with this governmental institution because the negotiation is still in process. The people have put all their trust and security on that; now they feel discouraged and have discontinued taking care of these areas and starting working in timber extraction").

Moreover, communal and federation authorities perceive that the number of local residents involved in timber extraction is increasing; consequently, the conflicts with illegal loggers is also on the increase. The communal president of Brillo Nuevo said that, "*Los nombres de mujeres en los pases es reciente, esas familias son ambiciosas, ellos quieren sacar mayor cantidad y por eso hay nombres de mujeres en la lista de pases y ahora casi todos quieren trabajar madereando y por nada quieren el ingreso de madereros de afuera*" ("Recently the names of women on permits have increased because those families are ambitious. They want to get the biggest quantity of timber per family and that is the principal reason why women are starting to ask for permits, and each year more families are involved in timber harvesting and they do not want the presence of illegal loggers in the basin").

Given the complexity of the forest law 27308, I wanted to have an idea of the degree of knowledge that the interviewed dwellers have about this law, regulations and implications. I asked questions about the new legal framework of the forestry law and

how it involves indigenous land in the use of forest resources during open interviews with dwellers in the Ampiyacu. A very high percentage of interviewees did not know about the forestry law or the regulation for commercial use of forest resources. Specifically, some of them did not recognize whether requesting a permit from INRENA is different or similar to the permit granted by the FECONA. However, they did recognize that the INRENA timber permit is better for price negotiation with intermediaries due to its legal acceptance. Although some interviewees mentioned knowing something about this law and the forest permits, their knowledge referred to the negative impact of forest concessions in their communities.

Table 6 Timber permits granted to Ampiyacu villages

Village	Number	Date	Species	Volume (m3)	Companies
Huitotos de Pucaurquillo	1	22-Jun-06	Capirona, Catahua y Azucar huayo	463.6	Maderera Joer
Huitotos de Pucaurquillo	1	08-Apr-03	Cedro, Huimba y Cumala	1014.475	Trimasa
Estiron del Cuzco	1	25-Nov-02	Cedro, Huimba, Lupuna y Cumala	1231.059	Trimasa
Boras de Brillo Nuevo	1	10-Sep-02	Cedro, Huimba, Lupuna y Cumala	1339.148	Maderera JJ
Boras de Brillo Nuevo	1	19-May-06	0	0	Maderera Joer
				4048.282	

Source: (INRENA 2007)

Table 7. Regulation's performance in the Ampiyacu Basin

Variables	N	% Yes	% No
Families perform logging activities	291	49.8	50.2
Villages have communal assemblies	13	85	15
Villages participate in agreements in congresses	13	100	0
Villages comply agreements	13	92	8
Loggers participate in asemblies	35	91	9
Loggers comply agreements	35	60	40

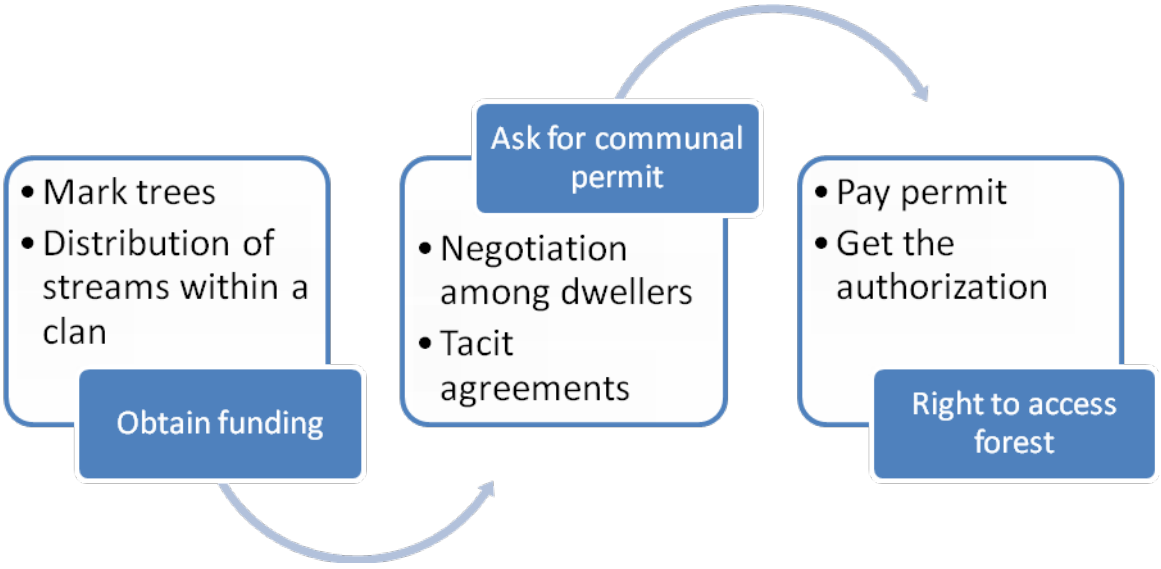


Figure 6. Unwritten and unwritten mechanisms for access to timber resources

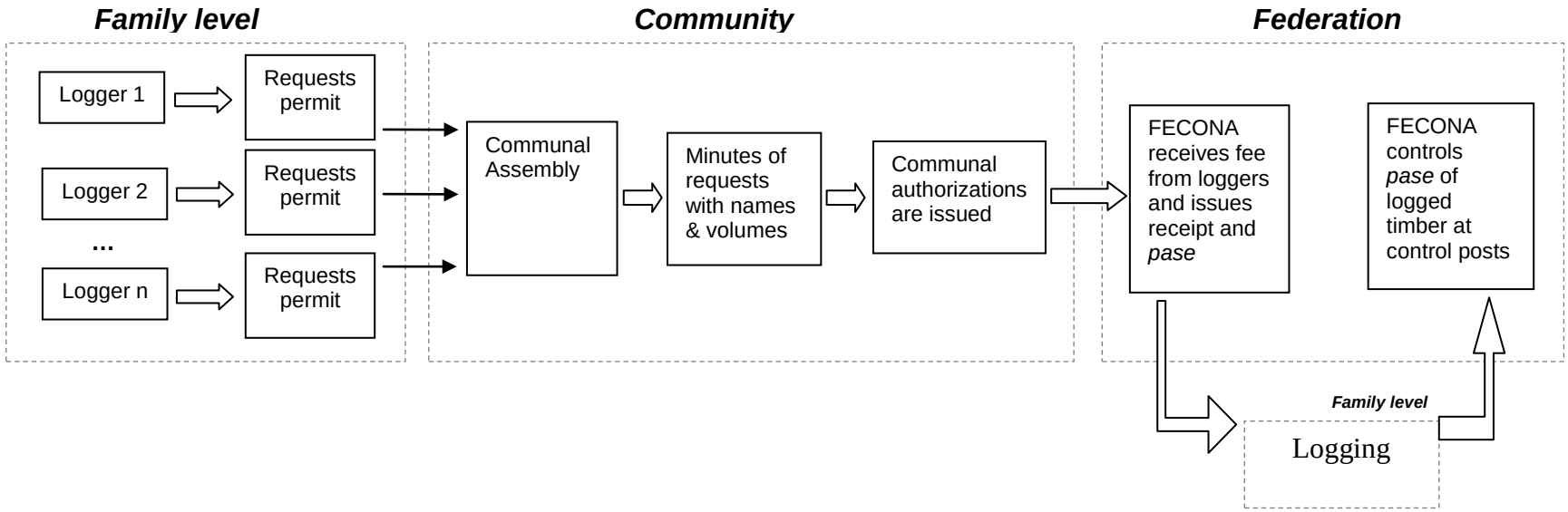


Figure 7. Written mechanisms for access to timber resources

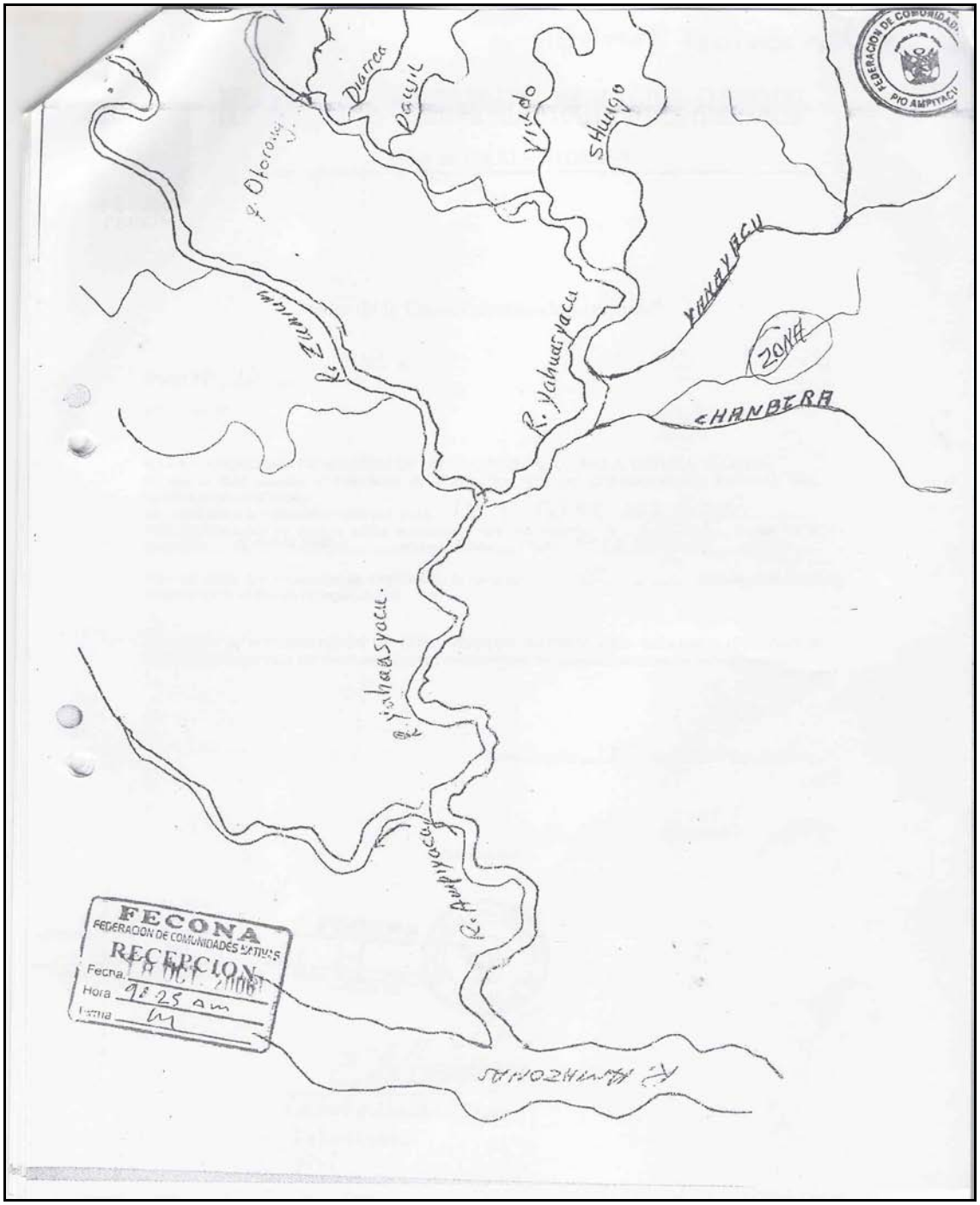
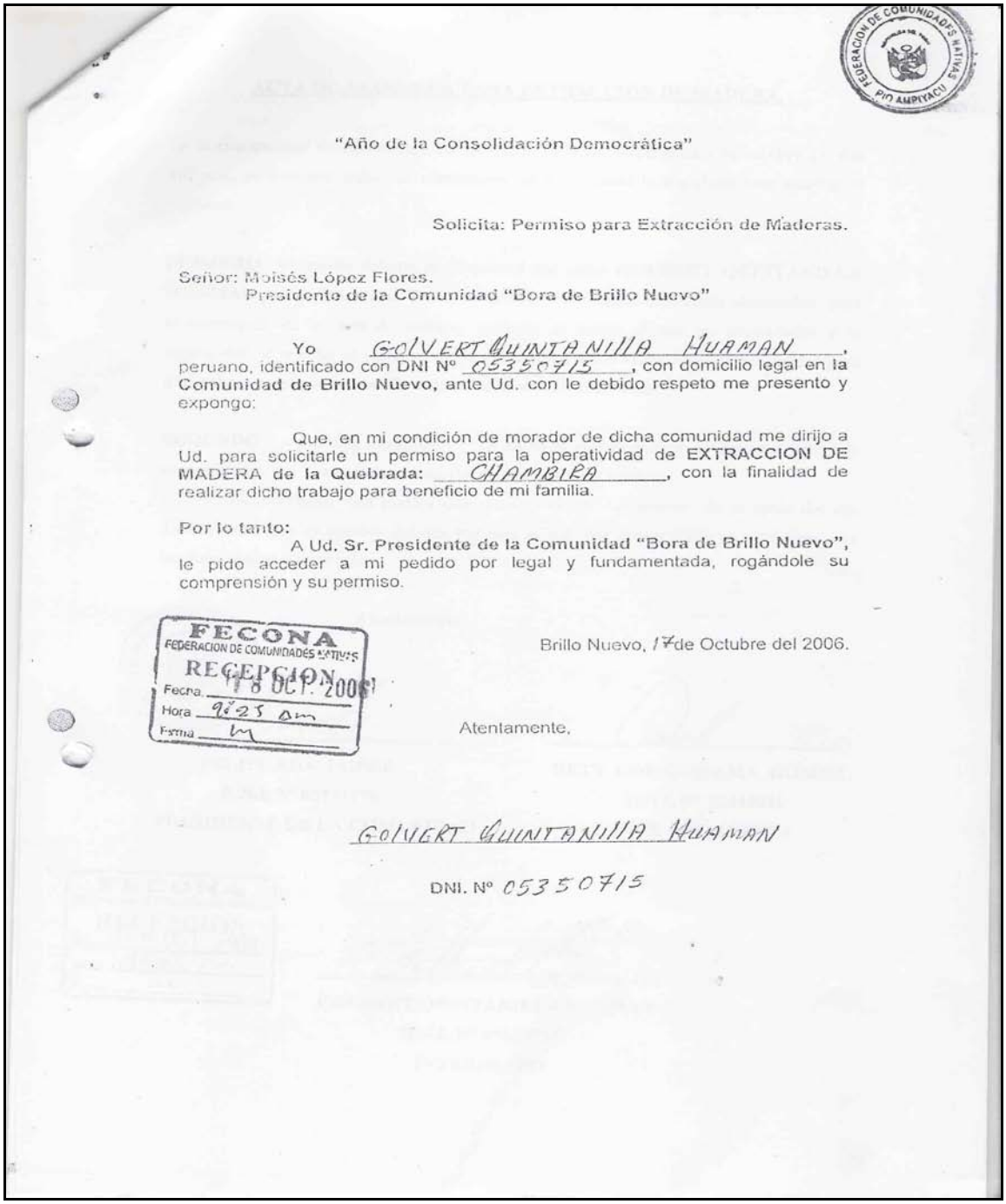


Figure 8. Sketch location of extraction areas



"Año de la Consolidación Democrática"

Solicita: Permiso para Extracción de Maderas.

Señor: Moisés López Flores.
Presidente de la Comunidad "Bora de Brillo Nuevo"

Yo GOIVERT GUINTANILLA HUAMAN, peruano, identificado con DNI Nº 05350715, con domicilio legal en la Comunidad de Brillo Nuevo, ante Ud. con le debido respeto me presento y expongo:

Que, en mi condición de morador de dicha comunidad me dirijo a Ud. para solicitarle un permiso para la operatividad de EXTRACCION DE MADERA de la Quebrada: CHAMBIRA, con la finalidad de realizar dicho trabajo para beneficio de mi familia.

Por lo tanto:
A Ud. Sr. Presidente de la Comunidad "Bora de Brillo Nuevo", le pido acceder a mi pedido por legal y fundamentada, rogándole su comprensión y su permiso.

FECONA
FEDERACION DE COMUNIDADES NATIVAS
RECEPCION
Fecha 18 OCT. 2006
Hora 9:25 am
Firma

Brillo Nuevo, 17 de Octubre del 2006.

Atentamente,

GOIVERT GUINTANILLA HUAMAN

DNI. Nº 05350715

Figure 9. Communal Authorization

Golvert Quintanilla Huaman

FEDERACION DE COMUNIDADES NATIVAS DEL AMPIYACU

Base de ORAI – AIDESEP.

FECONA

"Año de la Consolidación Democrática"

Pase Nº 15

PARA EXTRACCIÓN DE MADERA DE ESPECIE (CEDRO, CUMALA, LUPUNA, MARUPA)
El que al final suscribe el Presidente de la FEDERACIÓN DE COMUNIDADES NATIVAS DEL AMPIYACU (FECONA).
En referencia a la solicitud emitida con fecha 18 OCTUBRE DEL 2006.
Para la extracción de madera arriba mencionado con una cantidad de 100 trozas, en la quebrada CHAMBIRA afluente del río YAHUASYACU.

Para tal efecto doy en nombre de contribución la suma de 50 nuevos soles como estipula los acuerdos de la organización.

En nombre de la FEDERACIÓN DE COMUNIDADES NATIVAS DEL AMPIYACU (FECONA) se expide la presente para los fines conveniente a las dependencias quienes interfieran en todo momento.

Puca- Urquillo 18 de OCTUBRE del 2006.

Atentamente.

FECONA
Edgard Churay Rivera
PRESIDENTE

FECONA
p/o
Brus Rubio Churay
SECRETARIO

FEDERACION DE COMUNIDADES NATIVAS RIO AMPIYACU

Golvert Quintanilla Huaman.
Interesado
piri

Figure 10. The timber permit or *Pase*

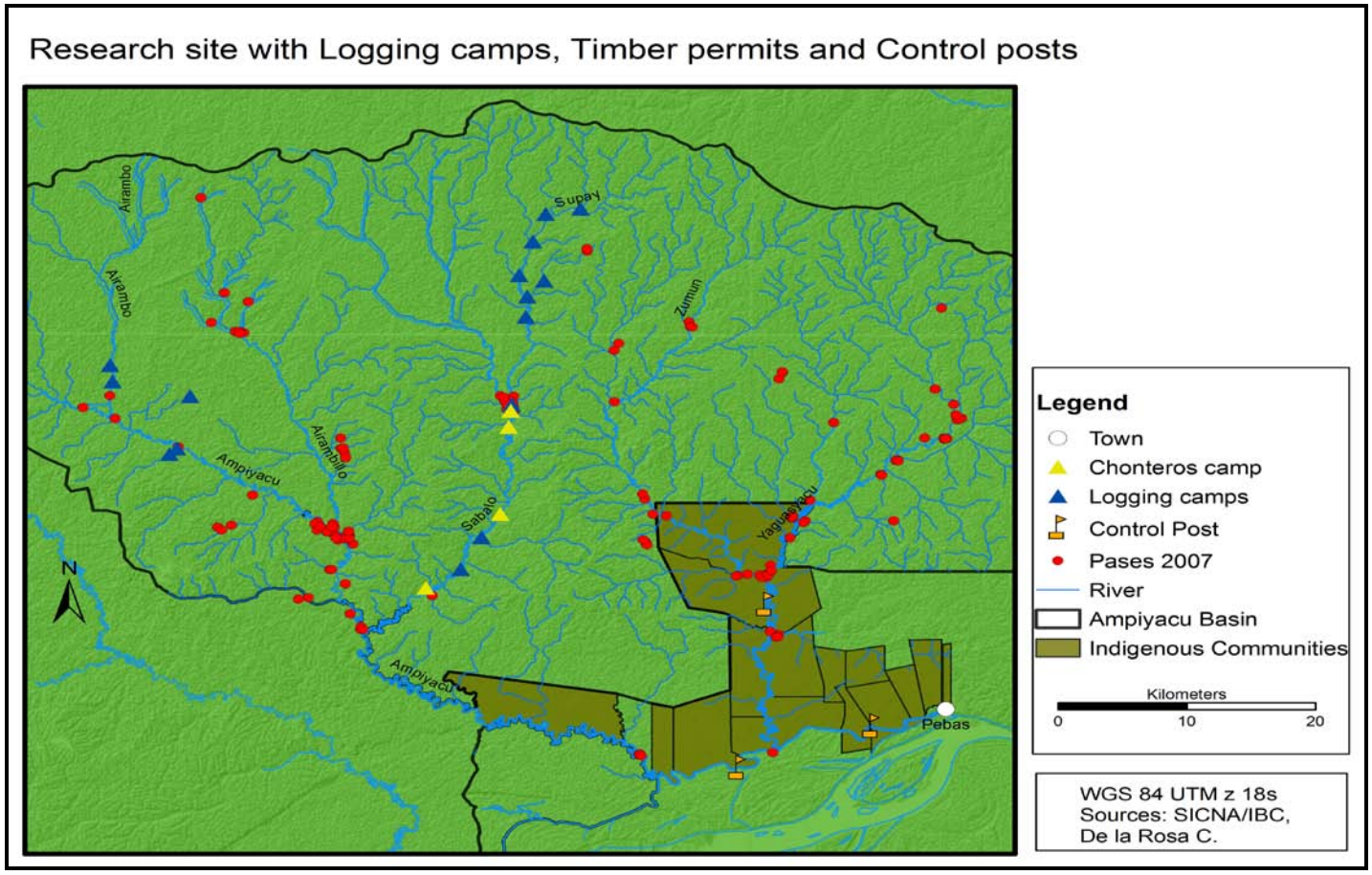


Figure 11. Logging areas according to the camps visited, timber permits and control posts.

Figure 12. Control post located in the village of Pucaurquillo

Figure 13: *Junta directiva* that conduct the congreso in 2006. Photo IBC, De la Rosa C.

Chapter Seven: Timber extraction characteristics

Pre-timber extraction activities

The timber extraction activity in the Ampiyacu basin starts when the clans, or their members, are in the forest doing subsistence activities. Commonly, these activities subsidize each other. During the season when local residents are not harvesting timber, they work on different activities. According to interview data, six activities are of local importance in the basin: hunting, fishing, palm heart gathering, *Irapay* palm leaf harvesting, production of handicrafts and agriculture. In addition, the *mateado* or marking of trees takes place while local dwellers are hunting or harvesting palm heart. As was previously stated, the *mateado* consists of the selection and marking of standing trees in the extraction areas. A member of the clan that has the best knowledge about the commercial species does the selection. The mark in the standing trees is made with a machete (Figure 19). Once clans have marked the trees and have received funding for logging operations, loggers form logging crews to remove the trees.

Logging crews are an important part of the timber extraction operation. These crews are composed of adults and youth at least 15 years of age who may be local residents or outsiders (Figure 20). Since an important factor for this activity is to recruit people that are skilled using a chain saw, trained outsiders from the cities of Iquitos and Pucallpa are recruited. The logging crews, called *brigadas*, are in charge of all the operations in the forest (e.g. felling, logging, and dragging). Each member of the team has one or more particular roles. For instance, each crew has a *mitayero* who plays a very

versatile role. This person looks for bushmeat and cooks for the team. He has his own shotgun, and the contractor provides him with cartridges, batteries and salt for hunting and preparing the food. While hunting, the *mitayero* also looks for commercial trees, identifying and marking them in the forest. In addition to these roles, a man with a chain saw (*motosierrista*) and his assistant are in charge of felling, logging, and opening the forest trails. Next, a variable number of workers, on average three per team, remove old logs, branches and obstacles from the streams. In addition, they drag the logs, drop them into the creeks or streams, and transport the logs as rafts.

According to the interviews, a logging crew has between two to eight members. Moreover, 23% of interviewees include a woman in their teams who carries out cooking tasks. However, there are logging crews which engage an entire family (father, mother and children). In such cases, the children of 9 years and older are in charge of driving the boat and women help in activities such as opening pathways, dragging logs, and cooking. Members of the crews are paid on a daily basis. They receive part of their payment at the beginning and the rest at the end of the activity, when the logger receives the payment for his timber. The salary of the chain saw man is US 8.3 – 10 dollars per day, *Mitayero* and workers receive US 3. 3 – 8.3 dollars per day and women cooks receive US 1.6 – 3.3 dollars per day.

Once logging crews are in the forests, the next step is to set up a campsite in their extraction area (Figure 21). If commercial timber still exists near to their old camp they remain there, otherwise crews will open a new campsite closer to the area of work. In addition, the camps provide food since people grow some crops for their daily

consumption in campsites. Crops such as *cocona*, *casava*, herbs and chilis were present in all camps visited.

Timber extraction operations

The seasonal stream flows are one of the most important factors in timber extraction since loggers plan and carry out the extraction operations according to the water level in streams and rivers (Figure 14). Commonly, in the Peruvian Amazon, people call the dry season "summer" and the rainy season "winter", regardless of the hemispheric seasons. Thus, the first phase of extraction called by local people *la corta* (felling) takes place during the "summer season". It is when there is no rain, and rivers are at their lowest levels. In this phase, the felling, logging, and bucking are carried out, as well as the dragging of the logs to the stream banks and forest pathways. After finishing these operations, most members of a team return to their communities, and only *tanganeros* (rafters) stay to wait for the rain to be able to transport the logs. The second phase, called *la saca,* is carried out in the "winter season", when the rains begin. In this phase the logs are removed from the forest. The actions involved are the cleaning out of streams, dropping and buoying of logs, and the fluvial transportation of logs to the contractor in Pebas.

The felling and bucking operations are executed in sequential manner. First, during the cutting operation the *motosierrista* and assistant clean out the dense underbrush around the tree, and remove vines from each tree. They exchange roles constantly to work efficiently. Once the tree is felled, the bucking of the tree into logs is

performed. In the visited areas, it was observed that each cut tree followed its natural fall line and that there was no presence of tangled trees. A *motosierrista* can cut and buck an average of five trees per day. A variable number of logs are obtained from the trees, leaving the crown in place. An average of four logs were obtained per tree for *Cedrela* sp., *Virola* sp. and *Simarouba* sp., while up to eight logs per tree were obtained for *Ceiba* sp.. The difference in log yield is in part explained by log size. The commercial length for logs cut from *Ceiba* sp. was 9 feet, while the length of logs from *Cedrela* sp., *Virola* sp., and *Simarouba* sp., among others, was13 feet.

Just after the tree is cut down, the cleared area is used to open forests trails or pathways. These pathways are utilized to drag the logs to the bank of the closest stream for the eventual transportation of the logs (Figure 22). The first step in this operation is for the *motosierrista* to open the path and clear away the trunks and branches. Next, the workers clear and finish the pathways with machetes. In the areas of extraction visited up to five trees were dragged along the same pathway, but the width and length of these pathways varied. The average length of forest paths was 108 meters, and the average width was 5.7 meters. Trail conditions also varied even though the length of the operation was the same for all the areas visited. Differences were found in the forest structure. Certainly, the trails in forest of *bajiales* were barely covered by *purma* or secondary vegetation while forest in *terraces* and *low hills* presented much more closed *purmas* of one to two meters in height.

The dragging and stacking of logs occurred after opening the forest trails. Two to three persons drag the logs from the forest to the log yards by sheer force, in some cases

with the help of a pole as a lever. For rolling, two poles are used along the path to help the logs roll until the bed of the stream. To extract *Ceiba sp.* trees, a *molinete* or pinwheel is used to drag wider logs (Figure 23). This pinwheel, built with forest materials, is utilized to guide the logs downhill along the path. This rudimentary equipment is also employed to move the logs uphill and horizontally when human force is insufficient. Dragging and rolling logs is considered one of the hardest tasks in timber extraction. The terrain was uniform along most of the pathways, ranging in elevation from 90 to 139 meters above sea level. However, interviewed loggers pointed out that commonly the physiography where they log *Virola* spp. *Ceiba* spp. and *Simarouba* spp. is of *bajiales*, flat areas that facilitate log dragging. Conversely, in the low hills, where *Cedrela* spp. are harvested, the topography is slightly hilly. After dragging the logs, they place them very close to the stream (Figure 24).

As indicated by loggers in the interviews, when logging crews fail to remove all *Virola* spp. logs, it is common to find the timber end up rotting in the forest. According to the loggers, softwoods such as *Virola* spp. can remain only three to six months in the forest in good condition before rotting. Hardwoods such as *Cedrela* sp. can remain up to two years in the forest without rotting and the wood will still be in good enough condition for sale. Loggers pointed out that wasteful situation occur when loggers harvest large quantities of timber that they are unable to remove due to insufficient labor capacity in their crews. If the loggers do not have favorable weather conditions and enough capital to return for the remaining logs, the timber may end up rotting in the forest.

The initial transportation of logs is made possible by cleaning out the creeks. The cleaning of the creeks is carried out with the purpose of clearing all the obstacles that could impede the free movement of logs from the creeks to the main river. Two laborers carry out this activity. Generally, the youngest of the team works with the help of the *motosierrista*. These laborers will subsequently carry out the initial transportation of the logs when the rain comes, as well. Furthermore, they will work as *balseros* and *tanganeros* transporting the logs in rafts to Pebas. Once the creeks are cleared of obstacles and the stream levels are high enough, the logs are dropped into the creeks and the initial transportation begins. The logs are transferred by pushing them one by one from small creeks towards the main rivers. Once the logs arrive at a navigable river, workers construct rafts with the logs at the river's edge using rope and float them down stream to Pebas. The two workers who remained in the forest to perform this activity carry out this activity.

Next, the process of buoying the logs in the main river begins. The logs that arrive at the main river are placed in parallel and tied up with ropes and eyebolts of corrugated iron (Figure 25). In general, the transportation of the timber is in rafts containing logs or planks of wood. The rafts are propelled simply by the river flow. However, the *tangana*, a long wood pole, is used as a pushing, braking and steering device during transportation (Figure 26). The *balseros*' journey usually takes four to seven days to arrive in Pebas. If the *balseros*' communities are en route to Pebas, they usually stop at home to change clothes, deliver bush meat or wait for the contractors in case further arrangements with FECONA are necessary.

Decisions in timber operations are made in regards to weather conditions and fluvial accessibility to the headwaters of the Ampiyacu River and tributaries. According to interviewees, loggers return more than once into their extraction areas either in the rainy or in the dry season. They will take advantage of any small rain to transport some of their logs out the basin. As a result, numerous visits to their extraction areas can occur over the course of a year. Re-entering these places also allows loggers to search for new harvest areas for the next logging season. Commonly, a logging season lasts 6 months, starting in December and finishing in May (See Figure 14).

Logging effects in the extraction areas

The three most common types of damage were measured in the extraction areas. These types of damage are related to the remnant forest, soil and water (Sabogal et al. 2003). To obtain the value of impacts in extraction areas, a total of 146 stumps were measured using the methodology of "stump counts" (Hernandez 1999). It is important to consider that these impacts were registered during just one trip; however, loggers might extract more trees from the same areas if they make more than one trip during the logging season.

To estimate the cleared areas, the result in Table 8 show that cleared areas are on average 0.5% of the total extraction area, ranging between 0.11 and 1.24%. The average area of a tree clearing in an extraction area is 106 m², ranging between 43 and 271 m². Data is showed in averages per extraction area (Table 8). The Basal Area of the 146 trees logged in the twelve extraction areas ranged from 2.08 to 10.12 m² per extraction area.

For the entire area, the average Basal Area removed is 0.016 m² per ha (Table 9). The Basal Area removed per type of forest or intensity of extraction in percentage was calculated comparing with the Loreto Forest Inventory (INRENA 2000), considering all the species with diameter classes above 40 cm. The result shows that the intensity of timber extraction is between 0.05 to 0.56% (Table 10).

To estimate the surface of soil damaged, the percentage occupied by forest pathways was calculated. It was found that forest trails cover between 0.028 to 0.99 % of the extraction area. The average width of pathways is 5.7 meters and the number of pathways per hectare is 4.53 meters. In addition, the forest pathways are an average distance of 108 meters from the nearest stream where the logs are dropped (Table 11). The distance of pathways from streams observed was highly variable, though, with a minimum distance of 2 meters and a maximum distance of 800 meters from tree to stream. Loggers were observed using one pathway to drag up to 5 trees.

To estimate the removal of obstacles from the water courses, the percentage of water courses with obstacles present was calculated. The percentage of water courses with obstacles present was very low, ranging from 0 to 13%. In addition, the indices ranged from 1 to 2, indicating that the water courses in the extraction areas were in good condition (Table 12).

In addition, the existence of some techniques of management that offset the damage caused to the remaining forest was also documented. According to interviews, it was possible to determine that the main practices oriented to this purpose are the cutting of vines and working with the natural falling direction of trees. Even though some

loggers mentioned taking care of the natural regeneration and protecting seed-trees, none of these practices were found in the areas visited.

The cutting of vines is a regular practice that facilitates logging operations for all the interviewees. For that reason, it is something that every *motosierrista* performs on a regular basis. Cutting vines is the first action performed by the *motosierrista* and by his assistant prior to cutting a tree. This operation is performed from the ground and consists of cutting off vines and climbing plants around the tree. The removal of vines allows a clean fall of the tree and clears the trunk of the hanging vines that hold it. It also impedes kick back of the trunk when it is falling.

Likewise, almost all of extractors interviewed (97%) take into account the falling direction before cutting a tree. The majority of the 146 trees visited in the field were cut down following their natural leaning forces (Figure 27). The arrangement and orientation of the undercuts were observed to determine the natural inclination of each tree. In addition, in the cases where the natural inclination was to fall in the stream in use, the trees were cut down in opposite direction to the streams. The interviewed loggers pointed out that they proceed this way to avoid obstructing the streams and to make the initial transportation of float logs on the creeks less laborious.

Some loggers described the management of natural regeneration. According to these loggers, the natural regeneration of *Ceiba* spp. and *Virola* spp. occurs very close to the mother tree, and a few *Cedrela* sp. trees leave seedlings. Sometimes they have tried to transplant these species' seedlings to forest pathways or any cleared area, having only partial success. Thus, they consider that *Ceiba* spp. and *Virola* spp. respond well to

manipulation. Some manipulation experiences of the natural regeneration for some species of *Virola* exist in the basin. For example, two years ago, in the village of Puerto Izango, a dweller transplanted to his small land around 1,000 seedlings of *Virola* spp. At present the dweller counts 700 saplings that have survived and are two meters tall. In addition, the naturally regenerated seedlings of *Cedrela* spp. have been transplanted to forest pathways close to the camps and in pathways from which this species was logged. Those seedlings have responded well in places where they were planted dispersedly and in the areas where the species had previously developed, as in the hills. The same happened with *Simarouba* spp.

Regarding the protection of seed-trees, Interviewees indicate that they do not preserve seed-trees as future sources of seeds within the accessible harvesting radius. In fact, a tall and vigorous tree would be very desirable for harvesting. In addition, the loggers point out that they do not harvest distant trees; instead, they only cut those trees located in the proximity of the rivers and streams banks. They consider that the trees that remain in inaccessible areas safeguard the source of seeds for regeneration of the forest.

Louman and Stanley (2002) emphasized that to achieve a balance between use and conservation of forest resource a minimum felling diameter should be considered. The MFD needs to be greater than the diameter rank in which the species has its maximum production of seeds. In this study, this parameter was calculated from the stumps measured in the forest. It was compared with the table of MFD established by INRENA for the same species. In addition, the loggers reported the commercialization of five commercial members of genera *Cedrela*, *Virola*, *Ceiba*, *Simarouba*, and *Cedrelinga*.

However, for this analysis only *Cedrela*, *Virola*, *Ceiba*, and *Simarouba* were considered due to the presence of insufficient data to include *Cedrelinga.*

For this analysis, the MFD was included as an indicator of intensity of harvesting of the species exploited in the basin. The longer and shorter diameter of each of the 146 stumps surveyed was measured. However, for the estimation of the MFD per species, the longer diameter was considered since it is the one used by the loggers. A table showing the minimum felling diameter per species is presented (Figure 15). The results show that 19 % of *Cedrela* sp. trees were cut down with diameters below 65 cm, the MFD established by INRENA (INRENA 2003). In the case of species members of *Virola*, *Simarouba*, and *Lupuna*, the stumps' diameters were above the MFD established for each of these species. This means that in most of the species exploited in the basin, the minimum felling diameter used by loggers fulfill the national regulation. Only in the case of *Cedrela* was it found that a few trees were logged above the MFD, due to the high harvesting intensity of the members of these species for years. In addition, this result shows that the extraction areas may still have individuals suitable for harvesting in the future.

In the study area, each crew depends on a *mitayero* whom is supplied with a shotgun, cartridges, salt and batteries with the purpose of providing daily meat for the group during their stay in the forest. Once the hunter finishes his commitment, he dedicates the remaining time to his own hunting. Upon returning to his community, the hunter destines the surplus meat for his family's consumption, for sale, or for barter (Figure 28). According to the information supplied by extractors, a ranking of the species

hunted with greater frequency in the extraction areas was obtained (Figure 16). To obtain this information each extractor was asked to make a list in descending order of the species consumed with greater frequency during their timber operations. Next, this information was used to create a ranking of the species consumed by the loggers. According to the ranking, 83% of loggers place the *Sajino* (*Tayassu tajacu*) as the species more frequently hunted. The species consumed in second place (69%) is *Majás* (*Agouti paca*). Wild turkeys (among them the *pucacunga* -*Penelope jacquacu* and the *paujil* -*Crax salvini*) were in third place, and primates (mainly machin negro -*Cebus apella*) in fourth place. The least frequently consumed animals were the tortoise *motelo* (*Geochelone denticulata*) and the *añuje* (*Dasyprocta sp.*).

Factors that influence the spatiality of timber extraction

Three important factors influence the spatial arrangements of loggers in the forest and determine the level of benefits from timber extraction. The amount of investment and benefits, the number of commercial species, and the timber species present are factors that influence how far from his community a local resident can go to harvest timber in order to obtain significant benefits from this activity.

The methods of funding for the timber extraction were classified as external and internal funding. External funding is derived from the *habilitacion* system. In this mechanism, a contractor delivers provisions, materials and even equipment to loggers prior to the extraction, in exchange for a determined quantity of logs. The timber can be logged inside or outside of communal forests. According to loggers, the prices of the

goods (e.g. salt, rice, sugar, soap, batteries, machetes, rifles, motors, and saws) are overpriced. For example, in the Ampiyacu, prices can be between 60 and 80% higher than regular prices found in Pebas.

The term internal funding is used when loggers fund their activities using their own resources. According to interviews, the capital is obtained from the sale of products such as fish, manioc, banana, and handicrafts in the markets of Pebas and Iquitos. These products are also exchanged for necessary materials and equipment, such as gasoline, oil, and chainsaws to carry out the timber extraction. Results from interviews with loggers show that 94% of the loggers have external funding while only 6% self-fund this activity since they do not need external funding. The latter group said that they extract small quantities of timber that allow them to work fast and obtain cash immediately without being involved in the *habilitacion* cycle. In addition, their activity requires less investment since no laborers are needed and they work only with family members.

The amount of investment is one of the most important factors influencing the harvest location (Figure 17). Results show that most loggers with external funding (48.5%) received up to US $1,000 per season. From this percentage, the majority (81 %) were funded by amounts from US $501 to 1,000. The minority of the loggers interviewed (21.1 %) received funds between US $2,500 and 3,000, from which 71 % of them obtained between US $2,001 and 2,500. In contrast, all the loggers that were self-funded invested only up to US $500 per entry into the forest.

Once the logger is in the field, the feasibility of extracting trees is another factor that determines the harvest location as well as production and benefits obtained. For

loggers, besides the amount of funding, the numbers of trees available to extract is also highly important in determining the profits. The number of trees harvested is related to the distance necessary to drag the logs. Thus, long distances are covered when value of a species pays for its cost of extraction. Otherwise, long distances are not convenient. Long distances in timber extraction represent an increase in the cost of production. For instance, logging crews require more people for this operation; it is more time consuming and in consequence they harvest fewer trees per day. According to loggers, only *Cedrela* pays for the cost of dragging logs long distances. The results show that the average distance to drag *Cedrela* (305 meters) was higher than for the rest of the species. In addition, the maximum distance traveled for this species was 800 meters, while the minimum distance was 5 meters. In the case of *Lupuna* (*Ceiba* sp) the average distance traveled was 101 meters, while *Cumala* (*Virola* sp) and *Marupá* (*Simarouba* sp) registered 78 and 57 meters respectively.

To calculate the average production of timber per logger, the weighted average volume per log of four species was calculated. Thus, the weighted average volume per log of *Cedrela, Virola, Simarouba and Ceiba* species was obtained (Table 13). The results show that the weighted average of a log of *Cedrela* has 2.37 m^3, *Cumala* 1.9 m^3, *Marupá* 2.01 m^3, *Lupuna* 5.16 m^3 and others 3.05 m^3. Thus, the volumes obtained correspond to the logger's timber volumes harvested per one trip in a logging season. Next, the results are shown classified per the type of funding (external and internal) (Table 14). According to the results, the average volume per logger with external funding was 285 m^3 per trip whereas for loggers with internal funding it was 107 m^3 per

trip. The maximum volume per logger with external funding was 485 m^3 while for loggers with internal funding it was 119 m^3. The minimum volume per logger with external funding was 133 m^3, whereas the minimum volume for those with internal funding was 95 m^3.

The timber production per species according to each type of funding is shown (Figure 18). According to Figure 18, the self-funded loggers harvest only *Cedrela* sp. and *Virola* sp., whereas the loggers with external funding also harvest three other species (*Ceiba* sp., *Simarouba* sp. and *Cedrelinga*). This is because the most profitable timber species in the local market are currently *Cedrela* and *Virola*, followed by *Lupuna*, *Simaouruba*, and *Cedrelinga*. According to loggers, they use species as *Simaouruba*, *Cedrelinga*, and *Ceiba* to complete their production. Although *Cedrelinga* has a better price than *Virola* in the local market, the trees of this species are less exploited. According to loggers, these trees are not founded near streams and rivers of the Ampiyacu area. The average prices of the timber species per board foot in the basin are as following: *Cedrela* US $0.4, *Cedrelinga* US $0.16, *Virola* US $0.09, *Ceiba* US $0.082 and *Simarouba* US $0.072.

In order to calculate the total costs of production and obtain the net income for timber extraction loggers were asked to estimate the amount expended in salaries if they were paid. Generally, the amount of funding represents the total amount invested by loggers, for others an additional cost is added at the end of the operations. Most loggers easily remembered how much they paid their laborers and how much was left. At the moment that loggers are funded, they receive some cash as part of the total amount

funded, in these cases the cash is invested in laborer salaries. The cost of salaries is partially covered with this cash at the beginning of the timber activity and the complete payment of salaries occurs at the end, when loggers receive all revenues for the timber harvested.

The net proceeds from this activity were estimated based on the costs and earnings for each logger. The earnings were calculated based on the volume harvested by each logger and the average weighted price for each species. The costs were estimated based on the total amount of funding and the additional costs for salaries. Thus, with both values earnings and costs was calculated the average income per logger in a logging season. The debit balance is the amount of the old debt that each logger has pending to solve with the contractor. The income by type of funding is presented in Table 15. The results show that the average costs corresponding to funding, salary and debit balances are higher for the loggers with external funding. Even self-funded loggers have debit balance due to past transactions with contractors in small amounts, though. Thus, the average income per logger with external funding was US $1,197 per month, whereas the income for a self-funded logger was US $788 a month for the six month logging season. It is important to point out that the amount of debit balance is highly significant in the calculation of the average net income. The majority of loggers have this debit balance because they previously received overpriced motors and chain saws from the contractor.

Table 8. Clearings impact in percentage of total area

Extraction Area	Average clearings m²	Impact of clearings % EA
1	113	1.05
2	116	0.21
3	108	0.34
4	100	0.11
5	102	1.24
6	91	1.05
7	100	0.29
8	84	0.13
9	176	0.63
10	109	0.70
11	99	0.62
12	91	0.18

Table 9. Basal Area in the extraction areas

Extraction Area	Area ha	Total Basal Area m²	Basal Area logged m²/ha
1	840	10.12	0.012
2	348	3.55	0.010
3	314	4.92	0.016
4	233	2.08	0.009
5	185	8.00	0.043
6	382	8.80	0.023
7	167	4.09	0.025
8	422	2.63	0.006
9	137	7.96	0.058
10	348	7.06	0.020
11	230	4.19	0.018
12	512	3.60	0.007

Table 10. Intensity based of Basal Area of forest type

Extraction Area	Basal Area logged m²/ha	Basal Area forest type m²/ha	Intensity %
1	0.012	19.54	0.06
2	0.010	19.54	0.05
3	0.016	19.54	0.08
4	0.009	19.54	0.05
5	0.043	10.47	0.41
6	0.023	10.47	0.22
7	0.025	10.47	0.23
8	0.006	10.47	0.06
9	0.058	10.47	0.56
10	0.020	10.47	0.19
11	0.018	10.47	0.17
12	0.007	10.47	0.07

Table 11. Pathways impact in percentage of total area

Extraction Area	Area ha	Pathway width average m	Pathway length average m	Density m/ha	Pathways impact % EA
1	840	6.1	108.0	3.6	0.21
2	348	4.9	75.8	1.7	0.08
3	314	4.6	54.4	1.7	0.07
4	233	4.8	37.8	0.8	0.04
5	185	5.3	63.1	5.1	0.03
6	382	6.8	139.6	7.7	0.50
7	167	5.0	434.1	19.9	0.99
8	422	5.4	75.9	1.4	0.07
9	137	5.6	100.4	5.1	0.28
10	348	5.5	41.3	1.8	0.10
11	230	6.0	32.0	1.7	0.10
12	512	6.1	191.7	3.7	0.23

Table 12. Obstacles and wood waste removal from water courses in percentage

Extraction Area	Water courses with obstacles %	Water courses Condition Indices
1	2	1.32
2	5	1.125
3	13	2
4	10	2
5	0	1
6	1	1.14
7	1.3	1.23
8	1.25	1.25
9	0	1
10	1	1.2
11	1.1	1.16
12	0.5	1.1

Table 13. Weighted Average volume per log of timber species

Species	Number of trees	Percentage of trees	Average Volume m^3	Average logs per tree	Average volume per log m^3
Virola	80	54.8	7.59	4	1.90
Simarouba	25	17.1	8.06	4	2.01
Cedrela	21	14.4	9.48	4	2.37
Ceiba	13	8.9	30.98	6	5.16
Others	7	4.8	12.22	4	3.06

Table 14. Average volume per logger in relation to type of funding

Type of funding	Volume m³		
	Average	Minimum	Maximum
External	285	133	485
Internal	107	95	119

Table 15. Income for timber extraction in a logging season

Type of funding	Avg Gross income US $	Average Costs		Avg Debit balance US $	Avg Net income US $	Avg Net income per month* US $
		Funding	Salary			
External	9584	1438	211	4008	7182	1197
Internal	5894	542	0	1250	4727	788

* Average income per month for the six month logging season

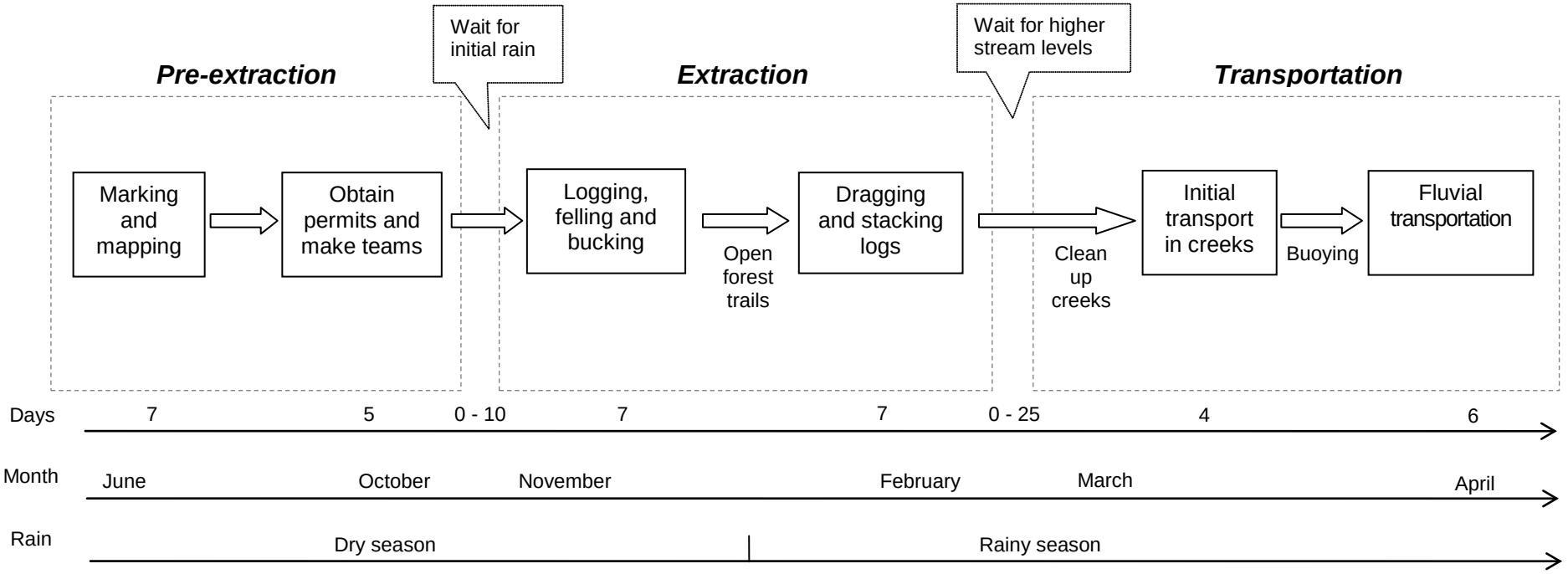


Figure 14. Logging operations and seasons management

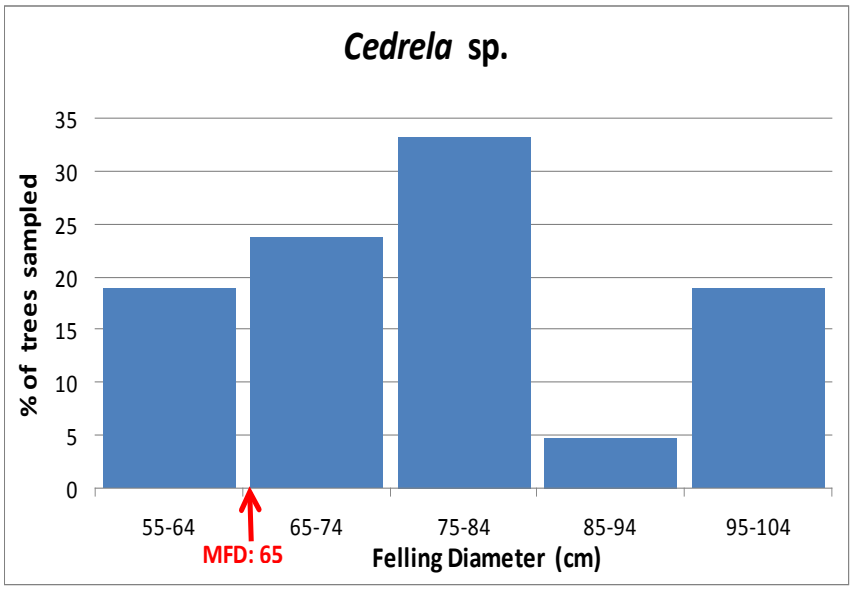
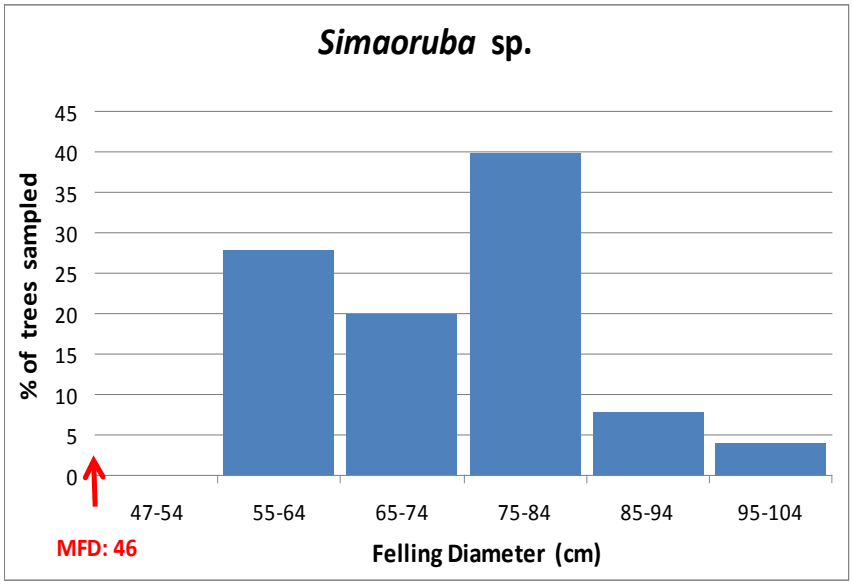
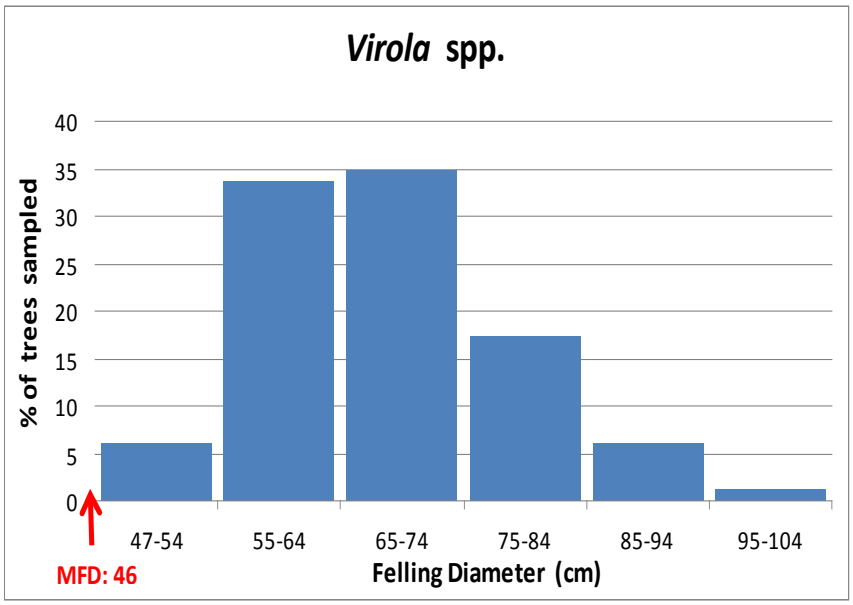


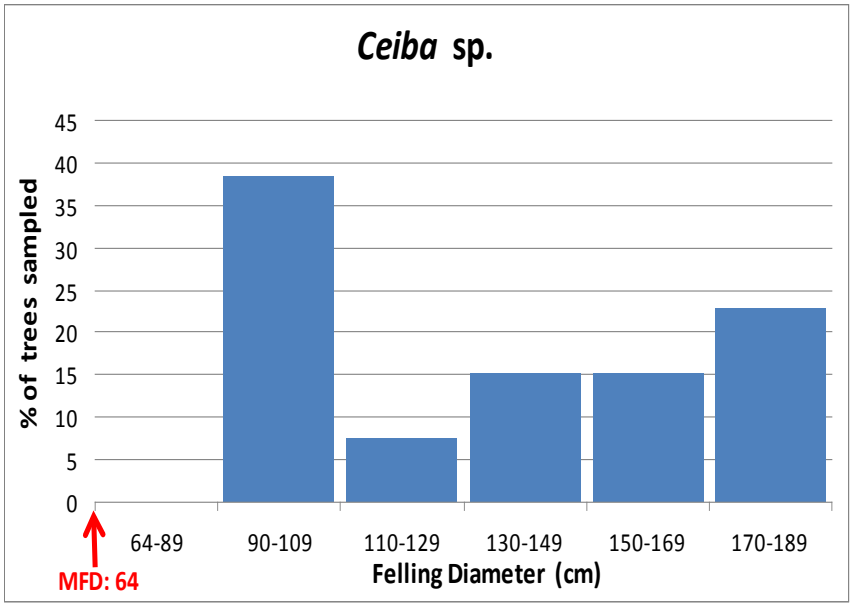
Figure 15. Minimum felling diameter by species (a-d) a) Cedrela



b) Simarouba



c) Virola spp.



d) Ceiba

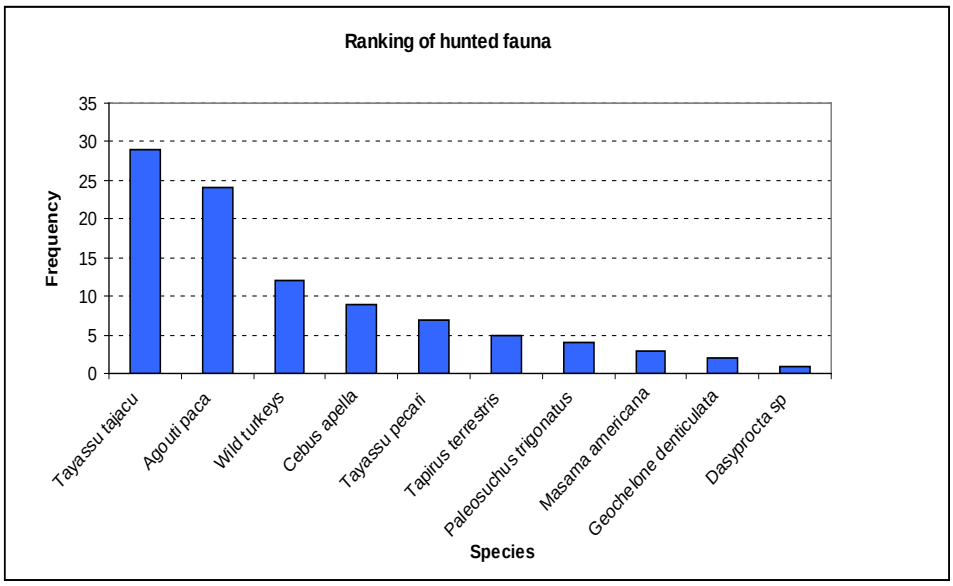


Figure 16. Ranking of fauna species hunted in timber extraction

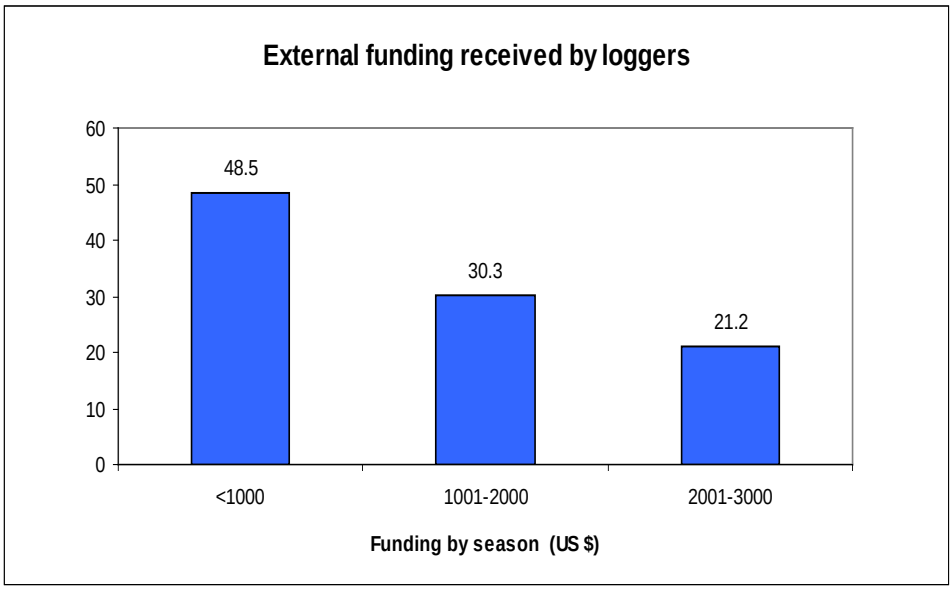


Figure 17. Amounts of external funding in a logging season

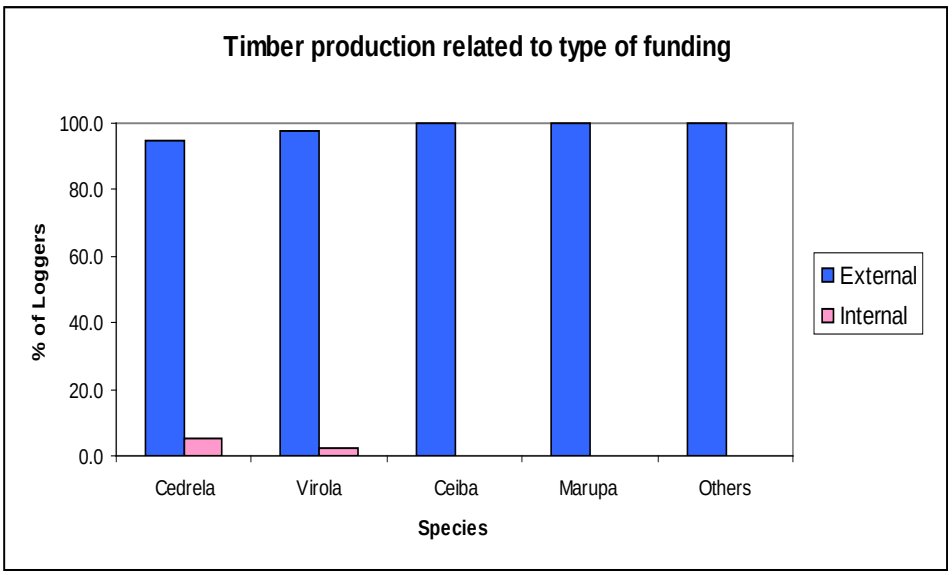


Figure 18. Timber production related to type of funding

Figure 19. Mateado of tress in extraction areas

Figure 20. Logging crews working in extraction areas

Figure 21. Logger’s camp in extraction areas

Figure 22. Pathways are cut through the forest in extraction areas

Figure 23. Pinwheel to drag Ceiba sp.

Figure 24. Logs wait the rainy season at the sides of streams

Figure 25. Logs in parallel and tied up with ropes in main rivers. Photo Freddy Ferreyra

Figure 26. Rafts transporting timber in planks along the Ampiyacu River

Figure 27. Cutting following natural leaning forces

Figure 28. Bushmeat hunted for crew consumption

Chapter Eight: Discussions and Conclusions

The Ampiyacu Basin has three levels of institutional interactions that frame the mechanisms and rules pertaining to forest resources. Institutions control access and use of timber resources at multiple levels: extended family (clans), community, and Basin. In daily life, clans organize themselves based on a series of tacit and unwritten rules that are the product of daily interactions in logging seasons. The importance of these tacit rules is the resulting distribution of extraction areas according to the *mateado* of species. In contrast, community and basin institutions operate by written rules. In general, four steps are necessary for access to timber resources following agreements in the basin: to sketch the location of timber work areas, to request the communal authorization, and to subsequently request the *pase* with the aforementioned requisites. The interactions among these levels of requirements were defined and performed at each level of organization.

Local institutions organize and interact to incorporate written and unwritten regulations to face policy and market influences in the use of forest resources. Thus, local institutions have controlled open access to forest resources, where unwritten rules govern the practices of extraction resources as well as the distribution of benefits. In addition, in the case of *comunidades nativas* in Peru, indigenous federations have been playing an important role to have legal control over forest resources in Amazonian basins (Chirif 2006). In that sense, local institutions interact with actors who have different levels of power over forest resources (e.g. law, funding), influencing norms and rules. The case of the Ampiyacu Basin shows how local institutions respond to external factors influencing

how they organize control over access to resources used by local residents for subsistence and market activities.

Local institutions in the Ampiyacu Basin organize creating rules and sanctions in forests management without intervention of third parties. These institutions lead the arrangements and creation of rules for the use of forest resources inside and outside their titled land. Specifically, they govern, establishing mechanisms to organize and resolve conflicts regarding control over the access to forest resources in both areas. Moreover, local arrangements include basic elements that decentralize access to resources. The strongest element is formal or informal meetings at community and basin level. The communal assemblies allow the participation of the different decision-makers at community level. Moreover, the congresses are where most agreements are made, and the indigenous federation is the highest authority at the basin level. In addition, the control posts were created with the purpose of not only increasing control over resources but also decentralizing the power of the federation in the basin.

Local institutions are more effective in comparison with those institutions implemented by the state. Most communities participate in the mechanisms of decision-making and agreements in the basin. However, 40% of local residents do not perform activities in complete accordance with agreements. In comparison, the percentage of illegal logging in Peru is estimated in 80%, (Arce 2004). This timber is obtained from unauthorized places (e.g. open access, protected areas) and without any control of the

quantity of timber harvested. In the Ampiyacu Basin, 60% of timber is removed from authorized places and in the amounts agreed upon in meetings.

Individuals act collectively to access resources in the forests and restrict access to extraction areas from outsiders. The spatial distribution of camps in the areas visited indicates the existence of purposeful strategies to prevent penetration by outsiders. In the current extraction areas, loggers of the same community have control over zones, occupying and using them as a strategy to restrict outsiders' presence. Relatives and members of the same community share information about the location of timber. Moreover, they follow embedded norms of behavior to occupy potential extraction zones, consequently guaranteeing their exclusive use and restricting access by outsiders. Therefore, outsiders are forced to move to distant locations, generally occupying the headwaters of the Ampiyacu River.

Conflicts over timber extraction seem more related to the presence of external influences. Most local residents referred to external influences as the major cause of conflicts in the basin. The Ampiyacu case indicates that the internal mechanisms of organization in timber extraction favor the resolution of internal conflicts but not external conflicts. It is interesting that the loggers have effectively carried out the mechanisms of forest access. However, the internal mechanisms of organization fail to control the presence of external agents. In comparison with the forestry law enforcement described by Smith et al. (2006), small-scale producers in Loreto have never been visited by enforcement agencies, and even when violations were detected, no penalties were

imposed. Given the relative isolation of this region, the control and regulation of timber activities by the state is infrequent or inexistent.

More populated communities have conflicts with intermediaries due to timber permits obtained from INRENA. Communal timber extraction is not registered in the Ampiyacu basin due to the close proximity and relationship of local residents to the market, which facilitates business initiatives at the individual level. However, more populated communities obtained forest permits from INRENA, in most cases that were funded and processed by intermediaries. Under this condition of extraction, communal authorities and not the community as a whole receive the greater benefit. This occurs because, generally, the intermediaries (that represent timber companies in Iquitos) coordinate directly with the legal representative of the community, who is the only one that can process the permit and in this case is the president of the community. The president is therefore the only one who knows the terms of the contract.

While the amounts of FECONA's collections in the Ampiyacu basin have been rising due to timber extraction collection fees, locals have denounced increasing irregularities or cases of corruption among federation leaders. Indeed, most of the concerns in community-based forest management are the difficulties faced by local institutions in administrative issues (Klooster 2000, Smith 2002) and corruption (Robbins 2000). Results show that due to an increase in timber collection fees, conflicts in accounting administration increase. Moreover, the recent creation of the conservation area Ampiyacu-Apayacu provides local institutions certain hegemony in front of

INRENA-Pebas and outsiders to create rules and sanctions to control the use of resources in the basin. For instance, fines to outsiders were implemented as a strategy to keep the control over the basin from outsiders. In addition, the decentralization of power and sources with the creation of two control posts has driven the distribution of the collections. However, the constant presence of outsiders increases pressure on timber resources.

External factors such as the forestry law and the market have furthermore increased the pressure on forest resources in Ampiyacu. The implementation of the Forestry Law 27308 has accelerated timber extraction in indigenous lands, especially in Loreto, where the timber market is primarily supplied by small-scale producers (Grupo Regional de Manejo de Bosques 2003, Tello et al. 2004). Indeed, the regional timber industry increased the removal of valuable timber due to an increase in the international demand for species such as *Cedrela* and *Virola* spp. (Maroni 2005). Moreover, companies increased the removal of species before current timber contracts were canceled and forest management plans were requested (Smith et al. 2006). Consequently, the pressure for Cedrela and *Virola* spp. timber has increased in those forests of relatively uncomplicated access such as the *communal forests* and *Permanent Production Forests* (open access areas) in the Ampiyacu basin.

The forestry law implementation and the increase of *Virola* spp. for exportation partially explain local arrangements. The extraction of *Virola* and *Cedrela* species reached its peak in the period of 2004-2005, the time of the implementation of the new

law. In this period, important changes in rules occurred in the Ampiyacu basin. Logging quotas established by FECONA increased from 20 round-timber logs per family in the 1990s to 50 logs in 2001, to finally 100 logs (233 m^3) per family in 2005. The constant increasing of the allowed quota as well as the adaptations of rules were a response to external factors such as the forestry law and market influence. Since the *Virola* spp. boom started, the number of people involved in timber extraction has increased.

Different studies in the Brazilian Amazon show that access to roads connecting forests with local markets is a determining factor to increase selective logging and consequently initiate deforestation (Nepstad et al. 2004., Verissimo et al. 1992). In the Ampiyacu case, proximity to the market is another reason for the increasing pressure on timber resources in the forests. However, the low rates of deforestation found in this region indicate that selective logging in the Peruvian Amazon is not necessarily a precursor to deforestation as in Brazil (Oliveira et al. 2007). Oliveira et al. (2007) evaluated the impact of the forestry law on rates of forest disturbance and deforestation in the Peruvian Amazon. The author found that forests disturbances resulting from logging operations increased in areas outside the concessions in the northern Iquitos region during 2004. In addition, the author points out that disturbance and deforestation rates increased in these areas by 468% and 304%, respectively, in 2004.

In this study, forest management is defined as the capacity to organize and create rules that govern the use of natural resources. In this context, a logger is a local resident who works in timber extraction. In general, local arrangements take into account the

outcomes of previous activities to ensure the success of timber operations. To acquire timber permits, loggers define volumes and sketch the location of their extraction area. Immediately after obtaining the permit, they initiate timber operations in the forests. In addition, local knowledge of water levels and exchange of information about resource distribution provides them with the advantage to be more efficient in timber operations. According to the hydrological service of Peru, the months of April to July are the period in which the rains diminish, and it is possible to work in good conditions in the forest, and the rivers still have water levels that secure adequate conditions of transportation. In timber extraction, the management of time, taking in consideration water levels, is the most important factor to determine the timber production of a group and, therefore, the number of logs removed in a logging season.

Level of experience and amount of funding can be used to define two types of loggers: specialists and opportunists. Loggers in the area prefer taking small amounts of funding to extract a number of logs according to their operative capacity. Consequently, they are mostly opportunists, removing small numbers of logs per trip (10 trees), although they can make up to two trips in a logging season. In addition, this group considered 3,000 Soles (US $1,000) as the minimum amount of funding to extract timber. Likewise, specialists indicate that they prefer contract debts up to 6,000 Soles (US $2,000) per logging season. Certain factors determine higher borrowing capacity (creditworthiness), such as greater experience or operative capacity. Operative capacity concerns with the group's quantity of trees that a group may harvest, for instance, the

ability to harvest more than 100 logs in a logging season. Two thousand dollars in timber is approximately equivalent to 25 trees, the number of trees considered to be accessible and a low risk investment for specialists. In comparison, ten trees, worth the equivalent of one thousand dollars, is an amount of timber accessible for opportunists.

Prices in timber extraction are a complex problem. As Sierra (2001) points out, the local market domain in timber prices functions in a way so that small producers always lose, even when prices go up. In the Ampiyacu area, a logger receives US $1,197 per month for 285 m^3 of timber for the six months of the logging season. In contrast, the community of Calleria in Pucallpa receives approximately US $3,000 for 43 m^3 of certified timber per month for the six month logging season (Cass 2006). In the Ampiyacu, when loggers work with an INRENA permit, although they need large quantities of timber to fulfill the agreements of contracts with their intermediaries, they can negotiate higher prices. Consequently, recognition of the local forest governance system is a key element to improving the capacity of negotiation of local institutions.

Sustainability in this study is framed in the context of the impacts caused by logging operations and the viability of continued timber production. In addition, sustainability in this analysis refers to the practices used by loggers in their operations. Smith et al. (2006) found that most producers in the Peruvian Amazon did not attempt to reduce logging damage or ensure future harvest; for instance, extractors did not correctly practice directional felling. In contrast, in the Ampiyacu basin, loggers are market oriented, thus, they act like “professional loggers” and are constantly trying to maximize

resources in timber extraction. Loggers are careful to engage in practices that reduce risks of accidents like cutting vines and performing directional felling. However, they do not deliberately carry out any measures to protect seed trees and regeneration.

Since 2004, the number of species harvested in the basin has increased from two (*Cedrela*, *Virola*) to four species (*Cedrela*, *Virola*, *Ceiba*, and *Simarouba*). According to the minimal felling diameter (MFD) found in the areas, *Cedrela* presented tendencies to be overexploited because MFD were below the diameter that allows the species to produce seeds. Moreover, only *Cedrela* trees of small diameters were found in the more accessible extraction areas. In contrast, *Virola* and other species growing in high densities or *manchales* facilitate the sustainable harvesting of higher volumes of trees.

The impact of different timber operations is difficult to compare due to the different methodologies, classification and definitions of impact used in different evaluations (Heinrich 1998). It is beyond the scope of this study to examine all of the methods and concepts involved in the sustainability of the timber extraction. However, in this study, the three most common types of damage considered were related to the remnant forest, soil and water. The size and shape of clearings (gaps) are determining factors for the regeneration of desirable species in the forests,(Hartshorn 1989, Gorchov et al. 1993, Pinard et al. 1999). Rudimentary logging, as White (1978) points out, is highly selective and highly restrictive in its extent, and can be calculated measuring the total area cleared per enterprise and compared with the total extent of the exploited area. To examine the impact of timber operations on lowland forests of the Ampiyacu River,

and place these operations in the context of the Amazon region, the data was compared with those describing similar extraction practices in Urubamba, Peru, and extraction areas of small size in Costa Rica.

White estimated that in extraction areas of Urubamba about 4% of the area licensed is cleared and an additional 14 percent is slightly affected (remnant forest). His rough estimation of the total area was based on the number of trees and the cleared area per fallen tree. Moreover, in small areas in Costa Rica, Yalle (2004) found that the total damage in unplanned operations was 10.03 %, while in planned operations it varied from 5.44 to 7.71% of the total area licensed per producer. In contrast, in the Ampiyacu Basin the percentage of total area impacted by logging operations (clearings and pathways area) is lower, varying from 0.06 to 1.04%. However, the calculation of the total extent of the exploited forest appears challenging since Ampiyacu-extraction-areas are volume-based as opposed to area-based. In addition, these areas can be reused more than once. The size of extraction areas varies strongly among loggers, but considering the maximum distance from harvested trees to the stream provides a good estimate of the total area exploited.

The area disturbed and damaged by clearings and pathways at Ampiyacu was lower than that reported from other "unplanned" logging operations in the Neotropics. In Urubamba, White (1978) estimated average tree-fall gaps of 400 m^2 per tree. In Paragominas, Uhl et al. (1996) found similar values of tree-fall gaps of 355 m^2 in unplanned operations. Finally, in Costa Rica, Yalle (2004) reported an average tree-fall gap of 195 m^2 in unplanned areas. In the Ampiyacu area, the average clearing was 106 m^2

per tree, representing 0.5% of the total area. Lower percentages found in the Ampiyacu can reflect that current timber extraction practices in the area prevent the damage of larger areas of forest by tree-fall, and that larger tree-fall gaps are more related to higher harvest intensities of timber extraction and mechanized operations.

Indeed, the percentage of area occupied by pathways in Ampiyacu was lower than in forests in Costa Rica and Urubamba. In Ampiyacu, the percentage of areas occupied by pathways varies from 0.03 to 0.99%. Yalle found that the percentage of areas occupied by pathways in unplanned logging was 1.51 % in Costa Rica. Para Pereira et al. (2002) found that ground damage in unplanned logging occupied 8.9 to 11.2 % of the total area. In Belize, Whitman et al. (1997) found that impacted soils covered 3.8% of the total area. High harvest intensity and mechanized operations determine the level of soil damage in the area used for timber extraction, as the studies in Brazil and Belize show.

Selective logging can cause damage to the soil. Although soil erosion is rare, it can occur due to the dragging of logs, especially on steep slopes (White 1978). In the Ampiyacu, most extraction areas are located in *bajiales* or flooded forests, except for the case of *Cedrela*, which is harvested from *low hills* causing more damage to soils during transport to streams. Moreover, species like *Ceiba*, due to large size, are dragged from *bajiales* with pinwheels (or *molinete),* causing relative damage to soils due to removal of litter cover and scratch to areas with standing water. According to White, the molinete cause minor and localized disturbance to the soil in the areas where it is used. However,

the size of pathways is a determining factor to calculate the total damage of the area from the fallen tree to the stream.

The lengths of pathways in Ampiyacu were likewise shorter than in Urubamba. This can be an indicator that the extraction areas in Ampiyacu still have commercial species close to the streams. White (1978) found in Urubamba that the longest pathway was 1.5 km from the stream bank, with most ranging from 50 to 500 meters; while in Ampiyacu the longest pathway was 800 meters, while most ranged from 10 to 200 meters. However, the variation in path width was similar among places in Peru, ranging from 5 to 8 meters in Urubamba and from 5 to 7 meters in the Ampiyacu. In Costa Rica, Yalle (2004) calculated the average width of pathways as 3.88 meters. Maximum distances to trees are related to the particular tree species' habitat. The distances estimated by White were for the extraction of tropical cedar and mahogany, species founded mostly in hills, while in Ampiyacu most species are harvested from *bajiales* and are therefore closer to streams.

The conditions of streams in the extraction areas are an indicator of the care for water courses by timber operations. In Ampiyacu, it was found that the percentage of watercourses with obstacles is similar to that reported in planned operations in Costa Rica. In Ampiyacu, the percentage of water courses with obstacles varies from 0 to 13%; while in unplanned operations, Yalle (2004) calculated that the 71% of watercourses had obstacles present. In addition, indices indicated that watercourses were from good to moderate conditions in Ampiyacu and Costa Rica. In Ampiyacu, conditions (indices)

vary from good (1.0) to medium (2.0). Moreover, in Costa Rica, in unplanned operations, the indices indicated medium conditions (2.2).

With regard to the impacts generated by the hunting of fauna, in general, logging crews in the basin tend to consume long-lived mammals with low rates of reproduction, such as *sajino*, *huangana* and *majaz*. These mammals, in general, respond in a positive way to moderate hunting pressures. Following these mammals, the animal hunted in third place of importance are *cracidos* birds. Though populations of *cracidos* can bear light to moderate hunting pressure, it has been shown that the populations of these birds do not respond well when hunting pressure increases (Gonzales 1999). It is known that species of *cracidos* have been driven extinct locally as a result of excessive hunting, and hunting them in certain locations is prohibited. Of particular concern is the case of the turkey Paujil *Carunculado* or *Piurí* (*Crax globulosa*), a species which is in critical danger and that has been reported near the city of Pebas. It is very probable that Paujil also inhabit the areas of timber extraction in the Ampiyacu basin although it was unregistered during the rapid inventory conducted by the Field Museum in 2003. Major impacts on the turkey species could occur along the rivers, main access roads to the places of extraction and in the adjoining areas to logger's camps.

In general, the majority of studies reviewed (i.e. Ochoa 2000; Lambert et al 2005) have investigated the impacts of selective logging with machinery (using tractors as main dragging force) on the small communities of mammals (bats, marsupial and rodents) around the exploited areas. The changes were registered measuring changes in

populations of small species of rodents in the areas exploited and in intact areas. In general, the variations in taxonomic diversity and the guild structure resulting from selective and mechanized logging were proportional to the degree of forest intervention. There is generally higher seed and seedling predation for harvested tree species and increased levels of competition among frugivores and granivores. The reduction in the availability of food resources and the change in micro climate produced by the elimination of emergent trees in part explain the reduction of the fauna communities. During the execution of this study, logging was observed to be carried out manually rather than using mechanized methods. For this reason, this study considers that the impacts generated by the logging, falling, bucking, and transportation on the populations of wild fauna is minimal.

Conclusions

The present study focuses on identifying and clarifying the factors that have influenced the creation of regulations to control access over forest resources, the problems faced in their implementation, and the resulting influences on logging practices. The group of methodologies used in the study provided the data to complement small-scale logging related impacts of Amazonian forests (Pinedo-Vasquez et al. 2001, White 1978, Sierra 2001). The present study contributes by generating detailed information about small-scale timber extraction practices and the mechanisms in place for local actors to access to timber resources. Furthermore, the study identifies the struggles that a local system and its institutions have been facing since locals organized themselves and took control over access to forest resources.

In summary, the results include several findings. First, in the Ampiyacu Basin, local institutions organize and create rules and sanctions for forest management without the intervention of third parties. Local institutions govern the use of forests resources inside and outside their titled land and established mechanisms to resolve conflicts and control access to forest resources in both areas. The mechanisms of decision-making and organization of the timber extraction are meetings, formal or informal. The norms and rules of local institutions are more effective in comparison with those implemented by the state. However, as the local system responds to external influences, policies and the

market with the growth of commercial timbering, conflicts in the use and sustainability of the resource increase.

Second, the forestry law implementation and the growth of *Cumala* for exportation explain the local arrangements and the increase of local residents involved in timber extraction. External influences are the major causes of conflicts in the Ampiyacu Basin. Because of external factors, the pressure on *Cedrela* and *Virola* spp. increases in easily accessible forests such as the *communal forests* and open access areas. In this context, individuals act collectively to access resources in the forests and restrict areas from outsiders. The close relationship of local residents with the market facilitates business initiatives at the individual level. Loggers in the area prefer amounts of funding between US $1,000 to 2,000 to extract a number of logs according to their operative capacity.

Finally, this study finds that in the Ampiyacu Basin, loggers carry out practices that reduce the risk of accidents, but they do not take deliberate measures to protect seed trees and regeneration. In Ampiyacu, the percentage of total area impacted by logging operations (clearings, pathways and water courses) is lower than values found in other Neotropical areas. Previous studies on the impacts of logging on fauna are related to logging with machinery. Therefore, it is considered that the impacts on populations of wild fauna generated by the logging, falling, bucking and transporting of logs in the Ampiyacu basin is minimal.

In the Ampiyacu Basin at present, thirteen villages governed by local institutions and are desperately seeking recognition of their environmental governance of the basin. Under this context, the recent creation of the Area of Conservation Regional Ampiyacu-Apayacu has the potential to strengthen the local environmental governance system. Therefore, communities in the Basin may have the opportunity to become involved in a management scheme where local regulating mechanisms influence decisions on land allocation and resource management. Therefore, timber extraction and its social and environmental repercussions are key issues in analyzing the long-term viability of this new conservation area, and the indigenous federation has an important role in improving the conditions of logging activities in the region.

Currently, the economic activity of most importance to local residents is timber extraction. Although timber operations are not highly pernicious to the structure of the forest due to the low harvest intensity in the area, the increasing extraction of a few high demand species carried out without adequate planning can be damaging for the regeneration of these species. It is therefore necessary to make an inventory of the commercial species of greater than 10 cm dbh. This data will provide complete information about the potential production of the forest and allow for the management and protection of future timber supplies. The pressure on timber species is increasing and without a management plan for the forest, the species can be over harvested, causing damage not only to local fauna but also to residents depending on forests resources for their subsistence and livelihood.

In addition, the hunting activity in the Ampiyacu basin should be studied in detail. Areas of hunting and quotas should be identified, among other necessary studies in this basin. The rates of hunting in the area should be identified to complement the activities of forest management in the basin. Furthermore, the geographical features of the Ampiyacu basin permit control over the entrance of outsiders and the conduct of illegal activities. The capacity of local control posts should be strengthened taking advantage of the geographic conditions of the Ampiyacu basin. Indeed, empowering the governance system implemented by FECONA is necessary to strengthen local capacity regarding administrative issues and forest management. The system of environmental governance in the Ampiyacu basin has potential for replication by indigenous communities in areas throughout the different basins of the Peruvian Amazon where communities are accessing resources under local arrangements.

Appendices

FORM 1: QUESTIONNAIRE

1. Hace cuantos años Ud. trabaja en la madera como extractor?
    a. 1 - 2 años
    b. 3 – 4 años
    c. 5 – 6 años
    d. 7 - 8 años
2. Cuantas veces al año ingresa a sacar madera de la misma área de extracción?
    a. 1 vez
    b. 2 veces
    c. 3 veces
    d. 4 veces
3. Que meses corta y en que meses saca la madera?
    a. Enero-Marzo
    b. Abril - Junio
    c. Julio - setiembre
    d. Octubre-Diciembre
4. A que otras actividades se dedica para ganar dinero los meses que no se dedica a la madera?
    a. Pesca
    b. Irapay
    c. Caza
    d. Agricultura
    e. Artesanía
    f. Ninguna, solo madera
    g. Bodega

Áreas de extracción

5. De que sitio sale la madera que esta sacando, de los bosques comunales o bosques del estado?
    a. Bosques Comunales
    b. Bosques del estado
6. Razones por los cuales usted ha escogido su área de extracción?
    a. .....
    b. .....
    c. .....
7. Hay otros grupos o familias de su comunidad o de otras comunidades que extraen madera en ese mismo sitio?
    a. SI
    b. NO

8. Ha habido conflictos por esto?
    a. SI
    b. NO

9. Que mecanismos tienen Uds. Para distribuirse las zonas de extracción?
    a. .....
    b. .....

Financiamiento

10. ¿Cómo consigue el dinero para trabajar con madera?
    a. Financiamiento externo
    b. Financiamiento propio
    c. Otros
11. ¿Cuánto son los montos de financiamiento por remesa? por zafra
    a. 1000-3000 soles
    b. 3001-6000 soles
    c. 6001-9000 soles
    d. 9001 - 15000 soles

12. ¿Cómo distribuye ese dinero en sus gastos para sacar madera por zafra ó remesa? Cuánto gasta en comestibles (fariña, arroz, enlatados, etc) Cuanto gasta aproximadamente en materiales de trabajo (cadena, aceite de cadena, combustible, etc) por remesa/ zafra?

Mano de Obra (S/.)	Maquinaria (S/.)	Materiales (S/.)	Alimentación (S/.)	Total financiado (S/.)

13. Cuantas personas generalmente hay en su grupo o brigada y Cuantos soles paga por jornal a c/u de los miembros de su grupo o brigada?

Miembros de brigada	Nro de personas	S/. día	días de trabajo
Matero-montero			
Motosierrista			
Ayudante			
Paleteros			

14. Cuenta Ud. Con equipo propio (Motosierra, botes, molinetes)?
    a. Equipo propio
    b. Equipo alquilado

15. Cómo y en que estado de transformación transportan la madera (en trozas, en cuartones)
    a. En Trozas con cancamos
    b. En cuartones o tablas
    c. Otros
16. De que dimensiones aproximadas tienen las trozas o cuartones que saca?
    a. Ancho
    b. Diámetro
    c. Largo

17. ¿Cuánto tiempo les toma hacer el tumbado-trozado de los árboles, el arrastre de trozas, hacer la trocha y la limpieza de las quebradas?

Tumbar-trozar N° días	Arrastre N° días	Viales No días	Limpieza de Quebadras y arreada N° días	Transporte madera N° días	Remesa o zafra N° de días

18. Que equipos utilizan para arrastrar las trozas?
    a. Palanca
    b. Molinetes
    c. Winche

19. Que especies esta sacando y Cuantas trozas de madera le vendió al intermediario y Cuánto le pagan por troza, pie tablar por cada entrada?

Especies	N° de Trozas	Precio por (pt)
Cedro		
Cumala		
Moena		
Marupa		
Lupuna		

Manejo

20. Cuantos árboles en total cortan en cada remesa?
    a. 5 -10
    b. 10 - 15
    c. 15 - 20
    d. 20 – 25

21. Cuantas trozas en promedio obtienen de un árbol?
    a. 4 - 5 trozas
    b. 6 – 8 trozas
    c. 8 – 10 trozas

22. Realizan prácticas para disminuir daños al bosque como:

Realizan prácticas para disminuir daños al bosque	SI	NO
Corte de lianas		
Dirección de caída		
dejan árboles semilleros		
Regeneración Natural		

23. Tienen un diámetro mínimo para cortar un árbol y a partir de cuanto es?
    a. SI
    b. NO
    c. DMC.....

24. A que distancia en metros de la quebrada se encuentran los árboles que están sacando?
    a. Menor a 20
    b. 20 – 200
    c. 200 - 380
    d. 380 – 560
    e. Mayor a 560

25. Cómo transporta la madera el intermediario
    a. BALSAS
    b. PKPK
    c. OTROS

26. Hasta donde sacan la madera para entregarla al intermediario?
    a. Hasta Pebas
    b. Hasta su comunidad

27. Cazan en el monte, cuales son las especies mas cazadas y cuantos kilos por viaje?

Cazan	SI	NO	Kilos /viaje
Huangana			
Majas			
Sajino			
Monos			

Percepción

28. La extracción le ha generado algún progreso?
    a. SI
    b. NO

29. Que hace con el dinero que gana por sacar madera?
    a. Lo invierto en sacar madera
    b. Comprar víveres (arroz, azúcar, etc)
    c. Pagar educación de mis hijos
    d. Comprar vestimenta

30. Ha tenido algún conflicto por extraer madera (de que tipo, especifique)
    a. Si
    b. No
31. Conoce UD. la ley que norma el aprovechamiento de Recursos forestales?
    a. SI
    b. NO

FORM 2: CLEARINGS

ID	# arb	Iden. Especie	dap menor (cm)	dap mayor (cm)	Ancho fuste (m)	Ancho copa (m)	Largo (m)	Observ aciones

FORM 3: SOIL DAMAGE AND WATER COURSES

ID	Largo viales (m)	Ancho viales (m)	Remoc. Obstaculos en vias de agua %	Presencia de residuos de madera (indice)	Observaciones

References

Agrawal, A. (2003) Sustainable governance of common-pool resources: Context, methods, and politics. *Annual Review of Anthropology,* 32**,** 243-262.

--- (2007) Forests, Governance, and Sustainability: Common Property Theory and its Contributions. *International Journal of the Commons,* 1**,** 111-136.

Agrawal, A. & M. C. Lemos (2007) A Greener Revolution in the Making?: Environmental Governance in the 21st Century. *Environment: Science and Policy for Sustainable Development,* Volume 49.

Alavapati, J. R. R. & D. Zarin. 2004. Neotropical Working Forests: For What and for Whom? In *Working Forests in the Neotropics,* eds. D. J. Zarin, J. R. R. Alavapati, F. E. Putz & M. Schmink, 279-289. New York: Columbia University Press.

Arce, J. 2004. Propuesta de Estrategia Nacional de Lucha contra la Tala Ilegal. In *I Foro Nacional sobre Tala y Comercio Ilegal de Maderas,* ed. IRG/WWF/USAID, 58-63. Lima, Peru.

Asner, G. P., D. E. Knapp, E. N. Broadbent, P. J. C. Oliveira, M. Keller & J. N. Silva (2005) Selective Logging in the Brazilian Amazon. *Science,* 310**,** 480-82.

Baland, J. & J. Platteau. 1996. *Halting degradation of natural resources: Is there a role for rural communities?* Oxford: Clarendon Press.

Bedoya, G. E. & A. Bedoya Silva-Santisteban. 2005. El trabajo Forzoso en la Extraccion de la madera en la Amazonia Peruana. Geneva: Oficina Internacional de Trabajo.

Benavides, M., M. Lázaro, M. Pariona & M. Vasquez. 1996. Continuidad y cambio entre los Bora, Huitoto y Ocaina de la cuenca del Ampiyacu, Perú. . In *Amazonía: Economía indígena y Mercado,* eds. R. C. Smith & N. Wray. Quito: Oxfam America y COICA.

Bennett, E. L. & J. G. Robinson. 2000. Hunting for Sustainability: The Start of a Synthesis. In *Hunting for Sustainability in Tropical Forests,* ed. R. a. B. (eds). 499-519. New York.: Columbia Univ. Press.

Bodmer, R. E., J. F. Eisenberg & K. H. Redford (1997) Hunting and the likelihood of extinction of Amazonian mammals. *Conservation Biology,* 11**,** 460 - 466.

Bodmer, R. E., T. G. Fang & L. M. Ibanez (1988) Ungulate management and conservation in the Peruvian Amazon. *Biological Conservation,* 45**,** 303-310.

Bowles, I. A., R. E. Rice, R. A. Mittermeier & G. A. B. d. Fonseca (1998) Logging and Tropical Forest Conservation. *Science,* 280**,** 1899-1900.

Bromley, D. W. & D. Feeny. 1992. *Making the commons work : theory, practice, and policy*. San Francisco, Calif.: Institute for Contemporary Studies.

Cass, J. 2006. Better Business, Brighter Future for Peru's Shipibo-Konibo People. WWF.

Chirif, A. 2006. Hacia una vision Compartida sobre ANPs en la region Loreto. Iquitos: Informe de consultoría realizada por el autor para el Instituto del Bien Común (IBC), en la segunda mitad del año 2005.

Cochrane, M. A., D. L. Skole, E. A. T. Matricardi, C. Barber & W. Chomentowski. 2004. Selective Logging, Forest Fragmentation, and Fire Disturbance: Implicantions of Interaction and Synergy. In *Working forests in the neotropics-conservation through sustainable management?,* eds. D. Zarin, J. R. R. Alavapati, F. E. putz & M. Schmink, 310-324. New York: Columbia University Press.

Coomes, O. T. 1992. Making a living in the Amazon rain forest : peasants, land, and economy in the Tahuayo River basin of northeastern Peru.

Cronkleton, P., P. L. Taylor, D. Barry, S. Stone-Jovicich & M. Schmink. 2008. Environmental Governance and the Emergence of Forest-Based Social Movements Bogor, Indonesia: Center for International Forestry Research (CIFOR).

Duivenvoorden, J. F., H. Balslev, J. Cavelier, C. Grandez, H. Tuomisto & R. Valencia. 2001. Evaluacion de Recursos vegetales no maderables en la Amazonia noroccidental. . Amsterdam: IBED, Universiteit van Amsterdam.

Fairhead, J. 2001. "International Dimensions of Conflict over Natural Resources.". In *Violent Environments,* eds. N. Peluso & M. Watts, 213-236. Ithaca: Cornell University

Galarza, E. & K. La Serna (2005) Son sostenibles las concesiones en el Peru? *Economia y Sociedad,* 56**,** 34 - 41.

Galarza E., L. S. K. (2005) Son sostenibles las concesiones en el Peru? *Economia y Sociedad,* 56**,** 34 - 41.

GEF, PNUD & UNOPS. 1997. Amazonía Peruana, Comunidades Indígenas, Conocimientos y Tierras Tituladas. In *Atlas y Base de Datos*. Lima: PNUD.

Gibson, C. C., M. A. McKean & E. Ostrom. 2000a. Explaining Deforestation:The Role of Local Institutions. In *People and Forests : Communities, Institutions, and Governance* eds. C. C. Gibson, M. A. McKean & E. Ostrom, 1-26. London, England: The MIT Press.

---. 2000b. Forests, People, and Governance: Some Initial Theoretical Lessons. In *People and Forests: communities, institutions, and governance*, eds. C. C. Gibson, M. A. McKean & E. Ostrom, 227-241. Massachusetts: The MIT Press.

Gonzales, J. (1999) Hunting of cracids in varzea forests of the northeastern Peruvian amazon: a sustainability analysis. . *Bulletin of the Cracid Specialist Group,* 9**,** 9 - 13.

Gorchov, D. L., F. Cornejo, C. Ascorra & M. Jaramillo (1993) The role of seed dispersal in the natural regeneration of rain forest after strip-cutting in the Peruvian Amazon. *Plant Ecology,* 107-108**,** 339-349.

Grupo Regional de Manejo de Bosques. 2003. Diagnóstico del Sector Forestal de la Región Loreto. 223. Iquitos: GRMB - CADESAM.

Hardin, G. (1968) The tragedy of the Commons. *Science,* 162**,** 1243-1248.
Hartshorn, G. S. (1989) Application of Gap Theory to Tropical Forest Management: Natural Regeneration on Strip Clear-cuts in the Peruvian Amazon. *Ecology,* 70**,** 567-576.
Hecht, S. B. 2004. Invisible Forests. In *Liberation Ecologies: environment, development,social movements,* eds. R. peet & M. J. Watts, 65-103. New York: Routledge.
Heinrich, R. 1998. Aprovechamiento ambientalmente apropiado para mantener los bosques tropicales. In *Memorias del Simposio Internacional sobre Posibilidades para el Manejo Forestal Sostenible en América Tropical,* eds. CIFOR, IUFRO & BOLFOR, 5-15. Santa Cruz, Bolivia: Editora El País.
Hernandez, G. 1999. Methodologia de conteo de tocones. In *Forest Management and Conservation,* 90. Costa Rica: CATIE.
Hidalgo, J. (2003) Estado de la situación forestal en el Perú. Pucallpa, Ucayali, Peru. *SEPIA X*.
Huerta, P. 2005. Procesamiento digital de imágenes de satélite y elaboración de mapas de fisiografía, forestal de uso de la tierra para la propuesta de Zona Reservada de Ampiyacu-Apayacu-Río Algodón. Lima: Instituto del Bien Común.
Hvalkof, S. 2000. Outrage in Rubber and Oil. In *In People, Plants & Justice: The Politics of Nature Conservation,* ed. C. Zerner, 83-116. New York: Columbia University Press.
INEI. 2008. Peru: Crecimiento y distribucion de la poblacion, 2007. Lima: Instituto Nacional de Estadistica e Informatica.
INRENA. 1996. Inventario Forestal Loreto. Instituto Nacional de Recursos Naturales.
Instituto Nacional de Desarrollo. 2005. Compatibilización e Integración de la Zonificación Ecológica -Económica del ámbito del PEDICP. ed. Proyecto Especial de Desarrollo Integral de la Cuenca del Putumayo. Iquitos, Perú.
Johns, J. S., P. Barreto & C. Uhl (1996) Logging damage during planned and unplanned logging operations in the eastern Amazon. *Forest Ecology and Management,* 89**,** 59-77.
Kalliola, R. & F. S. Paitán (1998) Geoecología y desarrollo amazónico: estudio integrado en la zona de Iquitos, Perú. *Annales Universitatis Turkuensis,* A**,** 114.
Kalliola, R. & M. Puhakka. 2003. Amazonía Peruana - vegetación húmeda en el llano subandino. In *Geografía de la selva baja peruana,* eds. R. Kalliola, M. Puhaka & W. Danjoy. Lima: Universidad de Turku - ONERN.
Klooster, D. (2000) Institutional Choice, Community, and Struggle: A Case Study of Forest Co-Management in Mexico. *World Development,* 28**,** 1-20.
Leach, M., R. Mearns & I. Scoones (1999) Environmental Entitlements: Dynamics and Institutions in Community-Based Natural Resource Management. *World Development,* 27**,** 225-247.

MacPherson, C. B. 1978. *Property: Mainstream and Critical Positions.* Toronto: University of Toronto Press.

Maroni. 2005. Analisis Preliminar sobre Gobernabilidad y Cumplimiento de la Legislacion del Sector Forestal en el Peru. Lima: The World Bank.

McCay, B. J. & J. Acheson. 1987. *The Question of the Commons: The Culture and Ecology of Communal Resources*. Tucson: University of Arizona Press.

McGrath, D., C. M. Peters & A. J. Mota Bentes. 2004. Community Forestry for Small-Scale Furniture Production in the Brazilian Amazon. In *Working forests in the neotropics-conservation through sustainable management?,* eds. D. Zarin, J. R. R. Alavapati, F. E. putz & M. Schmink, 200-220. New York: Columbia University Press.

Mehta, L., M. Leach, P. Newell, I. Scoones, K. Sivaramakrishnan & S.-A. Way. 1999. *Exploring understandings of institutions and uncertainty : new directions in natural resource management*. Brighton: Institute of Development Studies.

Menzies, N. K. 2007. *Our Forest, Your Ecosystem, Their Timber: Communities, Conservation, and the State in Community-Based Forest Management*. New York: Columbia University Press.

Mittermeier, R. 1987. Effects of hunting on rain forest primates. In *Primate Conservation in the Tropical Rain Forest,* ed. A. R. Liss, 109 - 146. New York: John Wiley & Sons.

Molinas, J. R. (1998) The impact of inequality, gender, external assistance and social capital on local-level cooperation. *World Development,* 26**,** 413-431.

Naughton-Treves, L. (2002) Wild Animals in the Garden: Conserving Wildlife in Amazonian Agroecosystems. *Annals of the Association of American Geographers,* 92**,** 488-506.

Nepstad, D., A. Ane Alencar, C. Barros, E. Lima, E. Mendoza, C. A. Ramos & P. Lefebvre. 2004. Governing the Amazon Timber Industry. In *In Working forests in the neotropics: Conservation through sustainable management? ,* eds. D. Zarin, J. R. R. Alavalapati, F. E. Putz & M. Schmink, 389 - 414. New York: Columbia University Press.

Nepstad, D., A. Verissimo, A. Alencar, C. Nobres, E. Lima, P. Lefebvre, P. Schlesinger, C. Potter, P. Moutinho, E. Mendoza, M. A. Cochrane & V. Brooks (1999) Large-scale impoverishment of Amazonian Forests by Logging and fire. *Nature,* 398**,** 505-08.

Neumann, R. P. 2000. Land, Justice and the Politics of Conservation in Tanzania. In *People, plants, & justice: the politics of nature conservation,* ed. C. Zerner, 117-133. New York: Columbia University Press.

Oliveira, P. J. C., G. P. Asner, D. E. Knapp, A. Almeyda, R. Galvan-Gildemeister, S. Keene, R. F. Raybin & R. C. Smith (2007) Land-Use Allocation Protects the Peruvian Amazon. *Science,* 317**,** 1233-1236.

Ostrom, E. 1990. *Governing the commons: the evolution of instituttions for collective action*. Cambridge: Cambridge University Press.
---. 1999a. Self-Governance and Forest Resources. Bogor: Center for International Forestry Research.
---. 1999b. Self-Governance and Forest Resources. . Bogor: Center for International Forestry Research.
Padoch, C. & M. Pinedo-Vasquez. 2006. Concurrent Activities and Invisible Technologies: An Example of Timber Management in Amazonia. In *Human Impacts on Amazonia: The Role of Traditional Knowledge in Conservation and Development,* eds. D. A. Posey & J. M. Balick, 172-80. New York: Columbia University Press.
Pearce, D., F. E. Putz & J. K. Vanclay (2003) Sustainable forestry in the tropics: panacea or folly? *Forest Ecology and Management,* 172**,** 229-247.
Peet, R. & M. J. Watts. 2004. Liberating Political Ecology. In *Liberation Ecologies: environment, development, social movements,* eds. R. Peet & M. J. Watts, 3-47. London and New York: Rootledge Taylor & Francis Group.
Pereira, R., J. Zweede, G. P. Asner & M. Keller (2002) Forest canopy damage and recovery in reduced-impact and conventional selective logging in eastern Para, Brazil. *Forest Ecology and Management,* 168**,** 77-89.
Pinard, M. A., F. E. Putz, D. Rumiz, R. Guzman & A. Jardim (1999) Ecological characterization of tree species for guiding forest management decisions in seasonally dry forests in Lomerio, Bolivia. *Forest Ecology and Management,* 113**,** 201-213.
Pinedo-Vasquez, M., D. Zarin, K. Coffey, C. Padoch & F. Rabelo (2001) Post-Boom Logging in Amazonia. *Human Ecology,* 29**,** 219-39.
Pinedo-Vasquez, M., D. Zarin & P. Jipp (1992) Economic returns from forest conversion in the Peruvian Amazon. *Ecological Economics,* 6**,** 163-173.
Pitman, N., R. C. Smith, C. Vriesendorp, D. Moskovits, R. Piana, G. Knell & T. Watcher. 2004. Peru: Ampiyacu, Apayacu, Yaguas, Medio Putumayo. In *Rapid Biological Inventories Report 12*. Chicago, Illinois: The Field Museum.
Poteete, A. R. & E. Ostrom (2004) Heterogeneity, group size and collective action: The role of institutions in forest management. *Development and Change,* 35**,** 435-461.
Putz, F. E., Michelle A. Pinard, Todd S. Fredericksen, and Marielos Peńa-Claros. 2004. Forest science and the BOLFOR experience. In *In Working forests in the neotropics: Conservation through sustainable management?,* ed. J. R. R. A. Daniel Zarin, Francis E. Putz, and Marianne Schmink, 64-96. New York: Columbia University Press.
Ribot, J. C. & L. N. Peluso (2003) A Theory of Access. *Rural Sociology,* 68**,** 153-181.
Rice, R. E., Gullison R. E & J. W. Reid (1997) Can Sustainable Management Save Tropical Forests? *Scientific American,* 273**,** 44 - 49.

Robbins, P. (2000) The rotten institution: corruption in natural resource management. *Political Geography,* 19**,** 423-443.
---. 2004. Degradation and marginalization. In *Political Ecology: ,* ed. P. Robbins, 129-146. Oxford: Blackwell.
Sabogal, C., F. Carrera, V. Colan, B. Pokorny & B. Louman. 2004. *Manual para la Planificacion y evaluacion del Manejo forestal Operacional en Bosques de la Amazonia Peruana*. Lima - Peru: Proyecto INRENA - CIFOR - FONDEBOSQUE.
Scherr, S. J., A. White & D. Kaimovitz. 2004. Making Markets Work for Forest Communities. In *In Working forests in the neotropics: Conservation through sustainable management?,* eds. D. Zarin, J. R. R. Alavalapati, F. E. Putz & M. Schmink, 130-55. New York: Columbia University Press.
Sears, R. & M. Pinedo-Vasquez. 2004. Axing the Trees, Growing the forests: Smallholder Timber Production on the Amazon Varzea. In *Working forests in the neotropics-conservation through sustainable management?,* eds. D. Zarin, J. R. R. Alavapati, F. E. putz & M. Schmink, 258-278. New York: Columbia Univesity Press.
Sears, R. R., C. Padoch & M. Pinedo-Vasquez (2007) Amazon Forestry Transformed: Integrating Knowledge for Smallholder Timber Management in Eastern Brazil. *Human Ecology,* 35**,** 697-707.
SICNA. 1998. Communities in the Ampiyacu basin. Lima: Instituto del Bien Comun.
Sierra, R. (2001) The role of domestic timber markets in tropical deforestation and forest degradation in Ecuador: Implications for conservation planning and policy. *Ecological Economics,* 36**,** 327-340.
Smith, J., V. Colan, C. Sabogal & L. Snook (2006) Why policy reforms fail to improve logging practices: The role of governance and norms in Peru. *Forest Policy and Economics,* 8**,** 458-469.
Smith, R. C. 2002. El don que hiere: reciprocidad y gestion de proyectos en la Amazonia Indigena. In *El Cuidado de los Bienes Comunes: Gobierno y Manejo de los Lagos y Bosques de la Amazonia,* eds. R. C. Smith & D. Pinedo, 155-179. Lima: IEP, Instituto del Bien Comun.
--- (2005) El manejo forestal comunitario como proceso social. *Recursos Naturales y Ambiente CATIE, Costa Rica,* 44**,** 102-108.
Smith, R. C., M. Benavides & M. Pariona. 2004. Protecting the Headwaters: An Indigenous Peoples Initiative for Biodiversity Conservation. In *Rapid Biological Inventories Report 12,* eds. N. Pitman, R. C. Smith, C. Vriesendorp, D. Moskovits, R. Piana, G. Knell & T. Watcher, 178-88. Chicago, Illinois: The Field Museum.
Tello, H., A. Quevedo & J. Gasché. 2004. Sistema de incentivos para el manejo de bosques de Loreto: El caso de los recursos forestales maderables. Iquitos: IIAP/CIES.

Terborgh, J., L. H. Emmons & C. Freese (1986) La fauna silvestre de la amazonía: el despilfarro de un recurso renovable. *Boletin de Lima,* 46**,** 77- 85.

Tucker, C. 2004. Aiming for Sustainable Community Forests Management: The experiences of Two Communities in Mexico and Honduras. In *Working forests in the neotropics-conservation through sustainable management?,* eds. D. Zarin, J. R. R. Alavapati, F. E. Putz & M. Schmink, 178-199. New York: Columbia University Press.

Uhl, C., P. Barreto, A. Verissimo, E. Vidal, P. Amaral, C. Barros, C. Souza, J. Johns & J. J. Gerwing (1997) Natural Resource Management in the Brazilian Amazon. *BioScience,* 47**,** 160-68.

Uhl, C., A. Verissimo, M. M. Mattos, Z. Brandino & I. C. Guimaraes Vieira (1991) Social, economic, and ecological consequences of selective logging in an Amazon frontier: the case of Tailandia. *Forest Ecology and Management,* 46**,** 243-273.

Varughese, G. & E. Ostrom (2001) The contested role of heterogeneity in collective action: Some evidence from community forestry in Nepal. *World Development,* 29**,** 747-765.

Verissimo, A., P. Barreto, M. Mattos, R. Tarifa & C. Uhl (1992) Logging impacts and prospects for sustainable forest management in an old Amazonian frontier: The case of Paragominas. *Forest Ecology and Management,* 55**,** 169-199.

Wade, R. 1988. *Village republics : economic conditions for collective action in South India*. Cambridge Cambridgeshire ; New York: Cambridge University Press.

Watts, M. J. 2000. Contested Communities, Malignant Markets, and Gilded Governance: Justice, Resource Extraction, and Conservation in the Tropics. In *People, Plants, & Justice: The Politics of Nature Conservation,* ed. C. Zerner, 21-51. New York: Columbia University Press.

White, S. (1978) Cedar and Mahogany Logging in Eastern Peru. *Geographical Review,* 68**,** 394-416.

Whitman, A. A., N. V. L. Brokaw & J. M. Hagan (1997) Forest damage caused by selection logging of mahogany (Swietenia macrophylla) in northern Belize. *Forest Ecology and Management,* 92**,** 87-96.

Yalle, S. 2004. Desempeño Ambiental de la Certificacion Forestal y el pago por Servicios Ambientales, como mecanismos de promocion del Manejo Sostenible de Boques Naturales en Costa Rica. In *Programa de Educacion para el Desarrollo y la Conservacion* 92. Turrialba: Centro Agronomico Tropical de Investigacion y Enseñanza.

Zerner, C. 2000. *People, Plants, & Justice: the politics of nature conservation*. New York: Columbia University Press.

Vita

Carolina De la Rosa Tincopa was born on December 03, 1971 in Puquio, Ayacucho, Peru, to Pedro Jose De la Rosa and Rosa Felicitas Tincopa; she has five brothers and six sisters. After graduating from high school in Lima, she attended the Agrarian University La Molina in Lima where she received a Bachelor of Science in Forestry Engineering in 1999. Upon graduation, she has worked as coordinator of the non-wood forest products transformation and commercialization program in the Northwestern Biosphere Reserve in Piura. Ms. De la Rosa has also worked in the design and evaluation of forest management plans for timber concessions in Permanent Production Forests in the Peruvian Amazon. Proved experience in community development projects in Cusco, Peru and former Resource Management Specialist at Iquitos Ampiyacu-Algodon Project, Peru. She had received an award by the International Tropical Timber Organization – ITTO, for her training in Diversified Management of Tropical Ecosystems in CATIE, Costa Rica. In August 2007, she has received a Ford Foundation fellowship and entered the graduate program in Geography and the Environment at the University of Texas at Austin.

Permanent Address: Alameda El Corregidor U3 Mz A, Lt 4, Urbanizacion La Capilla, Lima 12

This thesis was typed by the author.