

# **Decentralization Reforms: Help or Hindrance to Forest Conservation?**

**Krister P. Andersson**

Post Doctoral Fellow  
Center for the Study of Institutions, Population  
and Environmental Change (CIPEC)  
Indiana University  
Email: kanderss@indiana.edu

**Clark C. Gibson**

Associate Professor  
Department of Political Science  
University of California at San Diego  
La Jolla, California

July 28, 2004

DRAFT--  
CITE AT YOUR OWN RISK

---

Presented at the Conference of the International Association for the Study of Common  
Property (IASCP) in Oaxaca, Mexico, August 9-13, 2004

## ABSTRACT

This study seeks to contribute to more nuanced expectations concerning the outcomes of decentralized forest governance. The paper argues that even in instances where local governments effectively carry out their decentralized mandate it is unreasonable to expect that decentralization will lead to conservation of all forests, all the time. Realistic predictions of decentralization outcomes need to base their assessments on the limitations of the local government mandate. We develop a theoretical approach that posits that the decentralization outcome is a function of the local government mandate, the effectiveness of the local governance institutions, and a series of structural factors, such as local demographics, road infrastructure, and resource endowments. We test our theory in the post-decentralization period in 30 Bolivian municipalities in the country's forest-rich lowlands. We identify the circumstances that allow municipal governance institutions to dampen the effect of the main drivers of forest loss. Our empirical analysis finds that the local governments' effectiveness in providing formal forest property rights to local forest users is associated with low levels of *uncontrolled* deforestation, but it detects no systematic relationship between local governance effectiveness and *total* deforestation.

## INTRODUCTION

Existing theory about the impact of decentralized natural resource policy is contradictory. Classic treatments of decentralized public policy tout its ability to match citizen desires and local government response. Tiebout and others present models in which decentralization leads to citizens revealing their true preferences about the kind and level of public goods they want (Tiebout, 1956; Ostrom, Warren and Tiebot, 1962). Local governments compete for citizens in a quasi-market; citizens would sort themselves according to their preferences for public goods in relation to tax expenditures by voting with their feet. Others suggest that local governments necessarily have better information about local conditions and preferences, and therefore make better decisions regarding the provision of goods (Hayek, 1945; Blair, 2000; Oluwu and Wunsch, 1999). These approaches have been borrowed for theories about decentralized environmental governance: Revesz (1999) argues that inter-jurisdictional competition is more likely to lead to efficient environmental governance.

Other scholars argue that decentralized policy-making facilitates a race to the bottom process: given decentralized powers of natural resources, local will governments engage in a downward spiraling competition to have the lowest, least costly regulations in order to maximize external capital investments in the local polity (Peterson, 1995; Oates, 2001; Stewart, 1977; Dwyer, 1995). In the forestry sector, for example, such race-to-the-bottom analysts predict that decentralization will lead to depletion of forest resources. Local politicians will favor short term private benefits such as remaining in office or acquiring kickbacks from forest concessions, over long term public goods such as protection of soil fertility, controlling soil erosion, safeguarding water supplies, and ensuring a stable source of forest products.

Empirical studies also find divergent outcomes. In some cases decentralized forest policy apparently leads to poor outcomes on the landscape; in others decentralized policy leads to outcomes apparently better than more centralized policy.

We argue that these analytical and substantive differences stem from at least three analytical weaknesses found in most existing studies. First, most studies do not examine the local institutional context of the decentralized policy. Decentralized policies bequeath specific powers to local actors that are crucial to determining policy outcomes. Second, most research often ignores policies either within the decentralization reform or in other policy domains that may overwhelm any policy goals regarding conservation. Third, analyses often do not tie institutional factors to forest conditions. Consequently, policy analysts have a fragmented theoretical understanding of decentralized forest governance. We believe that better accounts of the effect of decentralized forestry policy should include an approach that includes the theoretical attention to the institutional context and non-forest policy, and measures that include the actual condition of the forests being examined.

We begin this paper with a review of the literature that seeks to explain the variation in forest decentralization outcomes. In section two we build on earlier work to develop a theoretical framework to organize the study of decentralization reforms in the forestry sector. In section three we use the framework to formulate hypotheses about the relationship between local government institutions and forest conditions in a decentralized regime. We then test our theoretical predictions for what constitutes

effective decentralized forest governance with observations from 30 forest-rich, local government jurisdictions in Bolivia's forestry sector in section four. We close our chapter with a discussion about the implications of our findings for forestry policy and future research endeavors.

## LITERATURE REVIEW

Our limited understanding of how decentralization reforms affect the conditions for effective natural resource governance and resulting resource conditions is further undermined by an apparent disconnect between the two main bodies of literature that analyze natural resource governance: *Land cover models*, on the one hand, attempt to explain observed forest condition changes with a range of variables including broad categories of government policies, and *institutional models* on the other hand, analyze the factors that make local governments perform well in the forestry sector. Because there is no explicit connection between these two bodies of literature, we are still in the dark concerning the underlying factors that determine the effect of decentralization on forest conditions. In this paper, we attempt to learn from these limitations in the literature and begin to develop a coherent theoretical framework that allows for a systematic empirical testing of decentralization theory. We start our review with a discussion of the studies that focus on the changes in the natural resources, followed by a review of the decentralization literature, and finally an attempt to bring the two together through a theoretical framework.

### *Land cover change models*

The ultimate test of natural resource policies is to examine their ability to alter the human influence on the condition of natural resources. However, to examine this mitigation effect is a complicated endeavor. Apart from having to measure physically the condition of a natural resource for a sampled region, which requires expert input and collaboration from colleagues in the biological sciences, policy evaluation also demands systematic collection of a large number of social science variables. One of the most difficult issues is to select an appropriate set of biophysical indicators. For instance, it may not be appropriate to measure total deforestation as an indicator of public policy performance in a country where the public policy allows for (or even encourages) deforestation in some areas. In the handful of studies that actually use forest condition as an indicator of public policy performance, the selected dependent variables seldom reflect policy objectives.

Klepeis (2003) compares the influence of public policies on deforestation rates in Southern Yucatan in Mexico under two distinct institutional regimes: the policies under President Diaz (1876-1910) and President Cardenas (1934-40). The former regime had a strong centrally managed forestry sector while the latter was characterized by more decentralized decision-making structure. The comparative analysis finds that total deforestation was significantly higher under the centralized era, not necessarily because decentralization produced more environmental concern, but because the centralized regime pursued a series of big, centrally planned development projects that were destructive to the tropical forests in the Yucatan peninsula.

As such, it seems that the high deforestation rates under the centralized era were caused by the big development projects rather than the centralized decision-making in itself. The centralized policy may have failed to protect the forest, but it never set out to do so in the first place. It is entirely possible that the centralized approach could have outperformed the decentralized structure in terms of protecting the forest, had this been the objective of the centralized policy. It is also possible that a decentralized approach to achieve economic development through forest conversions to agricultural land may have been even more destructive to the forests of the Yucatan. It would be erroneous to conclude from this study that decentralized decision-making is an inherently superior governance structure for forest conservation.

Using satellite imagery to study deforestation patterns in a protected area in Indonesia, Curran et al (2003) find that during the 1985-2001 period, the study area lost 56 percent of its forest cover due to mostly timber logging and oil-palm plantation. While their evidence did not indicate any systematic relationship between deforestation and local population densities, smallholder conversion to agriculture or paved roads; it did attribute the accelerating deforestation rates to the forestry decentralization reform of 2001. The reform allowed local governments (districts) to issue small logging parcels, which the authors argue, caused “uncontrolled harvest of remaining accessible lowlands” (p. 1002).

However, the authors also note that the extensive deforestation patterns are fueled by state policies that promote agro-industry establishments in the form of tax breaks and subsidized loans. Because of these central government policies and the effect they had on the land users, it would be inappropriate to conclude that decentralization is responsible for the observed deforestation patterns. It may be that in the absence of the market distortions introduced by agricultural subsidies, farmers would have found the destructive land use practices unprofitable, and local governments might not have issued the logging permits in the first place. Again, decentralization per se, is not the culprit of deforestation in Indonesia.

In Bolivia, several studies that have looked at the broader changes in land cover changes conclude that, so far, the decentralized forestry regime has been largely ineffective in preventing increased deforestation (Hecht, 2001; Camacho et al, 2001; Contreras et al, 2001). The Bolivian studies argue, more or less explicitly, that the increasing deforestation rates in the country as a whole are indicative of the general weakness of municipal governments, suggesting that if only municipal governments had been stronger, especially in terms of trained personnel and financial resources, they might have been able reverse the trend of deteriorating forest cover. There are several weaknesses of these arguments. First, it is not clear whether a continued centralized regime would have had any different outcomes than the observed. Second, only Camacho et al (2001) bases its arguments on empirical deforestation data at the municipal level. And finally, none of these studies attempt to explain why some municipal governments experienced higher rates of deforestation than others. Because such variation is not analyzed in these studies, it is unclear what processes are at work in the decentralized regime that produce the mixed outcomes.

In a study of Uganda’s 1997 decentralization reform in the forestry sector, Banana et al (2004, in this volume) examine how community-level institutions have responded to the reform and consequently influenced local user patterns, which in turn have affected

forest conditions. The analysis draws on time-series observations made both before and after the reforms, collecting systematic information about social and institutional variables related to local decision making as well as direct measurements of forest resource attributes in each forest. The study finds that most forests in the Mpigi district are degrading in quality and that the decentralization reform has been unable to reverse this trend. Only a small number of forests maintain a stable condition. The study explains this variation in forest condition with variable levels of local commitment and direct involvement with forest monitoring and enforcement activities (p 10). The authors also note that because all nine communities were exposed to the same decentralization reform, decentralization alone cannot explain the varying forest conditions. Rather, it is how communities respond to the reforms that make a difference for forest conditions.

None of the reviewed studies selected an indicator of forest condition that reflected the goals of the forestry policy. This omission weakens the analysis of the possible link between decentralization and changing forest conditions because no forest policy in any country, that we know of, aims to protect all forests at all times, and at all costs. Another weakness in this literature are the research designs employed, which make it impossible to isolate the effect of the decentralized regime on the forest condition. Moreover, the findings from all four groups of studies reviewed here suggest that public policy has had a strong influence on the observed changes in forest conditions, but only Banana et al (2004) specify the processes by which the public policies affect forest user decisions.

#### *Decentralization studies*

A number of empirical studies point to the importance of well-functioning local institutions for effective decentralized forest governance: In summary, positive outcomes are associated with the strength of local institutions for downward accountability (Ribot, 1999, 2002; Blair, 2000; Agrawal and Ribot, 1999), the kind of property rights that are devolved to the local level (Bruce, 1997; Agrawal and Ostrom, 2001; Andersson et al, 2004); the support and legal backup from the central government (Larson, 2003; Andersson, 2003), the financial and technical resources available to the local government (Pacheco and Kaimowitz, 1998; Kaimowitz et al, 2000; Ferroukhi, 2003; Larsson, 2002); the strength of the political incentives for local politicians to invest in forestry (Andersson, 2003; Gibson and Lehoucq, 2003) as well as the degree to which local government actors are willing and able to cooperate with other actors within and across levels of governance (Andersson, 2004).

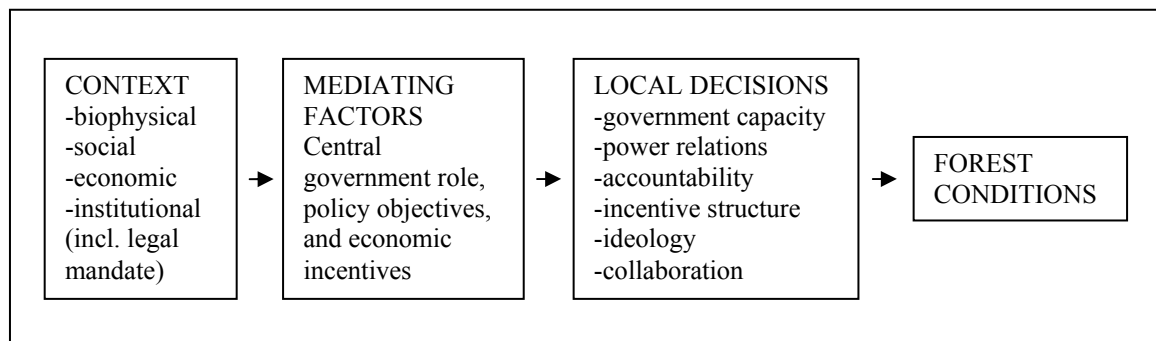
In line with the findings of these studies, we argue that explanatory models should treat public policies as mediating institutions that indirectly affect forest conditions. As such, decentralization policies empower local government officials whose actions may either bolster or constrain the existing incentives for a range of decisions that are available to forest users. Local government officials are the linchpins of the decentralized regime. If the local politicians are not asked to support sustainable forest management practices, are not motivated, have insufficient resources, or are incapable of coordinating actions with other governance actors, the decentralized regime is unlikely to perform effectively. In the following section we draw upon earlier studies on the factors that influence local government performance in governing natural resources to develop a

theoretical framework for analyzing how decentralized forest governance affect forest conditions.

### *Linking deforestation and decentralization studies*

In an effort to tie together the contributions of some of these empirical findings into a coherent a more general theory of what makes decentralized forest governance work, Larson (2003) proposes a comprehensive theoretical framework. The framework has turned out to be very valuable for organizing future empirical efforts as it outlines how variables based on findings from past studies relate to each other. It links these variables together and specifies what their predicted effects on outcomes are. The framework assigns a mediating role to the municipal level institutions that have been empowered both politically and financially by the decentralization reforms. According to this framework, of which a simplified view is presented in Figure 1, the condition of the forest depends on (1) the particular mandate given to local governments and the legal structure that governs this mandate and how this mandate influences (2) the actions of the central government and (3) economic incentives which combine to affect (4) the local political decision making process, which in turn affect social and environmental outcomes (Larsson, 2003).

**Figure 1:** A theoretical framework for decentralized forest governance



Source: Adapted from Larson (2003) and Ostrom, Gardner and Walker (1994)

In this framework, public policy plays a mediating role that can either help or hinder efforts by natural resource users to manage the forests in a sustainable manner. We propose that exogenous drivers of deforestation, such as topography, soil quality, road infrastructure, and commodity prices; are mediated by the actions taken by government, including municipal governments and local community institutions. The effect that these government actions have on resource user decisions, however, depends on a variety of contextual and mediating factors as displayed in Figure 1.

It is possible that the actions of municipal governments in a decentralized regime contribute to improving the sustainability of forest users' decisions. For example, municipal governments can help users to make forest management plans, provide information about market opportunities for forest products, and facilitate smallholders' access to formal land titles and forest property rights. To determine the likelihood of local governments actually doing this, it is important to first consider the official mandate of local governments. Only if the official mandate asks local governments to carry out these

tasks, and the local governments are able to carry out the mandate effectively, can one expect decentralization to have a positive effect on sustainable forest management.

### **Hypotheses**

We propose that decentralization outcomes are a function of the decentralized mandate combined with the performance of the local government to whom the mandate for forest governance has been devolved. Assuming that the decentralization reforms ask local governments to perform actions that are generally supportive of sustainable forest management we posit that municipal governance systems that perform these functions more effectively enjoy better forest conditions. Since one of the key responsibilities of Bolivian municipal governments is to work with local forest users to facilitate their access to formal forest property rights, we chose to measure municipal government performance in the forestry sector by the number of forest users that each municipal government administration has assisted in acquiring their formal forest property rights. We posit that citizens who live in municipal territories where the municipal forestry-sector institutions are effective are more likely to engage in forest conservation and management activities relative to other land uses, because a mix of both rewards and penalties, enforced by the local and central governments jointly, will encourage them to do so. Controlling for other external factors that also influence deforestation patterns, we expect that municipalities with strong municipal forestry institutions experience less *uncontrolled* deforestation. However, we do not expect that the strength of the municipal forestry institutions will have any significant impact on *total* amount of deforestation because municipal governments in Bolivia are not asked to prevent all types of forest conversions. To test these hypotheses empirically, we analyze data from 30 randomly selected municipalities in Bolivia.

### **EMPIRICAL ANALYSIS**

We study decentralized forest governance in Bolivia because (a) Bolivia is considered as a forerunner in forest policy; (b) forestry is an important economic sector there; (c) it is a country where the central government has actually devolved substantial resources and power to lower levels of government, and (d) deforestation rates have increased in some areas and slowed down in others in the period after the decentralization reforms (FAO, 1999; Andersson, 2002; Camacho et al, 2001). We study municipal governance systems because it is to municipal governments that the central government has devolved many of the key governance responsibilities, such as forest monitoring, technical support to smallholders, and the establishment of community forestry concessions (SIF, 1996). We study a representative sample of 30 municipal governments in the Department of Santa Cruz in the Bolivian Lowlands, because it is the Department that has the highest proportion of the country's forest resources and where much of the land use change has taken place in the last 50 years. The next section describes the concrete forest governance mandate of these municipal governments.



### *Decentralized Forest Governance in Bolivia*

In pre-reform Bolivia, municipal governments were essentially small, voluntary urban organizations without any significant political power, financial resources, or a clearly defined jurisdiction. Many of them had very few formal obligations to the central government and the citizens. That all changed with the reforms in 1994, when the central government began to transfer political decision making competence and financial resources to municipal governments.

Starting in 1994, President Sanchez de Lozada's government introduced a series of decentralization reforms that would radically change the country's political structure. The Law of Popular Participation (1994), the Law of Municipalities (1999) and the Law of Decentralized Administration (1995), define the extent and content of the municipal government mandate. In the decentralized regime, 314 municipal governments have been given the formal political competence and financial instruments to carry out a mix of centrally and locally defined priorities and political programs.

In 1994, just after the Law of Popular Participation was passed, many municipal government's annual operating budget increased by as much as a thousand percent, and more than a few went from a zero budget to tens of thousands of dollars in available resources, practically overnight. For instance, the 41 rural municipalities in the Department of Cochabamba increased their annual budgets by an average 1,310 percent from 1993 to 1994, and by 259 percent from 1994 to 1998 (Government of Bolivia, 2000). In addition to the intra-governmental financial transfers, each municipality may levy taxes on motor vehicles, all urban property, and large rural properties (50 ha and larger), although the contribution of the municipality-levied taxes has been minimal for most rural administrations.

The central government is the owner of all forest resources, including forests that grow on titled private lands. All commercial use of forests is subject to central government taxes and technical approval. All commercial forest products must be harvested according to government-reviewed forest management plans. Municipal governments are asked to assist local forest users to develop forest management plans and to seek central government permits for commercialization of products. Municipal governments may not levy their own taxes on operations in the forestry sector, and they are not allowed to ask for user fees when providing public services in the sector. Table 1 lays out the broad mandate of the municipal governments in the forestry sector, codified in the 1996 Forestry Law.

In Bolivia's decentralized forestry regime, the main duties of municipal governments are related to the monitoring and enforcement of formal rules prescribed by the Forestry Law. As long as municipalities comply with the overall formal mandate, they are free to adopt their own strategies for how to meet the exigencies of forest users in their jurisdictions, but only if these strategies do not conflict with the formal forestry regime.

The 1996 Forestry Law indicates that municipalities that receive forestry royalties must, within six months of the reception of these funds, create a Municipal Forestry Unit (Government of Bolivia, 1996). According to the regulatory framework associated with the 1996 Forestry Law, each municipal forestry unit should be headed by a professional forester, assisted by at least two field assistants, as well as being equipped with one 4x4 vehicle; one motorcycle; a computer with a Geographic Information System, a hand-held

Global Positioning System device, as well as a set of land use and land cover maps (Superintendencia Forestal, 1997). Two recent evaluations of municipal government performance in the forestry sector conclude that out of the 109 municipal governments that receive some forestry royalties, about half provide some level of services but less than ten percent completely satisfies the requirements of the formal mandate (Superintendencia Forestal, 2000, cited in Pacheco 2001)

Several policy analysts have noted that forest resources are underutilized in the country's fight against poverty (Pacheco, 2001; Superintendencia Forestal, 1999; Andersson, 2001; Contreras and Vargas, 2001). There is an emerging consensus among Bolivian forestry sector analysts that one of the primary reasons for the forestry sector's limited contribution to the improvement of rural livelihoods is the widespread insecurity of forest property rights among the rural poor (FAO, 2001; Pacheco, 2001; Contreras and Vargas, 2001). What can municipal governments do about that? Several of the main tasks that the decentralized regime asks of municipal governments relate directly to policy remedies for improved forest tenure security for smallholders. Apart from giving local forest users technical advice on how they can acquire formal property rights to forest resources on both private and communal land, municipal government officials are asked to monitor and enforce the rules of the formal forest property right system (Forestry Law, 1996: Article 25 c-h; Law of Municipalities, 1999: Articles 8-III-8 and 8-V-4).

**Table 1:** Municipal Forestry Mandates in Bolivia

<i>Mandate</i>	<i>Tasks</i>
<b>Judicial</b>	<ul style="list-style-type: none"> <li>-Municipal Governments (MGs) are asked to assist the central government, who owns all forest resources, in monitoring and enforcement of national forestry Law and regulations;</li> <li>-MGs may propose municipal forest reserve for community use on up to 25 percent of the total forested public land within the municipality;</li> <li>-MGs should assist local user groups in making a forest management plans;</li> <li>-MGs should report transgressions of the forestry law to the central government, who decides what sanction to impose, if any. Fines paid go to central government.</li> </ul>
<b>Fiscal</b>	<ul style="list-style-type: none"> <li>-MGs receive 20 percent of commercial logging royalties collected by the central government (USD 1 per hectare of managed forest);</li> <li>-MGs are not allowed to charge user fees for services provided or to charge any property or management taxes in the forestry sector.</li> </ul>
<b>Technical</b>	<ul style="list-style-type: none"> <li>-MGs give technical advice to local forest users to acquire formal management rights and to prepare forest management plans.</li> <li>-Support the National forestry registry (database of forest resources)</li> </ul>
<b>Socio-economic</b>	<ul style="list-style-type: none"> <li>-Organize training for user groups;</li> <li>-Facilitate, promote commercial undertakings and private sector participation in the municipality.</li> </ul>

**Source:** 1996 Forestry Law (Law 1700) and the 1994 Popular Participation Law.

According to their mandate in land use planning, which was introduced through the regulations of the 1994 Law of Popular Participation, municipal governments are also to develop and enforce *a municipal land use plan* that should identify the current and optimal land uses for all property polygons in the municipal territory, considering the varying economic, ecological and social costs and benefits of alternative uses. Once the

plan is approved, the national and regional governments officially recognize the plan and municipal government become the primary authority for the enforcement of the plan.

The effective implementation of these tasks is critical for the overall functionality of the decentralized forestry regime. The regime's objective to promote sustainable forest management to the equitable benefit of all Bolivians, rests to a great extent on the performance of the municipal governments. One of the regime's more immediate goals is to contain the uncontrolled deforestation on ecologically sensitive land, such as in watersheds, steep terrain, and in areas where denuded land is susceptible to desertification. We assess the performance of the decentralized regime by comparing how the actors in 30 different municipal territories have organized to protect these important forestlands.

Municipal governance actors who strive to contain the current deforestation rates are up against an enormous challenge. While the formal legal framework for natural resource management, allows municipal governments to define and implement their own land use policy for the municipal territory, the institutional incentives that they face often discourage them from actually taking any real measures to invest time and effort in forestry sector governance. On balance, municipal governments seem to have stronger incentives to support agricultural development as they benefit more from that activity than from forestry. The incentives that do exist for municipal governments to get involved in forestry sector governance are not related to conservation but rather to the extraction of forest resources. Municipalities do not make any money from encouraging users to conserve forest resources, but they do get 25 percent of all fees from legal timber extractions. Since municipalities are authorized to tax only in the agricultural sector and not the forestry sector, it may be argued that the decentralization process has produced incentives within the municipal governments to support agricultural companies to deforest, as this is one of the few ways in which the mayors can directly increase their tax base without relying on the central government.

There are, in other words, several important reasons why one should not expect that the decentralization process per se would reverse the current trend of rapid forest conversions in the Bolivian Lowlands. But there are equally important reasons why one should try to find out to what extent municipal governance actors might influence current land use patterns. Such an analysis can shed light on why some municipalities perform better than others, and which local governance strategies seem to be most effective in promoting sustainable forest management.

### *Deforestation in Bolivia<sup>1</sup>*

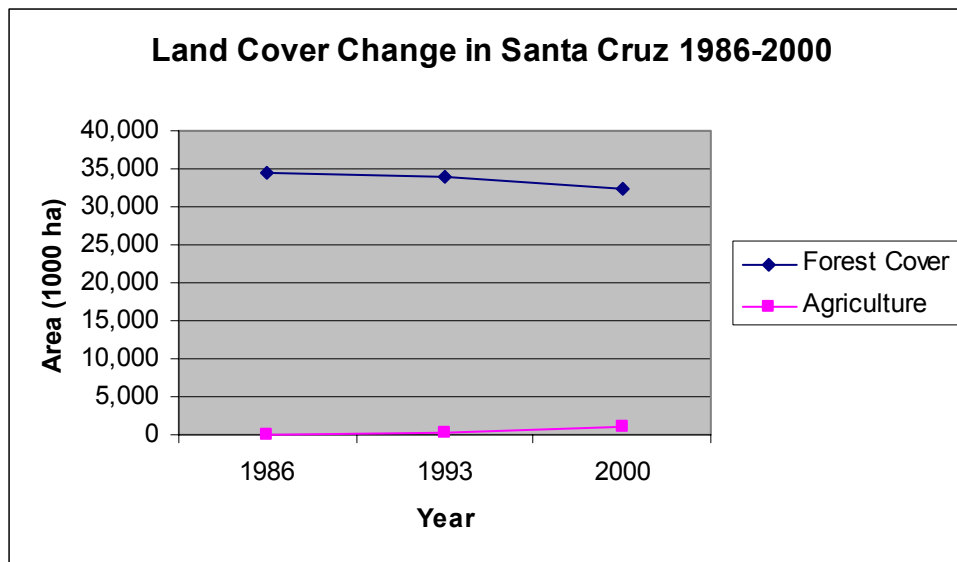
A recent forest resource assessment in Bolivia estimates that more than 3 million hectares of lowland forests have now been cleared (Camacho et al, 2000). 1.4 million hectares, or 45 percent of that total, was deforested in the Department of Santa Cruz during the seven years between 1993 and 2000 (ibid). Figure 1 presents the deforestation

---

<sup>1</sup> *Deforestation* is defined as "the conversion of forest to another land-use class or the long-term reduction of the tree cover below the minimum 10 percent threshold" (FAO, 1996). This definition of deforestation also implies that any type of forest degradation that does not reduce the forest's canopy cover below the ten percent limit, is not considered deforestation. This definition of deforestation practically limits the deforestation activities to conversion of forests to agriculture and cattle grazing only.

rates for the time period 1986-2000 for the Department of Santa Cruz. At the regional scale, the increase in deforestation in the Lowlands coincides with an increase in population density. It is tempting to jump to the conclusion that population growth has caused the observed decline in forest cover. Several spatially explicit analyses reject this hypothesis, however, showing that the deforested areas are not densely inhabited, but were in fact were associated with large industrial, soybean plantations (Hecht, 2001; Steininger et al, 2001a).

**Figure 1.** Forest cover and conversion to agriculture 1986-2000



Source: Authors elaboration based on Camacho, et al, (2001) and Steininger et al, (2001a)

Figure 1 shows how roughly half of the forest that was cleared between 1986 and 2000 was converted to agriculture. After agriculture, the second most important driver of forest loss was urbanization, accounting for about 25 percent of the deforested areas during the period (Camacho et al 2001). According to Hecht (2001) 87 percent of the forest clearings for agriculture during this period was carried out by about 3,000 industrial farmers, including the Mennonite colonies, while the almost 100,000 small scale farmers accounted for only 13 percent of the agricultural conversions (Hecht, 2001).

The discovery that industrial farmers are the main agents of deforestation in the Bolivian Lowlands raises the question as to what underlying incentives exist that might have motivated them to deforest in the places where they did and at this particular point in time. It turns out that the location and timing of the soybean expansion are neither random nor coincidental. The Bolivian national government has actively supported extensive, industrial agriculture by offering the agro-industry owners a variety of incentive packages. The structural adjustment policies that were introduced in the late 1980s, included economic instruments that removed price controls on soybeans, devalued Bolivian currency, and introduced tax breaks and fiscal incentives for soy bean exporters and involved government investments in physical infrastructure, such as roads and telecommunication networks (Kaimovitz et al, 1997). These policy instruments explain the particular timing of forest conversions, while the location is best explained by the particular bio-physical characteristics in the Lowlands. The Department of Santa Cruz in

the Amazon Lowlands enjoys very favorable biophysical conditions for extensive agriculture as soils are relatively rich in nutrients and the topography is very flat. Under these conditions, large-scale forest clearings, as well as the subsequent cultivation, carry a relatively low economic cost (Hecht, 2001).

Although few municipal governance systems have been able to contain increasing deforestation rates, the numbers on deforestation do not inform us of the effectiveness of the reforms and the institutional arrangements at the municipal level. In fact, one of Bolivia's public policy objectives with regards to rural development, which was introduced in the late 1980's, was to create favorable conditions for agro-industrial exports (Pacheco, 1998). The introduction of such public policy measures was a deliberate effort by the central government to support the creation of one million hectares of soy bean plantations before the year 2000 (Urioste and D. Pacheco, 2001).

The extensive deforestation that resulted from the implementation of this policy was not an unexpected side effect, but would be more accurately described as a calculated cost that had been taken into account when the policy instruments were designed. For example, in the central government's land use plan for the Department of Santa Cruz, the soy bean plantations are located in an area determined as appropriate for extensive agriculture (Government of Bolivia, 1995c). Hence, the almost complete removal of forest cover in this part of the lowlands was in complete accordance with the existing public policies on land use at the time. Whether the centrally defined land use policy is conducive for achieving sustainable development is a different issue, which is a topic for ongoing debate in Bolivia.<sup>2</sup> When placing municipal forest governance into this larger perspective of how centrally defined public policies influence forest user incentives at the local level, it becomes clear that decentralization cannot be held responsible for the pervasive forest clearings in the Bolivian Lowlands.

Both agricultural and forestry policies in Bolivia allow for deforestation to take place in certain areas and under certain circumstances. For Bolivian public policy, it is not deforestation per se that is the enemy, but rather *uncontrolled* deforestation -- the deforestation that takes place in areas that the national government has assigned for exclusive forest use in its land use plan (Government of Bolivia 1995). The land use plan protects forests from conversion to other land uses in areas where forest management has a comparative advantage to agriculture and cattle ranching, given the local social, economic and ecological characteristics. The land use map has defined forestry as the only authorized land use on about 22 million hectares, nationwide. This land area is comprised of private timber logging concessions (6 million ha) protected areas (8 million) and forested areas that are inappropriate for other land uses (watersheds, hilly

---

<sup>2</sup> Some critics have argued that the central government's land use plan is too supportive of conversions from forest to large-scale agriculture, although little scientific evidence exists to support such allegations. The land use plan is a result of a series of studies carried out by private contractors under a government contract for each of the country's nine departments. The purpose of the land use studies was to determine the optimal land use for each homogenous land polygon given its current land use, ecological condition, economic potential and the land users' socio-economic characteristics. The result was a map of recommended land uses for the entire land surface of Bolivia's territory. The land use map for Santa Cruz was the first to be completed and approved by the government in 1995. In 1999, the central government issued the National Land Use Law (Government of Bolivia, 1999), which codified the rights and responsibilities of different political actors with regards to the implementation of the law. It also defined the conditions under which land users may change the current land use, i.e. from forestry to agriculture.

terrain, and areas that are susceptible to desertification). The empirical analysis considers how the performance of municipal governments interact with other external factors to help explain why some municipalities have a higher proportion of uncontrolled deforestation than others.

## QUANTITATIVE ANALYSIS

The empirical tests of the hypothesis draw on survey data collected through interviews with three different forestry sector actors at the municipal level, as well as national census data and independently collected information about forest cover change and land uses in a representative sample of 30 municipalities in the Lowland Department of Santa Cruz. The hypothesized relationship between hypothesized exogenous drivers of deforestation, municipal governance performance and different measures of deforestation will be examined using multivariate regression techniques.

### Dependent Variables

We employ two different dependent variables (DVs) to study the relationship between municipal forestry institutions and forest conditions. In the first model, we use the **total proportion of the forest that was cut during 1993-2000** as our DV. Because this is a percentage, we did a logit transformation of the DV so that all predicted values fall between 0 and 1. In the second model, our DV is the amount of forest that was cut in areas that the government land use map for Santa Cruz (1995) determined to be inappropriate for land uses other than forestry. We call this variable **uncontrolled deforestation** and it is measured in thousands of hectares (1000 ha). To calculate this area, we overlaid the 1995 land use map with the 1993-2000 deforestation map and municipal boundary map and summed up the areas of the polygons representing deforested areas on restricted forestland for each municipality.<sup>3</sup> The results of the GIS analysis are presented in table 2 and in Figure 2 below.

### Independent Variables

*Municipal forest governance index:* The variable is a proxy for the level of institutional development of the municipal governance system in the forestry sector. It indicates whether the municipal governments helped smallholders acquire any formal forest property rights during the 1997-2000 period. The issuing of formal forest management rights to individuals and communities in rural areas is a central component of the Bolivian government's strategy to fight uncontrolled deforestation (Government of Bolivia, 1996). The logic behind this notion is that local land users will increase their net benefits from forest use because of the municipal services related to forest management that are offered to them. As more local forest users acquire forest property rights, more

---

<sup>3</sup> As a general rule, the 1995 land use plan based the definition of recommended land uses on the existing land use at the time. Because the exclusive forest use category did not exist until 1995, and the areas for exclusive forest use were defined for areas that were forested at the time or did not have competing land uses, means that the variable called "uncontrolled deforestation" does not include areas in protected forested that might have been deforested before the land use plan became law.

local people will choose to engage in sustainable forest management rather than clearing forests for agriculture, which in may lead to less uncontrolled deforestation.

Since the facilitation of formal forest property rights is one of the main responsibilities that the municipal government is charged with through the 1996 forestry law, the number of individual and community property rights that have been approved in each municipality is indicative of the municipal government's performance in the forestry sector. Previous studies in Bolivia's forestry sector have shown that there is a strong correlation between this variable and user satisfaction of municipal forestry services as well as the availability of other forestry-related municipal services, such as technical support and plant nurseries (Andersson, 2003; Andersson, Gibson and Lehoucq 2004; Andersson, 2004). Our theoretical expectation about the effect of this variable is that the greater the institutional development of the municipal governance system, as evidenced by the number of formal property rights acquired by smallholders, the less total and uncontrolled deforestation will occur.

*Central government monitoring* is an ordinal variable that measures the Mayor's perceived frequency of unannounced visits by the central government forestry service, La Superintendencia Forestal (1=extremely rarely; 5= very frequently).

*Deforestation before 1993* (1000s of hectares) is a continuous variable. By including this variable in the regression equation, we are able to control for historical factors as well as other omitted variables that affect the amount of deforestation that took place during the period of interest. It is expected that municipalities that experienced high levels of deforestation before 1993 are more likely to continue to experience those rates after 1993. This IV is employed in model 1 only to avoid collinearity problems in model 2 (since it is closely correlated with total deforestation during 1993-2000).

*Total Deforestation* (1000s of hectares) in a municipal territory is expected to have a positive and linear effect on uncontrolled deforestation. Total deforestation is estimated using GIS analysis of the 1993-2000 Deforestation map of Bolivia (Camacho et al 2001). This variable is used in Model 2 only as in Model 1 this variables is essentially the same as the DV.

*Population density* (persons/km<sup>2</sup>) is a continuous variable that is composed of the number of inhabitants per square kilometer in each municipality, based on the 2001 national census (INE, 2001).

*Density of roads* (kilometers/km<sup>2</sup>) is a continuous variable that was calculated by dividing the total length of primary roads (calculated in a GIS) with the total area of each municipality. The theoretical expectation is that if a municipality has a low level of road infrastructure it is more difficult for settlers to move the agriculture frontier, which should result in less uncontrolled deforestation in the territory.

**Table 2:** Descriptive Statistics of Dependent and Independent Variables (n=30)

<b>Variables</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>Median</b>	<b>Std. Deviation</b>
Uncontrolled deforestation (93-00)	0.00	65.64	11.54	4.98	16.79
Total deforestation 1993-2000 (1000s of ha)	205.85	256.00	31.28	19.91	47.71
Forest cover 1993 (millions of ha)	0.00	6.76	0.86	0.20	1.48
Municipal Forest Governance Index	1.00	7.75	4.21	4.38	2.40
Central government monitoring Deforestation before 1993 (1000s ha)	0.00	5.00	1.96	2.00	1.60
Population density (inhab/km <sup>2</sup> )	0.00	207.32	51.09	23.76	64.80
Density of roads in municipality	0.26	28.60	5.58	3.76	6.63
Household dependency on fuel wood	0.00	1.00	0.60	1.00	0.50
Proportion forest management land	0.06	0.95	0.65	0.74	0.26
	0.00	0.60	0.17	0.06	0.21

Source: Data from Camacho et al (2001), CIPEC (2001), INE (2001) and SIF (2001).

*Salience of forest for subsistence* is measured by the percentage of the population in the municipality that depends on fuel wood for their domestic energy needs, such as cooking and heating, based on the 2001 census (INE, 2001).

*Extent of managed forests* held by private firms is the total amount of forestland in each municipality that is under government-approved forest management plans (ha). These areas have been granted forest property rights to extract and sell a range of forest products. This variable reflects three aspects that are crucial for effective municipal forest governance: (a) The larger the area under management the greater the municipality's financial income. The municipality will receive USD \$ 0.20 per hectare of managed land and year (a tax collected by the central government), which is the only legitimate forestry sector income for municipal governments in Bolivia; (b) The managed forest lands' tenure situation has been sorted out by a special government agency prior to management plan approval and official government land titles have been issued, improving tree and land tenure security for the owner, and (c) Because private forestry firms are the sole income for the central government forestry service, the central government prioritizes its monitoring activities in areas where the large firms operate and provide more support to municipal governments in these areas. Hence, these factors combined lead us to believe that the greater proportion of forestlands that are under private firms' formal forest management plans, the better the conditions for effective municipal forest governance, and the more likely that the local government is successful in containing uncontrolled deforestation.

## RESULTS

Consistent with our theoretical expectations, the empirical results suggest that the municipal level institutions matter for strategies to contain uncontrolled deforestation, but not for deforestation in general. Comparing the results of the two models, displayed in table 5 below, we find that structural characteristics, such as the previous rate of deforestation and road infrastructure help explain why some municipal territories have higher total deforestation than others, while governance variables, such as the quality of municipal forestry institutions and central government monitoring, *in combination with*



*structural characteristics*, explain why some municipalities experience more uncontrolled deforestation than others. These findings underscore the importance of employing nuanced measures of forest conditions in the analysis of decentralized forestry policy. The independent variables in the first model explain 52 percent of the variation in total deforestation during the 1993-2000 period. The IVs in the second model explains 74 percent of the variation in the area of uncontrolled deforestation during the same period. The total area of deforestation during the period significantly influences the amount of forest that was cleared against the prescription of the land use plan: Holding all other variables constant, a 1000 ha increase in total deforested area corresponds to a 198.5 ha increase in uncontrolled deforestation. Likewise, the proportion of land that is under forest management plans in each municipality is systematically linked to the amount of forest that is cut on reserved forest land, but the effect is opposite to our theoretical expectation. Holding all other variables constant, a one percent increase in the proportion of forests under management plans by private firms corresponds to about 33,500 ha more vulnerable forest being cut. This result, we believe, does not suggest that private firms is responsible for uncontrolled logging but rather that municipalities that have a high proportion of land under forest management also has a high proportion of its land reserved for exclusive forest use by the land use plan, thus making it more susceptible to experience higher uncontrolled deforestation rates compared to municipalities with a lesser proportion of their land set aside for exclusive forest use.

**Table 3:** OLS regression results

Independent Variables	Model 1: Proportion of forest cut 93-00 (%) <sup>4</sup>	Model 2: Uncontrolled de- forestation 93-00 (ha)
Municipal forest governance index	-0.1951 (-1.11)	-3.7683 (-2.43)**
Central government monitoring	0.2864 (1.44)	3.1132 (1.97)**
Deforestation before 1993	0.006 (3.79) ***	-
Total deforestation 93-00	-	0.1985 (3.00)***
Population density	-0.0050(-0.13)	-0.51123 (-1.11)
Road Density	1.0966 (2.35) **	6.90621 (1.37)
Saliency of fuel wood	1.5665 (1.52)	0.3378 (0.09)
Proportion of forests under management plans	2.0730 (1.37)	33.5577 (2.50)**
Constant	-4.9740 (-6.88)***	4.9970 (0.40)
r <sup>2</sup>	0.52	0.74
N	30	30

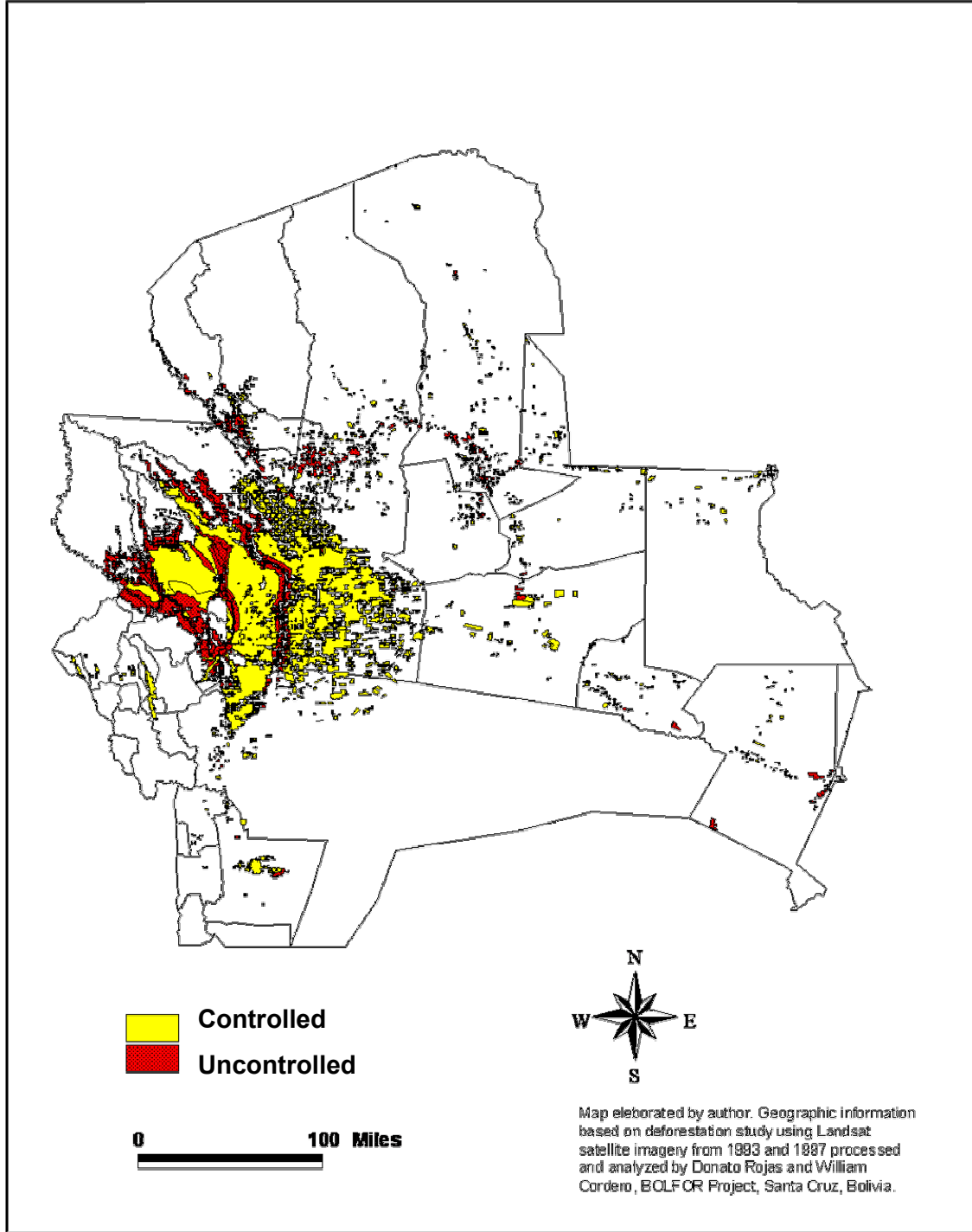
OLS coefficients with t-scores in parenthesis

\*\*\* Significant at the 0.01 level

\*\* Significant at the 0.05 level

\* Significant at the 0.10 level

<sup>4</sup> Since model one has a proportion as the dependent variable (DV) it is necessary to do a logit transformation of the data so that the predicted values also fall between 0 and 1:  $DV = \ln(dv/(1-dv))$ .



**Figure 2:** Total and uncontrolled deforestation in Santa Cruz, Bolivia 1993-2000

The results also suggest that the quality of municipal governance in the forestry sector has a systematic and negative influence on uncontrolled deforestation. Holding all other variables in the model constant, a municipality that has a government

administration that is effective enough to help some of its local users to acquire formal forest property rights, experience an average 3768 ha less uncontrolled deforestation than municipalities that did not help users acquire property rights.

The effect of the central government monitoring efforts is surprising and has the opposite sign to what we expected. It turns out to that the more intensive the central government monitoring is in a municipality the more uncontrolled deforestation exists. The reason is likely to be related to the strategic decision making by the forestry service to target the areas that are the most susceptible to uncontrolled deforestation. The purpose of central government monitoring is to enforce land use regulations and limit illegal activity, especially in forested areas that have been restricted to forestry as its only appropriate land use by the national land use plan. Such strategic monitoring is important when resources are scarce: if you have limited resources you make sure you select carefully the areas that you decide to monitor actively. This interpretation receives some support from the data as the proportion of restricted forest land is significantly correlated with the number of visits that a municipality received from the central government employees ( $r=0.72$ ).

To test the idea that municipal institutions mediate people's efforts to use the forest in a sustainable manner, we create a dummy variable for institutional development and let it interact with the two biophysical drivers of illegal deforestation in each municipality: the total amount of deforestation during the period and the proportion of restricted land. If the municipal institutions for decision making in the forestry sector are effective, we can expect that high performing municipalities to dampen the effect of the exogenous drivers of illegal deforestation. To examine whether the effect of the biophysical drivers differ between the high and low performing municipalities, we perform a Wald test. Consistent with your theoretical expectations, the test results show that the effect of total deforestation is significantly weaker in high performing municipalities ( $X^2=4.56$ ,  $df=2$ )

There is empirical support for the notion that municipal governance systems can mitigate pressures to deforest indiscriminately. We find that municipal governments play a crucial role in improve local forest users' access to and protecting existing forest property rights. Forest users that have firmer forest property rights are more likely to engage in forest management activities and are less likely to convert forest to agricultural and ranching lands.

However, the role of the municipal government should not be exaggerated, as the enforcement of the existing land use plan has little bite without the active participation of the central government agency. This means that the results can be best explained by the overall performance of the municipal governance system, in which a variety of actors are at work: municipal government officials, central government representatives, NGOs and forest user associations. As such, the municipal forest governance variable reflects the governance system's institutions for co-provision and co-production among the various forest governance actors, not just the performance of the municipal government.

While the results may seem quite encouraging in the sense that municipal governance systems seem to be capable of having a positive impact on the sustainability of land uses in the lowlands, one should not exaggerate this positive effect. The rates of uncontrolled deforestation in Santa Cruz are still very high in absolute terms. Among the 30 surveyed municipalities, 24 experienced some degree of deforestation during the

1993-2000 period. On average, about 40 percent of the deforestation that took place in these municipalities was unauthorized and therefore considered “uncontrolled”. The sheer magnitude of this uncontrolled deforestation is a concern for policy makers and analysts who are preoccupied with the sustainability of current land use practices in the lowlands. It is doubtful that the current level of performance among the majority of municipal governance regimes is sufficient to ensure sustainable use of the lowlands’ natural resources.

It is important to interpret these results as preliminary and aim at increasing the number of observations for future studies. The low number of observations make the analysis especially prone to be skewed by extreme outliers. In fact, when outlier cases, such as Montero (that did not have any forest left in 1993) and Cabezas (which is a very large and sparsely populated territory with little commercial forest resources) are dropped, the estimated coefficient for municipal forest governance is weakened somewhat.

## CONCLUSIONS

Eight years after the decentralization reforms transferred substantial responsibilities to municipal governments; one can begin to take stock of the actual effects of the reforms. Has the decentralization reform improved the prospects for saving Bolivia’s forests? The decentralization reforms are mere pieces of paper and cannot be expected to change the outcomes unless they are acted upon by the different actors involved—the local forest users in particular. Nevertheless, the analysis in this paper suggests that the reforms have produced important opportunities for improving the governance of forests resources in Bolivia.

The results represent a beginning to a more nuanced study of the relationship between decentralization reforms and land cover change. By specifying the process through which local level institutions matter, not so much by themselves as in conjunction with other crucial governance actors, we have a clearer view of how decentralization reforms affect changes on the landscape. Our study finds that the predictions of the race-to-the bottom scholars—that the decentralization reforms will inevitably lead to worsened environmental performance—are over-simplified because the outcome depends on how the local governance system performs in relation to the larger forest governance regime. The study have also shown that decentralized forest governance is not inherently superior to centralized governance systems, but the performance of any system depends on how human institutions at multiple levels interact with a myriad of exogenous factors. Hence, designing institutions for good forest governance is not just about deciding whether the structure should be decentralized or centralized, but it is also about agreeing on a the rights and responsibilities assigned to each actor, according to its comparative advantages and existing incentives to perform a particular governance task.

When assessing the mediating effect of local institutions on forest conditions, it is important to move beyond the label of “decentralization” and the “local government administration” to consider the policies and actions of the central government, because these tend to have a profound effect of the incentive structures of resource users. Moreover, any study that aims to gauge the environmental impact of public policies need

to define an appropriate biophysical indicator of institutional performance, because even the most effective institutional arrangements may not affect indiscriminate measures of deforestation.

## REFERENCES CITED

- Agrawal, A. and E. Ostrom (2001). "Collective Action, Property Rights, and Decentralization in Resource Use in India and Nepal." Politics & Society 29(4): 485(30).
- Agrawal, A. and J. C. Ribot (1999). "Accountability in Decentralization: A Framework with South Asian and African Cases." Journal of Developing Areas 33.
- Andersson, K. (2001). An Institutional Assessment of two Cornerstones of Bolivia's Decentralized Forestry Regime: Municipal Governments and Indigenous Territories. Rome, Italy, The Food and Agriculture Organization of the United Nations.
- Andersson, K. (2002). Can Decentralization Save Bolivia's Forests? An Institutional Analysis of Municipal Forest Governance? Ph.D. Diss. Bloomington, IN, Indiana University: 285.
- Andersson, K. (2003). "What Motivates Municipal Governments? Uncovering the Institutional Incentives for Municipal Governance of Forest Resources in Bolivia." Journal of Environment and Development 12(1): 5-27.
- Andersson, K., C. Gibson, et al. (in press). "The Politics of Decentralizing Natural Resource Policy." PS: Political Science and Politics 37(3): xx-yy.
- Andersson, K. P. (2004). "Who Talks With Whom? The Role of Repeated Interactions in Decentralized Forest Governance." World Development 32(2): 233-250.
- Blair, H. (2000). "Participation and Accountability at the Periphery: Democratic Local Governance in Six Countries." World Development 28(1): 21-39.
- Bolivia, G. o. (1994). Leyes de la Participación Popular Ley No.155 y 2028. La Paz, Bolivia, UPS Editorial: pp 172.
- Bolivia, G. o. (1995). Ley de la Descentralización Administrativa, Ley No. 1654 de 28 de julio de 1995. La Paz, Bolivia, UPS Editorial: pp61.
- Bolivia, G. o. (1995). Plan de Uso de Suelo para el Departamento de Santa Cruz. Decreto Supremo No. 24124. La Paz, Bolivia, Gobierno de la Republica.
- Bolivia, G. o. (1996). Ley Forestal, 1700. La Paz, Bolivia, Ministerio de Desarrollo Sostenible y de Planificación.
- Bolivia, G. o. (1999). Ley de Municipalidades, Ley No. 2028, 1999. La Paz , Bolivia, UPS Editorial.
- Brinkerhoff, D. W. (1996). "Coordination issues in policy implementation networks: An illustration from Madagascar's Environmental Action Plan." World Development 24(9): 1497-1510.
- Bruce, J. (1998). Legal Bases for the Management of Forests as Common Property. Rome, Italy, Food and Agriculture ORganization of the United Nations.
- Camacho, O., W. Cordero, et al. (2001). Tasa de Deforestación del Departamento de Santa Cruz, Bolivia, 1993-2000. Santa Cruz, Bolivia, La Superintendencia Forestal and Proyecto BOLFOR.
- CIPEC (2001). A National Survey of Municipal Mayors and Technical Staff in 100 Bolivian Municipalities: Preliminary Results. Bloomington, Center for the Study of Institutions, Population and Environmental Change (CIPEC).
- Cohen, J. M. and S. B. Peterson (1999). Administrative Decentralization: Strategies for developing countries. West Hartford, Connecticut, Kumarian Press.

- Contreras H, A. and T. M. Vargas (2001). Dimensiones Sociales, Ambientales y Económicas de las Reformas en la Política Forestal de Bolivia. Santa Cruz, Bolivia, Proyecto de Manejo Forestal Sostenible and the Center for International Forestry Research.
- Food and Agriculture Organization(FAO) (2001). The State of the World's Forests. Rome, Italy, FAO.
- Food and Agriculture Organization (FAO) (1999). State of the World's Forests 1999. Rome, Italy, Food and Agriculture Organization of the United Nations.
- Ferroukhi, L., Ed. (2003). Municipal Forest Management in Latin America. Bogor, Indonesia, CIFOR.
- Gibson, C. and F. Lehoucq (2003). "The Local Politics of Decentralized Environmental Policy in Guatemala." Journal of Environment and Development 12(1): 28-49.
- Hernáiz, I. and D. Pacheco (2001). La Ley INRA en el Espejo de la Historia: Dos Siglos de Reforma Agraria en Bolivia. La Paz, Bolivia, Fundación Tierra.
- Instituto Nacional de Estadísticas (INE) (2001). Censo Nacional de 2001. La Paz, Bolivia, INE.
- Kaimowitz, D., G. Flores, J. Johnson, P. Pacheco, I. Pavez, J. Roper, C. Vallejos and R. Velez (2000). Local government and biodiversity conservation: A case from the Bolivian Lowlands. Shifting the Power: Decentralization and Biodiversity Conservation. B. S. P. (BSP). Washington, USAID.
- Kaimowitz, D., G. Thiele, et al. (1999). "The Effects of Structural Adjustment on Deforestation and Forest Degradation in Lowland Bolivia." World Development 27(3): 505-520.
- Larson, A. M. (2002). "Natural Resources and Decentralization in Nicaragua: Are Local Governments Up to the Job?" World Development 30(1): 17-31.
- Larson, A. M. (2003). "Decentralisation and Forest Management in Latin America: Towards a Working Model." Public administration and development 23(1): 211-226.
- Marc K. Steininger, C. J. T., John R. G. Townshend, Timothy J. Killeen, Arthur Desch, Vivre Bell, Peter Ersts (2001). "Tropical deforestation in the Bolivian Amazon." Environmental Conservation 28(2): 127-134.
- Ostrom, E., R. Gardner, et al. (1994). Rules, Games, and Common Pool Resources. Ann Arbor, MI, University of Michigan Press.
- Pacheco, P. (1998). Estilos de Desarrollo, Deforestación y Degradación de los Bosques en las Tierras Bajas de Bolivia. La Paz, CIFOR, CEDLA, Fundación TIERRA.
- Pacheco, P. (2001). The Role of Forestry in Poverty Alleviation: Bolivia. Forum on The Role of Forest in Poverty Alleviation, Cortevicchia, Italy, Forestry Department, FAO.
- Pacheco, P. and D. Kaimowitz (1998). Municipios y gestión forestal en el trópico boliviano. La Paz, CIFOR, CEDLA, Fundación TIERRA, BOLFOR.
- Ribot, J. C. (1999). "Decentralization, participation and accountability in Sahelian forestry: legal instruments of political-administrative control." Africa 69(1).
- Ribot, J. C. (2001). Local actors, powers and accountability in African decentralization: a review of issues. Decentralization and local governance in Africa, Cape Town, South Africa, International Development Research Centre of Canada Assessment of Social Policy Reforms Initiative.

Ribot, J. C. (2002). Democratic Decentralization of Natural Resources: Institutionalizing Popular Participation. Washington, D.C., World Resources Institute.

Superintendencia Forestal, 2002b. Informe Anual 2001. La Paz, Bolivia: Sistemas de Regulación de los Recursos Naturales Renovables.

Superintendencia Forestal, 1997. Directriz Técnica de la Superintendencia Forestal, No. ITE-002/97. Santa Cruz, Bolivia: Superintendencia Forestal.

Urioste, J. M. and D. Pacheco (2001). Las Tierras Bajas de Bolivia a fines del Siglo XX. La Paz, Bolivia, PIEB.