

# Private Versus Common Property Forests: Forest Conditions and Tenure in a Honduran Community

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*Establishing secure tenure is widely recognized as a fundamental component of sustainable forest management. Policy-makers generally prefer privatization to achieve these ends, although common property institutions may also be appropriate. But if common property tenure is insecure and fails to control exploitation, theory predicts that private tenure should lead to better forest conditions. In this case study of a western Honduras community, forest mensuration data were collected from four private forests and two relatively open access common property forests. Statistical analyses failed to find consistent, significant differences in vegetation structure or soils related to tenure. Notable contrasts between forests reflected historical conditions and owner preferences. Neither form of tenure appeared to emphasize concerns for sustainable management, and ongoing processes of change constrained the possibility for limiting common property forest exploitation. The study adds to others which show that the outcomes of private or common property tenure relate substantially to the socioeconomic, political, and ecological context.*

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**KEY WORDS:** forest management; land tenure; privatization; common property; Honduras.

## INTRODUCTION

Sustainable management of forest resources poses one of the world's greatest challenges. Deforestation has serious ramifications for global climate change, economic development, and the well-being of many (if not all) human beings who depend directly or indirectly on forests. Many forests

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have been open-access resources, and the unconstrained exploitation associated with open access has been a notable factor in deforestation (Ascher, 1995, p. 20; cf. Ostrom, 1998, p. 1–2). Establishing appropriate forms of tenure to delineate boundaries and limit exploitation therefore constitutes an important step toward achieving sustainability, but considerable debate exists over the form of tenure most likely to result in sustainable management. The nature of forests complicates the matter; forests involve complex ecosystems, which have yet to be fully understood, and they provide diverse products, uses, and services that may entail various time horizons for ecologically wise and economically efficient management (Ostrom in Ascher, 1995, p. xii).

One of the major debates over tenure forms has revolved around the relative merits of private versus common property arrangements. A body of theory and research addresses this debate, but few empirical studies have compared the ecological and social outcomes of these different property arrangements within a single ecosystem and sociopolitical context. This study presents such a comparison within a Honduran *municipio* (similar to a county) where private and common property forests lie adjacent to each other, and the residents depend on forests for firewood and other resources.

The county presents a long history of common property forests and a relatively recent emergence of private forest ownership. Residents have effectively excluded outsiders from exploiting their common property forests, but they have placed few restrictions on their own use. No limits exist on the number of cattle that may be grazed in the forests, or the amount of firewood that can be cut for household use. As a result, the common property forests receive little protection from overexploitation, even though the county population has been increasing, and the area in common forest has declined. By contrast, owners of private forests usually limit tree cutting and restrict access. Under such circumstances, privately held forests are likely to be in better condition than common property forests (Banana & Gombya-Ssembajjwe, 1996; Becker *et al.*, 1995). In this case, however, vegetation and soil analyses do not reveal consistent differences.

The discussion opens with an overview of the concepts and the theoretical issues related to the debate over private and common property tenure. Then it examines the data to demonstrate the ecological similarities and points of difference in the forests under contrasting tenure arrangements. Consideration of historical factors and current conditions provide important insights regarding the dearth of statistically significant differences. This study, in conjunction with others, shows that the theoretical and policy perspectives concerning appropriate property rights for resources requires recognition of the specific historical, socioeconomic, political, and ecological

contexts (Agrawal & Yadama, 1997; McCay, 1987). The paper argues that the form of tenure is not a good predictor of sustainable management. Instead, the more critical factors are whether the owner(s) have decided to limit their levels of exploitation, and are able to achieve their goals through monitoring and enforcement.

## THEORETICAL PERSPECTIVES

Following the Brundtland Commission, the paper defines sustainable use as that which does not compromise the ability of future generations to meet their own needs (World Commission on Environment and Development, 1987, p. 8). This definition does not necessarily encompass what would be most advantageous for resource utilization from an economic or ecological perspective, but it provides a rough index for management success (Feeny *et al.*, 1990, p. 5).

Private ownership has often been viewed as an optimal tenure arrangement for achieving sustainable management of natural resources. By contrast, common property has been widely interpreted as subject to degradation (e.g., Demsetz, 1967; Gordon, 1954; Hardin, 1968; Smith, 1981; Welch, 1983). This position derives from assumptions that common property constitutes open access and therefore leads inevitably to a "tragedy of the commons." The association between open access and resource degradation is beyond dispute, but it is not the case that common property necessarily implies open access. McCay and Acheson (1987, p. 8) note that the assumption ". . . fails to distinguish between common property as a theoretical condition in which there are no relevant institutions (open access) and common property as a social institution (the commons)" (see also Bromley, 1992, pp. 3–4).

Making this distinction has been difficult because the term "common property resource" has often been used to describe resources characterized by difficulty of exclusion (preventing access can be hard), and subtractibility (any person's use reduces the resource for other users) (Feeny *et al.*, 1990, p. 3; McKean & Ostrom, 1995, p. 5). Examples of such resources include forests, fisheries, and watersheds. Given the difficulty of bounding such resources, they have often been de facto open access. However, these resources may be held under a variety of property arrangements, whether public (government-owned), private, or common. This paper uses "common property" only to denote situations in which a property arrangement exists. The term "communal resource" refers broadly to de facto shared resources, whatever the de jure property status.

Many proponents of private property continue to assume that commu-

nal resources always exist as open access; they support this view with the assumption that users are not capable of imposing and enforcing constraints on their exploitative activities even when it would be to their joint benefit (Ostrom, 1990, p. 8). Based on these assumptions, theoretical propositions hold that private property provides owners with higher incentives to use resources efficiently and sustainably, because they are able to monopolize many of the benefits of wise management, and they bear most of the costs of poor management (externalities are likely to appear so that owners cannot capture all the benefits, nor be subject to all the costs). Private property holders are expected to have a lower discount rate, so that they tend to place importance on the future value of the resource. Under common property, users share the costs of overexploitation, but they can gain the full benefits of individual exploitative efforts (Hardin, 1968). If rules governing use are absent or ineffective, this circumstance provides greater incentives than private property for users to value resources at a high discount rate, and harvest resources unsustainably. Private property does not, however, guarantee efficient and sustainable resource management. Owners may act with poor judgment, or depending on their circumstances, they may not place importance on a resource's future value (Brouwer, 1995b; Nations & Komer, 1983).

Researchers recognize that it is difficult for people to cooperate for the common good, but they have found that under certain conditions, groups can establish common property institutions that manage resources sustainably (e.g., Behar, 1986; Berkes & Farvar, 1989; Berkes *et al.*, 1989; Brouwer, 1995a, 1995b; Casimir & Rao, 1998; Denman *et al.*, 1967; McCay & Acheson, 1987; McKean, 1982, 1992; Netting, 1976; Ostrom, 1990; Ruttan, 1998). A fundamental condition for common property is that users perceive its benefits to outweigh its costs; this occurs in conjunction with other important factors (Ostrom, forthcoming). Successful common property institutions result in closed access; the resource is held as shared private property (McKean & Ostrom, 1995, p. 6). The joint owners of effectively managed common property define their membership and the boundaries of their resource, restrict nonmembers' access, and develop a set of rules, duties, and mechanisms to govern the resource (Bromley, 1989; Ostrom, 1990).

Common property presents potential advantages in comparison to private property. If a given resource is mobile (e.g., wild animals and fish) or dispersed and variable (e.g., certain plants), a common property arrangement can provide all users with a larger area in which to seek it and a greater chance of success than if the resource habitat were subdivided into private parcels. Common property may require much lower investments for the users (and even government entities) in the bureaucratic

superstructure needed to maintain a private property system (McKean & Ostrom, 1995; Runge, 1986).

A critical aspect for economic development is the potential for common property owners to distribute resources more equitably among themselves (McCay & Acheson, 1987; Netting, 1982, p. 471; Runge, 1986). This is of particular importance for poorer populations that often depend on communal resources for their survival. Communal resources provide important sources of supplemental income, and privatization of these resources has been linked to pauperization of economically marginal groups (FAO, 1993, p. 30; Jodha, 1992, pp. 11–17, 27–28). Loss of rights to communal resources may fall disproportionately upon women and children, particularly in places where women cannot own land. Rights to communal resources can therefore be crucial for issues of gender equity (Agarwal, 1997; Sarin, 1995). Moreover, the exercise of common property rights can be integral to the identity and livelihood of indigenous populations; loss of these rights can threaten cultural survival (Durning, 1993; Ebright, 1996; Wittayapak, 1996). Owing to widespread convictions in the benefits of private property, however, many nations have implemented programs to privatize communal resources.

Clearly, common property can provide important benefits, particularly for impoverished or minority groups who lack economic alternatives and opportunities to gain private property rights. Creating and maintaining common property institutions nevertheless proves a challenge. Changing social, economic, and political circumstances (such as privatization programs) often appear to threaten common property institutions, even though changes might provide incentives for reinforcement. In addition, the establishment of common property institutions does not guarantee equitable access, cooperation among beneficiaries, or wise resource management. Common property may allow resource degradation (e.g., Sheridan, 1988; Wilson & Thompson, 1993), and it may be controlled by the wealthy to the exclusion of the less fortunate (McCay & Acheson, 1987; see also Baland & Platteau, 1997, 1998).

The contrasts between private and common property rights and their relationship to forest resources vary considerably by location and culture. Certain aspects tend to be similar throughout the world. In Honduras as elsewhere, naturally occurring trees and those used for firewood tend to be communal resources, although the situation may change with scarcity. Work in Africa and Asia reveals a complex set of rights related to tree ownership, such that different individuals can have varying rights to a tree (Fortmann, 1985). Tenure rights to land and its trees may be separated (Bruce & Fortmann, 1988). This study finds a current situation that is more typical for the Americas: rights to land and its trees are rarely distinguished,

and owners tend to have full rather than partible rights to trees. Similar to other studies, this case study considers how processes of change in demographic, economic, social, and political situations may interrelate with changes in property rights, land use, and forest resources (e.g., Agrawal & Yadama, 1997; Fairhead & Leach, 1996; Peluso, 1996).

As this discussion indicates, both private and common property constitute viable options for sustainable resource use. But neither of these—nor any form of tenure—guarantees sustainability. Tenure must be secure, but in addition owners must be successful at restricting outsiders' exploitation and regulating their own use. Proponents of private property as well as common property agree that in the absence of responsible private management or effective common property institutions, resource degradation is the probable outcome unless exploitation rates are very low.

### THE RESEARCH SITE

The research focuses on La Campa County, located in the mountains of western Honduras. The people, known as Lacamperos, are descendants of Lenca Indians. Processes of assimilation have extinguished the Lenca language and irrevocably changed their culture, but a majority of the people continue to identify with their indigenous heritage and express a syncretic belief system. The shared use and management of the county's common property land has been an integral feature of local identity and a basis for community solidarity. Processes of market integration and contact with national institutions appear to be undermining traditional ideology, encouraging privatization, and increasing socioeconomic heterogeneity, which may have negative implications for common property forests.

Most of the population depends on the subsistence production of maize and beans. Households also plant orchards for fruit to augment their limited diets. Those with more resources plant surplus crops to sell locally, and a number have started to plant coffee for the export market. Although this is a relatively recent phenomenon, national incentives and relatively good prices have made coffee a desirable investment. Women produce artisanal pottery known throughout Honduras for its quality. Potters require large quantities of dry pinewood to temper their wares; they depend on common property forests for their supply. Income from pottery sales helps women to pay for children's school fees, health care, and supplemental food supplies.

A resource-poor environment has contributed to the population's history of relative marginalization in relationship to the Honduran nation-state and the dominant ethnic group, known as *ladinos*. Precipitous slopes

(averaging 30–60 degrees), shallow soils, and variable rainfall typify the region. Studies estimate that 97% of the land in western Honduras is inappropriate for intensive agriculture, and is best suited to naturally occurring pine and oak forests (Chávez Borjas, 1992; Pineda Portillo, 1984). Nevertheless, the area cleared for agriculture and pasture has evidently been increasing during the past 20 years. The trend has occurred nationally; Honduras lost nearly one quarter of its forests between 1980 and 1990. Although 8.3 million hectares (nearly 80% of the nation's land) is considered as suitable only for forest, less than 5 million hectares remained by the late 1980s (FAO 1993; SECPLAN/DEFIL/USAID, 1989).

For La Campa, as for the nation, forest conversion appears to be associated with population growth, logging, road improvements, and increased market-oriented agricultural production. Adoption of technological advances has contributed to the intensified use of agricultural land. The use of fertilizer and herbicides has been instrumental in maintaining fields under cultivation and reducing fallow periods that once allowed regeneration of forest cover. National emphasis on export agriculture to generate foreign exchange has contributed notably to transformations in agricultural methods and land cover (Stonich, 1992; Stonich & DeWalt, 1989). Although demographic pressure, road building, technological change, and increased participation in the market economy may provide motivations to improve forest management or plant trees (Fairhead & Leach, 1996; Leach & Fairhead, 1994; Leach & Mearns, 1988; McKean & Ostrom, 1995, p. 8; Tiffen *et al.*, 1994), these factors are more frequently incriminated in forest destruction (Fearnside, 1989; Kaimowitz & Angelson, 1998; Moran, 1992; Perry, 1991; Repetto, 1988; World Bank, 1991). La Campa's situation therefore reveals similarities with many other communities experiencing forest conversion in conjunction with social and economic transformations.

Nearly all of La Campa's land belongs to the county as *ejidos* granted to the residents by colonial and post-independence governments. With few exceptions, residents' private holdings are de facto claims, established by county council permission or public recognition rather than legal title. Usufruct rights nevertheless bear most of the benefits of private title; owners can buy, sell, and designate heirs for their property. The only restriction is that new owners must be county residents, and it is strictly enforced. Officials estimate that about 60% of the county lies in forest, but it is composed mainly of secondary successions and forest patches on land that is too steep, rocky, or infertile for agricultural activity. A remnant of old-growth forest survives; it contains a protected watershed that supplies water for La Campa and two adjacent counties. The largest wooded areas endure as common property forests and pastures. Many residents have small,

wooded areas and fallow fields on their usufruct plots, but certain residents with above average resources have claimed private forests that exceed a hectare in area.

## FIELDWORK METHODS

A team of researchers conducted fieldwork in La Campa during 6 weeks in July and August of 1997. The research built on household surveys and ethnographic data collected between 1993 and 1995 (see Tucker, 1996). The data collection centered on the county seat, La Campa, its common property forests, and the agricultural land and forests of its residents. The county seat included the urban center and its adjacent barrios (neighborhoods), which constitute the most densely concentrated area of population in the county. The barrios spread out along the main road leading to a neighboring county, and households become more dispersed as distance from the center increases.

For the purposes of this discussion, the term "forest" refers to a distinct property dominated by trees and associated with a unique combination of location, tenure type, and ownership. All of the forests included in this study were delineated by fences and topographic features, which facilitated their identification as distinct properties. The team sampled two common property forests and four private forests adjacent to La Campa's county seat. The forests met several criteria: proximity to the county seat, a similar range in altitude, similar vegetation, and proximity to each other.<sup>2</sup> The research aimed to control for these variables, so that differences could be more confidently credited to institutional aspects (private or common property) than to inherent topographical or ecological variations. Multiple forest properties were chosen to encompass the variability interpreted as natural to the area and the dominant vegetation class (pine-oak forest). Private forests were much smaller than common property forests, so four were chosen to augment the private area sampled, and to gain a more representative sample. Each of the private forest owners professed similar management strategies, and had been managing his forest for a minimum of 10 years. The impact of individual differences in management style was expected to be minimal. In order to test whether private forests were actually in better condition than common property forests, the team col-

<sup>2</sup>One of the common property forests and the four private forests share borders, and were located to the south of the county seat. The second common property forest was located just to the north of the county seat.



lected data on vegetation, soils, and physical characteristics of the forests from a random sample of forest plots.<sup>3</sup>

In addition to sampling the forests, the team collected information on the institutional, geographic, and demographic characteristics of the site. They interviewed local officials and each of the private forest owners to gather information on management strategies and histories of land use. The team also surveyed a random sample of 30 households (out of 116 in the settlement) to collect demographic, socioeconomic, and forest use data. These data provided a context in which to interpret the vegetation and soil analyses.

## VEGETATION STRUCTURE

Results from vegetation analysis revealed few significant differences between private and common property forests when plot data were aggregated by tenure. Biodiversity indexes were marginally more favorable for common property forests (Table I). Pine trees (*Pinus oocarpa*) dominated in both forests. Oak (*Quercus* spp.) followed in relative dominance. Basal area data at the aggregate level indicated a notably higher value for private

**Table I.** Vegetation Structure Summary Statistics and Biodiversity Indexes by Tenure

	Communal ( <i>n</i> = 20)	Private ( <i>n</i> = 21)
Total stem count (trees > 10 cm DBH)	138	177
Projected stem count/hectare	231	282
Total sapling count	19	59
Species richness (trees)	9	7
Basal area (trees)	9.69	13.76
Basal area (all size classes)	9.77	13.93
Simpson index	1.41	1.48
Simpson reciprocal	0.71	0.68
Pielou's Simpson index	0.34	0.39
Shannon index	0.74	0.70

<sup>3</sup>To sample vegetation and soils, members of the team first walked the forests to learn their borders and topography. A baseline was laid along the long axis of each forest. Plots were located randomly at perpendicular distances off the baseline; a handheld calculator generated random numbers for points along the baseline and plot distances off the baseline points. Nested plots were laid, with a 1-meter square plot for recording all ground cover, a 5-meter square plot for recording live saplings (2.5 to 10 cm diameter at breast height [DBH]), and 15 × 20 m for recording trees (over 10 cm DBH) and collecting soil samples. The team sampled 20 plots in common property forests, and 21 plots in private forests.

forests (13.93 m<sup>2</sup>) as opposed to common property forests (9.77 m<sup>2</sup>). At the plot level, however, basal area did not test as significantly different. The private forests' plots varied greatly in basal area within and between study forests, indicating that important variations occurred within tenure type; this is addressed in the forest level analysis below.

The presence of saplings appeared to be notably different (Table II), but this did not prove to be significant in terms of the mean sapling presence at the plot level. In both types of property, the mode was zero saplings per plot. Notably, the number of live saplings recorded did not provide a reliable indicator of tree regeneration, because forest fires burned much of the area prior to fieldwork. The degree of fire damage varied, but the common property forests evidently suffered more severely. Nine of the common property plots that had no live saplings did contain burned ones, as contrasted to three private plots.

The plot data collected on vegetation structure represent forest areas with slopes of less than 40 degrees. Both private and common property

**Table II.** Forest Plot Statistics by Tenure (Independent *T*-Tests for Equality of Means)

	Communal forest mean values ( <i>n</i> = 20)	Private forest mean values ( <i>n</i> = 21)	Significance (two-tailed)	Standard error
<b>Vegetation characteristics</b>				
DBH <sup>a</sup>	24.3 cm	27.6 cm	.362	3.64
Height	13.4 m	13.7 m	.840	1.44
Trees per plot (>10 cm DBH)	6.9	8.4	.558	2.59
Saplings per plot (2.5–10 cm DBH)	1.0	2.8	.094	1.08
Pine stems per plot (including saplings) <sup>b</sup>	6.2	8.2	.458	2.65
Oak stems per plot (including saplings) <sup>b</sup>	1.7	1.0	.265	0.59
Species richness (trees)	1.7	1.7	.813	0.30
Basal area (all species, DBH > 10 cm)	9.8	13.9	.096	2.44
<b>Physical characteristics</b>				
Altitude of plot	1213	1195	.118	11.48
Steepness of slope (degrees)	18	19	.750	2.54
Distance from nearest road	1532	747	.000	156.82
Distance from nearest house	1371	968	.082	225.27

<sup>a</sup>DBH, diameter at breast height.

<sup>b</sup>Saplings were included for these calculations to increase the sample size, particularly for oak, which occurred rarely.

forests encompassed precipitous sections with slopes exceeding 40 degrees. Team members decided not to lay plots on these slopes due to a lack of appropriate equipment and the associated risks. Biodiversity appeared to be higher on the steepest, inaccessible slopes and in ravines, but the team was unable to examine these areas closely. Therefore, the samples are biased toward the most readily accessible parts of the forests, and species richness may be underestimated.

## **PHYSICAL CHARACTERISTICS OF FOREST PLOTS**

### **Slope and Aspect**

The plots presented a similar range of variation in slope and aspect. More than half of the plots in both private and common property forests exceeded 15 degrees of slope, and the samples did not differ significantly in this variable (see Table II). The aspect varied around the points of the compass for both private and common property plots. Due to sample size limitations, it was not possible to test whether aspect was associated with changes in vegetation cover related to insolation.

### **Livestock Presence**

All but one of the plots showed signs of livestock presence. Several plots in both private and common property forests revealed signs of overgrazing. This reflected the use of common property and private forests as natural pasture.

### **Fire Damage**

Half of the private forest plots, and 90% of the common property forest plots, evidenced fire damage. An unusually dry spring had created conditions amenable to runaway fires, which were primarily associated with slash-and-burn agriculture. All of the private owners reported that they had taken measures, such as clearing fire lanes, to prevent the spread of forest fires onto their land. They seemed most concerned to prevent damage to their fences, and reported varying degrees of success. By contrast, community fire-fighting efforts in common property forests had been ineffective. People who grazed livestock in common forests reported that fires resulted in better grass cover; therefore incentives to fight fire may have been

minimal for an important segment of the population. These observations suggest that private ownership may be beneficial in terms of fire control. However, fire has been a component in the ecology of Honduras' pine forests since pre-Columbian times, and its role is poorly understood (FAO, 1968). Studies indicate that fires, or their absence, can shape the composition of plant communities (Caprio & Zwolinski, 1992; Huff, 1995; Keane *et al.*, 1990; Kercher & Axelrod, 1984; Murphy & Lugo, 1986, pp. 82–83; Perry, 1994, pp. 111–120; Romme, 1982; Swetnam *et al.*, 1992). Without a greater knowledge of fire's role in La Campa's pine-oak forests, a reduction of fire could lead to unintended consequences. Therefore, it is not clear that fire control in private forests necessarily implies better forest conditions in the long term.

### **Distance from Roads and Households**

The analysis estimated plot distances from the nearest road and nearest household to explore whether these factors differed in relationship to tenure. On average, common property plots fell significantly further from the nearest road than private plots (.000 level) (see Table II). As this suggests, most private forest owners preferred property adjacent to the road. No significant difference was found between private and common property plots in distance from the nearest household.

### **SOIL COMPOSITION AND CHARACTERISTICS**

With few exceptions, the plots contained shallow, rocky soils. No significant differences appeared in soil depth between private and common property forests. The chemical composition of soils in private and common property forests also proved to be quite similar (Table III). Soil analyses tested for pH, percentage of nitrogen and organic matter, and the concentration (ppm) of calcium, phosphorus, magnesium, and potassium. The resulting values were not normally distributed, and given the sample sizes, the Mann-Whitney U-test was selected to test for soil differences between private and common property forests. The only significant differences existed in pH and magnesium. Magnesium proved to be more concentrated in the private forest soils at a 0.020 level of significance. The effects of forest fires may be a factor. It is widely recognized that fire influences the availability, leaching, and runoff of soil elements in forest ecosystems (e.g., Binkley *et al.*, 1992; Ewel *et al.*, 1981; Grier & Cole, 1971; Kilgore, 1973; Lewis, 1974; Stark, 1977; Wright, R., 1976; Wright, H. & Heinselman, 1973;

**Table III.** Soil Data and Analysis (Mann-Whitney U)

	Depth of A horizon (cm)	Depth of B horizon (cm)	Nitrogen (%)	Organic material (%)	Calcium (ppm)	Magnesium (ppm)	Phosphorus (ppm)	Potassium (ppm)	Soil pH
Private forest mean values	12.0	5.2	0.1	4.5	836	257	0.8	172	4.8
Communal forest mean values	7.9	10.0	0.1	3.9	947	205	1.1	166	5.0
Private forest sum of ranks	377.0	395.0	483.0	465.0	445.0	530.5	446.0	445.0	350.5
Communal forest sum of ranks	364.0	466.0	378.0	396.0	416.0	330.5	415.0	416.0	510.5
Mann- Whitney U	154.000	164.000	168.000	186.000	206.000	120.500	205.000	206.000	119.500
Asymp. Sig. (two-tailed)	.445	.186	.271	.531	.917	.020	.895	.917	.018

Zinke *et al.*, 1978), but it is not clear the extent to which fires affected the sampled forests' soils in this case.

In terms of pH, most of the soil samples tested as strongly acid (a pH below 5.5), which is typical of pine forest. Only one private forest plot had a pH above 5.0, but eight common property forest plots tested above this level. These results contributed to a significant difference at the 0.018 level. The data revealed that the least acidic pH levels came from only one of the common forests. Studies have shown that forest fires can increase soil pH (Brinkman & Nascimento, 1973; Ewel *et al.*, 1981, p. 822; Lal & Cummings, 1979; Popenoe, 1960). The result may be attributed to a greater intensity of fire in that area even though it was not apparent from observations.

It had been hypothesized that private forests would occupy better soils, particularly because several owners reported that their forests might serve for future agricultural land. The soil analysis data did not support that hypothesis, implying that the private forest owners' selection criteria did not relate to soil differences. Overall, the results support the characterization of the region's topography and soils as largely unsuitable for permanent agriculture.

## FOREST LEVEL ANALYSIS

Although aggregation of forest data by tenure fails to reveal significant differences, closer examination of the data suggests that notable contrasts exist between the forests. The samples for each forest are too small for confident statistical analysis, but the results are nonetheless indicative. If each of the six forests sampled are ranked by trees/plot, mean DBH, mean height, and basal area, the two common property forests' mean values tend to fall in the middle for nearly all of the variables, whereas the private forests vary more (Table IV). This helps to explain the lack of significant differences in vegetation structure between tenure types; the aggregation of private forest plot data obscures their wide range of variation and results in mean values similar to those for common property forests. These differences emerge even though all of the forests were used for grazing and firewood collection; moreover, all of the forests had experienced logging, resin-tapping, or both. All of the owners agreed that they had claimed their forests to graze cattle. Historical details and subtle differences in forest management contribute to understanding the range of variation in study forests; private forest conditions also reflect owners' preferences.

*Private forest #1* presents the highest means for DBH, basal area, and tree height, and is fourth in the mean number of trees per plot. The data

**Table IV.** Characteristics of Sampled Forests<sup>a</sup>

Rank (high to low)	Trees/Plot	Mean DBH of trees (cm)	Mean height of trees (m)	Total basal area (cm <sup>2</sup> )	Mean slope (degrees)	Mean altitude (m)	Mean distance from road (m)	Mean distance from nearest house (m)
1	P2 (21.8)	P1 (42.17)	P1 (17.71)	P1 (20.35)	C2 (22.7)	P1 (1220)	C1 (1804)	P2 (2131)
2	C1 (7.9)	P3 (27.29)	P3 (13.48)	P2 (20.02)	P1 (22.2)	P4 (1217)	P2 (1321)	C1 (1781)
3	C2 (5.9)	C2 (25.47)	C2 (13.42)	C2 (11.25)	P3 (21.4)	C2 (1214)	C2 (1260)	C2 (960)
4	P1 (4.4)	P4 (23.41)	C1 (13.41)	P3 (9.45)	P2 (18.2)	C1 (1212)	P3 (800)	P3 (870)
5	P3 (4.2)	C1 (23.09)	P2 (13.38)	C1 (8.30)	P4 (14.0)	P2 (1191)	P4 (604)	P4 (654)
6	P4 (4.17)	P2 (18.53)	P4 (11.68)	P4 (7.24)	C1 (13.1)	P3 (1146)	P1 (290)	P1 (280)

<sup>a</sup>Communal forest 1 = C1 (10 plots); communal forest 2 = C2 (10 plots); private forest 1 = P1 (5 plots); private forest 2 = P2 (5 plots); private forest 3 = P3 (5 plots); private forest 4 = P4 (6 plots).

indicate an older forest with lower exploitation levels than the other forests. Interestingly, this forest lies the closest to the road and households of any in the sample. Proximity to a road and human dwellings should lead to higher exploitation, but the owners have limited their own uses. Unlike the other forests, it has not been logged in recent memory, but it was resin-tapped. Steep slopes and cliffs impede access, and its location behind the owner's dwelling discourages trespassing. Household members graze several cattle in the forest, cut oak for firewood, and the women use dead pine to temper pottery. They do not harvest healthy pine trees. Several fruit trees have invaded from the household's adjacent orchard. As a result, this forest has a low basal area for oak (Table V), but the highest species richness of any private forest. This was the only female-headed household in the sample. The aging matriarch retained forest ownership, but she had designated one of her grandsons as heir, and he had taken over management decisions. As is typical for La Campa, men and women may own property, but they share use rights with household members.

*Private forest #2* contains the youngest forest area sampled, and lies further from a road or house than any of the other private forests. In three of the five plots sampled, the team measured a total of 90 young pine trees, representing 51% of all pine trees sampled in private forests. These plots skewed the mean for private forests' trees per plot. The owner, who acquired usufruct rights in the 1980s, indicated that this particular section had been logged previously by a sawmill, and he had let it regrow. The regenerating area is unusual compared to the rest of the property and the broader sample; older pines at a low density dominate approximately half of this private forest area. The owner grazes cattle and harvests firewood in the forest, but rarely cuts pine. His job, one of the few salaried positions in the county, has provided the resources for investments in land, cattle, and his children's education.

*Private forest #3* represents the longest period of uninterrupted usufruct by a single extended family. The current owner inherited the area from his father in the 1970s; the father had originally claimed a portion of it for agriculture and pasture as a young man. The current owner expanded the forest pasture in the late 1980s by fencing in an adjacent section of common property forest. The forest contains old trees scattered sparsely over the area. The low ranks in trees per plot and total basal area, along with the high mean DBH, indicate an old forest with a higher level of exploitation than found the other private forests. Of all the private owners, this one expressed the least concern to defend his forest from neighbors' incursions. He was the eldest and most humble of the owners; his family depended on a strong social network and reciprocity to deal with occasional hard times. His good reputation almost certainly was enhanced by a willingness



Table V. Basal Area by Forest

Forest	Forest area estimate (ha)	Area sample (m <sup>2</sup> )	Basal area for <i>Pinus oocarpa</i>	Basal area for <i>Quercus</i> spp.	Basal area for all other species
Communal 1	129	3000	8.197	0.024	0.079
Communal 2	30	3000	9.653	1.245	0.347
Total communal	159	6000	8.925	0.635	0.213
Private 1	1.8	1500	19.145	0.111	1.095
Private 2	2.4	1500	18.601	1.175	0.239
Private 3	12.0	1500	8.153	1.253	0.048
Private 4	9.0	1800	6.185	1.053	—
Total Private	25.2	6300	12.695	0.906	0.329
Total Forest	184.2	12300	10.856	0.733	0.273

to allow neighbors to use his forest, and this contributed to the high level of exploitation.

*Private forest #4* belongs to the only man in La Campa who has acquired legal, private title to his land due to his ample resources. The forest experiences intermittent, intensive grazing from the largest cattle herd in the county. The owner rotates cattle among a number of landholdings to avoid overgrazing. Of the forests sampled, this one alone did not burn during the season's forest fires, nor has it been resin-tapped. The owner strictly prohibits trespassing, and he reported that he rarely cuts trees. The team expected to find good forest conditions due to these circumstances. Instead, the forest presents the lowest values of all the forests in mean number of trees per plot, mean tree height, and total basal area.<sup>4</sup> The explanations for these results appear to lie in the property's history and management details that emerged during the research. The owner periodically clears saplings and undergrowth. Tree stumps found in plots suggested more cutting than indicated. Prior to this owner, the forest had been selectively logged, and used by the Catholic Church as pasture. According to local knowledge, the land has been grazed continuously since the nineteenth century, which constitutes the longest period of sustained use in the sample (and perhaps in the county). The long history of grazing and the practices that limit regrowth evidently have shaped the forest conditions.

*Common property forest #1* is the largest, fenced common property forest in the county. It provides firewood and pasture for a majority of households in La Campa's urban center and neighboring barrios. Cattle graze freely throughout the area. Women and children gather kindling, mushrooms, and herbs, and collect snails from its streams. The team observed many signs of tree cutting, from stumps to discarded branches and sawdust. This forest ranked in the middle for total basal area and mean tree height. The data and observations indicate a forest typified by younger, scattered pine trees, and the most intensive human intervention in the sample. Residents regard most of the forest as too rocky and steep for agricultural use, but parcels with more favorable conditions have been claimed for agriculture within forest boundaries. The forest has the lowest mean slope, easing access for human exploitation.

*Common property forest #2* is subject to the same uses as common property forest #1, but it reveals some interesting differences. Its soil samples have the highest (least acidic) pH values found in the study. Upon further examination, soil samples from this forest also proved to have higher concentrations of organic matter, nitrogen, phosphorus, and calcium than

<sup>4</sup>The team added a plot out of concern that the randomly selected plots were falling in atypically sparse areas, even though the forest appeared to be low in tree density.

the other study forests (the sample sizes are too small to be confident of the significant differences that appear with statistical analysis). If these differences are genuine rather than a result of random chance, they may be due to historic use patterns or inherent characteristics. In any case, the generally higher nutrient presence does not result in biologically apparent differences. The forest has the steepest slopes in the sample, which may inhibit exploitation. However, a major footpath to a nearby village crosses through the center of the forest; pedestrian traffic is high, and signs of human and livestock intervention abound.

## LAND TENURE AND FORESTS IN LA CAMPA

The history of La Campa's land use provides a crucial context in which to interpret the inconclusive search for differences between private and common property forests. La Campa's forests experienced little population pressure historically, and even today the county's population density remains below the regional mean. In the past, the low population density allowed decades-long fallows, so slash-and-burn agriculture did not lead to permanent forest degradation. Residents raised their subsistence crops of maize and beans in a field for 1 to 3 years, then abandoned it to fallow for common use. This practice allowed forest regeneration, and kept most of the land under communal control.

Until the latter part of the twentieth century, county laws and traditions required that every land claim had to be cleared and fenced to establish a usufruct claim. This required tremendous labor investments, and given that market access was difficult before transportation improvements in the 1970s, farmers had few incentives to claim land beyond that needed for their shifting fields and permanent usufruct plots (houselots, gardens, and occasional pastures). With abundant land, labor scarcity, and high fencing costs, the fencing law discouraged excessive land claims, and the clearing requirement prevented the creation of private forests.

The historical conditions that tended to conserve forest cover and favor common property land management have changed considerably in recent years. Land abundance and labor scarcity no longer characterize La Campa. The population has nearly quadrupled during this century (Table VI). Fencing has become easier with availability of reasonably priced barbed wire. The demand for agricultural land has outpaced subsistence needs of the growing population, because road improvements and national economic incentives have encouraged surplus production for the market. As a result, people with adequate resources have claimed land in excess of their needs, and this land has come from common property forests. The

**Table VI.** Population of La Campa, 1804–1988

Census Year	Total Population
1804 <sup>a</sup>	1159
1887 <sup>b</sup>	951
1926 <sup>c</sup>	1606
1930	1932
1935	2103
1940	2118
1945	2198
1950	3066
1961	2927
1974	3959
1988 <sup>d</sup>	5545

<sup>a</sup>*Población de las Provincias de Honduras, matrícula de 1801* (reprinted in Leyva 1991: 276–289). Total population of La Campa and Caiquín, which were listed as separate *pueblos de indios* (Indian communities). The pueblos' boundaries probably experienced changes before joining as the municipio of La Campa.

<sup>b</sup>República de Honduras, *Censo General Levantado el 15 de Junio de 1887*. The figure includes the populations of La Campa, Caiquín, and Guana-julque, which were listed in this census as separate aldeas, but later united as the county of La Campa.

<sup>c</sup>1926–1974: República de Honduras, *Censos de Población y Vivienda Levantados en Honduras de 1791 a 1974*.

<sup>d</sup>SECPLAN [Secretaría de Planificación, Coordinación y Presupuesto], *Censo Nacional de Población y Vivienda 1988*.

county no longer requires that usufruct parcels be cleared; this change has permitted a transformation of common property forest to private forest.

Today, La Campa officials note that residents have claimed a majority of the land for private usufruct. Very few have had the financial resources to pay for legal title, especially because this option has generally been restricted under national law regarding municipal *ejidos*. This has undergone some change; the National Agrarian Institute (INA) has been conducting a land titling program for the agricultural sector. The implications for La Campa have yet to become clear. National policies reflect a belief in the benefits of privatization, as one newspaper noted: “The Honduran economy will develop when territory that has never been private property

at last has an owner, for all the world's economies are supported by private property" (*La Prensa*, January 29, 1997).

Despite demands for agricultural land, Lacamperos depend on common property forests for firewood, lumber for construction, forest pasture, medicinal plants, and ocote (a resinous pine used for lighting and kindling). Most favor pine for construction, tempering pottery, and fence posts. They prefer oak for firewood. All La Campa residents have the right to harvest common property forest resources for household consumption, and they may also sell firewood and lumber to other residents. The household survey revealed that all of the households that cut their own firewood did so in common property forests. Residents feel that they need common property forests; however, their interest in forest conservation takes a lower priority than their need and desire for agricultural production.

Major changes in La Campa's forest cover have occurred since 1974, when the national government created the Honduran national Forestry Development Corporation (COHDEFOR), and declared all trees to be federal property. COHDEFOR was charged with managing Honduras' forest development and conservation; profit-making timber production received priority. Under COHDEFOR, La Campa residents lost the right to control logging and other activities in their common property forests. COHDEFOR granted contracts to regional sawmills to cut La Campa's forests. From 1974 to 1987, nearly all of the forests accessible from the county's road were logged by high-grading methods. Resin-tapping, conducted by local groups organized by COHDEFOR, often took place prior to logging. COHDEFOR's actions undermined resident's common property institutions and their traditional forest use rights. In this context, private forests became desirable. Residents fenced off forests in areas that had already been exploited or were less accessible for loggers. Even though this occurred in violation of COHDEFOR rules, private claimants persisted. Eventually, Lacamperos petitioned COHDEFOR to set aside forests for common property use. Urban center residents obtained permission for the two common property forests that comprise this study's sample; COHDEFOR approved the forests as communal woodlots mainly because the areas had experienced exploitation and appeared degraded.

In 1987, a majority of Lacamperos united to expel COHDEFOR and reestablish control over their common property forests. COHDEFOR left the county, and the common property institutions supported by the citizenry and embodied in the municipal council regained some of their lost status. Lacamperos reinstated a "residents only" rule for forest use and limited forest exploitation to subsistence needs. They prohibited logging, resin-tapping, and exportation of forest products from the county. The municipal council, with public support, passed additional resolutions to limit residents'

forest exploitation and constrain forest conversion. Most of these resolutions have been inadequately enforced, but the council has required permission and fees to fell healthy pine trees, and chainsaws are forbidden (with no known violations). Although private forest owners are subject to municipal laws forbidding export of forest products, they are allowed to use chainsaws on their own property, and they may cut pine trees without seeking permission or paying fees. In this regard, common property forests receive greater protection. Residents confided that surreptitious export of firewood does occur; however, few feel that this should be sanctioned because it provides necessary income, particularly for poorer Lacamperos.

Common property forests have apparently shrunk since 1987 due to private claims. Interviews with residents indicated that private forests had reduced the area that they could enter to collect firewood. They concurred that it had become difficult to find ocote, and elders reported that the time needed to find firewood had increased since their childhood. People observed that there was no control over the amount of firewood collected, and some people complained that certain residents cut trees needlessly or wastefully. These reports suggested that the common property forests of La Campa were experiencing degradation. Owners of private forests often presented the most critical view of common forests, while asserting that they protected their forests from excessive exploitation. All but one of the private owners admitted that they used common property forests to harvest some of their firewood. They knew it reduced exploitation of their own forests. Several explained that they had fenced in forest for their children's future, when common property forests might be too degraded or diminished to provide firewood, pasture, lumber, or land for agricultural expansion. The private forest owners comprise a more privileged segment of La Campa's population; by claiming land in excess of their needs, they have exacerbated the pressure on the common property forests left for the majority of the population. Ironically, their concern to create personal forests against a possible tragedy of the commons has only served to enhance that possibility for the collective, of which they are members.

## DISCUSSION AND CONCLUSIONS

According to theoretical predictions, the relatively open-access conditions for common property forests in La Campa should lead to more degraded forest conditions than in private property. The results of vegetation and soil data analyses do not support such a conclusion. The differences observed between private and common property forests at the aggregate level are minor. In part, these results occur because the common property

forests do present some limits on residents' use and successfully prevent nonresidents' use. At the same time, certain private forest owners make decisions that inhibit forest growth or permit exploitation. Similarity in forest outcomes between the different tenure forms also relates to shared elements in past and present uses. All but one of the forests experienced resin-tapping, only one forest escaped logging, and all have been subject to livestock grazing and subsistence exploitation. Yet the private forests in the sample have been in existence for over 10 years. This time period should be adequate for significant differences to emerge if private property provided adequate incentives for owners to use resources wisely and limit exploitation as compared to common property forests.

The data and interviews suggest that private forest conditions reflect an owner's land use preferences and his relationship with the community. Owners varied in their perceptions of the future value of the resource and effects of management decisions. Two of the owners have made decisions that incorporate forest protection and permit regeneration; they see this as providing future opportunities to expand pasture or cut timber for construction. Data from their forests accounted for the slightly higher vegetation structure values in private forests. The other two owners have made choices that appear questionable from a forest conservation perspective. One utilized methods that limited forest regeneration in order to improve pasture. The other allowed neighbors to exploit his private forest freely, as part of his reciprocal relationships in the community.

All of the owners noted that they claimed the forest primarily to serve for private cattle pasture, and this shaped their management. Cattle represent an important economic investment, even though only one of the private forest owners owns enough cattle to derive a consistent income from their sale. Regional market prices for beef have been climbing and the transportation costs to market have apparently fallen as roads have improved. The owners' decisions suggest that acquisition of private forest, and its relative security as compared to common property forests, does not offer adequate incentive to convince owners to practice sustainable forest management if they have other priorities. Still, all of these owners felt that they managed their forests well and achieved the benefits that they sought. The sustainability of their resource use, even if doubtful, cannot be confidently evaluated without longitudinal analysis.

Although the data show that tenure alone does not constitute a good predictor for forest conditions in La Campa, residents do perceive differences between private and common property forests. Owners of private forests (including those whose private forests were not sampled) believe that their forests are in better condition than common property forests, even though the sample's data do not clearly support this contention. Their

assertions may be made to justify their appropriation of land at the expense of their neighbors. But non-owners agree that private forests are in better condition. Therefore, sampling may not capture differences that Lacamp-eros discern owing to their intimate knowledge of the land. Significant differences may eventually emerge between private and common property forests that statistical analyses do not yet show. Alternatively, it appears that the contrasts perceived by Lacamp-eros between private and common property forests relate primarily to their contrasting social and economic implications for the community.

The most important difference appears to be that of access. Even though the most owners lack legal title, usufruct rights bear a similar weight in the county. In general, residents said that they would not enter a private forest unless they had permission from the owner. The issue was not one of legality, but of neighborly respect. Private forests constitute a component in social stratification, and offer a hedge against a possible “tragedy of the commons” for their owners. Residents who do not own private forests often wish that they could, but they see private forests as a threat to common property and their own well-being. Poorer households have little hope of fencing forest for private use. The loss of forest access would prove a severe hardship for many because no other affordable sources of cooking fuel exist.

Regardless of social status, residents recognize that there is not enough forest for everyone to have a parcel large enough to meet their household needs. Many people nevertheless believe that privatization would provide better protection for the forest than the current common property institutions. In recent years, people across the socioeconomic spectrum have begun to see deforestation as a problem. Farmers blame deforestation for a widely perceived decline in precipitation, and many express concern that clearing for coffee in watersheds could lead to water shortages during the dry season. At the same time, they present sound economic rationales for clearing forest for agriculture and coffee. Ironically, deforestation (as opposed to overexploitation) of common property forests only occurs when a parcel has been claimed for private usufruct. Residents acknowledge their failure to effectively regulate common property forest use or prevent further claims by private parties. Even when people argue that survival of common property forest is in the interests of the majority, they doubt that the institutions will be strengthened.

The possibility of improving the common property forest institutions faces major hurdles. First, people continue to believe that they have access to adequate forest resources. One hundred percent of the households surveyed responded that there was no shortage of forest resources. This is despite their responses that common forests had diminished, deforestation posed a problem, and the time needed to gather firewood had increased.



Their perspective appears justified in the broader context. Compared to surrounding counties, Lacamperos buy and sell their forest products more cheaply. Outsiders, including COHDEFOR technicians, confirm the view that La Campa is relatively rich in forest resources. Lacamperos perceive forests as becoming scarcer, but not scarce enough to cause hardship or to change behaviors.

Second, Lacamperos see common property rights as insecure due to national policies promoting privatization. Without secure tenure, the potential advantages of enforcing limits on common property forest exploitation must be balanced against the risk of losing common property rights. Why should people work to improve forest conditions if private claimants might usurp the benefits?

Third, increased restrictions on forest resource use would require the greatest economic sacrifices from poorer households. They could lose income from the illegal export of firewood, and women in particular might suffer if limits on pinewood harvesting restricted pottery production and sales. Fourth, increasing social heterogeneity appears to undermine the possibility of creating consensus and cooperation from all parties that use the forest. The better-off households can survive without common property forests, so they have little to gain from supporting or complying with stronger common property institutions. Without cooperation from the wealthier segment of the population, the poorer majority cannot be assured that their cooperative efforts would be respected.

Although the future of La Campa's common property forests appears uncertain, it is too early to predict their demise. Lacamperos' experience with COHDEFOR indicates an ability to cooperate and self-organize to overcome a serious threat to their well-being. Increasing scarcity of forest resources and further reductions in common property forests could eventually motivate residents to use forest resources more sustainably. Regardless, private forest owners have greater confidence that their rights are permanent. There is no known case in the history of La Campa in which a usufruct claim has been expropriated as long as the claimant resides in the county, respects neighbors' rights, and maintains fences.

This study highlights the importance of evaluating forest property rights and outcomes in relationship to the relevant context. Decision making by forest owners, whether joint or individual, occurs with respect to historical processes, demographic conditions, ecological constraints, and social and political factors (cf. McCay & Jentoft, 1998). La Campa's experience adds to previous research that shows that private property may not necessarily improve on common property management, even when common property presents clear shortcomings. Privatization does not necessarily lead to wise forest management, and it could result in further impoverishment for

the county's poorest. Common property forests counteract processes of socioeconomic differentiation by allowing households to use forest resources in proportion to their needs rather than in proportion to their wealth. The study implies that achieving sustainable forest management in La Campa or elsewhere will require improved understanding of the variables with which tenure arrangements interact to shape forest users' behavior.

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