

# A tale of two roads: Land tenure, poverty, and politics on the Guatemalan frontier

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## Abstract

Agricultural frontiers are hot spots for the most dramatic land cover change in the history of humankind: forest conversion to agriculture. They are also areas of unusually rapid population growth and acute poverty, with scant access to public services and infrastructure. Although a large body of literature explores the determinants of land cover change on the frontier, one issue that has been largely unstudied is that of frontier political and socio-economic development. This paper reports on data from 28 communities along an agricultural frontier in a core conservation zone of the Maya Biosphere Reserve (MBR), where the predominant land tenure systems at the community level appear to be related not only to land use, but also to political organization and human development indicators.

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## 1. Introduction

The Sierra de Lacandón National Park (SLNP), a core conservation zone of the MBR (Fig. 1), offers a unique case study of land organization and political and socio-economic development. Markedly different land tenure patterns have emerged along the two main roads adjacent to the park, the Ruta a Bethel and Ruta a Naranjo. The land tenure pattern along the latter road consists mainly of cooperatives and has experienced less population growth, less deforestation, and superior human development than the former, which largely consists of farm families squatting illegally on park land. Given similar ecological endowments, settlement history, and market access, I speculate that differences in political organization and human development between the two regions may be partially attributed to the distinct land tenure regimes characteristic of the two regions. Various authors have noted the importance of

legal land tenure, not only for sustainable agriculture, but also for economic development in Latin America in general (Vargas, 1999) and in Guatemala's Petén in particular (e.g., Kaimowitz, 1995; Katz, 1995; Clark, 1996; Schwartz and Grunberg, 1998; Grunberg, 2000).

While scores of studies have documented farmer land use practices contributing to forest clearing in the tropics, few studies have examined factors contributing to socio-economic well-being on the frontier. Focusing primarily on land use, Moran et al. (2001), Rudel et al. (2002), and Walker, 1999 describe evolutionary stages of frontier development in which subsistence farming ultimately yields to land consolidation, market-oriented production, and attendant socio-economic development. Among the few studies explicitly examining socio-economic indicators among farm households, Murphy and colleagues (1997) found that proximity to a road, legal land tenure, farm size, access to credit, and cattle ownership were associated with higher socio-economic status. In the SLNP, these factors are interrelated. The first farm households that settled the region claimed the best land (most accessible to the road) and large

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Fig. 1.

farms. Farms along the road have been eligible for legal land tenure, unlike farms inside the park. This study compares differences between two distinct regions of the SLNP relative to political and socio-economic development. Data were obtained from interviews with community leaders and key informants in each of the 28 communities in, and adjacent to, the SLNP.

Agricultural frontiers are among the most dynamic as well as sociologically and ecologically important areas on the planet, for it is along agricultural frontiers where forest conversion to agriculture is responsible for most of the deforestation on the earth (Myers, 1994; Achard et al., 2002). This certainly appears to be the case in Latin America (Rudel and Roper, 1996; Carr and Bilsborrow, 2001). A host of interacting political, economic, demographic, and ecological causes are thought to act on deforestation across different scales (Geist and Lambdin, 2001; Turner II et al., 2001). One proposed causal factor of pertinence to this paper is land tenure security (Southgate et al., 1990; Schneider, 1993; Mahar and Schneider, 1994). Although this variable has been examined in a multitude of studies on land use and land cover change, few studies of agricultural frontier regions have investigated land tenure structures in relation to human development outcomes such as political representation, health care, and education (Murphy et al., 1997 is one exception). Since such factors are hypothesized to also link back to land use outcomes, attention to this topic may also contribute to a more complete understanding of how human development indicators may relate to deforestation—the topic of the vast majority of research in Latin American agricultural frontier regions.

Deforestation in the Latin American tropics is recognized as a major environmental concern among international government and non-government institutions. These concerns must be shared with these institutions since much of the region's deforestation areas coincide with some of the most socio-economically marginalized places in Latin America. The growing number of frontier farmers concentrated on lands with inadequate rainfall, poor soil conditions, and high erosion potential constitute a large portion of the poorest 20% of the rural population in developing countries. This is particularly important in Latin America where small farmers suffer more from land distribution inequity in comparison to farmers in other regions. Here, fully one-quarter of the poorest 20% occupy ecologically impoverished lands and more have little or no land at all (Leonard et al., 1989).

The soil and woodland degradation unleashed by deforestation on marginal lands has led to a chronic cycle of underdevelopment in many rural areas of the humid tropics, where primary resource extraction is necessary for subsistence. Indeed, settlers often colonize along roads traversing oxidized, nutrient-leached soils, unintended for agricultural development (Moran, 1983; Mahar, 1989; Almeida, 1992). Most frontier colonists practice semi-subsistence, land extensive agriculture that demands forest burning to fertilize nutrient-impoverished soils. In many places, rapid forest elimination from shifting cultivation spurs soil erosion, the sedimentation of waterways (Southgate and Whittaker, 1992), nutrient cycle perturbation (Fearnside and Barbosa, 1998; Rasmussen, 1998), and soil impoverishment (Ehui and Hertel, 1992; Lal, 1996)—all of which diminish small farmer capacities to maintain crop yields.

Frontier agricultural regions are plagued by a host of problems for settler families, including poor infrastructure in the form of roads, and lack of access to water, public works, schools, and health care (Murphy et al., 1997). It is thought that colonists are pushed by poverty to the frontier where capital, technological, market, and labor constraints further their immiseration (Barbier, 1997). This is particularly true for the majority of migrants (or settlers) who, following the initial influx of colonists, are left to select among lands of even poorer transportation access or production quality (Almeida, 1992; Murphy et al., 1997). While those colonists who are able to survive the first several years of settlement have sometimes experienced wealth improvements, the first phase of frontier colonization is generally characterised by indebtedness and low yields (Schmink and Wood, 1993; Stewart, 1994; Walker, 1994; Murphy et al., 1997). Often, this is quickly followed by consolidation in the hands of rural elites, resulting in an increase of both very large and very small plots (Martine, 1990; Bilsborrow and Pan, 2001), and the

subsequent exodus among the poor farmers, often to another rural frontier (e.g., Barbier, 1997).

Frontier colonists also suffer from the concentration of disease vectors present in tropical forests, unsanitary conditions, and the lack of health care (Schmink and Wood, 1993; Dale, 1994; Stewart, 1994). Malaria runs rampant in many humid frontier environments. For example, claiming only 0.66% of Brazil's total population in 1985, the Brazilian state of Rondônia (a frontier region whose population grew 400% from 1970 to 1980) suffered 42.1% of Brazil's documented malaria cases (Martine, 1990). In addition to affecting quality of life, health setbacks can also severely diminish labour capacity (Henriques, 1988).

Yet settlers invariably claim that their present situation is better than their previous one (Dale, 1994; Murphy et al., 1997). Given the tough conditions on the frontier, this suggests migrant selectivity of those who, shunning advantages offered in other destinations, desire land on which to work and to own above all else.

Frontiers are far from spatially homogenous and are in rapid flux. Despite this, variability in indicators of human well-being, though less pronounced than in longer-settled regions, is measurable. Place (location) matters even at the micro-scale. While frontiers are characteristically poorer than longer established regions, some places on the frontier are worse-off than others, and this variability exhibits human development and environmental implications. Following a description of the research methodology and of the SLNP, socio-economic differences within and between the communities of the Park along the Bethel and Naranjo roads will be investigated with a focus on land tenure regimes as a potentially key explanatory factor.

## 2. Research methodology

Data for the study were obtained from interviews I conducted in 1998 with community leaders such as *alcaldes auxiliares* (locally elected official representing the municipal mayor), members of *comités de pro-mejoramiento* (similar to town councilmen), teachers, and health promoters in each of the 28 communities within and adjacent to the SLNP (6 located along the Bethel Road, the remaining 22 along the Naranjo Road) (Fig. 2). Five of the six communities in the Bethel area used in this analysis are cooperatives. The 22 communities along the Naranjo Road are comprised mainly of squatter farm families. The few farmers with some claim to legal title to their land among the communities of the Naranjo region have farms on the northeastern side of the Naranjo road, which is considered part of the buffer zone of the Maya Biosphere Reserve (MBR). Information was gathered during fieldwork in 1998 and a follow-up visit in 2000.

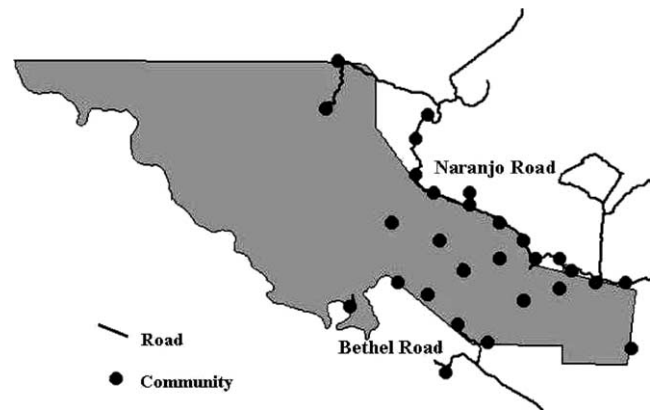


Fig. 2. Sierra de Lacandón National Park.

Political and economic data gathered from the interviews feature information on local political and institutional organizations, including community and regional politics, and the role of conservation and development organizations in the area. Socio-economic data encompass development and living standard indicators such as access to and quality of education and health care, physical characteristics of homes, and the availability of electricity, energy for cooking, and water.

The undertaking of community interviews permitted coverage of the entire SLNP region, which at the time was not feasible at the household level. It also allowed for a broader and richer context within which to situation a subsequent sampling of household data. Moreover, interviews with community leaders led to valuable changes in the substance and language used in household surveys, data from which are reported in Carr (2004) and to develop trust with informants, enhancing the accuracy and reliability of the data (Carr, in press).

## 3. The Sierra de Lacandón National Park

UNESCO, with heightened concern over the region's rapid, human-induced ecological change and working jointly with a host of institutes from donor nations, established the MBR in 1989. Occupying nearly 60% of Petén and 20% of national territory, the MBR forms the heart of the *Selva Maya* (the largest lowland tropical forest in Central America). The MBR also serves as a pan-continental biological bridge, a cardinal repository of biodiversity and archeological sites, including Tikal—the remains of the magnificent ancient Mayan city (The Nature Conservancy, 1997).

Established in 1990 as one of four *core zones* (areas of strict conservation) within the MBR, the SLNP is the second largest national park in Guatemala (Fig. 1). More than 10% of its forest canopy has been eliminated since 1990, the era during which most of the park's 3000

families settled in the area (Carr, 1999; Sader et al., 2000).

The historical course of population settlement in the SLNP bifurcates along its two channels of colonization, the Road to Naranjo and the Road to Bethel. The Bethel Road region was settled in the 1960s and 1970s when the Guatemalan government was sponsoring colonization in Petén. The Naranjo region was populated in the 1980s and 1990s when the government was taking the opposite tack, attempting instead to prevent further settlement in the MBR.

Running northwest along the park's core zone, an open-access situation along the Naranjo Road has fostered haphazard settlement (USAID/Guatemala, 1990). More than 40 farming communities have sprung up pell-mell along the road in recent years. Farms on the western side of the Naranjo road are located within the SLNP and therefore are not recognized by the national government and are officially ineligible for public works and other government investments. Colonists hail from diverse regions of Guatemala and include Ladino (Spanish-speakers of mixed Spanish-Indigenous descent) and indigenous families.

Conversely, most communities along the Bethel Road consist of agricultural and agro-forestry cooperatives. Internal codes of land use and communal and familial land rights were established in accordance with MBR restrictions and in the spirit of environmentally benign development. Consequently, these communities have cleared approximately half the forest, per capita, than their Naranjo road neighbors. Squatter farms, however, were not the category of farm responsible for the greatest forest clearing; rather, the farms with the greatest extent of cleared forest were privately owned parcels, as access to credit led many of these farmers to purchase cattle (Carr, 1999).

In addition to potentially affecting land use, community infrastructure, and human development indicators, it is possible that the distinct land tenure regimes between the two regions plays a role concerning the variation witnessed in population change (Carr, 2000). The population of the 28 communities with farms in the SLNP almost doubled to approximately 17,000 people from 1993 to 1998 (Carr, 2000). Population grew more rapidly due to both higher in-migration and natural population growth (high fertility) along the Naranjo Road (Carr, 2000). To discuss briefly local fertility rates, the total fertility rate in the SLNP greatly exceeds the national rate, and even outstrips the national rural rate, which at 6.1 births per woman is the highest in Central America (Carr, 1999). Colonists migrated from various regions of the country, with the departments of the southeast comprising the most represented areas of origin, followed by the Pacific Coast, and the Verapaces (Carr, 2000). Approximately two-thirds of the migrants are Ladino. Q'eqchi' Maya from Alta and Baja Verapaz

represent the largest indigenous group in the area. The park's communities are primarily divided between Catholics and Evangelicals, with agnostics comprising a minority fraction (Carr, 2000).

Since the SLNP is a core conservation zone of the MBR, and settlement in the park is illegal, policy investments in the area have focused on forest conservation primarily, with human development a secondary concern. Various non-government organizations (NGOs) work on practises encouraging more intensive land uses and promoting forest conservation. Land tenure for farmers in the buffer zone of the park has been a priority of only one NGO: CARE. If some of the differences between the two regions reported here are attributable to differences in land titling, this policy change could prove to be one effective strategy to improve community infrastructure, quality of life, and possibly to mitigate population growth and farm impact on the environment. The following section presents results from interviews with community leaders and key informants in the SLNP. The first part examines the role of politics and NGOs among the communities in the Park, followed by a discussion of socio-economic indicators.

## 4. Results

### 4.1. Politics and NGOs

As in early Amazonia settlement frontiers (e.g., Bunker, 1984), frontier settlers in the SLNP have begun to develop their own political systems in lieu of a strong governmental and non-governmental institutional presence. The Naranjo Road communities lag their Bethel Road neighbours relative to the development of political representation and the insertion of national and international economic development institutions. This difference is evident in the relative percentage of towns in the two regions that benefit from external political representation from locally elected town leaders, vigilance, agriculture and forestry committees, and the presence of women's clubs. These indicators are among the few quantitatively measurable variables of political and institutional development at the community-level in the region. While an in-depth ethnographic analysis of power relations, their development, and their negotiation is beyond the scope of this paper, I will briefly describe the differences in these indicators between the two regions.

In place of formal political representation (and the attendant benefits of government-sponsored public works) for the majority of communities located within the SLNP, area communities have galvanized forces at the community and regional level to assert their needs through a host of informal organizations (Table 1). At the community level, mirroring politics in migrant origin

Table 1  
Community political and community organizations

	Mayor (%)	Town council (%)	Women's group (%)	Vigilance (%)	Agriculture (%)	Forestry (%)
Total Ruta a Bethel ( <i>n</i> = 6)	83	83	67	33	33	33
Total Ruta a Naranjo ( <i>n</i> = 22)	77	77	5	0	5	5
Total ( <i>n</i> = 28)	77	77	17	7	10	10

Data from interviews in 28 communities in 1998.

areas, each community appoints an *alcalde auxiliar* by vote. Since only the larger political units, *municipios*, have *alcaldes* (mayors), towns appoint *alcaldes auxiliares* to lead community decision-making and to formulate and promote an agenda for community development. Town members also select a *comité de pro-mejoramiento* (similar to a town council), which serves as counsel to the *alcalde auxiliar* in levying decisions, both judicial and legislative. The Bethel area communities had slightly greater political representation from *alcaldes auxiliares* and *comité de pro-mejoramiento* than the Naranjo region communities.

Women are largely excluded from the community and regional political process. One exception is La Unión Maya Itzá, a community of refugees who returned to Guatemala from Mexico in 1996. In this community, the assistant *alcalde auxiliar* was a young Maya woman. Usually, however, women's concerns are voiced in *comités de mujeres*, or women's committees. Issues broached in women's meetings may be petitioned to the *comité de pro-mejoramiento*. While common among the communities along the Bethel Road, these women-based committees were largely absent among the communities of the Naranjo Road.

Other community groups include forestry, agricultural and vigilance committees. Forestry committees oversee labor, land, and capital allocations to forestry cooperatives, which are located only among the Bethel region communities. Agricultural committees consult on solutions to agricultural problems and share successful farming techniques. Vigilance committees safeguard community regulations and report infractions of them. Only one Naranjo area community had an agricultural committee compared to one-third of the Bethel communities. One-third of the Bethel communities also had vigilance committees compared to none among the

Naranjo region. These groups decide strategies to safeguard the integrity of landholdings, crops, and forest products on community lands from external and (occasionally) internal threats. As illegal logging in the park from Mexican and Guatemalan nationals is a constant threat, the presence of these committees among the forestry cooperatives of Bethel is of greater urgency than for the Naranjo-area communities, whose primary resource is the ubiquitous maize.

In both regions, and particularly within Bethel, the presence of NGOs is much greater than that of government organizations (Table 2). There are an estimated 40 or more NGOs operating out of the departmental capital "metropolitan" area of Santa Elena-San Benito-Flores. Several of them work in the SLNP, including Centro Maya, The Nature Conservancy, Defensores de la Naturaleza, CARE, and Guacamaya. These NGOs promote selective timber and non-timber forest extraction, agricultural intensification techniques, land tenure for buffer zone farms, and park conservation. Fundación Guacamaya and Fundación para el Apoyo Técnico en Proyectos (FUNDATEP) support health care services and sanitation projects. Health services providers are grossly understaffed and promoters reach each community only sporadically. Lastly, due to its status as a community of returned refugees, several national and international organizations are involved with land use and development in La Unión Maya Itzá, including the UN High Commissioner on Refugees (UNHCR). While all of these NGOs operate along the Bethel Road, Centro Maya, FUNDATEP, and the UNHCR are absent along the Naranjo Road.

Place (location) matters not only between the two regions but also within them. In both regions, communities situated along the road enjoy greater assistance

Table 2  
NGOs and GOs working in the Sierra de Lacandon area

<i>Alto Comisionado de las Naciones Unidas para Refugiados (ACNUR)</i>	UN High Commissioner on Refugees. Helps returning refugees in La Unión Maya Itzá
<i>Centre Maya</i>	Supports sustainable forestry and agriculture, mainly among Bethel Rd. cooperatives
<i>Fundación Guacamaya</i>	A health organization with coverage of the municipio of La Libertad subsidized by the national Public Health and Social Assistance Ministry (MSPAS)
<i>The Nature Conservancy (TNC)</i>	Supports park conservation and community relocations
<i>Defensores de la Naturaleza</i>	"Defenders of Nature." Main NGO in charge of the protection of the SLNP
<i>CARE</i>	Promotes land titling efforts along the Naranjo road
<i>Consejo Nacional de Areas Protegidas (CONAP)</i>	"National Council on Protected Areas." Part of the Executive branch of the Guatemalan government

than those within the park. Indeed, institutions remained uncertain even of the location and size of two small communities within the park until I visited them in the spring of 1998. It is interesting to note the lack of awareness among community leaders to the presence of certain organizations. For example, CONAP is the *de jure* party responsible for promoting and enforcing rules regarding park conservation in all of the communities in the SLNP area, yet its presence remained unknown to leaders in several remote communities (based on continued contact with informants from NGOs in Petén I doubt this is the case today).

Both the development of internal politics and the presence of external agencies appear more robust among the Bethel Road. Cooperatives are legally recognized and are eligible for government aid and credit. Since each individual's actions are more likely to impact the whole community, the cooperative structure may also promote the development of community-level political organizations. The greater development of such internal structures, in turn, may facilitate the success of NGOs. With limited resources, NGOs may be betting that investments in these communities have a higher probability of success as defined by adoption of programs and the efficiency of their implementation.

#### 4.2. Socio-economic indicators

##### 4.2.1. Economic earnings

The greater involvement of NGOs has helped boost economic revenues among participant cooperatives. Agro-forestry programs promoted in the Bethel Area by Centro Maya have led to notably higher income for cooperative members than their squatter farmer Naranjo neighbors who depend on maize for their primary source of revenue. One acre of forest selectively harvested for timber provides several times the value of a year's corn harvest on the same parcel of land (Gretzinger, 1998). Indeed, most of the predominantly maize farmers of the Naranjo Road are in debt or earn no more than several hundred dollars annually (Carr, 1999). However, NGO programs do not always act primarily in the best interest of locals, in some cases even blaming farmers for ecological degradation (Sundberg, 1998).

Earnings data were collected at the household level presented in Carr (2004). In a measure of basic assets, most families had only a radio, few had a horse or burro, and only a handful of the 279 households interviewed had an automobile or chainsaw. Local commercial "middlemen" and ranchers formed the rural aristocracy. Middlemen usually owned a large truck to transport maize from the local farmers to Guatemala City. These men also frequently owned small stores and served as the local bankers, lending money to farmers in exchange for a portion of their harvest. Typically,

a larger community on the road had one or two local middlemen while smaller communities usually had none, depending on the larger communities for this service. The other predominant type of entrepreneur in the region was the chainsaw owner. Usually one or two owners per community worked as day laborers felling trees on farmers' plots. Among the majority of small farmers, money was made selling agricultural produce (predominantly maize) working on neighbor's plots during planting or harvest seasons, or working on ranchers' farms clearing forest, weeds, or building fences. Wages averaged 25 *Quetzales*<sup>1</sup> per day, approximately \$3 US. Farmers rarely made more than 1000 *Quetzales* (approximately \$150 US) per month when averaged over the year, and many are in the red at the end of the year from debt to middlemen. Earnings are highly variable. A good maize harvest on a typical plot of several hectares could yield up to a thousand dollars or more, but more frequently droughts, plagues of infestations, and fires claim much of a farmer's harvests. This extremely low level of income marked by severe annual variability is typical of farm households in emerging agricultural frontiers (for example, the Ecuadorian Amazon in the 1980s; see Murphy et al., 1999).

##### 4.2.2. Health

The park's inhabitants suffer from a dearth of health care. Similar to frontier regions in Brazil and elsewhere, malaria is pervasive and intestinal infections are common, especially in children (Table 3). Although I did not specifically research magnitude or frequency of illnesses, all but a handful of informants claimed to have been infected with malaria at some time, and people complained that virtually all infants become seriously ill with gastrointestinal infections at least once and usually several times during infancy. As a result, infant mortality is exceptionally high, with most women losing one or more children during their lifetime.

The great reliance on maize means that some diarrhea cases may be related to pellagra, a disease induced by niacin deficiency. Anecdotally it did appear that some people had modest levels of skin inflammation, the primary symptom of pellegra, though this is of course for from conclusive. Pellegra incidence is surely much lower than it might be due to the widespread practice of nixtamalization, alkali processing which changes the nutritional quality of maize by increasing the bio-availability of niacin and glutelin.

Acute scarcity of health centers and professional medical attention plagues the region. Only seven communities have rudimentary health centers, but even these are only irregularly attended by visiting health care

<sup>1</sup> The Quetzal is the national monetary unit of Guatemala and its national bird. At the time of interviews in 1998, one dollar traded for seven *Quetzales*.

Table 3  
Socio-economic indicators

	Health care		Education			House composition		
	People per health promoter	Health centers per community	Primary schools per community	Number of teachers per community	Literacy	Walls of branches	Roofs of Guano Palm	Latrines
Total Ruta a Bethel ( $n = 6$ )	130	60%	1.0	5.4	83%	80%	83%	48%
Total Ruta a Naranjo ( $n = 22$ )	273	17%	0.8	1.7	69%	78%	87%	9%
Total ( $n = 28$ )	227	25%	0.9	2.4	70%	79%	89%	16%

Data from interviews in 28 communities in 1998.

workers (Table 3). Most communities have *promotores de salud*. *Promotores* are volunteer health workers whose training comes from personal experience, apprenticeship under past *promotores*, and, in some cases, from participation in a brief training workshop. Midwives (*comadronas*) are also present in most communities. These women volunteers usually have not participated in any formal training for attending births, but rather have learned their trade from elder *comadronas* in the community.

The ratio of health promoters to people and the percentage of communities with health centers was notably higher among the Bethel communities. This may be due to the desire of NGOs, such as Centro Maya, which maintains a constant presence in the area, to ensure at least minimal health care for their own workers as well as for community members. Although Centro Maya does not provide or promote health care, the strong presence of this NGO among the Bethel communities enhances information diffusion on how to train locals as promoters and may empower community members to demand improved health care. As a refugee community, La Unión Maya Itzá is the only community in the park with an occasional resident doctor. On shifts of several weeks, several times a year, these doctors are subsidized by the UN and their presence may provide improved care for neighboring communities in the Bethel area. In the case of an emergency, residents from neighboring communities can visit this doctor rather than traveling more than 100 km to the nearest hospital.

#### 4.2.3. Education

As small-farm agriculture in the SLNP scarcely provides subsistence, few resources are mustered for higher-order needs such as education. Few children attend school regularly in the SLNP communities. Four communities had no school at the time interviews were conducted, while four others had no teachers (Table 3). Because schools in the area are unlikely to offer education beyond third grade, and because many children do not go to school even when classes are offered, the school attendance rate in the SLNP communities is lower than the national rural rate of 26% (Instituto Nacional de Estadística, 1999). Where children were

attending classes, they enjoyed few resources other than several shared pens and notepads.

The government does not recognize communities located inside the park, and those adjacent to the park are not a high priority on government funding agendas. In the case of park communities, no property taxes are paid and no government investment is returned, hence the lack of government-funded schools. Children's education in communities in the park's predominantly indigenous interior (i.e. those within the "core zone" as shown in green in Fig. 2) depends on the few volunteers with sufficient skills to teach basic reading and writing skills, but few adults are able to provide such services. Even if they did have time away from the long hours invested in farming for household survival, only half the adults have ever attended school, and only a handful achieved a level higher than third grade (Carr, 1999).

One community exception in the region, La Unión Maya Itzá, supports several voluntary teachers. As refugees in Mexico, residents of this community were exposed to much better access to education during exile. These diverse Maya groups, speaking more than a dozen native tongues, galvanized forces while in Mexico to provide for their children. Today, unlike other communities, many young adults in this community are primary school graduates, and some have even attended secondary school.

Largely as a result of La Unión Maya Itzá, but also due to ample coverage in other communities, the Bethel area enjoyed notably higher teacher-to-population ratios and no Bethel community was without a school or without at least one grade-school teacher. While literacy is far from universal within the Bethel region, the Bethel communities, nonetheless, reported considerably higher literacy than the Naranjo communities, some of which had no schools, or had schools but no teachers. The exceptional example of La Unión Maya Itzá aside, legal recognition implicit in a cooperative appears to facilitate better education access and quality among the Bethel communities.

#### 4.2.4. The farm homestead

Materials used for household construction represent one of the few variations among households relative to



Fig. 3. Farm houses in the SLNP's interior.

material manifestations of development. Household building materials therefore serve as a good proxy for economic development in the absence of other measures. Nearly all the houses in the region were constructed from materials extracted from the forest (Table 3). However, as with other development indicators reported here, differences are evident both between the two roads and within the two regions based on distance to the road. For example, while “*guano*” palm leaf roofs are ubiquitous (see Fig. 3) for homes located inside the park, some of the houses on the roadside have metal roofs (*lámina de zinc*) because of donations made by NGOs and greater personal wealth. With few exceptions—again these exceptions will be found along the road in longer-settled and more financially able households in the Naranjo area or among the Bethel communities—house floors consist of packed earth. Lastly, with the exception of the Bethel cooperatives, few homes enjoy even simple sanitation, such as outhouses.

Few homes have electricity. Kerosene lamps and fires provide lighting at night. Food is prepared with wood from the forest or from farmland in fallow. The latter option is more common because recently fallow fields on the frontier are often strewn with a clutter of unburned branches remaining from initial clearings.

Water is collected in a communal well or is carried from the closest water source. Women and children may spend several hours a day lugging buckets of water on their head from the nearest river, stream, or pond. Some households were located as far as 7 km from water sources. However, Bethel households are never more than 10 km from the mighty Usumacinta River or one of its stream tributaries, whereas Naranjo communities rely on less reliable wells and seasonally fluctuating ponds.

In addition to the immense labor invested in this chore, water sources are often polluted, scarce, and overused. Clothes are washed in the same water that is used for household consumption. In the case of a pond, this water becomes increasingly saturated with surfactants over time. In the case of a river or stream, the pol-

lutants produced by communities upstream (including detergent, herbicides, and human waste) contaminate the drinking water of downstream consumers. Human waste infiltrating streams is particularly problematic among the more scarce water sources of the Naranjo region where only a fraction of the Naranjo homes have latrines, compared to nearly half the homes in the Bethel region. Although the quality of home construction is similarly rudimentary in both regions, the large difference in proportion of homes with latrines indicates greater incipient home improvements among the Bethel communities.

Another indicator of development is the number of homes with satellite dishes and televisions. Among Bethel communities, several small businesses that serve as community stores, restaurants, bars, general meeting places, and a handful of homes had recently installed satellite dishes in anticipation of the 2000 World Cup soccer tournament. Conversely, only in the largest towns along the Naranjo Road were businesses catering to soccer fans able to invest in such a luxury. Such differences in home and business improvements between the two regions is indicative of the greater income produced among the cooperative communities. This income depends on cooperation in business ventures such as timber harvesting, which yield more revenue than the pervasive small farm maize harvesting of the Naranjo region. Such ventures, in turn, are predicated on the cooperative structure and nurtured by NGOs which appear to be particularly attracted to investment in these communities.

## 5. Conclusion

The tale of two roads is one of cooperatives and squatters. Life in the SLNP is difficult, but regional variability in human development indicators and community infrastructure is salient. Differences may be partially explained by political, social, and economic factors related to the distinct land tenure regimes in the two regions. Cooperatives are legally recognized by the government and are therefore eligible to receive tax aid and bank credit. Organizationally, the cooperative organization encourages NGOs to work with community members since an investment in the community is more likely to benefit all residents. Similarly, cooperative members are accustomed to sacrificing personal needs for the good of the community, decreasing the chance that NGO efforts will be derailed by individual interests.

In addition to the increased human well-being indicators discussed in this paper, previous work reported that the population of these cooperative communities grew more slowly and the average household cleared less forest than their Naranjo neighbors. Cooperative communities also offered their residents advantages in

political representation and organization, as well as infrastructure in the form of health care, education, and home improvements. Although governments do not want settlements within the MBR, allowing squatters to remain without land title appears to be an untenable solution for human development and conservation interests.

The extraordinary poverty and underdevelopment pervasive in frontier regions alongside variations within these conditions have been little examined. More research is needed to go beyond the modest scope of this paper. Case studies from diverse locations and with larger sample sizes are necessary before we can begin to discuss the generalizability of findings, but the potential benefits of such research are rich. To the extent that land security and land systems promoting cooperation are found to be implicated in improving human welfare and stemming deforestation, conservation and development efforts may harmoniously promote compatible outcomes.

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