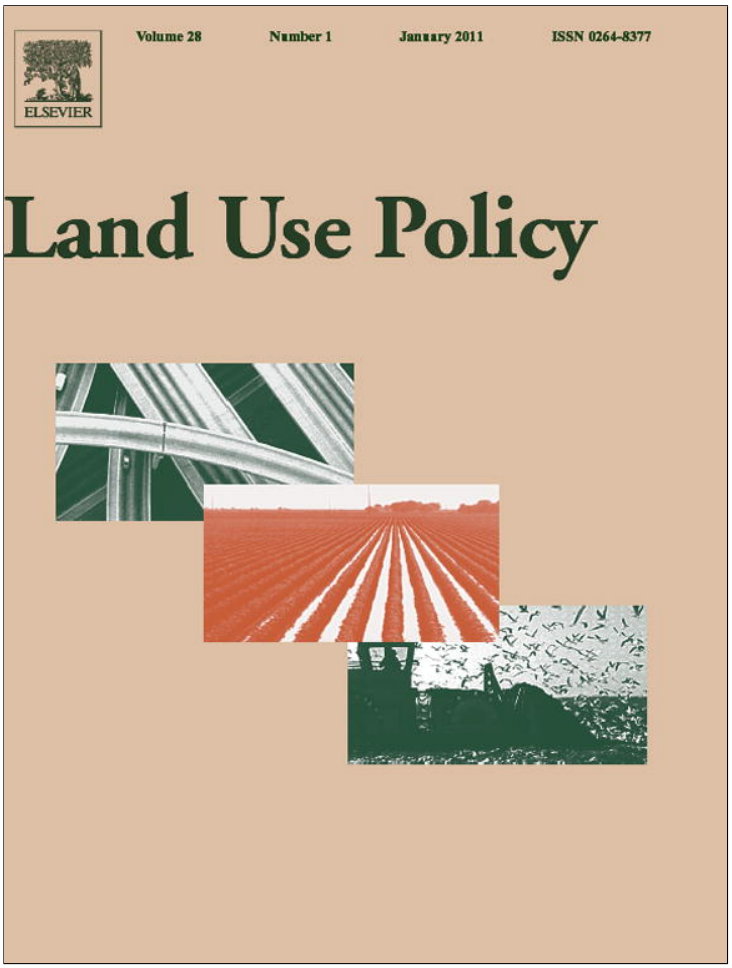

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# When collective action and tenure allocations collide: Outcomes from community forests in Quintana Roo, Mexico and Petén, Guatemala

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ABSTRACT

Based on a comparative case study of four community forestry enterprises in Guatemala and Mexico, we examine the relationship between user group characteristics and state allocation of tenure bundles. Using Schlager and Ostrom's four levels of tenure bundles and collective action theory, we illustrate how tenure bundles and collective action costs interact to either promote or create disincentives for conservation and communal economic benefits. We suggest that in communities with high costs for collective action, a tenure bundle that includes management, withdrawal and exclusion rights yet omits alienation rights may be optimal for community forestry. We also demonstrate how unclear allocation of rights can result in local interpretations of land rights that do support collective action.



## Introduction

The debate over property rights and sustainable management of natural resources began when the term "tragedy of the commons" was coined to refer to likely outcomes of non-private property tenure arrangements (Hardin, 1968). In Hardin's example, individual self-interest would inevitably lead to over-exploitation and eventual depletion of common-pool resources. The failure of management could be attributed to a lack of collective action, or the joint pursuit of a common goal (Olson, 1965). Common property theorists responded to this claim with an ever-growing body of literature that analyzed the conditions which allowed users of common-pool resources to produce collective benefits (Ciriacy-Wantrup and Bishop, 1975; Dietz et al., 2003; McCay and Acheson, 1987; Ostrom, 1990, 2007; Ostrom et al., 2002; Runge, 1986, or see Poteete et al., 2010 for a summary).

In recent decades, exploring linkages between tenure arrangements and tropical forest conservation has become increasingly important as nations worldwide look to devolve forest resources to local communities as a means of conserving forests and producing local economic benefits (Agrawal, 2007; Gibson et al., 2000; Molnar et al., 2007; Ribot, 2004; White and Martin, 2002). Research suggests that community forestry, which we define as the management of commonly owned forests for resource extraction, can provide both forest conservation and communal income generation (Bray et al., 2004, 2003; Ellis and Porter-Bolland, 2008; Gretzinger, 1998; Nittler and Tschinkel, 2005). Thus, for the purposes of this paper, we define 'successful' collective action in forest management as that which leads to maintenance of forest cover and communal income generation, although we acknowledge that other definitions of success exist and that many programs do not achieve these expected outcomes (Pagdee et al., 2006).

Community forestry is especially interesting in Mexico and Guatemala because in these adjacent countries non-forest land uses have resulted in mounting pressure on forest resources, deforestation often occurs in areas inhabited by the countries' poorest citizens (Nelson and Chomitz, 2007; Segura, 2000) and millions of dollars have been invested in community forestry programs (Sundberg, 1998; World Bank, 2003). Research to date on community forestry in the region has focused on the structure and function of community forestry programs (Wilshusen, 2005), the socio-economic and conservation benefits accrued (Antinori and Bray, 2005; Bray et al., 2007, 2004, 2003; Ellis and Porter-Bolland, 2008), as well as the response of community forestry programs to agrarian reform (Taylor and Zabin, 2000; Wilshusen, 2010). Much of this research confirms the common property management theories discussed below. In addition, in a study of 19 community forests

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and 11 protected areas in Mexico and Guatemala, Bray et al. (2008) found no difference in deforestation rates between the two type of land uses, suggesting that long term management of community forests can have equivalent outcomes for forests as uninhabited protected areas. However, allocation of bundles of tenure rights and the role of collective action in the success of the community forestry has not been as thoroughly studied in this region.

Our aim is to show how user characteristics within forest dependant communities have interacted with federally mandated allocation of tenure to produce varied effects on community forestry programs. We describe this interaction in four different forest communities of southeast Mexico and Guatemala's Petén in order to shed light on why some programs lead to successful outcomes while others do not. Based on these four case studies, we use this evidence to suggest a framework for how community characteristics interact with allocation of different tenure bundles (as described by Schlager and Ostrom (1992)) to affect collective action in forest management.

### *Tenure bundles and collective action*

Common property scholars posit a number of factors that influence the effectiveness of collective action for common property management, including: (1) characteristics of the user group, (2) attributes of the resource, and (3) external influences, which may include tenure regimes, state regulations, and relationships with government or non-government agencies (see Agrawal, 2001; Agrawal, 2007, for a review). Most literature on management of common-pool resources has focused on the first two sets of factors, and the collective action dilemma is often presented as a cost–benefit calculation in which resource and user group characteristics either increase or lower the cost of collective action. User groups characterized by small group size, ethnic homogeneity, and historical or cultural forms of cooperation and collaboration have been found to experience lower costs for collective action (Baland and Platteau, 1996; Bardhan and Dayton-Johnson, 2002; Ostrom, 1990; Ruttan, 2006), although the role of heterogeneity in determining commons outcomes has been disputed (Poteete and Ostrom, 2004; Ruttan, 2008; Varughese and Ostrom, 2001). Certain attributes of resources may change the costs of collective action as well. For example, user groups may find it easier to govern resources that are indivisible, well-bounded, small in size, and stationary (Dietz et al., 2003; McKean and Ostrom, 1995). In Quintana Roo, for example, the size and species richness of forest holdings have been posited as a determinant of community forestry success and of deforestation rates (Ellis and Porter-Bolland, 2008). Other resources, however, may be more profitable and more easily managed on an individual level.[1] Thus, even though user groups possess characteristics that can facilitate collective action, the characteristics of available resources influence the cost of collective action for managing that resource.

Focusing on the user group and resource attributes overlooks the role of external influences, including tenure regimes, in shifting the costs of collective action (Agrawal, 2001). When understood as embedded in specific historical, political and social contexts, these regimes play a critical role in shaping community forestry outcomes (Alcorn and Toledo, 1998; McCay and Jentoft, 1998; Reddy, 2002; Robbins, 1998; Taylor, 2000). Though external factors are mentioned repeatedly in the common-pool resource literature as equally crucial in determining outcomes in common property management, theory building in this area is relatively scarce.[2]

This study aims to address this shortcoming by providing evidence for the interaction between collective action costs within a community and tenure arrangements established by national governments. We use this evidence to aid in understanding why collective action succeeds in some cases and not in others. Schlager and Ostrom (1992) lay out a framework for analyzing the extent to which full property rights are allocated in an attempt to categorize the wide range of common property tenure regimes observed in diverse settings. According to this framework, rights are allocated in bundles that result in varying degrees of control over land and resources, as bulleted below:

- *Withdrawal rights* allow users to obtain resources at a rate specified by external authorities.
- *Management rights* allow the user group to define extraction rates and other management features, implying more rights than withdrawal rights.
- *Exclusion rights*, added to management rights, allow the user group to define who has access to resources.
- *Alienation rights* involve the right to sell or lease the other three rights to the resource.

The package of all four bundles defines a full property right, and when this right is shared by a group of people, a complete common property right is allocated.

Bundles of rights allocated by the state (*de jure*) may or may not match those determined by local institutions (*de facto*). This often depends on whether or not communities accept state attempts to define tenure and whether state definitions of tenure are congruent with existing local tenure arrangements. *De facto* tenure bundles may be strengthened by *de jure* allocation; however, allocation and enforcement of *de jure* tenure bundles may be undermined if they contradict *de facto* appropriation of rights (Alcorn and Toledo, 1998). Consequently, allocation of bundles of rights by the state within communities may result in (1) *de facto* rights that match *de jure* rights, (2) well-enforced *de facto* rights that conflict with *de jure* rights, or (3) unenforceable *de facto* rights that conflict with *de jure* rights.[3] The third case may result in negative consequences for forests and attempts to establish community forest management. In this paper, we attempt to understand why *de jure* allocations may strengthen or undermine *de facto* tenure arrangements, and suggest that the collective action costs resulting from user group and resource characteristics play an important role in this process.

Our analysis encompasses four cases of community forestry in Mexico and Guatemala, two countries with different histories of common tenure regimes, different levels of bundles allocated, and varying attempts by state actors to allocate tenure bundles. To explore how costs of collective action interact with the allocation of bundles of rights, we look at two communities in each country: one with user group and resource characteristics that suggest a lower cost of collective action and another with characteristics that suggest a higher cost. By noting how state allocation of bundles of rights differentially interacts with the characteristics of these com-

[1] In the case of timber management, economies of scale and the uncertain location of productive zones may promote collective action to distribute benefits and risks (Arnold, 2001; McKean and Ostrom, 1995). The relative profitability of agriculture and cattle ranching, however, often provide an incentive for individual land management.

[2] One exception is Katz (2000) whose research supports a component of our theory: When the potential for collective action is high, the effect of external variables such as tenure is low.

[3] In some cases, *de facto* rights may be considered illegal in the eyes of the state. Since these instances are often due a failure to clarify or enforce *de jure* rights, or a failure to recognize existing locally recognized rights, this can be considered locally sanctioned land rights (*de facto*).

munities, we attempt to understand how collective action costs resulting from user group and resource characteristics relate to external influences in forest management—in this case attempts by the state to define tenure rights. This information may be useful to governments looking to allocate appropriate tenure bundles in support of an intended forest management outcome.

*Comparing Quintana Roo, Mexico and Petén, Guatemala*

The state of Quintana Roo, Mexico and the department of Petén, Guatemala both present cases of highly successful community forestry programs as well as less successful examples (Bray et al., 2005; Chemonics, 2003; Nittler and Tschinkel, 2005). These regions are considered part of a contiguous corridor of semi-humid tropical forest; however, they possess widely different histories of forest use, including state intervention, formation of forestry programs, and prior timber extraction. Before proceeding with general overviews of each region, we note the bundles of property rights currently allocated by the state in each country. In Mexico, a set of rights including exclusion rights had been granted in the form of communal land grants, or ejidos, following the Mexican Revolution of 1910. In addition, ejidos were given the option to attain alienation rights under certain conditions beginning in 1992 when key agrarian laws were changed. In the Petén, while exclusion rights are granted *de jure* to user groups in the community concession zone of the Maya Biosphere Reserve, in reality, management rights have been clearly allocated but exclusion rights have not been clearly defined by the state or communities in many cases. The following description and subsequent case study results map this process and connect it to outcomes in forestry programs.

*Ejidos and tenure bundles in Quintana Roo, Mexico*

As a result of the Mexican Revolution, roughly 80% of Mexico's forests are under a common property regime, creating a complex and unique situation for forest governance (Bray et al., 2005). Before the revolution, 95% of rural peasants were landless (de Janvry et al., 2001). Following the revolution, Article 27 of the 1917 Mexican constitution created communal land grants called *ejidos* and *bienes comunales* to landless peasants and indigenous peoples, and by 1991 the Mexican agrarian reform had distributed 103 million hectares of land to ejidos (Theisenhusen, 1996). Although land was ostensibly controlled by communities, ejido members were prohibited from renting or selling land, being absent from the land for over two years, cultivating over 20 hectares, and employing wage labor. Individual usufruct rights were the norm for agricultural lands, while most forests remained common use areas. If any of these regulations were broken, the Mexican government retained a seldom-used authority to expropriate common land.

In Quintana Roo, the first wave of land reform occurred in the 1930s and 1940s when the establishment of ejidos was tied to the promotion of chicle cooperatives (Forero and Redclift, 2006). Rights were allocated on the calculation that each ejido member required 420 ha of forest to maintain their chicle production. In central Quintana Roo, 10 ejidos were established between 1935 and 1942, averaging 35,000 ha each. Although ejido members were granted use rights to non-timber forest resources such as chicle, the state still maintained control over timber resources (Klooster, 2003). From 1953 to 1983, Maderas Industrializadas de Quintana Roo had direct access to communal forests in Quintana Roo, extracting timber of only the best quality and size to produce plywood. Ejido members did not receive any benefits from timber extraction, nor did they have any input in management practices (Flachsenberg and Galletti, 1998; Galletti, 1998). Therefore, while forest communities had some rights to forested land, it is difficult to say that they had significant control over what happened to forest resources. This situation changed drastically with the advent of community forestry in the early 1980s.

In the late 1970s and early 1980s, as many timber concessions in the country were reaching their expiration, foresters and ejido organizations in various regions of Mexico recognized a policy window for the devolution of forest resources to local land owners. As such, there were multiple instances of public protests over the control of forest resources (Bray et al., 1993). The next two decades saw the rapid expansion of community forestry, the end of timber concessions, and a rise in earnings from timber sales in communities (Klooster, 2003). This was formally recognized in the 1986 Forestry Law which devolved ownership of forest resources to communities and "reaffirmed the importance of the ejido as a collective natural resource management entity" (Wilshusen, 2010). Currently, communities in Mexico can choose if and how much of their common forest resources they wish to manage for timber production as well as define who has access to common forests. Although forest ejidos are not completely autonomous because most depend on external assistance from forest technicians and are subject to government regulations, they currently have a tenure bundle that includes *de jure* withdrawal, management and exclusion rights.

A second important change in local rights to forested land occurred in 1992 with the Reform of Article 27 of the Mexican Constitution. The financial crises of the 1980s caused the Mexican government to pursue structural reforms to stimulate Mexico's lagging rural sector through investment and liberalization (Zepeda, 2000). Privatization of ejido lands was central to the economic overhaul. As such, the Reform of Article 27 granted communities with commonly owned lands the ability to legally divide, title, sell, and/or rent non-forested land. In essence, through the 1992 reforms, the state granted ejidos the potential to attain *de jure* alienation rights in non-forested areas in addition to the existing tenure bundle of management and exclusion rights. The Program for Certifying Ejidal Rights (PROCEDE) was created by the 1992 reforms, in part to officially recognize individual parcels within common lands, a key step in establishing alienation rights. Yet as of 2007, fifteen years after the reforms, less than 10% of the ejidos have actually become fully privatized (Registro Agrario Nacional, 2007) In Quintana Roo, 98% of ejidos entered the PROCEDE program, but the vast majority did not parcelize common lands, leaving 98% of all lands passing through the state's PROCEDE program without legal alienation rights (INEGI, 2000). Many communities have rejected the possibility of privatizing communal land, and opponents of privatization see the Reform of Article 27 as the state's attempt to divest from rural communities and undo the redistribution of land that occurred following the Mexican Revolution (Assies, 2008; Cornelius and Myhre, 1998; Zepeda, 2000).

In addition to political and cultural opposition to privatization of common land, the limited response of Quintana Roo ejidos to gaining alienation rights may be due to federal restrictions on privatizing forested lands. It is illegal to create individual parcels in forested land, and decisions to title non-forested land for eventual sale need to be approved by two thirds of community members (Government of Mexico, 1992). While *de jure* alienation rights to common forested land cannot be legally attained, many ejidos have attained alienation rights by extralegal mechanisms. A common mechanism is the illegal division and distribution of common lands to ejido members with a certificate of ownership granted through the PROCEDE program. This certificate does not legally entitle the possessor to sell and transfer land, but is respected internally by ejido members and is used to transfer and sell land. This has occurred mostly where land prices are higher, including coastal areas, the peri-urban zone, and areas suitable for planting high-value crops (Barsimantov et al., 2010; Barsimantov, 2009; Luers et al., 2006; Jones and Ward, 1998). In addition, while forested land

**Table 1**
Comparing land tenure in Quintana Roo, Mexico and Petén, Guatemala.

| | Quintana Roo | Petén |
|---|---|---|
| Land tenure system | Ejido system, since the 1940s; 1992 Reforms of ejido system | Biosphere Reserve, since 1990; Community concessions since 1996 |
| Initiation of community forestry | Mid-1980s | 1992 (pilot program), 1996 (concessions) |
| Tenure bundles allocated (*de jure*) | | |
| Withdrawal rights | Yes | Yes |
| Management rights | Yes – with minimal state rules, help of private foresters | Yes – with help of NGOs |
| Exclusion rights | Yes – communities can incorporate or exclude members | Technically yes, although not fully allocated in certain concessions |
| Alienation rights | Possible after the 1992 Reforms, but technically illegal in forests | Not granted |

may not be legally alienated, under the reform, membership rights can be; as such this is one mechanism used to transfer ownership and access benefits in forested ejidos.

*Community concessions and tenure bundles in Petén, Guatemala*

In the Petén region of Guatemala, formal tenure bundles for forested lands were not granted to communities by the government until relatively recently. Between 1959 and 1990, the military-led government agency Fomento y Desarrollo del Petén (FYDEP) developed infrastructure, promoted colonization, and granted land rights, including timber and non-timber concessions, to private companies and individuals (Schwartz, 1990). As in some parts of Mexico, timber extraction was not sustainable and reforestation was not sufficiently implemented. Population density was low in the Petén due mainly to lack of access to the region, yet government-sponsored resettlement programs slowly opened the frontier to colonists who favored cattle ranching over other economic activities. In 1990, the downfall of FYDEP due to excessive corruption was immediately followed by the Maya Biosphere Reserve (MBR) initiative, incorporating over 2.1 million ha for conservation and development in three main land use classifications: core protected areas, multiple use zones for communal and industrial forestry concessions, and a buffer zone (CONAP, 2001; Finger-Stitch, 2003). The MBR initiative did not begin with communal concessions however. Originally, core zones were completely restricted to all use rights and FYDEP was granted even greater jurisdiction over land in the Peten (McNab and Ramos, 2007). According to local residents and government officials, the creation of the MBR was done without the input of local residents (Finger-Stitch, 2003; Sundberg, 2003). Locals felt that the reserve removed their previously granted access to land without offering any benefits, a situation which led to escalating conflicts between colonists and government officials, including the demolition of guard posts, kidnapping of government officials, and burning of official vehicles (NotiCen, 2003). Although the MBR management plan called for areas of community concessions for timber extraction, virtually no action was taken by the government or international NGOs to distribute these concessions in the early years of the reserve.

This changed in 1996 with the signing of the Peace Agreement in Guatemala that ended over 30 years of civil war (Sundberg, 2006). Political pressures to provide land to landless peasants resulted in a clause in the agreement that required 100,000 ha of the MBR Multiple Use Zone were to be allotted to *campesinos* for sustainable forest management. By 2006, 66% of the Multiple Use Zone of the MBR was granted to 12 community concessions (over 400has total) and 2 industrial concessions (McNab and Ramos, 2007). Within these concessions, forest resources could be extracted only with approved management plans. The concessions were undivisible but concessionaires were otherwise allowed and required to develop management plans and exclude non-concession users from the area.

Thus, the creation of the Maya Biosphere Reserve replaced the private rights to land and resources that were distributed by FYDEP with permanent conservation areas and 25-year forestry concessions. These concessions granted a tenure bundle that was meant to include withdrawal, management, and exclusion rights to community organizations and forestry cooperatives. Because of their location within a protected area, however, concessions were never allocated alienation rights.

Table 1 summarizes some key difference and similarities between the two study regions.

## Research design and methods

To analyze the interactions between land tenure allocations and collective action in Guatemala and Mexico, two pairs of communities were selected: one pair from Quintana Roo, Mexico and one

**Table 2**
Comparing characteristics of case study communities.

| | Quintana Roo, Mexico | | Petén, Guatemala | |
|---|---|---|---|---|
| | Naranjal Poniente | Chunhuhub | Carmelita | Cruce a la Colorada |
| # of Households | 137 | 331 | 83 | 98 |
| Ethnic composition | Maya | Maya, with recent arrival of both Maya and non Maya | Mestizo with 40 years of establishment | Mestizo/recent migrant |
| Access | More remote | Less remote | More remote | Less remote |
| Prior forest use | Chicle extraction | None | Chicle extraction | None |
| Current forestry program | FSC certified, sawmill | Recently failed program | FSC recertified, sawmill | FSC certified, no sawmill |
| Forest cover loss (key informants estimate) | None | Some to extensive | Little to none | Extensive |
| Land sales/transfers | None | Extensive sales to locals for cattle grazing | None | Speculation and sale to migrants |
| Collective action costs from user group and resource characteristics | Low | High | Low | High |

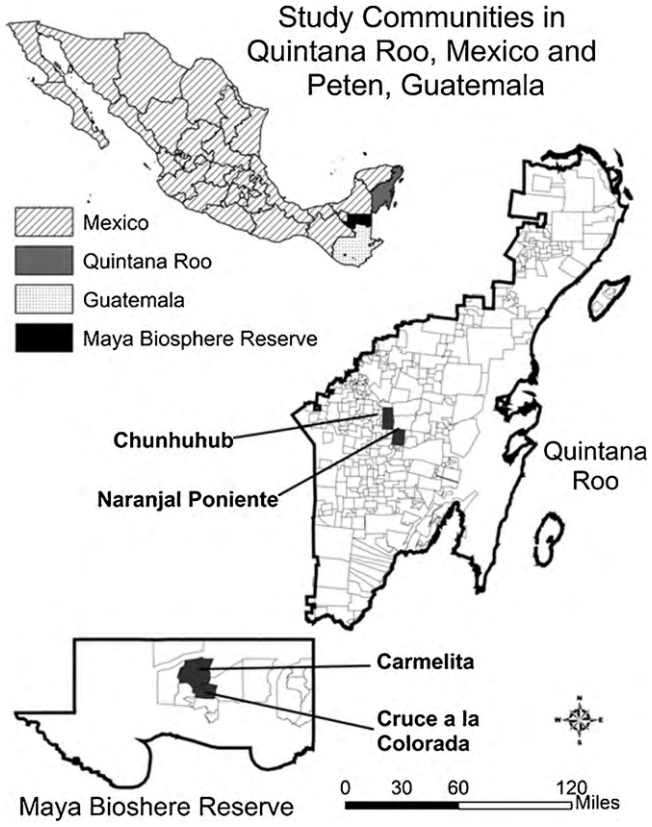


**Fig. 1.** Map of study communities.

from Petén, Guatemala. In each pair, one community with user group and resource characteristics that suggest lower costs for collective action and one with characteristics that suggest higher costs were chosen. Based on the literature discussed above, characteristics that define a community with lower costs for collective action in this study are ethnic homogeneity, history of cooperation, longer history of forest use, and economic dependence on a common-pool resource. In both pairs of communities, the community with lower costs of collective action is currently experiencing greater success in collective action for forest management: they have minimal or no deforestation and are producing value-added wood products that produce jobs and income. The other community in both pairs is currently experiencing consistent deforestation and is producing less or no income and jobs through forestry activities. We recognize that the communities with a longer history of forest use have larger tracts of land and that this land may be richer in valuable timber species because of historical enrichment, and thus we contend that resource characteristics and user group characteristics, at least in this case, co-produce a community's collective action costs and play a combined role in their success at CFM.

Key informant assessments of forest cover change were made with the help of government officials, NGO contacts, and local residents, as quantitative assessments were not available. Though it is not possible for a pair of communities in each region to adequately represent the gamut of forestry communities, we attempted to select two extreme cases in each region to explore how both *de jure* and *de facto* tenure arrangements influence collective action for community forestry. From this we can suggest the types of influences that varying tenure bundles might have in communities with different collective action costs (King et al., 1994; Lieberman, 2005). Table 2 gives key information on the four cases selected, which will be discussed in the results section, and Fig. 1 shows the location of case study communities.

Our approach is to qualitatively examine collective action successes and failures in these four communities to understand the mechanisms by which user group and resource characteristics interact with state allocations of tenure to produce a set of locally recognized tenure arrangements that are either enforced or not. This type of qualitative analysis can often uncover mechanisms that quantitative analyses are not capable of finding (King et al., 1994) Although our case selection strategy does not allow us to determine a cause and effect relationship between tenure allocations and forestry outcomes, by looking at pairs of communities with different user group characteristics we can explain the role of state-defined tenure bundles in collective action for community forestry.

Field data were collected during site visits in August 2006, February 2007, November 2007, and May 2008. In each community, open-ended interviews were conducted with communal and municipal authorities, locals with extensive knowledge of forest history and use, and older community members with extensive knowledge of community history. Questions pertained to history of forest use, local governance structures and rules, and interactions with external actors. In addition, interviews were conducted with government officials, local and international NGO staff, representatives from community forestry unions, and private foresters. In all, we conducted a total of 30 formal interviews and numerous informal interviews. Finally, secondary data from various government agencies on demographics and forestry management were collected, including forestry permits, deforestation, and the most recent census. These general data will help understand the overall landscape of community forestry in the two regions.

## Results

In the following sections we explain the collective action costs for each community based on user group and resource characteristics and then examine the evolution of tenure arrangements. We first describe user groups' ethnic homogeneity, history of cooperation, and economic dependence on forest resources. Though the general attributes of the forest resource are essentially the same for each community, timber value may vary based on historical usage patterns. Therefore, we briefly describe access to commercial products within each local forest to understand how resource characteristics may influence collective action. Finally, we trace the allocation of tenure bundles to each group to see how this external factor, combined with user group and resource characteristics, shaped *de facto* tenure arrangements and influenced the success of community forestry.

### *Naranjal Poniente, Quintana Roo, Mexico*

Naranjal Poniente has a long history of collective extraction of forest products predating its establishment as a chicle ejido in 1938. The ejido population is ethnically homogenous (Maya indigenous people), and receives significant income from current timber extraction activities. Therefore, we suggest that the community has a lower relative cost for collective action than our second case study community in Quintana Roo. Naranjal Poniente's current economic dependence on the forest has evolved from forest extraction activities including harvesting of *chicle* (*Manilkara zapota*)[4] and the felling of timber for railroad ties. To date, Naranjal Poniente remains economically dependant on the forest through the sale and use of timber and non-timber forest products. It was one of

[4] Commercial extraction of chicle was initiated by an American corporation for use in chewing gum (Schwartz, 1990).

the original participating communities of the community forestry pilot program, known as PPF,[5] and despite high levels of annual extraction of big-leaf mahogany (*Sweitenia macrophylla*) and Spanish cedar (*Cedrela odorata*) the community still reports abundant levels of high-value timber (personal communication, R. Ledesma). Of Naranjal Poniente's 13,620 ha of land, 10,500 ha (77%) are considered common forest area. Since the inception of the PPF, Naranjal Poniente has, with the help of government funds, invested in logging trucks, a sawmill, and training in carpentry and artisan work for community members (personal communication, R. Palomeque).

Livelihood strategies and tenure rights allocations within the ejido were almost unchanged following the Reform of Article 27 in 1992. While Naranjal Poniente certified their ejido boundaries via the PROCEDE program, they did not take steps to divide common lands. In fact, there was open resistance to individualization of property rights and the accompanying alienation rights that would come with individualization. Many ejidatarios of Naranjal Poniente perceived the 1992 Reforms as an encroachment of the state and a potential threat. Further, older generations view individualization as a threat to the Maya tradition of shifting cultivation that has been practiced for generations on large tracts of commonly held agricultural lands. Naranjal Poniente also has strong economic incentives for collective action in commonly held forest resources. Forestry and forest-related activities continues to be the main livelihood strategy among Naranjal Poniente's residents, providing annual royalties to ejido members of up to $2,000 USD per person in 2006 (Barsimantov et al., 2010). No sales of land or ejido rights have been reported to date and both residents and government officials report that forest resources have been maintained.

*Chunhuhub, Quintana Roo, Mexico*

Chunhuhub is less than 50 kilometers from Naranjal Poniente, but differs both in forest use history and cultural composition. After years of abandonment, people began to resettle Chunhuhub in the 1930s, forming a small chiclero camp (Anderson, 2005). The area did not officially become an ejido until 1964, when the land reform agenda was geared towards agricultural settlements rather than forest extraction and sought to accommodate migrants from the neighboring Yucatan state (Bray and Klepeis, 2005). Because it is ethnically heterogeneous (mixed Maya and mestizo), of relatively larger group size, and does not have a long history of collective forest extraction, we classify its collective action costs as higher than Naranjal Poniente's. In contrast to Naranjal Poniente, the population of almost 4000 and its location at the intersection of two major roads has facilitated commercial expansion and a diversification of livelihood strategies. It has also prompted in-migration from other parts of the region, creating a more ethnically mixed population. Many residents consider agriculture and animal husbandry to be the main livelihood strategies, along with participation in government-sponsored agricultural programs such as cattle ranching, citrus farming, and production of export crops such as papaya. A government-sponsored citrus project during the 1980s facilitated the first informal parcelization of parts of the ejido into individually managed orchards clustered around irrigation wells.

Although forest-related activities have been a source of income in the past, Chunhuhub has not been considered economically dependant on forest resources since agriculture and animal husbandry became significant sources of income. By 1996 the ejido had depleted valuable timber stocks and local leadership failed to halt increasing illegal timber harvesting (Anderson, 2005). In 2001, after repeated tensions between local and state environmental authorities regarding illegal timber sales and over harvesting, the ejido's forestry permit was suspended and no timber has been legally harvested since. Illegal harvesting continues and local authorities have been unable, or in some cases, unwilling, to stop it.

Over the years, illegal timber harvesting and unregulated land use change has created a breakdown of collective action for land management and a growing sense of uncertainty regarding property rights in Chunhuhub. Like many ejidos in the region, Chunhuhub was initially resistant to the 1992 reforms, and only participated by certifying the ejidal boundaries via PROCEDE. However, in 2001, *de facto* individualization of land within the ejido gained momentum as orchards and forest lands became a marketable commodity to non-ejido members (Anderson, 2005). Tensions between community members over potential land sales led the ejido to extra-legally parcelize all forested and non-forested land in 2005, allotting individual parcels of 46 ha to each ejidatario, including their prior claims to orchard lands. This in essence extended and codified, at the ejido level, the informal parcelization process that had begun years earlier. Because forested lands were included in the parcelization, it could not be conducted through legal mechanisms. One of the primary motivations for this *de facto* parcelization, according to one interviewee, was that local authorities felt overburdened by the task of regulating the management and exclusion rights within the ejido. By *de facto* individualizing those bundles of rights, local authorities passed the burden on to the individual and thus granted locally recognized alienation rights over communal resources. "Now," stated a community official, "what happens in the (individual) parcel is his/her problem."

Only a small forest reserve of 143 ha remained un-parcelized commons. Additionally, roughly 50 community members have sold their individual allotment, totaling almost 2500 of land sold. Land was sold at an estimated $1000 per hectare. Key informants reported that much of the land was sold with the intention to graze cattle, and as such, has been deforested and converted to pasture. While landsat images show that deforestation rates remain low (Edward Ellis, personal communication), the expanding network of parcels and pastures along the main highway in Chunhuhub suggest that parcelization may bring about further deforestation. Thus, in Chunhuhub, the high cost of collective action combined with weak de facto tenure arrangements may have brought about failure in community forestry through parcelization of forest land.

*Carmelita, Petén, Guatemala*

Early inhabitants of the Carmelita community arrived from nearby southern Mexico around 1910 to work in a *chicle* harvest camp, a similar history as that of Naranjal Poniente. The region remains quite remote; until 35 years ago there was no road to Carmelita and only 10 years ago was the road passable without a four-wheel drive vehicle. That the residents of Carmelita were accustomed to using forest products for both subsistence and income generation in a way that did not degrade forest ecosystems, that they have lived in the region for nearly a century, and that they currently create significant employment and income through forestry activities is important in understanding their low costs for collective action in the community concession. In 1997 they formed a cooperative to manage the concession, and today all but four families have joined the cooperative. According to respondents, forestry income has resulted in more youth attaining higher levels of education. Additionally, jobs created in timber extraction and milling have decreased the need to engage in labor-intensive *chicle* extraction and agriculture. Local informants agreed that if the concessions did not exist or were revoked the pressure to sell land to colonists may lead to extensive deforestation in the community.

[5] The Plan Piloto Forestal (PPF) was created in 1983 in collaboration with the German development agency, Gesellschaft für Technische Zusammenarbeit (GTZ).

An enabling factor for effective management of communal areas is the government-sponsored delineation of individual and communal land uses within the concession. In Carmelita, timber management areas were clearly marked in 2000, an important step in increasing local authority over the concession and thereby limiting the threat of deforestation by individual community members or colonists. The designation of individual usufruct rights to agricultural lands is still in process, but according to community members was almost complete at the time of fieldwork. Such demarcation of usufruct rights is not contrary to the *de jure* ban of alienation rights, rather provides clarity of exclusion rights within the communal property. The plan will give eight hectares of land to each family for agriculture, even though residents say that this amount of land is more than sufficient to satisfy their agricultural needs. According to a resident of Carmelita, the delineation of minimal area for individual land use will inhibit deforestation and the sale of land, specifically by two families that are not interested in forest management and control roughly 45 ha each. Because rights to land will be determined and enforced by the community, with the backing of *de jure* exclusion rights, Carmelita residents believe that the threat of future deforestation by community members and sales of land to migrants will be minimized.

*Cruce a la Colorada, Petén, Guatemala*

Cruce a la Colorada does not posses the user group characteristics that have led to lower costs for collective action in Carmelita. Residents are ethnically diverse colonists from throughout the country, have no shared history of successful collective action, and do not reap as many benefits from forestry because they control fewer hectares of forest and they do not own a sawmill. They are mostly farmers and cattle ranchers, and are not historically accustomed to making an income from forest products.

Cruce a la Colorada maintains a concession of 20,000 ha managed by a cooperative of 68 community members. Apart from these 68 members, another 30 non-member families live in the community but choose not to participate in the cooperative either because they prefer cattle grazing to community forestry or because they arrived after the cooperative formed. Although timber extraction is functioning relatively smoothly, the cooperative has not been able to control deforestation, colonization, and land speculations by non-cooperative members. As one community member explained, "How can I refuse my family member that wants [to come from my region of Guatemala] to live here?"

Of the approximately 20,000 ha granted to the community, 5000 ha have been deforested since the concession was granted according to government officials. In addition, 3000 ha that are controlled by five non-member families have been largely deforested. These families, dedicated primarily to large-scale cattle ranching, lived on the land prior to the creation of the concession and it is unlikely that they will relinquish access to these lands unless the state prosecutor's office intervenes. Thus, the total area of the concession available for communal forestry has been reduced from 20,000 to 12,000 ha (personal communication – CONAP official, Petén).

An important factor in the community's difficulty in controlling deforestation is the lack of a complete land use plan that delimits common and individual lands. The delay in this process partially results from an initial sour relationship between local residents and the National Commission of Protected Areas (CONAP), which presented highly restrictive land use regulations, resulting in the perception by residents that "they were like dictators." Consequently, CONAP, and the land planning and environmental regulations they brought, were ignored by the community in the first several years of the reserve and created animosity between the community and government agencies.

Currently, the government-sponsored land use planning process in Cruce a la Colorada has three components. The first phase, completed in 2005, delineated the forest management area. The second phase involves measuring lands currently controlled by community members, and the third will evenly redistribute those lands. The government's plan, agreed to with community leaders, is to distribute eight hectares to each family after the third phase, in a similar fashion to Carmelita, but many residents are not satisfied with this amount. Because of this disagreement and the continued arrival of new settlers, the likelihood of achieving clear land rights soon in Cruce a la Colorada is minimal. Though the entire communal area is clearly marked, discrepancies over individual usufruct rights within this area limit the implementation of *de jure* exclusion rights. Some fear the government will use its authority to revoke concession rights if agreements on the distribution of individual land are not reached. Like Carmelita, residents of Cruce a la Colorada seem certain that a cancellation of the concession would result in more uncontrolled deforestation.

## Discussion

How does the presence of internal characteristics that support collective action influence the effectiveness of *de jure* tenure bundle allocation? We suggest that user group and resource characteristics can shape the extent to which *de facto* rules are enforceable and to which communities adopt *de jure* allocations. Based on the analysis of these four case studies, user group and resource characteristics apparently play an important role in determining the costs of collective action, particularly group homogeneity and prior experience with forest-based extraction. In Quintana Roo, Naranjal Poniente and Chunhuhub had distinct forest extraction histories; Naranjal Poniente had a longer and more continuous history of chicle extraction and relative success with community forestry, while in Chunhuhub chicle extraction was not a key aspect of forest management nor did the community forest management program (PPF) succeed in integrating forest management into community livelihoods. In addition, Chunhuhub is a larger, more ethnically diverse and more urbanized ejido, which may make collective action for forest management more difficult. In the Petén cases, the main differences between communities are the origin of users and their historically dominant economic activity. These differences may have played an important role in determining outcomes in the community concessions.

In addition, we suggest that these internal characteristics have interacted with state tenure allocations to make *de jure* rights either effective or void, and this process in part produced the observed outcomes of collective action. It is clear that communities with user group and resource characteristics that suggest higher costs for collective action are at a disadvantage for producing positive communal forest management outcomes. These same characteristics make it more or less likely that *de jure* tenure allocations will be used to enforce or modify existing *de facto* arrangements. *De jure* tenure rules may have no effect on forest management in communities where collective action costs are low (Katz, 2000), but in communities where collective action costs are high, an ill-defined allocation may promote profitable private use and as a result, forest loss. In these communities, for *de facto* tenure rights to match the regime intended by the state, we suggest that *de jure* tenure bundles be clearly allocated in cooperation with communities. We examine case by case how tenure may have affected collective action decisions in our case study communities.

It is not surprising that Naranjal Poniente avoided the opportunity to attain *de jure* alienation rights presented by the 1992

Reform. It is equally understandable why Carmelita has prevented land speculation and deforestation despite the difficulties faced in implementing and enforcing allocated tenure rights elsewhere in the MBR. Because both communities had a history with and continued to perceive a large benefit from managing a standing forest, the opportunity costs for changing *de facto* prohibition of alienation rights were high. In other words, incentives to defect from collective action and attempt to attain legal or illegal title and sell land (in Mexico) or to illegally deforest for speculation and sell to migrants (in Guatemala) were not sufficient in either of these cases. From this we confirm previous work on collective action: *the relative ease of organizing in Naranjal Poniente and Carmelita seems to have lowered overall costs of collective action to the point that external variables had little effect on the overall success of communal forest management.* In these cases, *de jure* exclusion rights merely served to strengthen existing *de facto* arrangements.

The same cannot be said for Chunhuhub and Cruce a la Colorada, where collective action costs were high. In Guatemala, community concessions should have initiated with an accompanying land use plan to clarify *de jure* exclusion rights. In reality, however, official land use plans were delayed several years. In effect, this was equivalent to an incomplete allocation of exclusion rights since community members never agreed upon a clear definition of land use boundaries or membership. Without a clear definition, defectors found it relatively easy to illegally deforest and appropriate common forest. The period of ill-defined rights interacted with high costs of collective action, playing a role in the community's inability to develop and strengthen governance structures to protect its forest area. *In sum, clearly defined exclusion rights were not allocated by the government, enabling the illegal appropriation of* de facto *alienation land rights over common land and deforestation in Cruce a la Colorada.* This has made *de jure* exclusion rights unenforceable in the community. We suggest that a clear allocation of a bundle including exclusion rights may have lowered the overall cost of collective action in Cruce a la Colorada.

In Chunhuhub the 1992 Reform of the Mexican Constitution made it possible for residents to attain alienation rights to common land. Although it forbade the division and sale of forested land, this aspect of the law was not enforced. Thus, the potential for appropriation of *de facto* alienation rights was created. The possibility of economic gains from land sales encouraged the division of common lands in a community with high costs of collective action, creating options for nonforest land uses and thus increasing the likelihood of future deforestion. *The lack of enforcement of* de jure *tenure rules combined with user group and resource characteristics that suggest high collective action costs may have facilitated the* de facto *division of common forests, capture of economic benefits from forests by illegal loggers and increased land use change in Chunhuhub.* In short, due to high costs of collective action, *de jure* prohibition of alienation rights was unenforceable. We suggest that a clear allocation of a bundle that did not stimulate the potential for alienation rights may have lowered the cost of collective action in Chunhuhub.

It is important to extract from our analysis that *de jure* and *de facto* bundles of tenure rights have differential interactions with the potential for collective action, depending on the effectiveness of state implementation and the response of local users to tenure allocations. Recent research shows that land reform has been interpreted and redefined according to local objectives, resulting in hybrid land tenure arrangements and varying degrees of legitimacy for *de jure* control over forests (Barsimantov et al., 2010; Haenn, 2006; Nuitjen, 2003; Perramond, 2008; Wilshusen, 2009; Reddy, 2002, #314). In both Quintana Roo and Petén, the *de facto* tenure rules existing in high collective action cost communities were not what the state intended. It seems that both states intended to allocate complete exclusion rights but not alienation rights over forested land; however, for very different reasons these goals were not achieved. Based on our case studies, we postulate that if *de jure* state allocations of rights are not clear, *de facto* rights may be appropriated by user groups and unintended consequences may ensue. While it is impossible to know what might have happened if the appropriate tenure bundle had been clearly defined in both countries, we make the following conclusion: *By not defining and enforcing appropriate tenure rights in forested land, the state makes it more likely that commons management will collapse in communities with high costs for collective action.* Unless the costs of collective action are already low and/or alternative land uses are unprofitable, forest cover is unlikely to persist.

## Conclusions

Is there an optimal combination of tenure bundle allocations for successful collective action in community forestry? When alienation rights are included in a tenure bundle, private ownership becomes an option and consequently users may opt to take land out of the commons when non-collective uses offer larger economic benefit. This makes a decision for collective action in forest management less likely because opportunity costs to participate in collective action are higher. Similarly, a set of tenure bundles that does not include an exclusion right could also increase the costs of collective action because the user group does not have the ability to control who has access to common resources. Defection from collective action becomes easier and this could result in an open access situation that inequitably distributes benefits and risks, reducing the likelihood of success in community forestry.

We thus suggest that a clear allocation of exclusion rights and prohibition of alienation rights in communities with high costs for collective action may lower the costs of collective action by creating the opportunity for *de jure* allocations to structure local attempts to define rights. While our case selection does not allow for a definitive conclusion on this point, we suggest this based on our process tracing of the interaction between collective action costs and *de jure* tenure allocations.

This conclusion has practical and theoretical implications. Since user group characteristics are difficult if not impossible to change, understanding the sensitivity of these groups to external influences such as tenure rights may be essential to address and prevent failures of collective action in communal forest management. Though this study initiates an important discussion in the ongoing debate, further quantitative and qualitative studies are necessary to determine if these findings are valid outside the Maya region and in communities with more varied collective action costs.

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