strategies, other than the use of chemicals to ward off pests and diseases on chili plants. In some cases, however, preferred lands are 'mechanized'—cleared mechanically with the intent of cultivating annually. Overall, chili production intensifies agriculture.

Despite these changes, ejidatarios remain semi-subsistence or semi-commercial farmers. The chili market is too volatile and the vagaries of nature too large to abandon subsistence cropping, and alternative land-use strategies remain in various stages of experimentation under conditions of thin markets. Should the farming population of the region continue to grow under current conditions, tensions will likely mount between the government’s interest in the reserve and various external interests that have invested in El Mundo Maya and the Mesoamerican Biological Corridor.

The nature of the household, the ejido, and the myriad of organizations and institutions seeking to influence land and life in the region demonstrate that land-use dynamics are far more complex than perhaps imagined for a ‘frontier’. This complexity, however, is critical for understanding the subsequent modeling exercises (Part IV), illustrating various gaps between the extant and required data for fine-tuned land-change models.

The Editors

Institutions, Organizations, and Policy Affecting Land Change: Complexity Within and Beyond the Ejido

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Despite decades of colonization and development initiatives, the southern Yucatán peninsular region remains an economic frontier. The term ‘frontier’, however, hides a complex political economy of social, political, and economic structures in which land managers operate. Presently, multiple interest groups vie for influence, increasingly positioning themselves around sustainability concerns, and attempting to reconcile the competing goals of economic development and environmental preservation. The major political institutions and organizations promoting conservation and development in the region fit into five categories: federally decreed land management regimes, federal and state secretariats, local community-based groups and institutions, national non-governmental organizations (NGOs), and international accords.

These institutions and organizations aim to influence land-use decisions in the dominant land access unit, the ejido. The relationships among ejidos, social movements, NGOs, government policy, and international activity in the region are examined here, highlighting how even within a frontier economy, conservation and development visions increasingly influence resource use.

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1. The Ejido as an Institution

Before the Mexican revolution of 1910–17, 96 per cent of Mexico’s rural people were landless (Sinha 1984). These rural poor supported the revolution, in large part, to break up grand haciendas (estates) and to allow campesinos (peasants) access to agricultural land. Ejidos, one of four land-tenure types federally mandated, were designed to provide campesinos access to land that could not be transferred easily and thereby taken from them. Based on interpretations of pre-Hispanic land tenure, Article 27 of the Constitution established ejido land to be communal, ruled by an ejido assembly (consisting of all members with land rights in the ejido, or ejidatarios), and used in ejido-defined usufruct. Prior to 1992, when the law was reformed, ejidatarios were prevented from selling their land, renting it, or using it as collateral, and from negotiating deals with private investors.1

Perhaps more important than these official guidelines, however, are the perceptions of ejidos by state officials. Established, in part, to protect ‘indigenous’ people and not open to privatization, the ejido was stigmatized as ill-suited for modernization (Oasa and Jennings 1982). A bimodal Mexican agrarian policy followed (de Janvry 1981; Tomich, Kilby, and Johnston 1995) in which the potential productive role of ejidatarios was largely ignored (Oasa and Jennings 1982; Sonnenfeld 1992; Tomich, Kilby, and Johnston 1995). This bimodality was exacerbated in the study region given its sparse occupation, and when agrarian attention was given, it focused first on government-led, large-scale projects (Ch. 3).

2. Changing Views of Ejido Agriculture and the Colonization of the Region

A prerequisite to the beginning of the 1970s boom of colonization in the region was a change in governmental attitudes about the ejido as a vehicle for commercial agriculture (Szekely and Restrepo 1988). In the face of basic food-production shortfalls nationally, the federal government sought to implement technological changes in agriculture beyond the ‘green revolution’ systems in northern Mexico. Colonization of the sparsely populated frontiers of southern Mexico became a means of resolving problems of land shortage elsewhere in the country, low agricultural production nationally, and political tensions, especially in central Mexico (Bassols Batalla et al. 1976). The new ejidos were referred to as NCPB (Nuevo Centro de Población Ejidal—New Ejidal Population Centers), selected in areas of low occupation and with sufficient natural resources to support settlers (Fuentes Aguilar 1980).

With respect to the tropical forests of southeastern Mexico, the NCPE program had two principal goals: to provide workers currently active in forestry with opportunities in agriculture and livestock rearing, and to reduce deforestation that officials perceived to be associated with swidden agriculture, deemed a maladaptive and destructive cultivation strategy (ibid.). Secondarily, colonization and the NCPE initiative populated Mexico’s lands adjacent to British Honduras (now Belize) and Guatemala, as well as the territory of Quintana Roo, which needed a minimum of 80,000 people to become a state.

The Comisión Intersecretarial para Nuevos Centros de Población Ejidal (Inter-Secretarial Commission for New Population Centers), or COINCE, became law in 1971, designed to boost basic food production by coordinating the directed settlement of underdeveloped lands (Gates 1993). COINCE incorporated the Yucatán Peninsula in a program called Cuenca del Sureste (Basin of the Southeast), believing the southern Yucatán Peninsula possessed significant agricultural potential (Szekely and Restrepo 1988). The land grants of the 1970s that were associated with these development programs were a generous 100hectares ejidal (Dachary and Arnaiz 1983), plus 25ha for ejido centers.

The paving of the Chetumal–Escárcega road (Highway 186) by 1972, enabled the subsequent dramatic settlement and development of the region (Revel-Mouroz 1980; Vogeler 1974). As word spread about available land, settlers spontaneously migrated to the southern Yucatán Peninsula. The vast majority of respondents from the 1997–8 SYPR survey (Ch. 8) identified land availability as the reason for their move (Table 8.2). To a much lesser degree, environmental (e.g. drought and decreasing soil fertility) and political factors pushed people to the study region.

2.1. Expansion of Ejido Lands

The acceleration of ejido land grants in the southern Yucatán peninsular region after 1970 was dramatic. Most of the ejidos were small in size and
established along the north–south improved but unpaved road. The number of ejido land grants and the population of the region went up significantly in the 1980s (Fig. 7.1), triggered by the eruption of the volcano Chichonal in 1982 (4,000 Chol Maya from Chiapas) and political refugees from Guatemala (Cortez Ruiz 1998; Stedman-Edwards 1997). Today, many ejidos no longer accept new members, and instead, attract pobladores (settlers with no land rights who rent and borrow land and sell their labor) and squatters on government lands (Stedman-Edwards 1997).

2.2. Predominant Ejido Land Tenure and Uses

As mandated by Article 27, ejido members could not own land, but were given usufruct rights. These rights are administered differently in different ejidos, however. For the most part, land rights in the southern Yucatán peninsula region involve usufruct over assigned plots of land; that is, a designated area or number of parcels are assigned (delimited but rarely demarcated) to each ejidatario. As long as the rules of the ejido (established in the ejido assembly) are followed, the farmer is assured that the assigned plots are part of the farm household’s portfolio, including inheritance to offspring. A few ejidos, including one of the eleven in the SYPR survey (Ch. 8), follow less well-defined parcel use, at least in terms of repeated use by the same household. No ejidos in the region have moved to a private property system, an option made available after the reform of Article 27 in 1992.

Most ejidatarios in the region are semi-subsistent, using agricultural systems that simultaneously represent two distinct forms of organizing production: the profit-oriented family farm and the subsistence-oriented household (Ch. 11). In the absence of fully developed markets and insurance or subsidies to mitigate risk, most farmers follow hybrid consumption-commercial production, which translates into three basic land uses: swidden or milpa (Ch. 9); pasture; and jalapeño chili (Ch. 10). Milpa traditionally involves the intercropping of maize, squash, and nitrogen-fixing legumes as part of a rotation cycle (short to medium fallow) based on slash-and-burn technologies with minimal reliance on purchased inputs. Jalapeño chili is the predominant commercial crop, requiring significant capital inputs (human and physical). Pasture, much of which is maintained absent a significant number of livestock, is the third major land use. Perhaps, it should best be seen as investment that bets on future, expected programs fostering livestock.

3. Forging a More Complex Politics of Land Use

Development and agrarian policy shifts, national forest policy, social movements (coalitions of ejidatarios in various organizational forms), and the increasing involvement of a broad range of international actors in local use decision-making have complicated the institutional landscape. The context in which land-use decisions are made is, therefore, more complicated than that of farmer and ejido.

3.1. Agrarian Policy Intervention

This complexity is anchored in a shift in Mexican policy toward ejidos from state paternalism to neoliberal reform, beginning in earnest in the mid-1980s by the Salinas administration. For ejidos and Mexico at large, this shift resulted in the deregulation and privatization of large sectors of the economy, and social reinvestment programs to aid the transition away from
government subsidies to more marginalized zones of the nation (Galletti 1998). Perhaps the most important nation-wide policy initiatives linked to these reforms and with the potential for affecting land change on ejidos in the study region is land-tenure reform and PROCAMPO (Programa de Apoyo Directo al Campo—Direct Rural Support Program), although others have also been significant.

3.1.1. Neoliberal Reforms

More than a mechanism for distributing land, ejidos have served as the main conduit through which the state channeled resources to the region’s smallholder households. Various government agencies disbursed a package of entitlements to agricultural inputs, credits, and other expenditures (e.g., for roads, schools, clinics) to ejidatarios to hasten the adoption of modernized agricultural techniques (Gates 1988). In addition, the parastatal marketing agency CONASUPO (Compañía Nacional de Subsistencias Populares—National Company for Popular Subsistence) guaranteed prices for basic staples, such as maize, as an incentive for market participation. These support mechanisms were often conditioned on a series of restrictions on factor use intended to give the government political and economic leverage over ejido members. Moreover, the government’s credit extension program was commonly tied to the choice of specific crops and technologies, and output could often only be marketed through parastatal agencies.

A radical change in public support of agriculture occurred by the late 1980s. As part of its broader agenda to foster economic liberalization, the Salinas administration torpedoed the model of heavy state intervention that guided the Mexican government’s rural development policies for most of the twentieth century. In 1986 Mexico entered into the General Agreement on Tariffs and Trade (GATT), the impact of which reached the agricultural sector by 1990, when tariffs on most products were dropped or drastically lowered, subsidies on inputs were withdrawn or sharply reduced, and the guaranteed price was eliminated for all crops but maize and beans (Foley 1995: 62). The continuation of these reforms was secured under the terms of the North American Free Trade Agreement (NAFTA), effective in 1994, obligating Mexico to liberalize fully its agriculture, including maize and beans, over a fifteen-year period.

3.1.2. Land-Tenure Reform

On the legal front, Article 27 of the constitution, which had served as the embodiment of the government’s commitment to the rural poor in post-revolutionary Mexico was amended in 1992 to terminate the continued extension of ejido land grants and to permit existing ejidatarios the right to enter into business arrangements with outside investors and obtain private title to their lands, all of which were prohibited under the original terms of Article 27. The original intent of ejidos to prevent smallholder loss of land and land concentration among largeholders was now seen as an impediment to both the modernization and commercialization of the sector. Paraphrasing President Salinas, speaking in 1992, Article 27 anticipated both the capitalization of the countryside and the opening of productive options by establishing a legal framework guaranteeing property ownership.

The effect of tenure reform on land use is difficult to isolate in the study region, however. No ejido has voted to privatize their land, and few indicators signal the adoption of the suite of other options opened to ejidos in the revised Article 27, including engaging in business ventures with off-farm investors. In short, the option of land-tenure reform has not generated a move to private holdings and integration into agricultural markets (Klepeis and Vance 2003).

3.1.3. PROCAMPO

Land reform has been complemented by the introduction of alternative income support mechanisms that specifically seek to deflink the extension

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2 PRONASOL (Programa Nacional de Solidaridad—The National Solidarity Program) and SEDESOL (Secretaría de Desarrollo Social—The Secretariat for Social Development) were the two main institutions established to implement the social reinvestment programs (Galletti 1998).

3 Restrictions included the prohibition of employing wage labor on ejidal property and the renting or selling of land, limitations on plot size, and restrictions on patterns of land use (e.g., bans on intercropped maize) (de Janvry et al. 1996).

4 The comments of President Carlos Salinas de Gortari, speaking in 1992, were cited in Foley (1995: 62).

5 While small-scale business transactions have taken place between individual ejidatarios and outside investors both prior to the 1992 reform (albeit illegally) and afterwards, the SYPR survey (Ch. 8) identified only one case in which an ejido negotiated access to private credit. In this case, a private bank gave ejidatarios an early disbursement of their PROCAMPO payment to be repaid with interest following the harvest. In another ejido, a small group of ejidatarios collectively were able to solicit permission from their ejido council to obtain private legal title to a land parcel for independent agricultural enterprise within the designated ejidal common use zone.
of aid from the direct command of production decisions. One of the most pre-eminent of such programs is PROCAMPO, which extends agricultural support via payments for the continued cultivation of a fixed area of land over fifteen years, a period corresponding to the time in which agrarian price supports are to be phased-out under NAFTA. Introduced in 1993, with payments first awarded in 1994, the PROCAMPO program extends a per hectare direct payment on the production of a wide range of crops, including maize, beans, wheat, soybeans, sorghum, rice, and cotton. The number of hectares receiving payment is based on the area that was cultivated in any of the aforementioned crops in 1994 (SARH 1993) and ejidatarios not registering with the program at that time could not subsequently join. Because aid is not tied to the cultivation of a specific crop, the terms of PROCAMPO are intended to be consistent with the increased ejidal autonomy conferred by the legal changes to Article 27. It was the hope of SAGARPA (Secretaria de Agricultura, Ganaderia, Desarrollo Rural, Pesca, y Alimentacion/Secretariat of Agriculture, Livestock, Rural Development, Fishing, and Food), the agency now administering the subsidy, that PROCAMPO would decrease environmental degradation by reducing distortions in the supply of agricultural commodities. Since the area and location of payment is fixed over the life of the program, the assumption by government officials has been that the funds are to be used to intensify production and thereby decrease pressure on remaining forest.

Analysis of results from the SYPR survey indicates that PROCAMPO support is a significant determinant of deforestation, contrary to its intent, a result that may be due to inherent contradictions in the program’s terms and objectives (Klepeis and Vance 2003). PROCAMPO’s policy of payment by lands cultivated in 1994 implies the intent of sedentarizing or intensifying cultivation—thus reducing the expansion of cultivated lands. The policy has had a statistically significant, positive effect on chili cultivation, consistent with PROCAMPO’s aims, but has had even greater impact on the hectare in pasture. Farmers are more likely to invest PROCAMPO money in clearing lands for pasture, even absent livestock for its use, given that pasture is a relatively inexpensive use to initiate and maintain compared to chili. In this regard, the program’s relatively insubstantial payments of N$484/ha (US$64/ha)—fixed in real terms—appears to provide insufficient capital to produce the kinds of land improvements intended. Such results elsewhere in Mexico lead some authors to regard this support as essentially welfare (de Janvry, Gordillo, and Sadoulet 1997; Myhre 1998). For example, Sadoulet, de Janvry, and Davis (2001) found that 70 per cent of households in a nationwide panel survey (taken in 1994) used PROCAMPO funds to purchase agricultural inputs, although respondents claimed the subsidy was too small to stimulate change in cropping strategies or in area planted. This characterization fits well with how the program is perceived in the study region where it is cynically referred to as PROCAMPO, in reference to PRI (Partido de la Revolución Institucional—Institutional Revolutionary Party), Mexico’s dominant political party throughout most of the past century and author of PROCAMPO.

3.2. National Forest Law: Exclusion and Participation

Mexico is distinctive in that nearly 80 per cent of its forested lands are communally owned (Castilleja 1993; Klooster 1997; World Bank 1995: 22). Although forest legislation in Mexico dates back to 1884, forest law has historically been subordinate to agrarian development (World Bank 1995). In the absence of effective federal regulation, timber concessionaires of the late 1800s and early 1900s systematically logged significant volumes of precious hardwoods (Ch. 3). After the 1910 revolution and the initiation of agrarian reform, Mexican forests were gradually transferred to ejidos over six decades of land grants. Most concessions continued until the 1980s, however, exploiting timber at the expense of local communities that controlled the forests but lacked the capital to exploit them (Guerrero 1988; Klepeis 2000; Klooster 1997). Based on its 1926 precursor, the 1992 Forest Law mandates that timber extraction from forested areas requires permission from the environment ministry (SARH 1992: Articles 34 and 35, Fracción II). Inventories of timber in each ejido form the basis for annual allowable cutting volumes, and the signatories to the contract assume responsibility for reforestation under the national forest law.

7 Timber production in Campeche remains beset by various problems: the absence of an organizational structure that unifies the timber-producing forest ejidos around their common resource and sectoral interests; a lack of financial and technical expertise; and an inability to market tree species other than the traditional mainstay of forestry in the region, mahogany.
The National Reforestation Program (Programa Nacional de Reforestación), PRONARE, was formally created in 1995 to address the degradation of forest resources through ecological restoration and the establishment of forest plantations. The provision of employment and income opportunities is one of PRONARE's mandates (Galletti 1998). PRONARE projects in the study region were initiated through a strong local inter-ejido alliance (see CRASX below), and focused on providing technical assistance for timber extraction in selected forest ejidos.

The National Forest Development Program (Programa de Desarrollo Forestal), PRODEFOR, facilitates community access to technical expertise required to improve forest management (SEMARNAPE 1997). This program focuses on native forest management and production rather than plantations, and funds technical assistance and forestry training for ejido members, as well as non-timber forest product industries.

Along with these programs, a series of revolving funds for small businesses is available to local producers of forest-based enterprises. Rural development funds such as Alianza para el Campo (Rural Alliance) and FONAES (Fondo Nacional de Apoyo a Empresas Sociales—National Fund for Assistance to Social Enterprises) finance extractive activities such as agiculture, chicle production, or reforestation programs. Federal resources from diverse sources not only fund forestry initiatives but can also fund up to 45 per cent of costs of technology improvements in agricultural and livestock production, as well as agriculture (Ford 1998).

3.3. Social Movements and Smallholder Agency

The demise of logging and the large government-directed agricultural projects in the late 1970s and early 1980s (Ch. 3) opened up opportunities for increasing local agency in land management. In 1979, a union of five ejidos (UEPMC—Unión de Ejidos Pueblo Maya de Campeche or the inter-ejido Union of Maya Peoples of Campeche) was formed—despite resistance by the state, which viewed peasant organizations as a threat to state authority—in order to reclaim the rights of ejidatarios to the control and use of their forest resources, which up to that point had been largely under the control of the Mexican state and forest concessions.

Through political mobilization by ejidatarios (e.g. UEPMC), state, and NGO sponsorship of ejido development initiatives have increased. Two important examples of the interaction of the state, NGOs, and local social movements are reviewed here, one from Quintana Roo and the other from Campeche: Plan Piloto Forestal (Pilot Forestry Plan); and the Consejo Regional Agrosilvopastoril y de Servicios de Xpujil (CRASX), or the Regional Council of Solidarity and Agriculture, Livestock, and Forestry Services of Xpujil (Campeche).

3.3.1. Plan Piloto Forestal (PPF)

The end of forest concessions to parastatal companies gave ejidatarios the right to extract logs, produce their own processed lumber, and sell it (Snook 1998). Outside interests concerned with conservation and the social welfare of ejidatarios arrived quickly to offer aid and guidance to the ejidos. Federal, state, and NGO involvement led to the creation of PPF, which is now world-renowned in conservation circles. Bray (2000) refers to the ‘PPF process’ because, rather than a single coherent program of action, it represented a process of adaptive management by local ejidatarios to changing social and ecological conditions that was stimulated by state, federal, and international actors. This process started in 1983 to empower ejidatarios to gain a livelihood from forest extraction in sustainable ways, complemented by national and international conservationist aims to preserve the region's biodiversity and forest habitat in the face of rapidly expanding cropland. In addition, state governors sought to create a landscape consistent with public images of the El Mundo Maya (The Maya World) tourism scheme (see below; Bray 2000).

These broad goals were accomplished by providing ejidatarios within forestry lands (i.e. ejidos with long land grants that were designated originally for forest extraction; Ch. 3) with the technical and management skills necessary to manage their own forest resources. The PPF approach grew out of an agreement between SARH (Secretaría de Agricultura y Recursos Hidráulicos—Secretary of Agriculture and Hydraulic Resources) and the GTZ (Gesellschaft für Technische Zusammenarbeit—German Association of Technical Cooperation), referred to as the Mexican-German Accord (Galletti 1998). The goal of the German group was to encourage the

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8 In the end, these ‘forest’ programs affect the land managers’ livelihood options, and thus decisions about agriculture. In future work the SYPR project will account for this influence in various modeling ventures. Data limitations prevent the project from considering these factors in detail now. Understanding them, however, guides our interpretations of the results.

9 PPF also had the support of the governor of Quintana Roo, and organizations such as the British Overseas Development Agency (ODA), the John D. and Catherine T. MacArthur Foundation, and Conservation International (Galletti 1998).
establishment of local institutions that would continue to manage the forest sustainably even after the various NGOs and outside technical advisors left the area (Martens 1999). The goals of more sustainable forest extraction and institution building were furthered by numerous approaches at the ejido level: permanent forest extractive reserves were established; forest inventorries helped to formulate sound management practices; civil organizations were created to represent ejidatarios, provide technical assistance, and explore marketing strategies; and ejidatarios were trained in all aspects of forest planning and management (Bray 2000).

The PPF ended in 1998, and the degree to which it met its goal of sustainable forest management is questionable. Perhaps its primary legacy lies less in forest management per se but in institution building and the enhancement of the political skills of ejidatarios who gained valuable organizational, political, and technical capabilities (ibid.). The program served to engage ejidatarios in land management beyond agriculture and ranching, and brought international conservation and development attention to the study region.

3.3.2. Consejo Regional Agrosilvopecuario y de Servicios de Xpujil (CRASX)

The Salinas administration of the late 1980s reasserted its political reach into the study region through the institution of the federal 'solidarity brigades' of PRONASOL (Programa Nacional de Solidaridad—National Solidarity Program) and the INI (Instituto Nacional Indigenista—National Institute for the Indigenous) (Galletti 1998). The projects implemented by the INI's Fondo Regional (revolving funds for regional development) program were populist and participatory. The Xpujil Regional Solidarity Council was formed by ejidos in the Calakmul region in order to negotiate the terms of projects in the local communities funded by Fondo Regional. The initial Solidaridad funds were directed towards subsidies and extension programs for agriculture, focused primarily on chili cultivation, cattle ranching, and apiculture.

The Solidaridad metamorphosed in the CRASX (Consejo regional Agrosilvopecuario y de Servicios de Xpujil—Regional Council of Solidarity and Agriculture, Livestock, and Forestry Services of Xpujil), representing over half of southeastern Campeche's ejido communities, and serving as the vehicle for almost all development and conservation projects targeting the region. Primary concerns of the CRASX were managing water, marketing of cash crops, improving roads, and facilitating the implementa-

mentation of numerous NGO and government-sponsored conservation, education, and development programs, most notably ecotourism in recent years (Haenn 2000; Haenn 2003). Initial activities centered on development rather than conservation.

In the ensuing years, CRASX went on to claim 3,000 members in fifty-eight ejidos, and oversaw the establishment of five nurseries in the region, the reforestation of 1,500 ha, establishment of agroforestry plots in 150 ha in seven ejidos, the establishment of 75,200 ha of permanent forest areas in seventeen ejidos, and the promotion of organic agriculture and apiculture in several ejidos (CRASX 2000). Due to organizational problems, regional tensions within geographically distinct ejido communities, corruption, financial mismanagement, and perhaps most significantly, the creation of the municipality of Calakmul in 1997, however, CRASX is no longer the major political entity it once was (Haenn 2000; Haenn 2003).

Like the PPF, the most important legacy of the CRASX is its impact on the regional profile of the southern Yucatán peninsula. For much of the 1990s CRASX was the channel for political organization and lobby for international and national government attention in southeastern Campeche, as well as the sole conduit for all federal, state, and non-governmental funding. Both CRASX and PPF can be seen as paving the way for subsequent large-scale initiatives, most notably the establishment of the Calakmul Biosphere Reserve and municipality of Calakmul, Bosque Modelo (Model Forest project), the El Mundo Maya tourism scheme, and the Mesoamerican Biological Corridor (MBC) initiative.

3.4. Calakmul and Increasing Conservation Concerns

The establishment of the Calakmul Biosphere Reserve (CBR) was a watershed event for the study region. The 1989 federal decree that established the reserve attracted the attention of researchers and environmental NGOs and set the tone for federal, state, and local politics predicated on the conservation-development dialectic.

3.4.1. The Calakmul Biosphere Reserve

In 1993 Calakmul was designated a UNESCO (United Nations Educational, Scientific, and Cultural Organization) Man and the Biosphere site, explicitly drawing human activities into the reserve's scope of management, responsibility, and vision, leading the reserve to seek the active
participation of CRASX in its management decisions. The reserve's technical advisory committee represents a plethora of federal, state, and local organizations (e.g., ejido authorities), NGOs, and academic institutions. Goals for regional development include both economic development and environmental conservation: environmental education, organic agriculture, composting, waste management, home gardens, and tourism programs focused on archaeological sites, biodiversity, and Maya culture (SEMAR-NAP 2000). The reserve's larger agenda includes controlling fire, deforestation, and both settlement and cropland expansion into the reserve, resolving tenure and boundary conflicts, and promoting social development programs.

The reserve did not officially function until 1995, when its first administrative and management committee was founded. Reserve boundaries, however, were defined in the first official site decree in 1989, although without appropriate biological and land-tenure information. Some well-preserved areas remain unprotected, therefore, located outside the reserve's legal boundaries, and other areas that are within reserve limits were cultivated for a long time prior to reserve declaration. These planning errors highlight inconsistencies about the relative importance of regional development versus conservation goals, and have sparked considerations about re-demarcating the reserve better to ensure long-term security of the reserve's ecosystems.

3.4.2. Bosque Modelo de Calakmul (Calakmul Model Forest)

During the early 1990s the Canadian Model Forest network, an international NGO, negotiated with the Mexican government the establishment of a network of 'model' forested areas of better management practices funded by the GEF (Global Environmental Fund, UN). Bosque Modelo (Calakmul) was instituted in 1993, operating in an area of 380,000ha lying between the Quintana Roo border and the biosphere reserve, 300,000ha of which is comprised of forested ejido land (Ercison 1996). Bosque Modelo incorporated local (CRASX), national (SARH), and international interests (e.g. International Development Research Centre).

Defining its mandate as the promotion of 'productive ecology', Bosque Modelo focused its efforts on the sustainable management of its forested lands and sustainable development of the communities within its boundaries. Its primary goals were to decrease swidden agriculture by promoting agroforestry, to encourage the management of wildlife, reforestation, and agriculture, to facilitate the administration and management of water, and to promote the restoration of ruins and ecotourism (International Model Forest Network 1994). Bosque Model worked to decrease human disturbance of the forest by promoting what it assumed were sustainable uses while at the same time improving the quality of life for local people. Subsequently, Bosque Modelo has refocused its attention to the original Canadian mandate of promoting sound forest management practices and strengthening community forestry in Calakmul's forest ejidos. The swing back to forest conservation rather than community development projects follows evaluations of the project's ineffectiveness at promoting a regional vision of better forest management owing to its myriad development projects.

3.4.3. Other NGOs

A diverse group of NGOs now share two basic common goals for the study region, its actions often channeled through the biosphere reserve, Bosque Modelo, or CRASX: (1) the promotion of sustainable natural resource management and conservation, including better forest management practices and extractive industries, and (2) agricultural 'sedentarization' intended to reduce cultivated land expansion into extant forest.

The most prominent NGO still active in the region is ProNatura Peninsula de Yucatán (ProNatura Yucatán Peninsula), founded in 1988. ProNatura is the Mexican partner of The Nature Conservancy in the funding and evaluation of the Calakmul Biosphere Reserve's annual management plans. ProNatura began its activities in the region focusing on flora and fauna research and environmental education in schools. The organization later

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10 The reserve is funded federally by SEMARNAT (Secretaría del Medio Ambiente y Recursos Naturales—Environment and Natural Resources Secretariat), and internationally by the GEF (Global Environmental Fund, United Nations) and the World Bank. The Nature Conservancy, through the Parks in Peril program, oversees and evaluates annual work plans of the reserve in a joint partnership with SEMARNAT and the World Bank. The reserve receives additional support from the World Wildlife Fund, the Ford Foundation, and the US Fish and Wildlife Service in an assortment of conservation and research activities.

11 J. Rodriguez de la Gala, Director, Calakmul Biosphere Reserve, personal comment.

12 J. Miranda, Fire Prevention and Control Program Coordinator, Calakmul Biosphere Reserve, personal comment.

13 L. Poot, General Coordinator, Bosque Modelo para Calakmul, personal comment.
evolved to include communities in conservation and development projects. In this regard, ProNatura is focused on the sedentarization of agriculture and generating income from sustainable development projects. Projects in multiple ejidos (totaling over 1,000 ha) promote apiculture, environmental education, and organic agriculture using green fertilizers and reduced chemical inputs and burning.

The International Center for Research in Agroforestry (ICRAF) is active to the east of the biosphere reserve. Between 1994 and 1999, approximately 700 ha of agroforestry plots were established in forty-two different ejidos in the buffer zone of the reserve (Snook and Zapata 1998). The plots consist of alternating rows of timber trees, mahogany, cedar, and orange trees as well as maize and other crops associated with milpa (Ch. 9). In addition, NGOs such as Naturaleza Compartida (Nature Shared) and Tropico-Rural Latinoamericana (Tropical Rural Latin America) recognize the problems stemming from inadequate commercialization of sustainable forest products, and are exploring initiatives, such as product certification, to boost forest management practices and production (Boege and Fuentes 2000). As demonstrated in Quintana Roo, initiatives such as forest certification can affect not only forest ecology but also local livelihoods and social relations by providing new income opportunities and broadening the base of participating actors (Maynard and Robinson 1998).

3.5. Pluralization of Institutions

As the southern Yucatán peninsular region moves away from its long-held status as an economic frontier, the diversity of land uses has increased following the synergy of numerous local-to-international agents and organizations and the governing institutions they promote. New or expanded land uses/associations include apiculturalists, chili cultivators, timber producers, allspice gatherers, chicleiros, and ranchers, to name a few. The first four uses/associations were among the most important producer groups to believe that their needs and demands were not addressed by the organizational structure of CRASX in the early–mid-1990s. These groups, assisted by INI in some cases (apiculture), went on to form their own unions, as did other sector-based groups, such as those focusing on organic agriculture, timber, and chicle production.15

Local unions to international programs give rise to three distinct "institutional" areas within the study region—the Quintana Roo portion that is to the east of the CBR, the centrally located CBR-Bosque Modelo area, and the region west of the reserve (Fig. 1.1). Among members of CRASX, the ejidos of the southern frontier with Guatemala were relatively isolated and marginalized, as were a group of ejidos west of Xpujil in the region of Laguna Silvite. They split off to form the Consejo Regional Indígena y Popular de Xpujil (CRIPX—Regional Indigenous and Popular Council of Xpujil), representing the southern portion of the municipality of Calakmul, and the Consejo Arteecologia Agropecuario (Art-Ecological-Agropastoral Council), representing the western subregion of the municipality. These new unions, aligned with Calakmul, focus not only on specific agricultural products but also small business enterprises in their communities.

A spatial picture of relative marginalization and government investment in ejidos of the Calakmul region is detailed in Fig. 7.2. This figure is based on a partial reconstruction of highly diverse development projects and conservation initiatives over the period 1991–2000 in the approximately eighty ejidos and communities in the greater Calakmul region, on the Campeche side of the study region. As noted in this chapter, numerous programs funded these projects. The variation is cumulative over the decade indicated.

4. Beyond the CBR

From an institutions perspective, the southern Yucatán peninsular region is no longer a frontier. Numerous local social movements interact with the vision of external organizations for conservation and development in the region. Increasing settlement growth and establishment of the CBR spurred organizations and movements at various sociopolitical scales,

15 Among those exploring market-specialized production is the allspice producers' union. It is shifting its strategy from promoting allspice as a non-timber forest product to be gathered from forested ejido lands, to a product that can be cultivated in forest plantations and agroforestry parcels under cooperative arrangements among groups of ejidatarios, thereby profiting from economies of scale (L. Guzman, President, Bosque Modelo de Calakmul and Allspice Union (Sociedad en Solidaridad Social de Pinimenteros de Xpujil, SPR), personal comment).
4.2. The Mesoamerican Biological Corridor

The Mesoamerican Biological Corridor, formalized in 1997, is an ambitious international project that aims to combat habitat fragmentation and improve the connectivity of regional ecosystems in southern Mexico and Central America (Fig. 7.3; Kaiser 2001; Miller, Chang, and Johnson 2001). The broad objectives of the project are to (1) facilitate genetic flow among established forest reserves, and (2) integrate regional policy, land use, and conservation for sustainable development. Many different stakeholders are involved in the development of corridor(s) (e.g. producers’ associations, research institutions, and planning committees), composed of ‘nodes’ and

16. The Mesoamerican Biological Corridor is led by the respective country governments, and supported by the GEF, World Bank, United Nations Development Program, GTZ, and many other national and international organizations. The steering committee of MBC-Mexico is comprised of federal actors from eight government ministries, including SEMARNAT, SEDESOL, SAGARPA (Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación—Secretariat for Agriculture, Livestock, Rural Development, Fishing and Nutrition), SEP (Secretaría de Educación Pública—Secretariat for Public Education) and SCT (Secretaría de Comunicaciones y Transportes—Secretariat for Communications and Transportation), as well as the National Ecology Institute. The MBC-Mexico project is budgeted at an estimated US$79.9 million, and includes the states of Campeche, Quintana Roo, Yucatán, Chiapas, and Tabasco, with additional linkages to protected areas in Oaxaca and Veracruz (GEF 1999).
'connectors' (Galletti 1999). Nodes are pre-existing, legally protected conservation areas such as the Calakmul Biosphere Reserve. Connectors are the areas between nodes where various conservation-based management strategies will aim to conserve forest cover. The southern Yucatán peninsula region is a corridor between the CBR and Sian Ka'an reserve (node) to the northeast and reserves (nodes) in Guatemala to the south. If implemented, this corridor would try to protect 600,000 ha of forest in the study region deemed important for genetic flow and ecosystem health. It portends significant land-use consequences because MBC aims to create or preserve corridors by considering biophysical processes and ecosystem functions in a particular place in relation to the various human use systems employed.

The corridor’s strategy in the Calakmul region is to focus on (1) ejidos and private lands located along Highway 186, extending from Veinte de Noviembre located east of Xpujil to Chichonal located in the west, (2) smaller agricultural ejidos located along the northeastern border of the Calakmul Biosphere Reserve near La Montaña, (3) the chili-growing region around the ejido Polo Norte, and (4) large forest ejidos (Alvaro Obregon, Nuevo Becal, Veinte de Noviembre, and Conhuas). The Zoh Laguna–Xpujil and Las Montañas focal areas lie in the center and north of the Calakmul region respectively, and are particularly critical to the corridor’s regional development and conservation initiatives. The Zoh Laguna focal area is also critical to establishing landscape connectivity between the northern and southern blocks of the CBR dissected by the trans-peninsular Highway 186. To achieve these aims, participatory workshops have maintained an overarching emphasis on increasing ‘sustainable’ agricultural productivity to reduce the amount of land required in cultivation and to expand markets for forest products, thus increasing the resource value of forests for local occupants (Boege and Fuentes 2000; CBM 2000).

5. Summary

The increasing institutional complexity of the southern Yucatán peninsular region makes uncovering the factors leading to land-use and land-cover change all the more difficult. The abrupt shifts in regional development initiatives over the past half century moved land change in different directions. The current broad goals of increasing conservation-tourism and the economic productivity of the land, no matter how laudable, remain unproven. These goals, placed in context of neoliberal reforms and a proliferation of agencies and organizations seeking to stake out land and resource institutions in the study region, mirror the local-to-global dynamics that are a part of globalization processes everywhere. For the SYPR project at large, accounting for the direct and indirect land impacts of these institutions and organizations is not easy. At this stage in our work, grappling with the cacophony of programs and projects helps us to understand variation in land dynamics across subregions and to assess better the results of our modeling work (Chs. 12–13). In subsequent phases of research we hope to entertain spatial data on ‘protected’ forests and to incorporate more fully those policies and institutions that affect farming decisions in our model design.

For phase one of the project, the following lessons apply.

- The ejido is the region’s main land-access unit.
- Over the last two decades, conservation and development initiatives have complicated the context in which land managers make decisions.
• Social forestry and environmental conservation initiatives have designated a significant amount of land (mediana) off-limits to forest clearing.
• Social movements and NGO activities that empower smallholders and more liberal agrarian policies have created more diversified land uses region-wide.
• Important changes in regional political economy, such as those linked to the Calakmul Biosphere Reserve and El Mundo Maya, hold important implications for land change and attempts to project future dynamics.
• This last development accentuates the need for refined understanding of the human-environment dynamics in the region as they play out in terms of land-use and land-cover change—the base rationale for the SYPR project.

REFERENCES


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