The Maya Forest in Campeche, Mexico: Experiences in Forest Management in Calakmul.

Acopa, Deocundo y Boege, Eckart.

Timber, Tourists, and Temples

Conservation and Development in the Maya Forest of Belize, Guatemala, and Mexico

Edited by

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Chapter 6

The Maya Forest in Campeche, Mexico: Experiences in Forest Management at Calakmul

Deocundo Acopa and Eckart Boege

Deforestation and forest degradation are common in the tropical forests of Mexico. Forests in Oaxaca, Chiapas, and the Yucatán Peninsula, as well as coastal forests of Michoacan, Jalisco, Nayarit, and Sinaloa are among those threatened, although the most badly degraded forests are found in Veracruz, Tabasco, and Chiapas. For geographic and social reasons, some forests in Campeche and Quintana Roo have experienced a slower rate of destruction. These forests in southeastern Mexico represent Mexico's best opportunity for preservation of existing forests and for restoration of degraded tracts because they are part of the largest unbroken forest mass in the northern hemisphere of Latin America. But this forest, along with adjoining areas of Guatemala and Belize, is not a "virgin" forest; it was historically the seat of ancient Maya civilization, and the remains of Maya cities are found throughout the forest. It is from this civilization that the Maya Forest, or Selva Maya, draws both its name and its status as a cultural and biological patrimony of humanity. The great challenge now before us is to preserve this forest and to plan regional development so that the forest is maintained as a permanent resource. However, causes of deforestation and forest degradation in Mexico are multiple, and it is necessary to understand their dynamics in order to plan suitable policies for preservation of these forests.

Forest Policy in Mexico

It is no small irony that "forest policy" in Mexico has historically encouraged removal of forests. The principal causes of deforestation and forest degrada-

tion include development of extensive cattle raising and commercial agriculture. These activities are supported by the state bank, the government, the World Bank, and the Inter-American Development Bank, and promoted by governmental agencies. Also, explicit colonization and land-clearing policies, led by the Programa Nacional de Desmontes (National Land-Clearing Program) in the 1970s, contributed to forest destruction by equating "improved"—that is, cleared—land with a claim to ownership of the newly converted tract. These colonization projects have been carried out in various regions of southeastern Mexico; they mostly focused on resettling displaced populations from elsewhere in Mexico, through both planned and spontaneous colonization, and lacked long-term assessments of the projects' impact on the environment.

Mexico's forest policy also favors private industries over local populations who directly depend on the resources. Historically, owners of forested land have been paid only a symbolic stumpage fee that does not represent the real value of the forest resource. Government forest agencies have been principally aligned with industry, and political structures at all levels—regional, state, and national—encourage the exploitation of common resources. Even where policies might favor sustainable use, lack of coordination among different levels of government reduce the policies' effectiveness. In some cases, policies are drawn up that are appropriate for temperate forests, not tropical ones.

Beginning in the 1980s, two alternative policies have been implemented to slow the process of destruction in Quintana Roo and Campeche: the creation of biosphere reserves (Map 1 in Introduction to this volume) and the management of natural resources by organized peasants. These two policies did not develop in tandem, but rather emerged as two parallel practices. In this chapter, we will focus on the interplay between these two alternatives as they have developed around the Calakmul Biosphere Reserve in southwestern Campeche.

Establishment of Biosphere Reserves in Southeastern Mexico

The biosphere reserve concept, which includes zoned and managed core and buffer areas, calls for the participation of local populations in reserve management. However, this principle has been difficult to implement. In the case of the Calakmul reserve, for example, local populations were not consulted before the reserve was declared by the Mexican government in 1989, nor did the decree take into account that there were already peasant communities existing in the presumably ecologically pristine core area. Furthermore, the creation of the reserve has done nothing to control activities such as the cultivation of narcotics, trade and sport hunting of rare and endangered species, and looting of archaeological sites. Nevertheless, the creation of the Calak-

mul Biosphere Reserve has initiated the challenge of turning the reserve into a focus for a regional development strategy that must extend the concept of sustainability even beyond the reserve proper if it is to successfully protect the forests of Calakmul.

One important instrument in such a strategy is land-use mapping and zoning. This activity can be implemented from above or develop from spontaneous land-use decisions of local producers, but the most effective way of implementing it is to approach it not as a theoretical mapping scheme but as an agreement among stakeholders to establish specific rules of conduct and resource use. Another instrument involves planning a biological corridor between Calakmul and the Sian Ka'an Biosphere Reserve in central Quintana Roo. This corridor includes permanent forest areas managed by communities.

The participation of local populations and resource users in all management decisions must be the basis of a regional development strategy organized around the biosphere reserve concept. Such participation is obviously taken for granted on their own ejido lands, but they should also take part in decisions affecting adjoining reserve land. This strategy gives them economic incentives for sustainable use of resources and generates self-organization, incomes, basic necessities, and stability for the forest. The local populations also tend to view the forests as a multiple-use resource, extracting not just high-value timber species, but also a multitude of nontimber forest products that can lend themselves to sustainable uses.

History of Natural Resource Use in Calakmul

Resource extraction in the forests of Campeche began with the exploitation of *tinta*, or logwood (*Haematoxylum campechianum*), a forest tree with a deep purple heartwood that was prized for the red and purple dyes that could be made from it. Although logwood had been exported since the seventeenth century, it became the principal export in the last decades of the nineteenth century. However, its use dropped dramatically after the invention of synthetic dyes in the early twentieth century. With the decline of the logwood market, two alternative products gained prominence: chicle latex, used in chewing gum, and timber.

Growth and Change in the Chicle Industry

In the late nineteenth century, latex from chicle (or *chicozapote*) trees (*Manilkara zapota*) emerged as a global commodity. At the industry's peak in 1940, 80% of the world's chicle came from Mexico, with over half of that coming from Campeche. In 1936, the powerful Chenes cooperative was created in Dzibalchén; this cooperative was granted a concession of 150,000 ha of national lands located in the core of the current Calakmul Reserve, which

were to be used for chicle extraction. A few years later, all the forests of Campeche were divided into 50 concessions, which were later declared ejidal lands. From 1935 to 1940, 69 ejidos were established, 9 of which were given extensive forest lands. In the largest of these, each ejidatario was given 400 ha of land so that they could be assured of having sufficient trees available to make a reasonable living collecting chicle. Most of these chicle gathering areas remained uninhabited, and at least one community was given forest lands located two days' walk from their homes. Colonists from throughout Mexico flocked into the forests to gather chicle, despite the horrible working conditions prevalent at the time.

The extraction of chicle saw several periods of rise and decline, coinciding with World Wars I and II, due to the U.S. Army's custom of providing its soldiers with a daily ration of chewing gum. This important market went into decline, like the logwood market before it, when artificial bubble gum was introduced during the Korean War. Since the 1950s, chicle production has decreased continuously, although enough demand exists that chicle tapping continues to be an important secondary economic activity for many peasants. The process of chicle extraction in the area has slowly evolved from large concessions operated by contractors working for foreign companies toward production by independent ejidos. This change has reduced extraction pressures on some of the more distant forest areas.

Timber Extraction

At about the same time that chicle was developing as a prominent resource, enormous logging concessions were granted to eight North American companies, which had access to 1.3 million ha in Campeche by 1910. Large-scale timber exploitation in the modern-day Calakmul Reserve began with the construction of a railroad in the early 20th century, and followed in later years by the Escárcega-Chetumal highway. Previously, timber extraction was limited to areas accessible to the few rivers that traverse the southern Yucatán Peninsula, which were used to transport the logs to Chetumal Bay, where they could be loaded onto ships for export. Even after alternative routes became available for transporting timber, a factor which theoretically increased the value of the concessions, companies exploited hundreds of thousands of hectares of forested land while paying only a very modest stumpage fee.

The first ejidos organized around forest exploitation rather than chicle extraction were created by the Mexican government during the 1960s. By the early 1970s, the Ejido Forestry Association included nearly one hundred communities. In 1974, it was converted into the Forest Ejido Union (UEF) and became a provider of the technical assistance necessary to receive logging permits. However, the process of issuing logging permits became very corrupt, with the permits being bought and sold rather than issued on merit. This pe-

riod in Mexico's timber industry was characterized by tremendous waste of the forest resources. Ejidos in the Escárcega region of Campeche were given logging permits even though they had no forested land; most of the permits were used to harvest timber from land that today is part of the reserve area. However, the ejidos received few benefits from this activity; the timber, primarily mahogany and cedar, was sold below its actual value to sawmills ostensibly owned by cooperatives, but which permitted the ejidos no participation in profits or decisionmaking. Uncontrolled logging produced impoverished forests and reduced benefits to the populations who lived closest to the forests; one particularly wasteful practice was the use of valuable tropical hardwoods for railroad ties despite the ready availability of more common species. Although a 1986 forestry law made management plans obligatory, few ejidos could afford the cost of putting the plans into effect, so they were seldom carried out.

The exclusion of peasant producers from an alliance established among government forest authorities, corrupt cooperatives, and influential businessmen triggered the beginning of a movement of independence of these producers from official organizations. This movement lasted ten years and sought control, management, and industrialization of natural resources. Peasants from the Alvaro Obregon ejido allied with other ejidos and fought government objections to gain the power to saw and market their own timber. After a long struggle, they were finally able to obtain their own sawmill. Although the government continued to deny them a logging permit, they began to mill the tips and branches left in the forest as waste by the logging industry. With this waste timber, they began making beehives, giving rise to beekeeping as a new economic activity in the region and creating a nontimber forest alternative. This period marked the beginning of the end of an exploitation regime that "mined" the forest, which coincided with the end of unorganized colonization.

Strategies for Comprehensive, Community-Based Forest Management

The Calakmul Biosphere Reserve was created in 1989 and was registered in the UNESCO Man and the Biosphere Program in 1993. Of the 723,185 ha that compose the reserve, 227,860 ha have been set aside as two core areas, with the remainder classified as buffer zones. Calakmul also adjoins the Maya Biosphere Reserve in the southern Petén in Guatemala and serves as the southern anchor for a vast 1.2 million ha corridor of permanent forest reserves managed by ejidos, with the Sian Ka'an Biosphere Reserve holding down the northern end (Figure 6.1). The reserve and its adjoining areas are populated by some 15,000 residents, including mestizo colonists from 23 states, as well as indigenous Yucatec, Chol, and Tzeltal Maya.

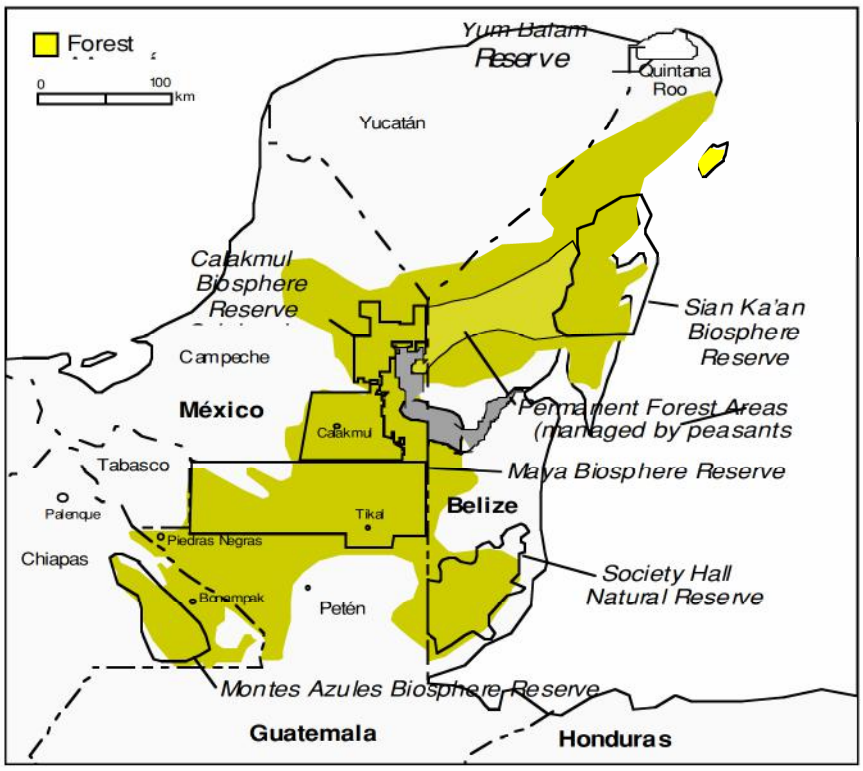


Figure 6.1

The Calakmul Biosphere Reserve in relation to other biosphere reserves in the Maya Forest.

The organization of the ejido populations around and in Calakmul to manage their own forests was heavily influenced by the successful Plan Piloto Forestal (PPF) methodology that had been applied in southern and central Quintana Roo since the mid-1980s (Galletti, this volume; Flachsenberg and Galletti, this volume). This methodology consisted of systematically training local people to carry out sustainable silvicultural practices, to reforest, and to manage their own forest industries. It is based on the assumption that natural resources must benefit the local populations because they have the most direct impact on the resources and have a long-term interest in developing a multiple-use strategy that includes both timber and nontimber forest products.

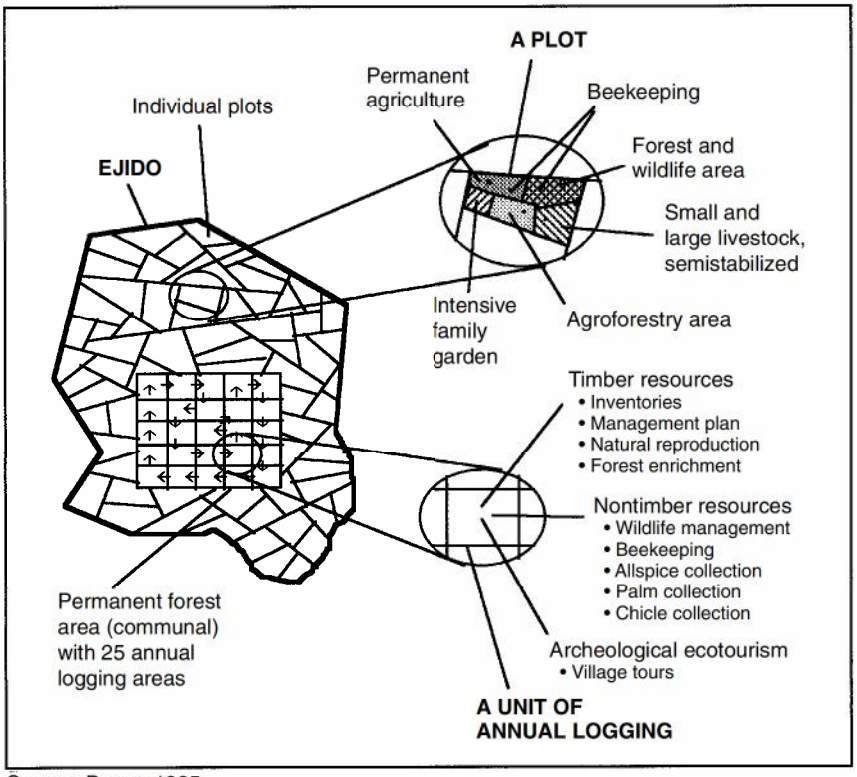
The fundamental strategy of this approach calls for a diversified management plan that includes timber and nontimber forest products (such as wildlife, chicle, honey, palms, and ecotourism), as well as sustainable agriculture.

The strategy also advocates the creation of inter-ejido organizations that support sustainable development. These organizations are composed of members from various production sectors, including timber workers, beekeepers, jalapeño farmers, and chicle workers. These organizations establish ecological zoning for the management of common goods, and introduce important elements of democratic decisionmaking in regions traditionally marked by authoritarian structures.

In addition, the strategy calls for the creation of technical capacity among the peasants to allow them to carry out the majority of the technical management of their forest. Ideally, this would include management structures to allow the peasants to supervise the work of forestry professionals they hire. Furthermore, the approach requires that industrial capacity developed for the ejidos be adjusted to the sustainable production potential of the forest, not the forest production to the size of the industry.

If the strategy is to work effectively, however, it requires an element of political planning as well as technical know-how. Political "cover" must be provided by seeking support from sympathetic government officials and foundations and by challenging destructive sectors when necessary. The project must negotiate differences between ejidos within the organizations, which may be of different ethnic groups and have very different resource endowments. The local organizations must also contend with contradictory policy directives emanating from state and federal authorities; they may frequently find themselves alone in promoting the most sustainable option. Since the natural tendency of both the state and the federal government in Mexico is to resist the actions and ideas of organizations they do not control, successful implementation of this strategy requires a high level of organization on the part of the peasants, but they have generally been able to meet this challenge. In Quintana Roo, peasant organizations established a precedent by refusing to be used as political springboards for the official party, and the Calakmul organizations have been able to achieve the same autonomy. They have developed enough organizational, economic, and political strength to negotiate with the state and federal governments.

The management plan the ejidos have developed has five principal elements, each of which can add value to the forest. The first and most crucial element is the creation by each ejido of areas of permanent forest (*áreas forestales permanentes* or AFPs), as well as wildlife habitats, foraging areas for apiculture, and management regimes for nontimber forest products. AFPs voluntarily established by 30 ejidos encompass some 125,000 ha. This element has halted the conversion of forest to agricultural fields and pasture over wide areas. Second, agroforestry regimes and timber plantations are being developed outside of the permanent areas. These areas can include sequenced harvesting cycles from 1 to 20 years that create open spaces needed for establishment of sun-loving species such as mahogany. The diverse vegetation of these



Source: Boege 1995

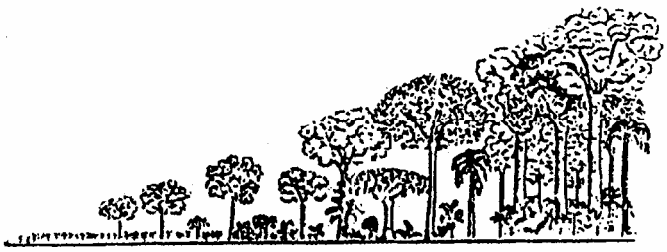
Figure 6.2

Proposed territorial and ecological zoning for ejidos with permanent forest areas in the areas of influence and buffer zones.

gaps also creates enriched habitats for wildlife populations. Third, the traditional milpa fields created using slash-and-burn cultivation techniques must become intensively farmed, fixed plots rather than migrating extensively across the landscape. The use of legumes as green fertilizer and control of soil humidity are key in managing the fragile soils of the tropics. Fourth, more intensive methods of stock raising that require less land are being developed. Fifth, the intensive use of family vegetable gardens must be encouraged. The ejidal proposal for territorial zoning is shown in Figure 6.2.

Timber Industry in Calakmul: Problems and Prospects

In the near future, it is likely that logging will be the most important economic activity for the region. The first major problem with this activity is that the intensity of logging in earlier periods in the Calakmul area has seriously



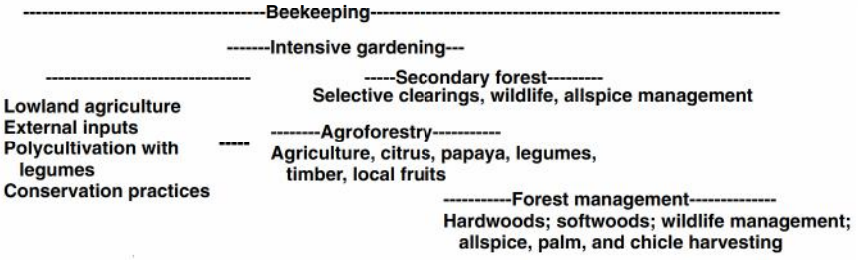


Figure 6.3

Schematic representation of different stages of forest succession showing activities that can be supported by each stage.

compromised the future productivity of its forests. For commonly used tropical timbers, Calakmul has a production potential of 75 to 80 m^3/ha, while nearby Quintana Roo and Chiapas have a production potential of 100 m^3/ha and 120 to 180 m^3/ha, respectively. Furthermore, only 10 m^3/ha of this timber from Calakmul is currently commercial timber, such as mahogany, due to heavy logging during earlier periods. Thus, sustainable logging plans and the economic needs of the local populations must be carefully calibrated so that expectations about income from logging are realistic and sustainable. Although the PPF model emphasizes management of cedar and mahogany, Calakmul is trying to emphasize the importance of the lesser-known tropical species.

Important steps have been made in sustainable forest management. In addition to the establishment of the AFPs, the first complete forest inventories have been carried out on 35,000 ha in ten ejidos, a new generation of ejido paraprofessional foresters has been created, management plans have been formulated, and 75-year logging cycles for mahogany, consistent with the PPF methodology, have been established. This cycle is still regarded as an estimate since the exact growth rate of mahogany and other precious species is still under debate. Furthermore, ejidos have established permanent sampling plots

to measure forest growth and ejido nurseries to enrich plantings on family plots and in secondary growth areas.

A major planning problem is the variation of forest resources held by each ejido. In fact, only 5 of the 30 ejidos that established AFPs have the potential to reach an economically important and sustainable annual yield. Differences in size and available species require that the organization, the territorial zoning plans, and the strategies of milling and marketing be adapted to the conditions in each ejido. For example, ejidos with small AFPs may permit logging only every three to five years, instead of annually; alternatively, wood could be extracted annually only from small exploitation areas. Under these difficult conditions, it is particularly important to find technical solutions to increase the value of production and obtain the highest profit with a small volume. Mobile sawmills shared among several smaller ejidos are one such technical solution that is being attempted. Enhanced income-generation on smaller ejidos is also obtained through the local processing of raw material using small carpentry workshops that experiment with different products for local use. This effort is interesting because it provides young people with jobs and generates products, such as beehives, that are bought locally, keeping money in the local economy.

In addition to mobile sawmills and carpentry workshops, more industrial milling operations also have their place. Efforts by the regional inter-ejidal organizations to operate their own sawmills have not proved profitable or efficient, but more recent efforts to associate established industry with the ejido organizations may prove to be more successful. This effort still requires external subsidies if the organizations are to move toward sustainable management. Requirements include a dependable supply of natural and secondary forests, in a framework of sustainable management; organization of production inside the ejidos; creation of a basic infrastructure by purchasing extraction equipment; construction of roads that can be used during the rainy season; the use of every extracted tree; an efficient system of transportation to reduce costs; and a system of reforestation. As mentioned before, enterprise size must be designed with the real sustainable production of the forest clearly in mind.

Finally, sustainability in the marketplace will also depend on getting the best possible prices at the regional, national, and international levels. Particularly important at the international level is the potential subsidy available from green labeling. If international consumers are willing to pay a somewhat higher price for timber sustainably harvested by these communities, the additional income could help support some of the expenses of sustainable harvesting, costs that sales of timber at regular market prices will not cover. Efforts to increase market demand for the lesser-known tropical hardwood species would also bring new value to the forest. With accurate inventories, which also will have to be subsidized, genuinely sustainable rates of harvest could be calculated in the AFPs. On the basis of these figures, a more finely

calibrated agroforestry program could be developed that would make up for the deficiencies in production of a given species from the natural forest.

Exploitation of Nontimber Forest Resources

There are a number of experiments taking place in nontimber forest product industries, including chicle harvesting, allspice plantations, beekeeping, and agroforestry. Many of these have met with success, as described below.

Chicle

As remarked earlier, the chicle boom ended several decades ago. However, a consistent international market, principally sales to Japan and Italy, has remained. It is important to develop this market because the chicozapote tree is the single most abundant species in the forest, and its logging is still prohibited by law. Further, chicle gathering is now restricted to ejido lands and is prohibited in the core area of Calakmul, giving the communities an even greater incentive to preserve their forests, assuming their chicle can be sold for a reasonable price.

Chicle extraction is extremely laborious, requiring the movement of entire families into the forest during rainy months. A 1994 survey of ejido members revealed that 160 families were involved in chicle gathering. The average figures are probably higher because 1994 was a depressed year for chicle production, a result of poor rainfall. The price of chicle is affected by a monopoly imposed by the Bank of Foreign Trade (BANCOMEX), its concession (IMPEXNAL), and corrupt official peasant organizations, aggravated by a tax of questionable constitutionality. If producers can organize themselves to administer their own marketing and export, as is now being done with the Chicle Plan Piloto in Quintana Roo, they can increase their incomes from this source. Recently, Campeche's *chicleros* had some initial success in marketing their own chicle, exporting 50 tons directly to Japan. The existence of a working capital fund was key to this achievement.

Allspice

Stands of allspice are available in the entire area, including AFPs and peasants' plots, and the spice is widely harvested, but it has not been subject to any management plan. Prices have also been quite unstable, and competition with traditional producer areas is strong. In order to increase the production of allspice, nurseries of two ejidos are carrying out a program of plant propagation for agroforestry plantations. Because the harvesting process is relatively simple, it is another activity, like chicle gathering, that can generate income for the entire family. Further, a more intensive agroforestry management

regime could create a more predictable income source. Markets could also be developed in organically grown allspice, achieving the kind of direct exporting that is now being developed for chicle.

Beekeeping

Honey production helps give added value to both secondary vegetation and primary forests. Beekeeping requires a low initial investment that can be recovered during a single cycle of production under normal weather conditions. However, as in other cases, its marketing has been hindered by corrupt official organizations. Beekeeping is a very useful economic activity that can be pursued during periods when there are few other options. Beekeeping can also produce a variety of other profitable products, like wax, pollen, and royal jelly.

Thus far, only the Yucatec and Chol indigenous ejidos in the area have practiced beekeeping. Production has been inhibited by traditional harvesting methods that had little technical assistance. The invasion of Africanized "killer" bees, which can hybridize with local varieties and lower honey production, forced changes in these methods, requiring the introduction of European bees in the hives. In these cases, subsidies from the Mexican government have had a significant multiplier effect, with beekeepers investing in new colonies and equipment. It has also stimulated the incorporation of 60 new families into beekeeping, with women being included in the activity for the first time. Further, as mentioned before, the construction of hives is done locally, using waste woods and supporting community carpentry shops. Beekeeping has also created a new interest in conservation, with one ejido putting a new area of primary forest into production as a "pasture" for the bees.

Beekeeping has been one of the most positive experiences thus far in the development of nontimber forest products, but further steps can be taken. First, greater local technical capacity needs to be developed. Second, product quality could be improved using local knowledge of the forest to locate apiaries where the most intensive flowering of particular species occurs, which could result in the introduction of different flavors in the market, giving new value to plant biodiversity. Export quality could be reached by establishing local packing centers with the adequate technology. Finally, marketing could be improved through locating national and international markets for certified organic and rainforest honey that could have a "Calakmul Biosphere Reserve" trademark.

Agroforestry and Intensive Agriculture

The last four years of work have revealed a great potential for agroforestry in the region. In ecological and economic terms, agroforestry has an important

role to play in giving added value and biodiversity to degraded areas and to enrichment of natural forests. In Calakmul, the following sequence has been developed: in the first year, slash-and-burn agriculture for the production of corn is followed by the planting of fruit trees with medium-term maturation period and timber trees for longer-term cycles. Corn, other basic grains, and subsistence crops can continue to be planted on the same plot until the fifth year. In the third and fourth years, the fruit trees will start producing. As the timber trees mature, the terrain begins to look more like a forest. Under this kind of regimen, growth rates are greater than those of natural regeneration, so the logging of some trees is possible after 25 years. Under these plantation conditions, it is also possible to cut cedar and mahogany trees with smaller diameters than is allowable in natural forests.

The concept is very attractive, and in Calakmul the initial experimental plots seem to be working according to the concept. The first agroforestry plots established around Calakmul are beginning to produce citrus fruits, which are being sold in local markets. Ejido nurseries are also being established that encourage the cultivation of indigenous fruit-bearing trees. These include zapote mamey (*Pouteria sapota*), black zapote (*Diospyros digyna*), chicozapote (*Manilkara zapota*), and huaya (*Talisia olivaeformis*). Improving their genetic quality and management is this program's current challenge. New planting areas must also be sought, since the fruit trees will cease to flourish once the forest canopy begins to close.

The experience in Calakmul has raised difficult questions about the nature of agriculture in and around tropical forests. Can the milpa, the traditional corn field, be grown on permanent sites with shallow tropical soils? Can sustained production be achieved without rotation or clearing new areas? How can farmers achieve soil fertilization without burning?

These questions must also be answered by looking at agriculture as part of an integrated system of production that includes secondary forests as reforestation areas, nonmigrating multiple-use plots with some agroforestry elements to improve soils, and a diversified system of corn cultivation. Fertilization is based mainly on the management of animal fertilizers, compost, and green fertilizers, as well as a method of minimal tillage. An objective for the future is to gradually improve soil conditions and stabilize corn production using native seeds. In addition, a system of annual rotation is being tested in the cultivation of chili peppers, as well as the use of a variety of squash to provide additional cover to the vegetation.

However, the most important improvement has been achieved during the last few years with the introduction of native legume species as green fertilizer. The simultaneous use of these nitrogen-fixing legumes, including jícama (*Pachyrhizus erosus*), ib (*Phaseolus lunatus*), cocuitc or xabyaab (*Gliricidia sepium*), and uaxim (*Leucaenia glauca*), along with other cultivars, allows the maintenance of a permanent layer of soil. Some cover crops, such as velvet bean (*Mucuna pruriens*), introduced by the peasants themselves, may generate

up to 5 tons per year per hectare of dry organic matter and also control weeds and maintain soil humidity. As a consequence, land can be used continuously, avoiding long years of fallow and the need to clear fresh plots.

The use of legumes provides many alternatives for combining crops that could make production a continuous process: annual and biannual agriculture, fruit plantations with short- (3 years) and intermediate- (7 years) term yields, and with long- term (25 years) plantations of precious woods. This productive strategy would cushion the negative effects of price fluctuations under monocropping conditions and create a continuous gradient from forests to plantations, without severe interruptions in the flora and fauna. All these techniques are being used jointly for the first time in the Yucatán Peninsula, and hold the promise of a new kind of tropical forest agriculture for the region.

Ecotourism As an Alternative Industry

Development of archaeological ecotourism also has great potential in the Calakmul region. There are several important Maya sites located two to six hours from the airport in Chetumal, Quintana Roo. What might be called "archaeo-ecotourism" presents another opportunity to bring new value to the forest's natural and cultural resources. The current plan attempts to base tourism in the local communities and discourages more destructive forms of tourist development. It will target those segments of the local, national, and international markets interested in the educational and recreational aspects of the forest and the Maya ruins it conceals. To avoid the concentration of tourists in a single place, two tourism circuits have been planned. One of these two regional circuits includes visits to several Maya sites located around the Calakmul town of X'pujil, including the well-known sites of Becán, Chicanná, Río Bec, and Hormiguero. The second circuit involves the archaeological sites of Calakmul and Balamku.

The biosphere reserve designation gives added tourist value to the region, and two ejidos have established wildlife reserves close to the ruins of Hormiguero and Río Bec to capitalize on this value. Ejidos have also established new regulations that forbid hunting close to the ruins, further increasing their value to tourists. An infrastructure of cabins and restaurants and a luxury hotel in Chicanná have been built in the town of X'pujil, providing various services for different market segments. Other programs related to ecotourism include artisan production, the framing of rainforest insects for marketing, and a workshop for ecotourism guides. This last program has stimulated the interest of young people in learning English and becoming guides.

Institutional Design

The most important element in community forest management in Calakmul has been the emergence of a consolidated regional peasant organization.

Calakmul benefited from the precedent of organizations in Quintana Roo, such as the Sociedad de Productores Ejidales Forestales de Quintana Roo in Chetumal, that had formed a common front for forest management and timber marketing. These organizations had no links with the forestry organizations of the government's ruling party, the Institutional Revolutionary Party (PRI), which had played a significant part in creating the policies that encouraged the destruction of Mexican forests. Inspired by this history, the Consejo Regional Agrosilvopastoril y de Servicios de X'pujil, S.C. (Regional Council for Agriculture, Silviculture, Farmland, and Services of X'pujil) was formed in Calakmul in 1991, and eventually included more than 40 ejidos.

As with ecological sustainability and economic sustainability, the sustainability of local organizations managing their own resources is crucial. The Consejo emerged as a strong representative organization capable of managing its affairs and its region. But the organizational process has not been free of conflicts. In the last two years, two additional organizations have split from the original Consejo, each having stronger affiliations with political parties; one organization has strong ties to the ruling PRI, and the other is affiliated with a rival political party, the Party of the Democratic Revolution (PRD). The challenge for biosphere reserve management now is to find a common ground for the three organizations to meet and form common strategies for regional development.

All three organizations operate on the same basic principles. Ejidos aligned with the organizations are asked to organize themselves internally and to nominate two representatives to participate in the Regional Councils or Rural Committees. Both development programs and sources of funding from the government, national nongovernmental organizations (NGOs), and international assistance are analyzed by these bodies. From this gradual process the following structure has arisen: inter-ejidal peasant organizations have been created, based on a concept of sustainable regional development and respect for each other's autonomy. Each organization independently seeks governmental and nongovernmental support for their development programs, and sends representatives to sessions of the Council, assuring that information is fed back to the communities. Monthly meetings include community representatives, peasant organizations by sector (forestry, apiculture, women's enterprises, etc.), and technicians. The foresters who work for the organization and who have the forest technical services concession from the government are included in the Council, and they and the peasants together design forest strategies, disseminate information, and train rural technicians.

In general these organizations serve to transmit information, provide technical assistance through contracted staff, create a united front during negotiations over forest policy, supply the organizational vehicle for funding by governments and NGOs, promote all of the activities mentioned above, and provide a forum where peasants can learn parliamentary techniques and build their negotiating skills—even if negotiations do sometimes end up in fights!

A basic challenge has been finding technicians who can work with the communities in providing some of the planning and technical tools for sustainability, and who can explain it in terms acceptable to them. The basic technique here has been to use "farmer-to-farmer" training techniques, in which a technician, frequently of a peasant background himself, provides training to a group of peasants who, in turn, provide training to their fellow farmers. This has been particularly successful in the agroecology programs, which hire farmers part-time as promoters over a several-year period. The empowerment of peasants and their organizations with knowledge of alternative paths has proved to be a powerful tool, and one that has met with considerable resistance from powerful interests in the region.

Conclusion

The last four years in Calakmul have constituted a sustained effort to incorporate peasant organizations and give them a major role in conservation and development decisionmaking in the region where they live. This constitutes a new element in biosphere reserve management, one that goes beyond mere "involvement" of local people. The creation of economic incentives is a long-term process, and some of the resources may not be abundant enough to permit intensive exploitation. However, unlike the Plan Piloto Forestal experience, multiple use of the forest was promoted from the very beginning in Calakmul, giving rise to the system of territorial and ecological zoning that has been discussed, and holding out the promise of a diversified economic base that depends on a diverse ecosystem. The Calakmul experience has been distinguished by a positive organizational experience, a new approach to biosphere reserve management, the agroforestry and agroecological experiences, and the incorporation of beekeeping as a major new source of NTFP economic activity. From the Plan Piloto experience in Quintana Roo, community members have learned about forest and wildlife management and new methods for chicle extraction. The last four years have shown that, as long as the political space is allowed by the state and federal governments, peasants can become leaders in the management of lowland tropical forests in general and biosphere reserves in particular.

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