

LAND TENURE AND CONSERVATION CONFLICTS IN THE LACANDON FOREST

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Introduction

The remaining tropical rain forest in the most Southern state of Mexico is threatened by a high-pressure colonization process, contradictory decrees by the government, land tenure inconsistency, lack of inter-institutional coordination, and political instability. To understand the problem of the Selva Lacandona it is important to know its history. There is presently a proposed management plan for the Selva Lacandona. The fulfillment of its objectives can be met only through the participation of all the sectors involved in the problem. In this section a short description of the Selva Lacandona is given first, followed by a description of the Lacandon people, colonizers, wood exploitation, government policies and land tenure. Then, the proposed management plan for the reserve is briefly described. Finally some personal recommendations are suggested by the author, based on literature reviews.

The Lacandon Forest

The Selva Lacandona is located in the Southeast of Mexico in the state of Chiapas, on the border of Guatemala between 16°05' and 17°45' north and 90°25' and 91°45' west, and encompasses about 1.5 million hectares (Medellin, 1993). The Selva Lacandona borders on the North with the Tulija river basin, the wetlands of Tabasco and part of the Usumacinta river, on the South with Guatemala; on the East with the Usumacinta river; and on the West with the Altos de Chiapas. The annual median temperature in the forest is between 24°C and 26°C and the annual precipitation ranges from 2,000 mm to 3,000 mm (Agrupacion Sierra Madre, 1991). Based on these data, the Selva Lacandona is considered as a tropical moist forest according to the Holdridge Classification of World Life Zones or Plant Formations (Holdridge, 1967).

The Usumacinta river, which flows within the Selva Lacandona, is considered one of the largest of Mexico and holds seventh place in the world for the volume of water it carries. It has a basin of 106,000 km² and empties 59 billion m³ of water into the Gulf of Mexico annually (GECH, 1990).

Chiapas is considered Mexico's richest and most diverse area in biological resources (Instituto de Historia Natural, 1989). There are 13 protected natural reserves (around 550,000 ha) that represent almost 10% of the total state surface (Hernandez, 1990). The Selva Lacandona represents 66% of the tropical forests in the state and comprises around 10% of Mexico's forest resources (Price, 1983), although at least half of that has been destroyed, and much of the remainder is degraded (Morris, 1994). The Selva Lacandona comprises a biosphere reserve (Montes Azules), four natural protected areas (Bonampak, Yaxchilan, Chan Kin, and Lacantum), and the communal reserve La Cojolita (originally proposed as Yaxbe) which functions as a biological corridor with the Peten of Guatemala.

The Montes Azules Biosphere Reserve contains biological, cultural and archeological richness. This reserve encompasses over one-fifth (331,000 ha) of the total surface of the Lacandon Forest, which represents 0.16% of Mexico's territory, and contains more than 20% of its biodiversity (Agrupacion Sierra Madre, 1991). It is estimated that in just one hectare of the

reserve one can find, for example, 30 species of trees, 50 of orchids, 40 of birds, 20 of mammals, 300 of diurnal butterflies and approximately 5,000 more of other invertebrates.

The deforestation at national level and in the Selva Lacandona has been dramatically large, and the rate of deforestation in the Selva Lacandona has increased in the last 30 years. Mexico had, at the beginning of this century, around 20 million hectares of tropical forest; nowadays, less than 10% remains (Perez Gil, 1991). The Selva Lacandona originally occupied about 1.5 million hectares of mostly tropical rain forest. The deforestation rate has had some decline in the 80's. From 1875 to 1969, 851 hectares were destroyed per year. From 1969 to 1975, the biggest deforestation rate was seen (53,578 hectares year⁻¹). From 1975 to 1982 a decline in the deforestation rate was observed (18,243 hectares year⁻¹) (Vasquez-Sanchez et al., 1992). In recent studies Arizpe et al., (1993) states that in the last 30 years, the Selva Lacandona has lost around 70% of its original extent, and 18% of the remaining forest is in some way degraded. Presently the Selva Lacandona comprises about 500,000 hectares of the original vegetation and is connected to the Peten of Guatemala through this vegetation (Medellin, 1991).

Besides the deforestation in the Selva Lacandona, oil found in the subsoil threatens its preservation. Strata of oil has been found in the northeast and south of the Selva Lacandona, of good quality and comparable in size to those in the Gulf of Mexico (Medellin, 1991). This strata are shared with Guatemala, where petroleum companies of the United States are already extracting the oil. This is causing a conflict between Mexico and Guatemala concerning the rate of extraction. The extraction of oil from the Selva Lacandona by the government-owned monopoly company Petroleos Mexicanos (PEMEX) can also seriously damage the environment. In Tabasco, a neighboring state of Chiapas, where there is abundant oil production, the drills, heavy machines, etc. used have polluted the environment and raised the cost of living in the region without being a considerable source of employment and income to the local inhabitants. But the more eminent cause of the deforestation of the forest has been the high rate of population growth in the last forty years. To understand the present problem in the Selva Lacandona, an historic analysis of the settlement process is important to know.

Lacandon people

The Selva Lacandona has had high densities of population since the Classic Maya Period (Thompson, 1985). From 300 to 900 A.D. the Mayan cities of Palenque, Bonampak, Yaxchilan, Piedras Negras, and Altar de Sacrificios flourished in the Selva Lacandona (De Vos, 1991). The Mayas were a society who used their natural resources intensively. The Mayan agricultural systems included intensive, extensive, and more sophisticated methods such as terraces, ridges and furrows, and raised fields. The Mayas were also significant agrosilviculturalists (Gomez-Pompa, 1990). Some vestiges of these systems are still found in the Selva Lacandona (Blom and Duby, 1957). The variety and amount of products obtained under these different systems made it possible to support various densities of population, between 4 and 34 inhabitants per km², taking into account the entire Mayan area. Based on this, it is estimated that Palenque and Yaxchilan could have had a population of between 20,000 and 30,000 inhabitants each (Casco, 1984). It is calculated that the collapse of the Maya civilization in the center of the Selva Lacandona occurred between the years 500 and 600 A.D. Among the possible causes of the collapse of the Mayan civilization are the depletion of agricultural resources, environmental

degradation, internal rebellions as a consequence of the existing social classes, sicknesses and epidemics (Casco, 1984). Based on this information it could be speculated that the actual "climax" forest had been disturbed long time ago.

After the disintegration of these cities, with a possible reduction of 90% of the population (GECH, 1990), only five villages at the middle of the Sixteenth Century were identified by the Spanish: Topiltepeque, Pochutla, Chamha, Tenosique and Lacantun (De Vos, 1991). The first three were relocated by the conquerors next to larger populations on the edge of the Selva Lacandona. Tenosique is the only one which survived, although its current population is mostly mestizo (a mixture of Spanish and indigenous). Approximately 30,000 Chol and Choltil Mayas still inhabited this area when the Spanish conquered the New World at the beginning of the 16th Century (Nations et al., 1980). Five expeditions were undertaken by the Spaniards in 1530, 1559, 1586, 1646 and 1695 to the Selva Lacandona (De Vos, 1991). In the first expedition Fray Pedro Lorenzo took the Choles and Tzeltales, both Mayan descendent groups, out of the Selva Lacandona and resettled them in larger villages (indigenous reductions) in order to have a better military control over the Indians, "christianize them" and have an accessible labor force. In 1586, the Spaniards conquered the Lacandon village of Sac Balam (renamed as Nuestra Señora de los Dolores de Lacandon) comprising 103 houses with approximately 500 inhabitants (Garfia et al., 1983). Lacantun resisted the conquerors more than a century and a half (five military campaigns) and the Indians were exterminated in 1695. During the 17th Century other Indian groups coming from El Peten (Guatemala) and southeast Campeche penetrated the Selva Lacandona. They were named Lacandones by the conquerors. These neo Lacandones speak Maya-Yucateco and the original-exterminate group spoke Maya-Chol (Burguete Cal y Mayor, 1978). Around 1702, the Lacandon population was about 500 people. In the middle of this century there were 400 Lacandones living in the Selva Lacandona (De Vos, 1991).

The actual Lacandon traditional farming system is considered one of the most diverse and productive systems in the world (Nations, 1979; Nations and Nigh, 1980), having a sustainable agroforestry system while living in low population groups. The Lacandones practice a multilayered cropping system that combines up to 75 crop species on single hectare plots. After five to seven consecutive years of harvests in the same rainforest clearings, Lacandon farmers plant the plots with tree crops such as rubber, cacao, citrus, and avocado. Far from being abandoned fields, these "planted tree gardens", as the Lacandones call them, continue to provide food and raw materials as the clearings regenerate with natural forest species. When forest regrowth finally overcomes the fruit tree crops, the farmers clear the plots for a second cycle of food and forest (Nations and Komer, 1983). In such a fashion, a traditional Lacandon farmer clears fewer than 10 hectares of rainforest during his entire agricultural career.

If such agroforestry systems are used in the Selva Lacandona, why is this tropical rainforest threatened? In the next sections possible answers will be explored. Mayan Indian groups, such as Tzeltales and Choles, who had been in the Lacandon forest before the Spanish came, and other new immigrants from other states of Mexico intensively colonized the Selva Lacandona in the last forty years. The role of the government in the exploitation of wood, resettlement policies of the different groups (mestizos, Indians, cattlemen, etc.), and the insecurity in land tenure are key issues to understand the actual threat to the Selva Lacandona.

Colonization

From 1949 to 1954, the Selva Lacandona was inhabited by about 400 Lacandones living in different villages (GECH, 1990). The process of settlement was initiated in the 50's supported by the Departamento de Asuntos Agrarios y Colonizacion to nullify the property titles granted during the dictatorship (beginning of this Century) to international logging companies (De Vos, 1991). This process was initiated by Tzeltal and Chol Indians from Bachajon and Tumbala, and also by mestizos farmers from Salto de Agua and Palenque who were established in the North of the Selva Lacandona.

In 1960-70, the process of settlement intensified. There was penetration from the North, groups from Margaritas, via the Santo Domingo river basin, as well as other groups from Ocosingo, via the Jatate river. Most of them were indigenous people who were driven from their villages because the lack of farmland and the inhuman conditions of life on the ranches of the Altos de Chiapas (De Vos, 1991).

The annual growth rate was 5.7% in the Selva Lacandona in 1970, which was high compared to 4.2 in the state of Chiapas and 3.5 in the country. This high growth rate in the Selva Lacandona confirmed that it was an area of high immigration (Casco, 1984). The annual growth rate (1990) for the Marques de Comillas area, located in the South of the Selva Lacandona, was 8% (Medellin, 1991).

By 1980, the immigration to the Selva Lacandona of more than sixty thousand Tzeltal and Chol Indians had radically altered the ecosystem of the tropical rain forest (Nations et al., 1980). The slash-and-burn agricultural system and the extensive cattle raising are the principal agricultural systems that had been established by the immigrants to the Selva Lacandona (Price, 1983). Presently, at least one third of the North region of the Selva Lacandona comprises grasslands. In a study done by SARH (1984) in 17 ejidos (an ejido is a property that is passed down through the generations but could not be sold) located in different areas of the Selva Lacandona, it was observed that during the period from 1979 to 1981 the grassland was increased at a rate of 36% annually but the farming only increased at an annual rate of 18%. The Indians in the Selva Lacandona had learned that, in general, by having lands with grass they could assure themselves tenure of the land (Mauricio et al., 1985). This process of extensive cattle raising had also been sponsored by the banks giving loans (Burguete Cal y Mayor, 1978).

The situation in the Selva Lacandona has been complicated more since 1981, with the immigration of thousands of Guatemalan refugees, as a consequence of the civil war in Guatemala. According to the census of February, 1991, by COMAR (Comision Mexicana de Ayuda a Refugiados), there were 44,144 Guatemalan refugees in Mexico; 24,828 in the state of Chiapas and the rest in the states of Campeche and Quintana Roo (Beltran, 1992). In 1982, Chajul, a village located at the south of the Selva Lacandona, had 500 Mexicans and 5,000 Guatemalans, as a consequence of the strong immigration at the beginning of the 80's. As a result of this high rate of immigration from inside of the state and the country and from Guatemala, many population centers were founded in the Selva Lacandona.

Population Centers

Contradictions in the estimated population of the Selva Lacandona are frequently found. CECODES (Centro de Ecodesarrollo, A.C. del Consejo Nacional de Ciencia y Tecnologia), had

estimated around 35,000 people in the Selva Lacandona on August, 1977. The state government had estimated 60,000. Three months later, in November 1977, the government estimated 70,000 (Burguete Cal y Mayor, 1978). Another source (Gonzalez, 1983) stated that more than 180,000 people lived in the Selva Lacandona in the middle of the 70's. Recent sources also give contradictions in the population numbers. Vasquez-Sanchez (1992) stated that the population in the Selva Lacandona is 400,000 but Arizpe (1993) stated that half of that population is living there.

The population in the Selva Lacandona in 1981 was probably greater than 80,000 inhabitants. Tzeltals were concentrated in the North and Center of the Selva Lacandona constituting more than 75% of the total population in the area. The Tzeltal is probably the sole dialect spoken by half of the inhabitants in the Selva Lacandona (Price, 1983).

In 1985, the total population was around 140,000 inhabitants and distributed by areas as follows: Marques de Comillas 7.1%, Valles y Cañadas Centrales 17.9%, Santo Domingo 25%, and new settlement centers 50% (Mauricio et al., 1985).

The Selva Lacandona comprises more than 700 localities which include ejidos, villages and ranches with a total population of 215,000 people. The annual estimated growth rate between 1975 and 1990 was 9.5% which give an indication of the magnitude of the immigration phenomena that took place in that period.

Wood Exploitation

The Selva Lacandona became involved in the international mahogany market in the middle of the 19th Century, as a consequence of the depletion of the mahogany in the Caribbean and coasts of Central America due to its commercial exploitation by England (GECH, 1990). At the end of the 19th Century and the beginning of this century, la Selva Lacandona was transformed into one of the principal sources of wealth of the state and the recipient of strong foreign investments (De Vos, 1991).

The most important companies that were taking mahogany (*Swietenia macrophylla*) and cedar (*Cedrella* spp) at the end of the 19th Century (1880) were Spanish, among them, the Romano, Bulnes and Valenzuelas. The system used for extraction of those species was selective cutting with animal extraction by dragging to the closest river. During the rainy season the trunks were floated down by the current of the rivers to the Usumacinta river, then gathered together in Boca del Cerro (near to Tenosique, Tabasco); from there the mahogany and cedar trunks were hauled to Ciudad del Carmen, Campeche for its final exportation to the United States (Burguete Cal y Mayor, 1978).

During the dictatorship of General Porfirio Diaz, at the beginning of this century, the Government of Mexico gave concessions to American and British companies for timber rights in the basin of Usumacinta. These companies were interested in mahogany, cedar and rubber (Casco, 1984). During this period the American market displaced the European market. Around 1910, the exportation of wood had become the biggest source of income for the Tabasco state government, giving profits mainly to 28 business families, most of them foreign (GECH, 1990). During this period many foreign companies exploited the tropical rain forest without forming settlements (Casco, 1990). B. Traven (1969) in his novel "Rebellion of the Hangers", denounces the atrocities and injustices to which the workers of the logging camps were subjected, most of

them Mayan Indians. The decline of the logging camps in the Selva Lacandona began with the Mexican revolution and the changes in the international market, as a consequence of the First World War (GECH, 1990).

At the beginning of the 50's, the Vancouver Plywood Company from Washington state owned more than 420 thousands hectares in the north of the Selva Lacandona. Because it was illegal for foreign companies to have properties in Mexico, they founded the Maderera Maya, S.A., with Mexican business leaders as figureheads.

In 1964, the Weiss Fricker Mahogany Company from Pensacola, Florida started logging in the Selva Lacandona under the name of Aserraderos Bonampak. They were the first to use heavy machines in logging operations in the Selva Lacandona increasing the damage to the forest (Gonzalez, 1983). This company from Florida had been logging previously in the region of La Candelaria, state of Campeche, and moved to Chiapas after depleting that region (Price, 1983). The Weiss Fricker Mahogany Company cut an average of 17,000 m³ of sawn wood (mainly mahogany and red cedar) from 1964 to 1973. Assuming that a tree yields around 5 m³ of round wood (Verissimo et al., 1992) and the sawn wood is half of the round wood, it means that in average they were cutting around two trees per day during that period. Based on the study done by Verissimo et al., (1992) in Brazil on tree damage by logging activities, one can assume that around 60 neighboring trees were damaged every day in the Selva Lacandona at that time by logging activities. These trees (mahogany and cedar) have a high economic value and require from 50 to 100 years to mature (Price, 1983). During this period this company accelerated the logging activities and built roads which encouraged subsequent settlements in the exploited areas.

Government Policies

Contradictions in government policies are frequent in the Selva Lacandona. In 1961, the claiming of the Selva Lacandona as federal land accelerated the colonization process (Perez Gil, 1991). The federal government decreed in 1967 more than 400,000 hectares as federal land in the south of the Selva Lacandona to promote settlements, especially in the area of Marques de Comillas, and to stop the spontaneous settlements in the north and west regions of the Selva Lacandona (GECH, 1990), declaring that those lands were "designated to give or enhance ejidos, or create new settlement centers" (Casco, 1984).

The Mexican government supported the settlement for several reasons, first of all because of the demands presented by the first immigrants from the Altos de Chiapas (Tzeltal and Chol Indians). Also, the government saw the Selva Lacandona as an alternative solution to the demands for land from other people throughout the country.

In 1972, 614,321 hectares in the Selva Lacandona were given to the Lacandon groups (sixty-six families) of Naja, Metzabok, Zapote, Caribal and Lacanja-Chansayab by a national decree. Seventy percent of this grant was private property (Casco, 1984). The decree of 1972 did not recognize 23 Tzeltal and Chol communities which were in this area (Price, 1983; GECH, 1990). More than one thousand non Lacandon families who were established in the area became illegal settlers (Perez Gil, 1991).

This grant to the Lacandones was supposedly based on their ancestral holding rights, now threatened by the new immigrants (mostly Tzeltales and Choles). According to Nations (1979)

and De Vos (1978) this was the exact opposite of the truth. The present Lacandones were relatively new in the region and the ancestors of the immigrants had been the original inhabitants. De Vos (1978) states "If any historic title of possession to the Selva Lacandona exists, it belongs to the Tzeltals and Choles immigrants that live there in more than 200 ejidos spread all around the Lacandon Forest".

The decree of 1972 favored the state government because in 1974 they founded COFOLASA (Compañía Forestal de la Lacandona, S.A.) a private and state owned logging company. In 1976, by national decree, the properties of Aserraderos Bonampak (Weiss Fricker Mahogany Company) were acquired by COFOLASA (GECH, 1990) being created with tax concessions (Burguete Cal y Mayor, 1978). From 1975 to 1984, COFOLASA cut 90,000 m³ of precious wood and 20,000 m³ of other tropical woods. It seems that the government preferred to negotiate the timber exploitation rights with a few illiterate Lacandones rather than with thousands of Tzeltal and Chol Indians that had no land (Nations, 1979). In 1975, the sixty-six Lacandon families started getting money from timber rights, provoking a high consumption of "western products" (Burguete Cal y Mayor, 1978). At the end of the 1970's, only 20% of the 360 Lacandones kept their traditional subsistence farming methods (Nations et al., 1980).

In 1976, the government, as an alternative to the 1972 decree, proposed building three new towns to unite the irregular and dispersed settlements in the Selva Lacandona: Manuel Velasco Suarez (Nueva Palestina) comprising 13 Tzeltal and Tzotzil villages; Frontera Echeverria (Corozal) comprising 8 Chol villages, and San Quintin. In less than a decade (1981 to 1989) the population in the newly created town of Corozal and Nueva Palestina was doubled. Some of these concentrations had to be effected by use of the army. A great number of immigrants, who were affected by the Lacandon grant decree, refused to go to these new settlements. Some of them "invaded" federal lands illegally and founded small villages. The army burned some of these "illegal" settlements at the end of the 1970's. In 1983, almost two thousand families requested legitimization of their reclamation of lands (Price, 1983).

Most of the government projects for giving services to the new communities were deficient and discontinuous, and finally they were abandoned. As stated by Gomez-Pompa (1990) "... ignoring the local people in programs of development in the tropics around the world is a very widespread attitude". Around 487 Chol families inhabited the government-created town Corozal in 1981. Most of them walked between 10 and 20 km to their crop farms which were located in lands with higher elevations than the town (Corozal was located in a swampy area). They lost 400 tons of maize in 1978 because of the deficient roads and the difficulties getting it to market. Presently, the young people from these new settlements are moving back to the old crop farms and to other new areas because of the limited land in the new settlements and the constant immigration of other Indians to the Selva Lacandona from the Altos de Chiapas.

The standard of living in some regions of the Selva Lacandona is critically low. In 1988, 71 communities with a total of 25,056 inhabitants were living in the region of Las Cañadas, the western part of the Selva Lacandona. This is considered the poorest zone in the whole country. Seventy percent of the communities did not have roads, 25% did not have elementary education, the rest only primary schools (most of them incomplete) and only 8% of the communities had health services through an IMSS-COPLAMAR clinic (GECH, 1990). On January, 1994, an armed Indian group, the Zapatistas, initiated their protest against landlords and governmental

institutions in this region. They are claiming solutions to their problems related to land tenure, education, health, and human rights issues. This political instability in southern Mexico will take its toll in the conservation of the Montes Azules tropical rainforest.

The opportunistic presence of preachers of different religions in the Selva Lacandona had affected the organization of the communities. The variety of religions in the new settlements of Nueva Palestina (8 religions) and Corozal (14 religions) has divided the community and obstructed the process of integration (GECH, 1990).

The conflict between the government and the settlers has grown due to a third decree (January, 1978), which declares 65% of the Selva Lacandona as the Montes Azules Biosphere Reserve. Eighty-six percent of this reserve overlapped the Lacandon community lands and the remaining 14% were lands where Tzeltal Indian communities were already established (Carrillo et al., 1989). Although this decree is not an expropriation decree, it controls the use of resources in the reserve (GECH, 1990). This decree was promulgated without knowing the real situation. For example, it was thought that the area decreed was uninhabited, when in fact, 20% of the zone was inhabited. Some of the villages in this reserve that already existed before the decree were: Amador Hernandez, Miramar, Palestina and San Quintin.

This decree (1978) also declared the Alto Usumacinta and Tulija basins, almost 2,300,000 hectares, as areas of protection. This decree generated conflicts with the timber exploitation rights of COFOLASA (government timber company) and the cattle and farming activities of communities previously established in this area.

On January, 1989, other decrees for land grants were issued to 26 ejidos of the Region de las Cañadas, which now affects lands of the new Montes Azules Biosphere Reserve (GECH, 1990).

Land Tenure

The change in the structure of land tenure in the Selva Lacandona is significant. The privately-owned surface area that constituted 95.3% of the land in 1950, dropped to 23.4% in 1970. By contrast, the land given to the Indians (ejidos) increased from 534.6 ha per ejido in 1950 to 4,908 ha per ejido in 1970 (Casco, 1984). The ejidatarios occupied 4.7% of the total surface in 1950 and in 1970 had changed to 76.6%. Of this communal area, the Tzeltales, who are 41% of the ejidatarios, own only 3.1%. Meanwhile, the Lacandones, who comprise 4.2% of the ejidatarios, own 86.7% of the land, but the Lacandones cannot dispose of the land as they please because of strong ecological restrictions recently implemented by the government.

In the Lacandon Forest there exist more than 200 villages that are demanding a solution to their lack of land tenure (GECH, 1990) as a consequence of the unplanned colonization process and bad government policies. At the beginning of 1992, the property rights of ejidos was modified by national decree, allowing the ejidatarios to sell their property. This decree also declared the end of agrarian reform land grants. These changes will certainly increase the conflicts in the Selva Lacandona. In March, 1992, Chol, Zoque and Tzeltal Indians (many of them inhabitants of the Selva Lacandona) marched from Palenque, Chiapas to Mexico City (a distance of 1,000 km in 55 days) to protest and to demand solutions to their land problems and respect for their human rights (Beltran, 1992; Correa, 1992).

The timber industry, the shifting cultivation, the extensive cattle raising, and the colonization process have reduced the tropical rain forest without accomplishing any sustained development in the Selva Lacandona. Presently, federal and state government institutions, universities and nonprofit organizations (national and international) are working together to find and propose solutions to the problems in the Selva Lacandona (PASECO-SEDUE, 1992). A program for a sustainable management of the reserve has been proposed and it is briefly described in the next section.

The Montes Azules Biosphere Reserve

The purpose of the Montes Azules Biosphere Reserve (around 300,000 hectares) included in the Selva Lacandona is to protect the tropical rain forest's biodiversity as part of the Mexican government's commitment to the program "The Man and the Biosphere (MAB)" from the UNESCO. The approximate agricultural surface use in the reserve is around 10% of the total surface by communities inhabiting the reserve. This includes fallow lands, crop fields (corn, coffee, etc.) and pasture lands. Three zones of management have been suggested (GECH, 1990) for the Selva Lacandona: Core, Buffering and Influencing Zones.

Core zone. This is the part of the reserve that has not received "modern" impacts and its primary vegetation has been conserved. It is delineated by the Lacantun river in the south, Lacanja river in the east, the San Felipe Mountains on the west, and the Ojos Azules Lake in the north (SDR-E, 1993). Some specific regulations briefly described are: 1) Human activities are restricted. Any type of use of land and aquatic vegetation and animals, any change in the use of the soil, tourist activities, new settlements, etc., are prohibited; 2) only scientific investigation is allowed; 3) and only protective activities are allowed.

Buffering zone. This is divided into areas according to land use, economics and social characteristics of the villages settled in the reserve. Two modalities are established: restoration, and agricultural and silvicultural use.

Restoration areas are those where human groups are established and their land tenure has not been defined. Ocotul is one buffering zone where a process of coordination with the local communities has to be initiated to define its legal status and future use of the land. Some specific regulations briefly described are: 1) ecological restoration through enrichment planting and natural regeneration; 2) highly disturbed areas which will be monitored and technically supervised for regeneration; and 3) ecotourism which will be promoted.

Agricultural and silvicultural areas are those areas with "legal" settlements (i.e., Palestina and Miramar) in the reserve where agricultural and silvicultural activities are performed. According to the specific necessities of each settlement, activities based on ecological, economical and social needs, and cultural traditions of the local people will be promoted. In brief, some specific regulations are: 1) elaboration of a community development plan; 2) land use will be restricted to ecologically sound management (no compaction of the soil will be permitted, no cattle grazing, no more land will be converted to agriculture use); 3) agroforestry will be encouraged (organic coffee, alley cropping, pest biological control, fire control, etc.); 4) use of agrochemicals will be restricted; 5) exploitation of some silviculture species such as Xate palm (*Chamaedorea* spp) should be sustainable; 6) introduction of exotic species and new settlement

will be prohibited; and 7) local people should be the main actors in this scenario to protect their lands.

Influencing Zone. The influencing zone comprises the regions of Las Cañadas, Comunidad Lacandona, Norte, Margaritas and Marques de Comillas, where the predominant activity is agriculture. Specific programs and set of norms should be proposed for each region according to its own characteristics.

Four components have been proposed for the management of the three zones described before: 1) conservation, 2) sustainable social development, 3) scientific research, and 4) legal issues.

Conservation. This component comprises: 1) Ecological check stations ("green police") to monitor traffic of vegetation and animals leaving the reserve; 2) management of natural resources; 3) prevention and control of fires; 4) ecological restoration mainly in less degraded areas; and 5) conservation and exploration of archeological monuments (i.e., Bonampak, Yaxchilan, etc.).

This component includes the participation of public, social, and private sectors; economic support to local projects and environmental education; establishment of commercial plantations in areas with more than five years of disturbance without any natural regeneration; the appropriate use of landscapes, ecotones and corridors with vegetation at different successional stages to protect biodiversity, watersheds, and other environmental services; and environmental impact and feasibility studies for promoting ecotourism in the archeological and cultural areas inherent in the reserve.

A proposal for establishment of a natural corridor called Yaxbe (a Mayan-word meaning "Green Passage") of 188,250 hectares, was proposed to link the Biosphere Montes Azules and the Peten tropical rain forest in Guatemala (Vasquez-Sanchez, 1992). Instead, the communal reserve La Cojolita was established for the same purpose (Ignacio March, personal communication).

Sustainable social development. This in general includes the natural resources managed by local people, and environmental education and creation of infrastructure for the communities (health centers, schools, etc.).

Scientific investigation. This includes the management and establishment of seed banks and germ plasmas; development of agroecosystems and alternative productive projects; development of plantations with fast growth plants and other products such as cinnamon, clove, coconuts, oil palm, rubber, tea, coffee, bamboo, rattan, jalapeño, and medicinal plants; socioeconomic diagnostics; and creation of new biological stations (at the present there is formally only one operating in Chajul).

Legal issues. Includes the immediate solution of the land tenure problems and norms of land uses.

Recommendations

To give recommendations based only on the scarce information available is a difficult task, especially without the opinion of the local people who are the principal actors in this scenario, but general suggestions given by the author can be considered in the integrated conservation and development program of Montes Azules Biosphere Reserve.

A. Coordination.

1) Among Federal Institutions:

- a) Immediate solutions to land tenure and use problems to promote long term interest for private and social sectors in the area must be sought. Bureaucratic processes have to be avoided.
- b) Federal institutions (i.e. Mexican Oil Company PEMEX, Federal Electricity Commission CFE, etc.) that are operating in the Selva Lacandona and receive environmental services should give economic and technical assistance for the implementation and development of the management plan.
- c) A "green tax" for institutions, private corporations, etc. that receive direct and indirect benefits from the Selva Lacandona should be established. These taxes should be invested in the Selva Lacandona.

2) Among researchers. Interchange of experiences at the different levels (researches, local people, etc.) with other similar projects such as the Plan Piloto Forestal in Quintana Roo (Johnson and Cabarle, 1993), the Unidad Ejecutora del Plan de Desarrollo Integrado de Peten in Guatemala, etc. has to be encouraged.

3) Within the Selva Lacandona Project:

- a) Credibility is a major issue particularly in the Lacandon area. Most of the proposed plans have only been on paper.
- b) Getting funding, through such programs as the green tax, is a key element to make conservation happen.
- c) Efficient inter-institutional coordination (government, NGOs, private, locals, religious, political parties, etc.) is another key factor to total efforts.
- d) A definition of specific tasks and responsibilities should be given to each participant in this conflict.
- e) Programs should be designed in a long term basis, and have continuity.
- f) Organization and implementation of a structure (like a Council with an institutional personality that integrates and coordinates all the sectors) is needed to enforce laws and norms.

B. Marketing.

- 1) Value-added timber and non-timber products and increased markets at the local and international level should be promoted.
- 2) Quotas should be established to limit production of some products (i.e., Xate palm, *Chamaedorea* spp.) to sustainable levels.
- 3) Promotion of a sustainable production of "certified" wood under certification programs such as Rainforest Alliance's "Smart Wood", Scientific Certification System's "Green Cross", etc. (Johnson and Cabarle, 1993) should be begun.
- 4) Local laws for industry, construction, etc. to use certified wood and non-timber products should be enacted and enforced.
- 5) Participation of these industries (furniture makers, construction, etc.) to finance commercial plantations (run by ejidatarios, colonizers, private corporations, etc.) for production of wood and other products for future use should be developed.

6) Efforts should be made to eliminate "middlemen" in sales so that producers reap more of the benefits.

C. Research and Education.

1) Priority in research and management should be given to local universities and institutions (UNACH, ICACH, etc.) to promote interest and motivation of local people in the conservation of the natural resources on a long term basis. Outsiders come to the state for short periods and propose plans without implementing them.

2) Educational programs for environmental protection and family planning to recognize a "limit to growth" (carrying capacity) must be developed.

Conclusions

The management plan integrates many aspects important for the success of the project, but the contradictory legislation that the government has enacted in the past (see section under "Government Policies") undermine credibility for any coming proposal (at least 50 big projects has been conducted during the 1970's in the Selva Lacandona (GECH, 1990)). Besides the problem of "credibility", a confrontation between ecologists and local people has been detected by Gomez-Pompa (1992) and Arizpe (1992). Presently, the armed insurrection in the Selva Lacandona and the current problems of the Mexican economy requires consensus and coordination among the local communities, researchers, governmental and non governmental institutions and organizations at the national and international level. It is important that all the sectors coordinate their efforts to achieve the goal of conservation and sustainability in the Selva Lacandona integrating the economic, ecological, social and cultural aspects. It is important that immediate solutions be taken in the field.