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Recent Intensification of Resource use in Quintana Roo, Mexico[1]

Under the slogan, "Alliance for Production," the Mexican government has for the past several years mounted an intensive campaign to increase domestic production of all kinds of goods, with emphasis on foodstuffs. One strategy has been to develop previously under-utilized parts of the country, and an obvious prime candidate was the state of Quintana Roo. Here was a thinly populated tropical lowland with a history of minimal exploitation of its resources except for some logging and gathering of forest products. It also had a history of separatism and outright rebellion against federal authority, and although that is largely past, it was advisable if not politically necessary to bring the region into a closer social and economic relationship with the rest of the country.

The manifestation of this policy that most interests us is the massive effort to mobilize Quintana Roo's resources to support a population that is increasing rapidly due to governmentally encouraged immigration, and to increase the country's total food production by extension of its cropland and pasture and by application of modern technology to agriculture and fishing. Recent changes in exploitation of timber are not so dramatic; the remaining reserves of valuable tropical hardwoods (Honduras mahogany and Spanish cedar) are now being logged under direct government supervision, the official perception being that the formerly unregulated exploitation by private concessionaires had unduly diminished the forest resource. However, despite improvements in regulation, there is great danger to rational exploitation in the rapid expansion of agricultural land at the expense of the forest.

The current phase of our inquiry is focused on agricultural land and the fishery and timber resources that had in the past few centuries been utilized but lightly (except for selective cutting of the valuable hardwoods), but which are now being subjected to a technological assault that may be unmatched in any area of equal size in the American tropics. Other aspects of development, such as the burgeoning tourism and urban growth, are included in our inquiry but are not discussed here except in general terms of their relationship to resource

exploitation. Another important aspect not treated here except in passing is the process of decision making as it is manifested ultimately in the human impact on the land.

Historical Background

The era of modern development began in the late 1950s with cursory examination by the federal government of Quintana Roo's potential for absorbing surplus population. In the early 1960s there were attempts to establish agricultural settlements, and families from central Mexico were encouraged to migrate and take up land. This effort met with indifferent success and subsequent immigrants have come mostly from the neighboring state of Yucatan as "spontaneous" colonists.

Quintana Roo was Mexico's least developed region by almost any economic measure. In the mid-1950s, logging for mahogany (*Swietenia macrophylla*) and Spanish cedar (*Cedrela mexicana*) and the gathering of chicle from the *chicozapote* (*achras zapota*) were the main commercial activities. Agriculture was almost exclusively shifting field farming in the native Maya style with little production of surplus and modest production of copra. Fishing was almost entirely for local markets with the catch sold fresh at the beach, except for small-scale export of lobster and sea turtle. Here and there small herds of cattle were kept, but with minimal contribution to meat supply. No paved roads or railroads linked Quintana Roo with neighboring states. Such commerce as there was pursued a leisurely route by sailor small powered vessel along the coast to Yucatàn. Consistent with the geographic and economic isolation was the slight population density, in the 1950s the lowest of any Mexican political entity. Still a federal territory (along with Baja California Sur; both attained statehood in 1974), Quintana Roo indeed offered an enticing vacuum for development.

But the land has not always been so empty. It is noteworthy that just within the last year or so, the population has risen to the minimum reasonable estimate of 212,000 for the time of first European contact (Edwards, 1957, 143). During the early years of Spanish occupation, Quintana Roo experienced the same catastrophic diminution as other tropical lowlands in the Americas, due largely to introduced diseases and re-ordering of native ways of life. The initial decline persisted as the region remained outside the sphere of effective Spanish control. The population remained low through Mexico's separation from Spain, but by

1845 the Mexicans had succeeded in revitalizing the area around Bacalar, and some commercial farming had appeared elsewhere. Then the "War of the Castes," the great Maya uprising, wiped out this advance and resulted in another half century of isolation and further decline in population. During the first and second decades of the twentieth century another Mexican effort, this one by military force, ended with yet another expulsion of non-Maya people. The nadir of population occurred sometime around 1910, when the census enumeration was 9,100, and vast stretches of countryside were unoccupied.

Population increase was modest through the next few decades, and the 1950 census counted about 26,900, indicating a density of about one person per two square kilometers. Thus, by the mid-1950s, most of the land had not been used for some four centuries. The present hypothesis is that social considerations rather than a deteriorated resource base have accounted for Quintana Roo's long respite from human impacts. On the eve of the current ambitious development program, the environment may have approximated in many respects a pristine condition. When more details of the then existing agricultural activity and other forms of land and resource use are filled in, we hope to establish a rough cultural-ecological "baseline" as of the mid-1950s from which the magnitude and quality of subsequent change can be assessed.

Crop Agriculture

The common view of agricultural prehistory in the Maya lowlands has been that all farming was the traditional Maya version of shifting field cultivation. However, archaeologists have become uneasy with the idea that this system provided support exclusively for the dense pre-Spanish population. There now seems the probability of a more permanent type of food production (Harrison and Turner, 1978). Whatever the case in prehistory, it seems clear that during the several centuries of colonial occupation the inhabitants of Quintana Roo, mostly of Maya stock, reverted to a less intensive, mainly subsistence agriculture that continued to modern times. Over most of the state, the soils had a long rest.

Then, abruptly in 1969, the leisurely pace of forest clearance by axe, machete, and fire was accelerated greatly by the introduction of mechanized clearing. The symbol of the new style is the "forest crusher," a seventy-six ton Diesel driven behemoth on three cylindrical wheels with sharp helical blades that moves through the forest at about four kilometers per hour, knocking it down with a

massive, toothed steel bar and leaving behind a low carpet of crushed and splintered wood which can be windrowed easily by bulldozers and burned. So far, only two of these machines, owned privately with their services contracted by the government, have operated in Quintana Roo, but their accomplishments are impressive compared to other means of clearing. Of the almost 50,000 hectares cleared by machine for crop agriculture in the last decade, the forest crushers have accounted for somewhat over 32,000. The rest have been processed by teams of bulldozers dragging immense chains through the forest, followed by the same techniques of windrowing and burning. In both cases the final clearing of sticks and roots which otherwise might cause problems by re-sprouting is done by gangs of hand laborers. All of this contract work is financed by the government, the objective being to hand over to the *ejido* fields fully prepared for planting.

The use of these machine-cleared lands varies. On some *ejidos*, planting, cultivating, and harvesting proceed in much the old-style way. However, more prevalent are modern, introduced means of performing these operations. For example, on *ejidos* where immigrant farmers from the central highlands have shown the way, draft animals or small tractors are used in plowing and weeding. On *ejidos* chosen by the planners for full application of modern technology, planting of rice and spreading of artificial fertilizers and pesticides have been by airplane, and weed suppression and harvesting are fully mechanized. Another innovation is dry season supplemental irrigation, using Diesel or electric groundwater pumps and sprinkler systems.

The heaviest investment has been in sugar cane, with the completion in 1978 of a huge mill at Alvaro Obregón in the south and the establishment of large cane acreages, fully mechanized, on several neighboring *ejidos*. In other areas, including land where the rice failed for lack of moisture at the right time, maize predominates. The latest crop chosen for large-scale production is sunflower. The emphasis has thus been on large cash crops, which so far have not alleviated in measurable degree Quintana Roo's almost total dependence on imports of basic foodstuffs from other Mexican states to feed urban populations.

Cattle

Despite the fact that cattle raising is seen by many as a popular alternative to crop agriculture, especially on land not suitable for mechanized cropping, the

livestock sector has been slow to develop. Since modern development began, the herd, mostly zebu and zebu crosses, has increased to about 38,000, and about 120,000 hectares have been cleared, mostly by old-style chopping and burning, for planted pasture, not all of which contains cattle yet. Just as we left the field (autumn, 1979), we heard of an ambitious government plan to establish a very large experimental plot of planted pasture, using private contractors in much the same way as for agricultural clearing. For the time being, the goal is self-sufficiency in beef for the state; it remains to be seen whether or not enthusiasm for cattle production will outstrip the current rush to increase mechanized crop acreage.

The Fishery

Isla Mujeres and, to a lesser extent, Cozumel and Holbox were the centers of pre-modern fishing, commercial aspects of which were confined mainly to lobster and sea turtle. A lucrative sponge fishery succumbed to a disease in the 1930s, Holbox fishermen used to profit by selling shark skins to Cubans, and some dried and salted fish found its way to markets in Mérida, Yucatán. Scale fish were sold fresh to local housewives. Shrimping in Quintana Roo's waters was by other Mexicans, Cubans, and North Americans. The local fishing fleet was a variety of unspecialized small craft, ranging from tiny dugout canoes to sailing smacks of some three or four tons burden, a few of the latter with auxiliary power.

Modernization began during the 1950s, with extension of credit for boats and gear by private entrepreneurs based at Isla Mujeres. This led mainly to an increase in the capture of lobster and turtle for the export market. An ice manufacturing and freezing plant opened in about 1955, and shrimp fishermen from Campeche and elsewhere who had been exploiting the banks off the north coast began to land their catches locally. The plant also received and processed lobster. Another plant, originally established on Cozumel but now moved to Puerto Morelos on the mainland, also received shrimp, lobster, and other fish.

The demand for seafood, especially lobster, sea turtle, shrimp, and conch has grown explosively with the blossoming of Cancún as the Caribbean's newest and most spectacular tourist facility. The demand from the older centers of Cozumel and Isla Mujeres is also strong, as is that from the export market. The response has been tremendous increase in production of all but the sea turtle, which

before the great tourist boom had already been under such pressure that many turtling banks and beaches were no longer viable.

By 1979 the number of registered fishermen had grown to about 800, all but 100 of whom were organized in eight cooperatives. The fleet now comprises about 400 registered craft, including 57 over ten meters in over-all length, 18 of which are large shrimpers. The purchase of most of these boats is subsidized by the government through the cooperatives. Shore facilities for reception and processing have increased to five in the private sector, one cooperative has built its own drying and salting works, and the government is building three packing-freezing plants to serve the northern, central, and southern fishing zones.

Although production figures as recorded on tax registers (the only long-term indicators available) do not represent the total catch, they do show adequately the trends in capture. Lobster tails now account for about 44 percent of the total value of all species caught,while since 1957, shrimp has jumped from negligible value to 34.5 percent. Scale fish have lost in relative importance, the current figure being 15.8 percent.

The potential of the fishery is unknown. Older areas of lobster exploitation, on reefs and shallows in the north, have been reduced heavily, but lobster are plentiful in deeper waters and from Bahía de la Ascensión southward. Scale fish of high commercial value (snapper, grouper, mackerel, tuna) occur off the coast, but this deepwater component of the fishery is undeveloped. Almost all scale fish are still taken from near-shore reefs and banks by handling from small skiffs or in shoreline traps, and in some areas large fish are increasingly scarce.. Among the seriously over-exploited species are the edible sea turtles and the hawksbill turtle, valuable for its shell; and conch, which has joined lobster, shrimp, and turtle as a delicacy for tourists. According to Mexican authorities, there has been an alarming decline in the conch population, probably due to rapid and unanticipated effects of over-collection.

The fishery is now oriented heavily toward species valuable as tourist fare and for export, and so far the design and placing of shoreside reception facilities and other infrastructure have followed this lead. With visiting experts from Japan and Spain, a beginning has been made in assessing the potential of the deepwater scale fishery, in the face of increasing public concern over the lack of inexpensive seafood in Quintana Roo's markets. In mid-1979 a center for aquaculture was

completed at Puerto Morelos, providing facilities for study of the possibility of raising sea turtles, conch, lobster, and small reef fishes that figure profitably in the aquarium trade.

Timber

It seems reasonable to assume that much, perhaps all, of the land suitable for agriculture had been cleared from forest at one time or another before arrival of the Spaniards. However, since then most of the forest has had about four centuries of regeneration, and by the early twentieth century it may have approximated the pre-farming condition, at least with respect to general mass, form, and structure.

The modern logging period began in the late nineteenth century when loggers selling to North American companies operating in British Honduras began cutting mahogany on the Mexican side of the Rio Hondo. The logs were floated to Belize City for milling, and the lumber was marketed as a product of British Honduras. Later, concessions were granted directly to North American companies to cut in Quintana Roo. There was little regulation of cutting, and there are no records from which estimates of volumes extracted can be made.

The significant technological changes in utilization of the timber resource began during the administration of Margarito Ramirez, territorial governor from 1943 to 1957. He organized a group of independent loggers into an association which acquired some modern logging equipment. Legislation was passed preventing the selling of logs to companies based in British Honduras, and Quintana Roo began processing and marketing its own lumber.

In 1951, Nacional Financiera, a federal financing agency, established Maderas Industrializadas de Quintana Roo (MIQRO), which built a large plant near Chetumal to cut lumber and manufacture plywood and veneer. This began the period of heavily mechanized logging and direct government supervision of utilization of the resource. In 1954 MIQRO was granted a huge logging concession on which mahogany and Spanish cedar were the dominant valuable species.

Beginning in the mid-1970s, the government attempted to increase utilization of other species by financing a dozen small sawmills, to be placed on selected *ejidos*. The main object was to produce sawn railroad ties, which otherwise are provided

by campesinos working with axe and machete. The program did not succeed, and most of the mills were inoperative in 1979.

Two larger mills, once privately owned, are now operated by the state government, both cutting lumber for surrounding *ejidos* and one producing veneer from Spanish cedar and other hardwoods. The state government is also attempting to re-vitalize some of the small mills built for the railroad tie program.

Government participation and control of logging have grown to include provisions for strict regulation of cutting, transport, and marketing. The basic premise concerning logging on ejido land is that the *ejidatarios* are to benefit from the proceeds, and in theory if not always in practice, operations on the *ejidos* are monitored closely by the authorities. This is ostensibly to protect the *ejidatarios'* interests as well as to ensure maximum and non-wasteful use of the timber, but one result is a complex system of fees, rebates, and remuneration in which chances for avoidance and manipulation militate against fair administration of the regulations. Ultimately, this is to the detriment of the resource.

Another set of problems has resulted from the *Programa Nacional de Desmonte*, which includes subsidized machine clearing of forest on *ejido* lands. From the forester's point of view, this is destruction of timber land that in the long view is more valuable for growing trees than for farming. Also, until recently there has not been effective utilization of the standing timber on land cleared for farming. If no ready buyer was available, or if the land was too remote for economic transport of the logs, the valuable species were simply cut and burned with the rest of the vegetation. This still happens occasionally, but as one informant, a government forest agent, put it, "...our hands are tied because of the political pressure to create new farmland. Food, not wood, is the primary objective of the Alliance for Production."

Although stands of the valuable species still exist in areas just now being penetrated by roads and settlement, the general opinion among foresters is that the "cream has been skimmed." There has been much uncontrolled cutting, and wasteful logging practices, the lack of adequate reforestation, hurricane damage, forest fires, and the effects of "nomadic" (shifting field) agriculture have diminished significantly the valuable species. The magnitude of the reduction is unknown; the first comprehensive inventory of Quintana Roo's standing timber appeared in 1976 (Mexico, 1976).

The outlook for future production is for continued cutting of mahogany and Spanish cedar, together with an increase in logging of other species. All production of lumber, plywood, and veneer is now consumed in Mexico; virtually no mahogany has been exported for over a decade, and logs for milling by MIQRO are being imported from Belize and Guatemala. The only species counted consistently in formal export figures is *guayacan* (*lignum vitae, Guaiacum sanctum*), shipped in small quantities to Japan and the United States.

Although not a timber species (except for some local, non-commercialized use), and thus not discussed here, the *chicozapote* has of course played a significant role in Quintana Roo's economic history. Although changes in the chicle industry have accompanied the recent development, they have been mainly in terms of increased benefits for workers, intensification of worker organization, and stiffening of government controls, rather than the kinds of technological changes that are affecting the other resources discussed here.

Summary

The over-all objective of our study is to obtain a comprehensive view of the processes and consequences of rapid large-scale development in a humid tropical context. This discussion of recent intensification of resource use leads to the question of whether or not the application of technologies developed elsewhere can override environmental constraints and provide sustenance for a greatly increased population. If our perception of Quintana Roo's prehistory is accurate, a large population was indeed sustained for a number of centuries by a particular mode of resource utilization. This mode has now been relegated to the past, with substitution of one drastically different and unproved in, this environmental context. It is clear that the tendency by planners to look upon shifting field farming as unproductive and even destructive has resulted in a concerted effort to suppress or change it.

Discussion of possible long-term effects of large-scale landscape modification is beginning, but pressures from the federal government and from development requirements as perceived within the state virtually assure the acceleration of new land opening, the substitution of mechanized farming for the traditional mode, and intensified exploitation of the fishery and forest resources. Although the need for thorough ecological analysis prior to development is also acknowledged by some, the time and money for such studies are not in current schedules or

budgets, which reflect mostly pressures for performance.

Recent developments in the fishery have increased production of high-value items for the tourist trade and export, and Quintana Roo's contribution to the seafood supply for people of modest means remains minimal. In forestry the concentration is still mainly on mahogany and Spanish cedar, although a start has been made to utilize other, less valuable but more plentiful species. Neither of these industries is destined to fill the need for employment of large surplus populations from elsewhere in Mexico.

Our preliminary observations suggest to us that the absorptive capacity of Quintana Roo for additional colonization, if it is to be based on large-scale, intensive, mechanized agriculture, may be less than is assumed by the planners. So far, the results have been rather disappointing, and incidence of crop failure has been higher than anticipated. Fortunately, the imported technology has not overrun much land that was being farmed actively in the old style. The major criterion for land to be machine-cleared and processed is that it be flat and not too stony, and the largest areas of such land are in seasonally moist, sometimes flooded *bajos*, most prevalent in the south. They contain heavy clay soils which must first be drained and are extremely susceptible to compaction when processed by machinery. These *bajos*, for example the Valle de Ucúm and Bajo de Morocoy, contain anthropogenetic features designated tentatively as "raised fields," and may have been used for intensive production of food crops in pre-Columbian times (Turner, 1978, 172). Such use probably ended soon after the Conquest, and the vegetation reverted to low, thickly tangled scrub forest. Thus, for the time being at least, the new technology is not being substituted massively on land devoted currently to the shifting field system. It is hoped that by the time this does occur, more light will have been shed on the comparative long-term viability of the two systems in the humid tropical context. Knowledge of alternative, more intensive systems as practiced by the pre-Columbian inhabitants assumes major importance as well.

The possibilities for expansion of cattle raising seem somewhat more promising, as applied to presently unproductive land, but as a labor extensive pursuit it is not likely to satisfy the need for gainful employment of a large rural population. Almost all pasture land in Quintana Roo is cleared from forest, raising once again the question of whether forest vegetation in the longest view is the region's most valuable resource. It has proved so in the past, as in regeneration of soil nutrients

for the native agriculture, and as providing valuable timber and other products. It remains to be seen whether permanent removal of the forest will result in net gain or loss for the folk who depend on the land for their living.

Note

1. Field reconnaissance in 1977 was funded by the College of Letters and Science and the Graduate School, University of Wisconsin-Milwaukee, and the UWM Latin American Center bore the expense of a set of air photos. Field work in 1978 and 1979 was supported by the Geography and Regional Science Program, National Science Foundation, under Grant No. SOC78-08475. David L. Miller, graduate research assistant, provided data on the fishery.

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