

Central America's Tropical Positive Steps

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Before the Europeans "discovered" and colonized Central America, the region probably had around 400 000 km² of lowland and lower montane tropical rainforests. Today, more than two-thirds of Central America's rainforests have been eradicated and the remaining forested areas are disappearing at the alarming rate of 4000 km² a year. Despite this grim record, the prognosis is not all black. A number of projects, both small- and large-scale, are underway that involve the local populations and utilize the rainforests in a sensible and sustainable manner.

When the 16th Century Spanish *conquistadores* touched shore on the territory that would later be called Central America, the region was covered by around 400 000 km² of lowland and lower montane tropical rainforests (1). Stretching from the eastern shore of central Mexico to the Darién rainforest of southern Panama, these rainforests teemed with tropical plants and exotic wildlife. Indigenous peoples searched the forests for food and raw materials, burned huge areas to create savannas crowded with wild food animals, and practiced highly productive, intensive agriculture. Then, with the arrival of Western civilization, Central America's rainforests began to change.

Today, almost five centuries later, more than two-thirds of the region's original rainforests have been eradicated in the name of survival, progress, and profits. Numerous species of animals and plants are threatened with extinction. If current patterns of clearing and burning are not drastically altered, much of the final third of the region's rainforests will be eradicated during the next 20 years, leaving only a few degraded forest relics in national parks and reserves (2). The region's rainforest inhabitants face an equally grim future. Most use obsolete agricultural techniques to raise Old World crops such as rice, coffee, bananas, and cattle. Many suffer from landlessness and poverty, and some from malnutrition (see Figure 1).

Despite this harsh assessment, the future of Central America's tropical rainforests and the future of the people who live in them hold forth some strong signs of hope. The region's leaders are fast becoming aware of the folly of wasting their remaining rainforests to produce quick profits or to postpone confrontation with population growth and the need for land reform. Now, increasingly, Central America's citizens are realizing that by halting rainforest destruction they can benefit both their own nation's people and the general health of the planet.

On at least three different levels—local, national, and international—organizations and individuals are struggling to promote

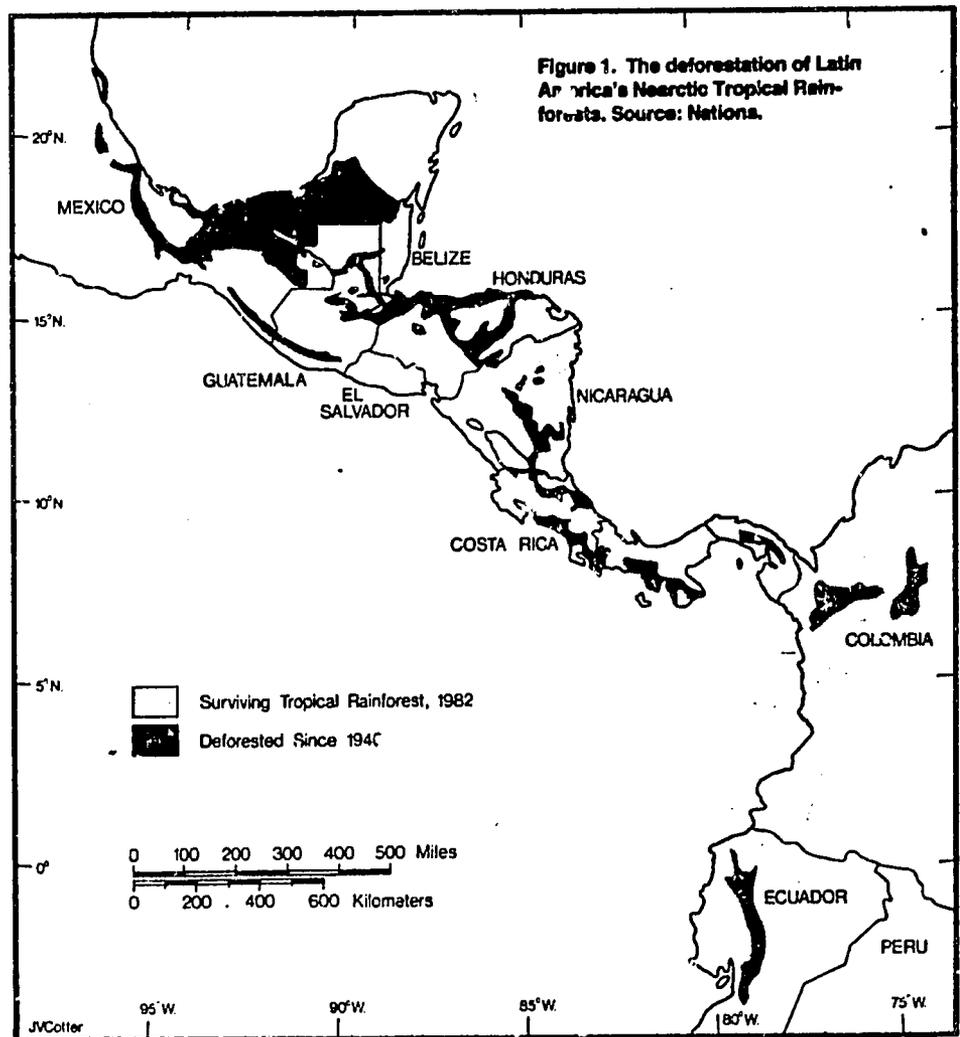


Figure 1. The deforestation of Latin America's Neartic Tropical Rainforests. Source: Nations.

Table 1. Lowland and lower montane tropical rainforests in Central America (Mid-1983).

Country	Undegraded rainforest	Current rate of loss per year	Major threats
Nicaragua	27 000 km ²	1 000 km ²	cattle ranching
Guatemala	25 700	600	colonization, cattle ranching
Panama	21 500	500	cattle ranching, logging
Honduras	19 300	700	cattle ranching, colonization
Costa Rica	15 400	600	cattle ranching
Belize	9 750	32	colonization
Mexico	7 400	600	cattle ranching, colonization
El Salvador	0	0	(deforested)
TOTALS	126 050 km²	4 032 km²	

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Rainforests: for Survival

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A few kilometers south of Kuna Indian territory in Panama, a bulldozer carves a swath through virgin rainforest for a road. By finding ways to utilize the rainforest as forest, the Kuna Indians hope to prevent similar destruction in their own region. Photo: J Nations.

the wise use and conservation of Central America's remaining tropical rainforests. Their success in this struggle will help determine the living conditions of Central Americans today and those yet to come. More than this, the struggle will also affect the rest of the world's citizens, including those who will never see the shores of Central America.

HISTORY OF RAINFOREST EXPLOITATION

During the first 400 years after European contact, most of the rainforests of Mexico, Central America, and Panama remained intact. In fact, in a few specific areas, the amount of forest actually increased during the first centuries of colonization. Dis-

eases, warfare, and slavery decimated the region's indigenous populations, and areas they had cleared for crops or for harvesting wild game reverted to forest (3).

During the 20th century, however, the commercial success of crops such as coffee, bananas, oil palm, and cattle have led the descendants of both invaders and Indians to convert huge tracts of rainforest into cropland and pasture. This conversion is fueled by population growth, inequitable land distribution, and international markets for export products, especially beef cattle.

The current trends in Central America's rainforest regions are toward the increasing transformation of forest and cropland into pasture for beef cattle, a decline in the number of people rainforest lands can support, increasing dependence upon the

vagaries of external markets, and the impoverishment of plant and animal life and most of the region's people. Admittedly, a few individuals are temporarily benefiting from the process of deforestation, especially loggers and cattlemen, and the developed world consumers who enjoy the short-lived fruits of rainforest destruction. But all of these benefits are produced at great social and environmental cost to Central America and its citizens.

POSITIVE STEPS

In the face of this ongoing deforestation, some Central Americans are finding positive ways to use and protect the region's rainforests. Their action takes a variety of forms, ranging from the local activities of indigenous groups to coordinated national

and regional efforts supported by international development and conservation organizations.

Indigenous Conservation

One of the most engaging success stories is that of the Kuna Indians of the Comarca of San Blas, Panama. On the northeastern shore of that nation, some 28 000 Kuna are struggling to protect a thin strip of 3106 km² of tropical rainforest that stretches—east to west—from Colombia almost to the Panama Canal. The San Blas Kuna still control large tracts of uncut forest land because they are primarily fishermen and coconut farmers who live on small islands just off the coast of their mainland territory. As anthropologist Mac Chapin has pointed out, they also have a cultural tradition of viewing the rainforest as the “domain of potentially malevolent spirits which are prone to rise up in anger and attack entire communities if their homes are disturbed” (4).

Although the rainforest of the Comarca of San Blas was legally ceded to the Kuna in 1930, recent illegal encroachment by cattle ranchers and colonists threatens to destroy both the forest and the Kunas' rightful claim to it. Behind this threat is the attitude that rainforest areas which are not being “used” may be expropriated by those willing to “improve” it by clearing the land and dedicating it to agricultural production or cattle ranching (5). Immigrant colonists have begun to slip across the Comarca's long, unprotected border to burn the forest and sell the “improved land” at US \$80 per hectare to cattle producers and week-end ranchers from Panama City. This same process is eradicating the rainforest of the Bayano and Darién regions of southeastern Panama at the rate of more than 500 km² per year (6) (see Box 1).

To prevent this destruction of their rainforest territory, the San Blas Kuna have begun a series of projects designed to utilize the forest *as forest*, thus demonstrating “use” of the land to outsiders while simultaneously creating jobs, producing income, and protecting both rainforest and Kuna cultural identity. The projects include a forest resource inventory, an agroforestry station, a training program for Kuna park guards, a botanical park with trees labeled in Kuna, Spanish, and Latin, and a program of scientific tourism that will allow photographers and researchers to study and enjoy one of Central America's most pristine rainforest areas (7).

The Kunas' program is now receiving crucial financial and technical assistance from Panamanian and international organizations, but the ideas, the work, and much of the money spent so far have come from the Kunas themselves (8). In this sense, their efforts constitute one of the most successful examples of indigenous protection of tropical rainforest in Latin America. Their example also reinforces an idea that is becoming a guiding principle in natural resource protection: wherever local people are involved *from the beginning* in planning and carrying out programs of natural resource conservation, both the resources and people prosper (9).

Intensive Agroecosystems

A second example of positive action in the protection of Central America's tropical rainforests is also the outgrowth of indigenous activities. Scientists throughout the region are investigating traditional Indian farming systems that could be adapted for use by immigrant farm families who would otherwise practice slash-and-burn agriculture or cattle ranching. By combining the ecologically sound, sustained-yield principles of traditional Indian agriculture with specific techniques of commercial agriculture, researchers are creating new produc-

tion systems that can improve the lives of rainforest colonists and conserve forest resources at the same time. This is possible because these intensive systems allow farmers to maintain production of food and cash crops on land that has already been cleared, thus relieving pressures to constantly expand into additional forest land.

Tropical Chinampas

Mexican researchers are experimenting with the centuries-old food production technique of tropical *chinampas* (10). This system can be utilized anywhere that water

Near the highland town of San Cristóbal las Casas, Chiapas, Mexico, a Chamula Indian completes a *chinampe* farming system he is creating in a rented boggy pasture. By piling the excavated soil onto the elevated cultivation platforms, the farmer can harvest crops year round without the use of chemical fertilizers. Photo: J Nations.





A Lacandon Maya farmer stands at the edge of an agricultural plot dominated by tobacco, bananas, maize (corn) and sweet potatoes in the rainforest of Chiapas, Mexico. The Lacandon Maya practice a highly efficient form of traditional agroforestry that allows them to cultivate small plots of cleared rainforest for up to 7 consecutive years. Photo: J Nations.

is available year round—a condition that is rarely a problem in rainforest regions. To create a *chinampa* system, the farmer digs narrow irrigation/drainage canals on three or more sides of a cultivation plot, then adds the excavated soil to the plot to raise it above the water table. The farmer maintains crop productivity by periodically dredging mud from the canals and adding it to the cultivation plots as organic fertilizer. Aquatic vegetation from the canals serves as “green manure,” and fish that colonize the canals provide additional, high quality protein.

As their name implies, the irrigation/drainage canals allow the farmer to control his crops' water supply. By using the canals to irrigate plants during the dry season and to drain off excess water during the rainy season, the farmer can maintain year-round production of cash crops, food crops, and trees in a system that is both ecologically and economically sound.

Experiments conducted by Mexico's Instituto de Investigaciones sobre Recursos Bióticos (INIREB) in Veracruz, and the Colegio Superior de Agricultura Tropical in Tabasco, have demonstrated that tropical *chinampas* can produce constant and abundant harvests in areas previously con-

sidered useful only for pasture or wet-crop cultivation. INIREB's experimental *chinampas* produced food and cash crops for a family of five on only 2000 m² of land.

Additional benefits of the *chinampa* system come from the fact that the farmer plants trees along the canals to hold the soil in place. By selecting the proper tree species, the farmer can produce additional food, fiber, and fuelwood and create wind barriers and habitat for wildlife such as insect-eating birds. Moreover, the *chinampa* system does not require machinery, insecticides, or artificial fertilizers. The system is also compatible with cattle production, since crop residues and weeds can be used as fodder. In turn, the cattle provide meat and milk, and their wastes are added to cultivation plots as organic fertilizer (11).

Agroforestry

Central American researchers are also placing deserved emphasis on agroforestry, the generic term for systems that produce trees, crops, and animals on the same units of land. The basic tenet of agroforestry—planting trees *with* crops, rather than cutting down trees to replace them with crops—enables farmers to increase

both their food supply and income without continually clearing new rainforest land (12).

In seeking the appropriate agroforestry systems for specific areas of Mexico and Central America, researchers are investigating the traditional agroforestry techniques of the region's indigenous peoples. One promising, though quickly disappearing, system is that of the Lacandon Maya, a rainforest Indian group in Chiapas, Mexico. The Lacandones practice a multi-layered 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 (13).

In such a fashion, a traditional Lacandon farmer clears fewer than 10 hectares of rainforest during his entire agricultural

cateer (14). Expanded to immigrant colonists in other rainforest areas, such systems of sustained-yield forest farming could dramatically improve the quality of life for rural families and prevent the destruction of renewable forest resources.

Other Agroecosystems

Other researchers are focusing on ecologically-sound, intensive production systems such as "orchard gardens," hillside terraces, and ridged fields (15). Interestingly, some of the most promising of these agroecosystems are emerging from archaeological research on the economic

bases of previous tropical American civilizations. Both archaeologists and agronomists are intrigued by the fact that groups like the ancient Maya sustained huge populations in areas that, today, are being devastated by the agricultural practices of the modern world (16).

Rainforest Parks and Reserves

Scientists as well as the general population in Central America also recognize the importance of preserving tropical rainforests in their natural state. In addition to providing lumber, raw materials, and new food and drug plants, Central America's rain-

A farmer's coffee crop is shaded by fuelwood and lumber trees in an experimental agroforestry plot near Turrialba, Costa Rica. Researchers with the Centro Agronómico Tropical de Investigación y Enseñanza (CATIE) cooperate with local farmers to create viable systems of agroforestry that increase the farmers' production and protect their land from erosion. Photo: J Nations.



Box 1.

Cattle Production and Rainforests

Clearing and burning rainforest to produce beef cattle has been the number one cause of forest destruction in Mexico, Central America, and Panama during the past three decades. The fact that this destruction frequently is preceded by other forms of forest exploitation—namely, logging and peasant colonization—has led some researchers to dismiss the destructive aspects of cattle ranching in Central American rainforests. But, in reality, beef cattle production serves as the motive force behind a three-stage pattern of rainforest eradication.

The process begins when logging companies or oil companies bulldoze roads through the rainforest to extract commercial resources. Later, landless peasant families use these roads to filter into the forest in search of land. They clear the remaining vegetation to plant subsistence crops such as maize, manioc, and rice, and low-level cash crops such as coffee, chilies, and bananas. After one to three years of this production, however, insect plagues, weeds, and soil exhaustion lead the colonists to clear additional forest land for crop production. But rather than allow their previous crop land to regenerate into forest, they seed the area with introduced pasture grasses and begin to produce beef cattle (1). Or, in an increasingly common pattern, they sell their cleared forest land to cattle producers who follow in their wake, buying up small plots to convert them into large ranches (2).

In many regions of Central America, government agencies, multilateral development banks, and international development organizations have actively promoted the transformation of rainforest into cattle pasture by providing incentives such as generous loans, new roads and beef packing plants, and pest eradication programs. In most cases, these incentives appear to be designed to increase export earnings by expanding the amount of beef sold to overseas markets, especially western Europe and the United States. In response to this financial and technical support, exports of deboned, frozen beef were the most dynamic sector in Central American trade during the 1960s and 1970s, with a 400 percent increase between 1961 and 1974 alone (3). In the importing countries, Central American beef ends up in luncheon meats, hamburgers, frankfurters, chili, soups, beef stew, hash, sausages, TV dinners, frozen pot pies, baby foods, and pet foods, although—especially in the United States—some of it is mixed with fatter, domestic beef to appear on



Beef cattle graze on pastureland cleared from tropical rainforest in the Bayano region of southeastern Panama. Pastureland is rapidly replacing rainforest throughout Panama and the rest of Central America. Photo: J Nations.

supermarket shelves as ground beef for homemade hamburgers and meatloaf (4).

Unfortunately, producing this beef on cleared rainforest land is a short-lived phenomenon. The effects of overgrazing and torrential rains soon turn rainforest pastures into weeded, eroded wastelands. As a result, although cattlemen may be able to raise one head of cattle per hectare during the first year of production, within 5 to 10 years they must dedicate five to seven hectares of land per head (5). After fewer than 10 years of production, the cattlemen—like the farm families before them—must move on in search of new forest lands. Throughout Mexico, Central America, and Panama, this system of extensive beef cattle production is destroying forest resources, wildlife, and rainforest peoples with equal disregard.

On the positive side, the intensification of cattle production is receiving increasing attention (6). Researchers realize that the current system of extensive beef cattle production must be eradicated if Central America's rainforests are to survive the coming decades. But these investigators also recognize that beef cattle production is firmly entrenched in the economies and politics of the region. Accordingly, they believe they will have better luck improving the industry's efficiency than attempting to eliminate it altogether.

The key factors in intensifying beef cattle production are better breeds, better pastures, better disease control, and better management (7). But the underlying premise is that these improvements must be carried out on land already cleared, not on additional rainforest territory. One of the most encouraging systems is that of forest grazing, in which cattle production is integrated with tree crops (8). Still, as astute researchers have pointed out, the primary constraints to intensifying beef cattle production are political and financial rather than technical, and these factors also must be addressed if intensification is to succeed.

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forests are important in protecting watersheds, preventing flooding, and controlling erosion and downstream siltation. For these and other reasons, the Central American nations are protecting specific areas of rainforest in national parks and forest reserves.

Both national and international organizations emphasize the importance of involving local people in the selection and protection of these rainforest reserves. For example, the government of Honduras recently created the 2500 km² Rio Plátano Biosphere Reserve in the La Mosquitia rainforest (see *AMBIO* No. 3-4, 1983). The area joins the expanding number of these conservation units under the aegis of UNESCO's Man and Biosphere Program (MAB). The Rio Plátano Reserve will protect the forest's abundant wildlife—jaguars, margay cats, ocelots, tapirs, har-

py eagles, and manatees, among others. But it will also protect the territory and lifestyles of the approximately 2000 Paya and Miskito Indians and a small number of Spanish-speaking farmers who live within its boundaries. The World Wildlife Fund-US, which provided funds for basic protection and management of the reserve, has noted that, "The continuing involvement of local Indians in the management and planning phases has been a major factor in the success of the project" (17).

CONCLUSION

Similar conservation measures throughout Mexico and Central America provide the hope that undegraded tropical rainforests will still exist in the region at the turn of the century and that other rainforest areas will be supporting populations on a sus-

tained-yield basis. This potential reiterates the need for continued research and for additional financial and political support for the growing movement toward the wise use of Central America's natural resources. For, despite these positive steps, much remains to be done. The region's rainforests continue to fall at an alarming rate; every year that current patterns of destruction continue means the permanent eradication of an additional 4000 km² of rainforest.

The fact that alternatives to this destruction are finally coming into play should stimulate the scientific community to redouble its efforts. Success in these enterprises will bring a brighter future for both the people and resources of the region. Failure will bring the increasing impoverishment of Central America's rainforests, wildlife, and citizens.

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