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## *Chapter Forty*

# **THE DISASTER OF DEFORESTATION IN THE BRAZILIAN RAINFOREST**

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### INTRODUCTION

In 1987, a major disaster occurred when an estimated eight million hectares of tropical forests in Brazil were destroyed (World Resources Institute 1990, 102). This event is considered a disaster because it was only the annual portion of an on-going process having immense spatial and temporal effects. The temporal impact is expected to remain virtually forever. In contrast to many disasters having a limited temporal impact because restoration is possible, the extermination of several biotic species associated with rainforest destruction is permanent. Likewise, some of the spatial effects have reached their potential areal maximum because they have affected the entire Earth.

In some respects, it may be misleading to refer to “the disaster of 1987” because the expression implies the tragedy happened only during a single year and that rainforest destruction no longer occurs. It should be made clear that many of the forces that led to the widespread cutting and burning of forests in the Amazon in 1987 had produced similar results in previous years and they continue to create conditions that encourage the destruction of forests (Figure 1). Nevertheless, comments here focus on a particular year because such a time constraint aids in describing the multitude of interrelated events that affect the Amazon region.

The magnitude of this disaster is revealed by noting the trend in destruction of tropical forests throughout the world. Prior to the industrial revolution, more than 1400 million hectares were probably in rainforests; by 1980 somewhat over 1000 million hectares remained; now their areal extent is approximately 800 million hectares (Wolf 1991, 13). This disaster is especially critical in Brazil because about a third of the world's rainforest is in this country and this is where the current rate of destruction will lead to the forest's complete destruction within a century (Shukla, Nobre, Seller 1990, 1322.)

In spite of the magnitude of forest destruction, it might be argued that such is not necessarily a disaster. After all, one could declare, vast temperate forests were destroyed in East Asia, Europe, and North America in previous centuries without major calamities resulting. Furthermore, according to this perspective, forests, which are composed of living matter, can be rejuvenated through purposeful plantings or by human abandonment that allows natural regrowth.

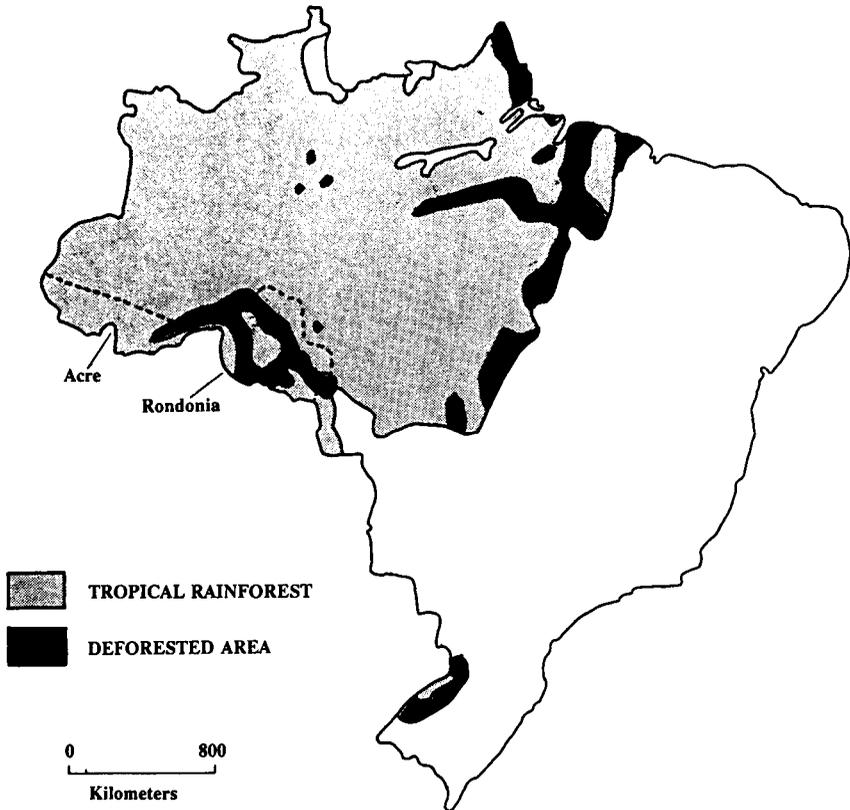


FIGURE 1. Areas of Deforestation in the Rainforest of Brazil. Recent deforestation has been especially prevalent in the provinces of Acre and Rondonia. (After World Resource Institute 1990, p. 104).

The current destruction of the tropical forest, however, is not the same as previous tree clearings. The difference lies in the magnitude and permanence of biological extinctions and alterations of the atmosphere. To clarify the detrimental consequences of this disaster, each of these global effects is discussed in greater detail.

### GLOBAL EFFECTS OF DEFORESTATION

The possibility of permanently losing much of the biological diversity is a critical concern because the rainforest is an extremely rich storehouse of the biota. According to current knowledge about the Earth's biological species, the rainforests hold 50 percent of our total genetic heritage, including 67 percent of all known plants, 80 percent of the world's insect species, and 90 percent of the non-human primates (May 1988; Shulka, Nobre, Sellers 1990). To destroy the rainforest habitat, therefore, results in the extermination of a major form of the Earth's wealth.

Some of the direct benefits from the rainforest are known: it provides fruit, nuts, resins, and latex, as well as drugs used to treat cancer, malaria, heart disease, and high blood pressure. If these were to be the only products that would be lost with the destruction of the rainforest, the term "disaster" might not be appropriate because some people might regard the costs of losing these few products as less than the benefits gained from clearing rainforests for other uses. This is not the case, however.

Humans know very little about the multitude of species living in tropical forests, which means it is impossible to know the potential benefits future generations might obtain from this huge storehouse of biological forms. No one can predict which additional sources of food and medicinal products may be discovered from yet unknown species. Humans depend heavily on about 20 food species, but an estimated 75,000 plant species are known to be edible, some of which are known to be superior to crops currently in use (Wilson 1989, 114).

In spite of our known present and potential dependence on many species, humans are causing the total extinction of many rainforest species by destroying their habitat. It has been estimated that four to six thousand plant species are disappearing per year—a rate much faster than that from natural extinction (Wilson 1989, 112).

Because of the complex interdependency of various species, the destruction of a few affects the environment of many others. Major superstructures of ecologically related species may be destroyed in a short time. Once destroyed these interrelated biological communities are almost impossible to reassemble. Reconstructed forests, for example, are often vulnerable to greater damage from pests and diseases than diversified virgin forests.

Also, the destruction of habitats in Brazil affects the wildlife in other areas. For example, some migratory birds that spend most of their time in North America depend on the Brazilian rainforest for their winter habitat. The disruption of these species, in turn, affects other life forms in an ever widening circle of alterations.

Furthermore, the effects are not proportional to the amount of habitat destroyed. According to the theory of "island biogeography," the number of species found

on an island corresponds normally to the fourth root of the area (Wilson 1989, 111). This means that clearing much of the forest while leaving several isolated reserves of virgin forest is not a viable option because such "islands" would not provide the habitat necessary to sustain the diversity of existing species.

Another critical concern associated with the destruction of the rainforest is its atmospheric effect. Climatologists reckon that recent burning in the Amazon accounts for 15 - 30 percent of the global carbon-dioxide emissions (Repetto 1990, 36). Many scientists believe the increase of carbon dioxide in the atmosphere may contribute to "greenhouse" conditions and thence to global warming. Although such a relationship has not been accepted by all scientists, the potential calamitous effects of global warming would be severe enough that very few policy-makers are willing to proceed as if there were no connection. If, indeed, global warming is occurring, tremendous changes in coastal inundation, precipitation patterns, and biological habitats would result in many areas of the world.

Even if long-range, global climatic modifications cannot be predicted with certainty, local climates are expected to change with deforestation in the Amazon. According to the results obtained from numerical models, replacing the forest vegetation with pastures will increase surface temperatures and decrease evapotranspiration and precipitation over the Amazon region (Shukla, Nobre, Sellers 1990). The decreased precipitation and the lengthening of the dry season would, in turn, make it very difficult to reverse conditions and reestablish a tropical forest. Thus, although trees would return if pastures were to be abandoned, they would not re-create the diversity of the original rainforest.

In summary, the deforestation occurring in the Amazon is a disaster because of the biological exterminations and the atmospheric modifications that can permanently affect life throughout the world. Given the seriousness of such a scenario, it would seem logical that humans would choose to preserve the tropical forests. What is logical in the long run and for a population in general, however, often does not coincide with the immediate needs of particular individuals. It is the combination of many persons, each with self interests, that in the aggregate creates the forces which are destroying large sections of the Brazilian rainforests.

It is not possible to study the motives of all individuals associated with the Brazilian Amazon, but groups of people with similar interests can be examined meaningfully. Some of the major groups involved with utilizing the resources of the Amazon are the indigenous populations, the rubber tappers, the small farmers, the ranchers, the lumber companies, foreign investors, and the Brazilian government. To understand factors that lead to rainforest destruction, it is helpful to study the varying power these groups have in exploiting or preserving the forests.

## COMPETITORS FOR THE RESOURCES OF THE AMAZON

One element in the mix of competitors for the resources of the Amazon is the *indigenous population*. Numerous Indian communities have been living in an overall ecological balance with the rainforest for centuries, but they have been continually

threatened by the invasion of other groups. Ever since the arrival of the Portuguese in the 16th century, the Indian populations have declined in number. The number of Indians living in the area that is now Brazil probably exceeded three million, but by 1960 the total was approximately only 200,000 (Branford and Glock 1985, 182). Death from European diseases and the collapse of several Indian cultures have diminished the size of many Indian forest communities.

Another main contributor to the decline of Indian communities has been the appropriation of their traditional territories and, hence, their source of livelihood. Through most of Brazilian history, Indian communities have suffered from the imposition of a fundamentally different view of the land. According to governmental law, land is legally owned and can be utilized as the owner wants. Usually these wants are commercial, which often depend upon "development" of the land. In contrast, virtually all Indian groups have viewed the land communally, with its resources available to those with long traditions of occupancy. From the Indian perspective, it is difficult to believe that individuals who obtain a sheet of paper—i.e., a land title—become sole possessors of the land and all its resources.

This conflict has resulted in the disposition of Indians from many regions of the Brazilian forests. Although government agencies have been established to protect Indian rights, these were generally ineffective in the past. In more recent years, however, actions by religious organizations (e.g., the Missionary Indian Council), anthropologists and other scholars, and assertive Indian leaders have led to the establishment of national parks in which land is preserved for Indian communities. Nevertheless, the discovery of gold within a designated park, the building of a highway nearby, or other changes having commercial benefits for various non-Indian groups jeopardize the continued preservation of Indian territories.

The indigenous population of Brazil must be considered one of the competing groups for the resources of the Amazon, but it certainly is not one of the forces leading to the destruction of the forests. The Indian peoples are among those wishing to preserve the rainforests. Nevertheless, as certain groups who oppose the Indian way of life and seek to destroy that culture and as various commercial forces gain access to Indian territories, the forests are also endangered.

The *rubber tappers* and other extractors of forest products also depend directly on the existing rainforest. This group consists primarily of people who occupied forest areas early in the 20th century to collect latex from wild rubber trees, but currently members also gather Brazil nuts and other products that can be sold. Although there have been some conflicts between groups of Indians and rubber tappers, both are vitally interested in preserving the rainforests and have recently joined forces to work toward such conservation.

The communities of extractors have also suffered from more powerful commercial interests in recent years. The plight of these people received considerable publicity when Chico Mendes was honored by the United Nations in 1987 for his attempt to protect the rainforest and again when he was assassinated in 1988. His death was not an isolated event; many hundreds of rubber tappers, along with Indians, were killed in the 1980s (World Resources Institute 1990, 110).

A third category of people wanting to use the land that is naturally covered by

rainforest consists of *small farmers*. Within the last two decades, an estimated 24 million persons have left their homes in the coastal regions of Brazil in hopes of making a living in the sparsely settled interior of the country. Factors that push migrants from the long-settled regions are the extremely inequitable ownership of land in Brazil and the general economic conditions that have increased the number of poor families. Between 1981 and 1985, for example, agricultural wages declined almost 40 percent in real terms (Repetto 1990, 41).

Factors encouraging migration into the rainforest, especially into the provinces of Rondonia and Acre, are government programs that have encouraged settlement in the Amazon and the building of new highways. Moving to the Amazon is regarded by many as an opportunity for acquiring land and thereby achieving a better life in a frontier region. New highways cut through the rainforests and provide access to previously isolated regions for millions of migrants wanting to own a piece of virgin land.

One of the first tasks undertaken by these aspiring farmers is the clearing of a plot of land, which is accomplished by cutting or girdling and then burning trees. Crops planted in the ash-enriched land grow fairly well during the first two or three years, but then the fertility of the cleared land declines rapidly. Because traditional farming methods are at ecological odds with the rainforest environment, within a few years crops fail and farmers are forced to abandon the land. In some situations, pressure from cattlemen accelerates the rate at which small farmers flee their cleared plots. After abandoning one area, farm families move to other virgin lands to repeat the process.

*Ranchers* form a fourth group of people competing for the use of the rainforest. As with the small farmers, they need the forests cleared so the land can be used for an alternative product, namely, grasses for pasture. Cattlemen destroy the rainforest either directly by burning trees or indirectly by scaring away farmers who have already completed that task. The forage grasses also suffer after a few years because of declining soil nutrients, which results in the invasion of shrubs and non-forage grasses. Although ranchers may then expend the costs of cutting and burning this undesired vegetation, the quality of pastures is rarely restored completely, which means that ranchers seek larger landholdings capable of supporting their cattle herds.

Ranchers who seek additional land do not experience the same constraints that apply to the Indians, rubber tappers, and small farmers who attempt adjustments to deteriorating conditions. Ranchers are usually able to obtain the financial backing necessary to acquire land as the need arises. Furthermore, this economic power is accompanied by political power, especially at the level of local and regional governments. Such power provides considerable leverage in conflicts with farmers, tappers, and other local groups over land ownership or utilization of forest resources.

During the period of greatest deforestation, ranchers were aided by the government through long-term loans, tax credits covering most investment costs, and tax write-offs. Ranchers typically lost more than half their invested capital within 15 years, but land could be repeatedly resold as tax shelters (Repetto 1990, 41). Most of these governmental policies were discontinued in 1989, but in 1987 they con-

tributed significantly to the magnitude of forest destruction.

The ranchers' greater economic and political power arises partly from their linkages with distant markets. In contrast to farm families who attempt to survive by growing crops for their own subsistence and for local or regional markets, the ranchers have the economic support of a marketing network that reaches metropolitan Brazil and buyers in Europe, Japan, and North America.

The fifth group of competitors considered here includes all persons associated with the *lumber industry*. In many countries, including Brazil, large corporations are cutting trees, primarily hardwoods, for distant markets, especially in Japan and the United States. At first glance, this activity might be regarded as similar to the harvesting of a renewable resource that occurs commonly throughout the world. It is not the same, however, because current logging practices destroy approximately half of the trees while only 10 percent are extracted and used (Repetto 1990, 37). The relatively few trees that are obtained are acquired at a tremendous sacrifice of the unused trees.

Wastefulness is also evident in the form of the final products. Rather than utilizing the tropical hardwoods for furniture or other items depending on distinctive qualities of the wood, much of the production goes into panelling, plywood, cardboard, pulp, and other materials for which numerous sustainable alternatives are available. Within Brazil, some trees have been used only as a commercial fuel, with one example being the making of charcoal for the iron smelters at Carajas.

The destruction of tropical forests may be more permanent than the cutting of trees in other vegetative zones. Efforts at reforestation of rainforests have generally failed because they do not replicate the wide diversity and extensive distribution of species. Without a freeze season to kill pests, blights, and diseases that attack trees, the wide dispersion of species is essential. Attempts to replace the forests with tree plantations consisting of only one or a few species, therefore, have generally failed.

In addition to these five groups of people living and operating within the Brazilian Amazon, other non-local forces affect the use of the forests. As already noted, the national government regulates land ownership and tax rates, which affect decisions about land utilization. The building of national highways greatly influences the accessibility of places and the economic feasibility of commercial ventures. Likewise, foreign investments and importation of Brazilian products provide the financial backing for activities that promote exports. For example, decisions made by the directors of a corporation in Tokyo can directly affect the rate at which lumber is extracted from distant rainforests.

## PROSPECTS FOR IMPROVEMENTS

What are the prospects for diminishing the magnitude of this reoccurring disaster? An answer depends on the degree that the various forces contributing to deforestation are changing and the likelihood that they will continue to reduce destructive activities. Any such prediction, of course, requires a fairly accurate assessment of the principal "causes" for the existing destruction.

Efforts to determine “the cause” for the deforestation in the Brazilian rainforest are thwarted because of the multiplicity of forces involved with its utilization and the varying power of these contending forces. For example, although it is easy to observe the actual burning of a section of forest by a small farmer, such action does not constitute the primary reason for the disappearance of tropical forests. Only when this act is repeated millions of times does it become a significant contributor to forest destruction. Even so, it can be argued logically that the clearing of land by small farmers is merely a symptom of an economic system that causes rural poverty and leads people to do whatever is necessary to eke out an existence. To declare that “an economic system” is the root cause, however, does not identify any causative elements because of the intricately interwoven components of a modern economy.

The difficulty in identifying factors that ultimately result in deforestation is illustrated by the complexity of international finances. In the 1970s, United States banks and other foreign financial institutions loaned money to the Brazilian military government with floating interest rates. As the United States budget deficits increased, interest rates rose, which then made it more difficult for Brazil to make repayments from export earnings alone. Brazil then sought money from the International Monetary Fund (IMF), which required the government to cut spending on health, education, housing, food subsidies, public transportation, and similar public benefits. These budgetary restrictions on social expenditures and the continual outflow of debt payments were followed by the expansion of poverty. These conditions of poverty, in turn, contributed to the migration to the Amazon and the resultant deforestation.

The Brazilian national debt also put more pressure on the government to encourage exports, particularly those with international marketing networks, such as associated with beef and lumber. Any expansion in the exportation of these products, however, is accomplished by more rapidly clearing the tropical forest. Again, as with the problem of assessing the true “cause” for burning trees by land-hungry migrants, there is little agreement about the primary “cause” for clearing the forest for rangeland. Is it the rancher who strives to make a living by producing a marketable commodity, the government that encourages the production of this export item, or the consumers in distant countries who buy Brazilian beef?

Without agreement on basic underlying conditions that have created the disaster of deforestation, it is difficult to assess the merits of current and prospective changes. Several factors have contributed to a reduction in the amount of forest destroyed in Brazil since 1987. Some changes have occurred since the return of a democratic government, which is more receptive to the interests of a diverse population.

One policy that was only partially implemented in the past but is now being enforced with greater vigor is the reservation of specified areas for Indians. In recent years, several million hectares have been designated as “extractive reserves” where Indians and rubber tappers, and hence the forest, are assured protection from encroachment.

Change is also occurring partly from the reevaluation of the costs and benefits of using the forest resources in particular ways. For example, studies in Acre show

that because pastures quickly lose their productivity and carrying capacity for cattle, the revenue from collecting wild rubber and Brazil nuts is four times as high as that from cattle ranching (Repetto 1990, 38). Similarly, research in the Peruvian Amazon found that the value of edible fruits, latex, and very selective logging can yield more than twice the income achievable from ranchers (Peters, Gentry, Mendelsohn 1989).

Since 1988, the Brazilian Institute for Natural Environment and Renewable Resources has been monitoring forest fires by examining imagery obtained by satellites. As soon as a fire is spotted on images, the site is checked by helicopter. Then the persons responsible for the burn are fined by an enforcement patrol arriving in trucks. The tremendous reduction in fires from 1989 to 1990 is believed to be largely attributable to this kind of immediate response.

Outside Brazil, a growing awareness about the problems resulting from the destruction of tropical forests has generated public pressure to make changes. Adverse publicity and direct protests seem to have encouraged world lending agencies to give more weight to the possible environmental impact of proposed development projects. The abandonment of highway extensions in Acre province illustrates what appears to be a modified lending policy.

These changes have reduced the amount of annual deforestation that has occurred since 1987, but they do not negate most of the basic forces that contribute to the destruction of the forests in Brazil. The economic factors that entice people, individually and collectively, to cut or burn a portion of the forest are still operating. As long as individuals benefit—or at least believe that they benefit—from clearing and cutting trees, this kind of activity will persist.

This “disaster,” therefore, is an on-going one. Although it results from human decisions and consequently is solvable by human action, the intricate and complex characteristics of the national and world economic systems make it very unlikely that deforestation will be stopped in the near future. The radical and rapid changes necessary to stop deforestation will occur only when the costs of biological extermination and atmospheric modification are deemed unacceptable by the major centers of economic and political power.

#### REFERENCES

- Branford, Sue and Oriel Glock. 1985. *The Last Frontier: Fighting Over Land in the Amazon*. London: Zed Press.
- May, Robert M. 1988. How Many Species Are There on Earth?, *Science* 241:1441-49.
- Peters, Charles M., Alwyn H. Gentry and Robert O. Mendelsohn. 1989. Valuation of an Amazonian Rainforest, *Nature* 339:655-56.
- Repetto, Robert. 1990. Deforestation in the Tropics, *Scientific American* 262:36-40.
- Shukla, J., C. Nobre and P. Sellers. 1990. Amazon Deforestation and Climate Change, *Science* 247:1322-25.
- Wilson, Edward O. 1989. Threats to Biodiversity, *Scientific American* 261:108-116.
- Wolf, Edward C. 1991. Survival of the Rarest, *World Watch* 4:12-20.
- World Resources Institute. 1990. *Forests and Rangelands, World Resources 1990-91*, 101-20. New York and Oxford: Oxford University Press.