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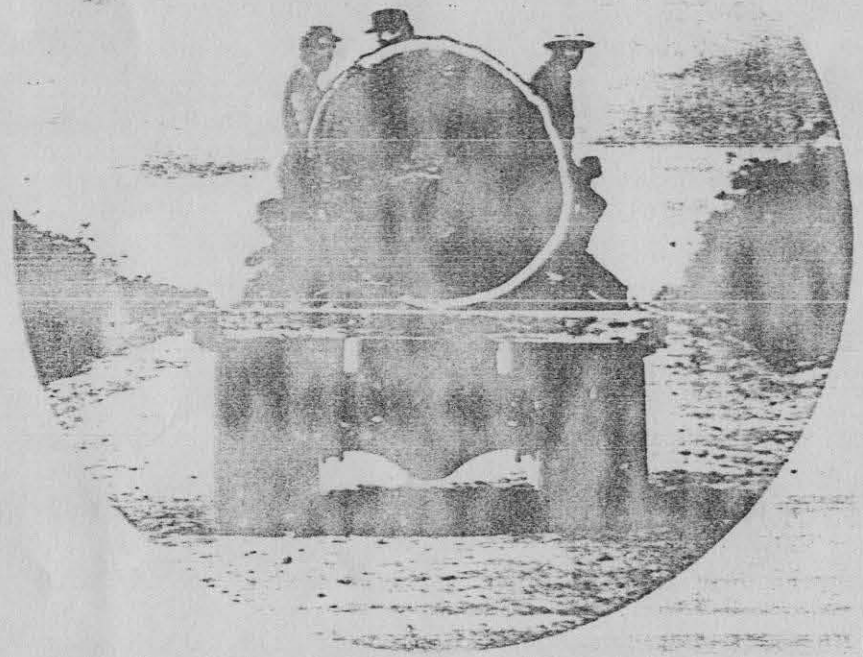

The destruction of the tropical forest is one of the major problems of our time. Vast areas are rapidly becoming wastelands which support only a few tough weeds, perhaps some cattle, and the farms allowed to the poor. This book provides a vision of hope: in Latin America, Africa, and South East Asia, growing numbers of people are developing techniques specifically designed to promote the wise use and preservation of remaining forest lands. However, these grassroots strategies are often ignored in favour of grandiose schemes which inevitably fail. This pattern must be broken now or the tropical forests will be lost forever.

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Saving the Tropical Forests

Preface by Michael Robinson

Judith Gradwohl and Russell Greenberg

with feeding stations in the gallery forest, and experimental reforestation plots have been established to provide them with shelterbelts for soil protection, food and habitat. New trees are being tested to see if they can survive when grown in conjunction with iguanas.

The management system is both easily transferred and economically efficient. Due to increases in production and growth rates, iguanas now produce meat at about half the cost of feeding other domestic animals. Compared to cattle, for example, which also take about three years to raise, iguanas yield the same or even more protein per hectare. And, according to a best-case scenario from the pilot work, production of iguanas appears to be profitable even at the lowest sales prices. It is projected that a farmer who reforests his land and raises iguanas will be free of debts incurred by the project after eight to eighteen years. Moreover, iguana ranching does not require any degradation of land. Although it is still at a developmental stage, the iguana management project provides a realistic model for producing a source of protein in tropical areas consistent with sustainably managed woodlands.

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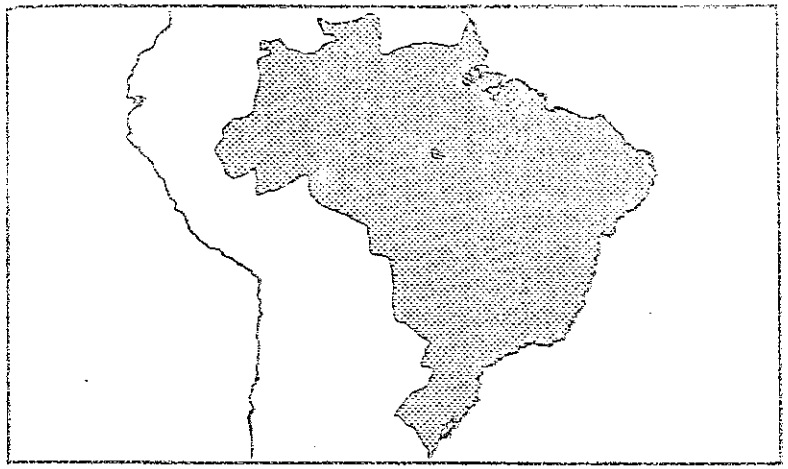
SOURCE: Dagmar Werner, Smithsonian Tropical Research Institute, P.O. Box 2072, Balboa, Panama.

Resource Management by the Kayapó, Brazil

The Kayapó Indians of the eastern Amazon Basin of Brazil employ a complex and sophisticated system of managing tropical forests. This system has been the focus of ethnobotanical studies by Darrell Posey and his collaborators since 1977. More recently it has become the object of interdisciplinary work examining all aspects of their knowledge of the forests and savannas, including wildlife, plants and soils—knowledge which may provide models for ecologically sound management of diverse, lowland forest communities.



One important aspect of the Kayapó management system is that it begins with a complete and detailed "taxonomy" of ecological zones. In the savanna (or campo/cerrado) areas, the Kayapó recognize approximately fifteen formations that vary with the amount of shrub or tree cover, presence of water, and location with respect to hills and mountains. By contrast, modern ecological research in the tropics often relies upon cruder distinctions between "forest" and "second-growth." In addition, Kayapó women use a detailed soils classification system at least as sophisticated as that of most modern tropical agronomical systems in planning which crops to plant and where they should best be located. In all, the Kayapó recognize and use over six hundred species of plants.

Within the savanna there are small "islands" of forest. These too are managed by the Kayapó, who group them into seven types ranging from newly-formed vegetative clumps to forest corridors apparently maintained for defense. Forest islands are common close to Kayapó villages; as many as three-quarters of them may be human-made, and as many as eighty-five percent of the plants within them are thought to have been planted by the Kayapó. In all likelihood the current system is only a remnant of former trails and villages throughout the region, and of a time when human management of the campo actively determined the distribution of forest patches.

The Kayapó establish mulch piles in the forest islands. They then transfer them to small depressions in the campo, where they mix them with soil from termite mounds and portions of *Azteca* ant nests

to form a mound one to two meters in diameter by fifty centimeters high. These mounds are nurtured over the years until they form islands as large as five hectares. Their functions are several: defense, shelter for the Kayapó when they remain in the campo, rest areas during the heat of the day, and the provision of privacy for other activities. Forest island plants are used for food (tubers, fruits, nuts, etc.), medicine, materials for baskets and other artifacts. Some food trees are cultivated to attract game. *Azteca* ants are introduced into the islands to repel leaf-cutting ants.

In the forest, the Kayapó practice slash-and-burn cultivation. The clearings are managed for a number of years, first for annual crops such as maize, beans, squash and manioc, then for perennial and tree crops such as sweet potato (which can be harvested for five years), yams (five to eight years), papaya (five years), banana (fifteen to twenty years) and Cupe (*Cissus gongylodes*) (up to forty years). The success of the system relies heavily upon continued nutrient enhancement of the soils through mulching and localized burning. Mulching and burning treatments are adapted for different crops. Old fields and secondary forest are particularly important for medicinal plants and as habitat for game. As in the Mayan, Bora and Taungya systems, the fallow period is managed by planting useful trees, some of which take many years to grow to harvestable size. The high concentration of fruit trees and relatively low vegetation attracts game, and clearings are frequently visited to gather seeds for transplanting into old fields and forest islands. The Kayapó understanding of crop succession is extraordinary. For example, the shade conditions of a fallow change dramatically as banana plants mature; the Kayapó know of approximately two dozen tubers and numerous medicinal plants that thrive under these conditions, known as "companions of banana."

The Kayapó used to travel over large areas along a network of trails, along which fruit-bearing trees were planted as a kind of way-station. One large Kayapó village, Gorotire, where much of this research has been done, still maintains a five hundred-kilometer trail system planted with yams, medicinal plants and fruiting trees. The villagers also plant in tree-fall gaps and openings created by removal of honey trees.

High-diversity gardens, rich in medicinal plants, are cultivated close to home. Older women maintain "hill gardens" of root crops, which, in the event of floods or other disasters, are important food sources. These gardens are planted in eight- to ten-year-old fallows. Others are planted on outcroppings of basalt.

This research, along with work on Mayan agriculture and other indigenous agroforestry, calls into question the apparent "naturalness" of some existing tropical forests, and shows that a diversity of species and habitats can be maintained while yielding food, medicine and household products to their human managers. If the basic requirements of such a system—the systematic classification of soils and plants and the intensive management of second growth—are met, there is little to prevent the Kayapó's efficient and sustainable agriculture from being fruitfully applied in other parts of the world.

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SOURCE: Darrell Posey, Nucleo de Etnobiologia, Museu Paraense Emilio Goeldi, C.P. 399, 66.000 Belém, Pará, Brazil.

Japanese Farming in the Amazon Basin, Brazil

Japanese farmers have lived in the Brazilian Amazon for over fifty years. In their small enclaves, they practice a diverse and sustainable form of agriculture. Until recently little was known of their culture or indeed of their successful farming practices. Now researchers are looking at the town of Tomé Açu, one of the largest Japanese communities in the region, located 210 kilometers south of Belem and the mouth of the Amazon, to see why Japanese farmers have flourished where most other colonists have failed.

The Tomé Açu farmers face the same ecological constraints plaguing all farmers in the upland forests of the Amazon: high rainfall, soil containing few nutrients, and a high concentration of metals in the earth. Their farms are located in much the same places as other farmers' plots. What, then, makes them unique? Researchers say that it is their attitude towards the land, and hence their cultivation practices that distinguish these farmers from the others.