



Tropical forest management options, social diversity and extension in eastern Amazonia

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An exposition of extension efforts with two resource-competing groups in a single municipality in Paragominas, Brazil.

["Islands" of biodiversity in Brazilian Amazonia](#)

Options for forest resource development are different for distinct social groups. The provision and exchange of information among resource users regarding these options must therefore be tailored to reflect this diversity. This article describes two recent experiences in forestry extension that have accommodated diverse local perceptions and interests in Paragominas, a municipality in Brazil's eastern Amazonia. The first example shows how participatory research helped to quantify the use and value of non-wood forest products (NWFPs) to the local communities so as to justify the sustainable management of forest resources for non-wood benefits, thereby mitigating the need for continued agricultural encroachment and destructive harvesting for timber. In the second experience, extension activities demonstrated to local loggers and policy-makers the technical and economic advantages of sustainable timber harvesting in the hope of reducing the rate of conversion of forest to pastures which, in turn, were quickly degraded. The emerging challenge is to identify ways that forestry extension approaches serve the needs of distinct client groups with apparently conflicting requirements. To the extent that extension reflects diverse options for human intervention in the same ecosystem, it can improve societal distribution of benefits from local resource use.

DIVERSITY AND SUSTAINABILITY

Since the United Nations Conference on Environment and Development in Rio de Janeiro in June 1992, attempts at sustainable forest resource utilization and management have increasingly taken into consideration the conservation of biological diversity. The term biological diversity generally refers to the conservation of animal and plant species and genetic variability within species as well as ecosystems and habitats. However, an operational

definition of diversity should also encompass human cultural diversity. Different peoples express their resource needs and relationship to the forest resource in different ways. Over the years, local groups have often developed an extensive knowledge of biological diversity and its uses. Forestry and conservation efforts in natural forest areas are increasingly drawing on this local knowledge in a participatory process.

A key concept in biological diversity conservation is the increasingly interdependent nature of the world. While this interdependence can increase access by people to beneficial goods and services at lower costs, it can also result in added pressure on the fragile natural resource base. The linking of forested regions to domestic markets that are themselves increasingly affected by competition as well as by increasingly accessible international markets poses a challenge to those concerned with the sustainability of tropical forest resources.

Forest products such as babassu nuts are of importance to the local economy

This challenge is particularly intense along the frontier of agricultural and timber expansion in eastern Amazonia of Brazil. Here, highway construction and mining activities that began in the 1960s attracted settlers from elsewhere in the country with the promise of new lands, gold and employment. When they arrived, they were thrust into contact with isolated indigenous groups and riverine populations whose low population densities, subsistence lifestyles and knowledge of soils, vegetation and wildlife, etc. had allowed a harmonious coexistence with dense tropical forests that represent "islands" of biological diversity in the Amazon regions. Such islands retained species that had disappeared elsewhere in the region during the period of extended drought, which converted much of the Amazon region to savannahs. However, they have now come under threat from "development", in the form of expanding timber extraction, migratory subsistence farming, cattle ranching and other anthropogenic forces.

Typically, the perception was that rural development required the wholesale replacement of forest land by other land-use options - basically crops or pasture. In the process, timber was extracted as a by-product of agropastoral expansion. Despite the presence of literally hundreds of hardwood timber species, loggers focused on harvesting a limited number of commercially desirable species such as mahogany and cedro. After harvest, ranchers planted the aggressive *colonião* grass, and burnt their pastures frequently to retard forest regeneration. Farmers grew exclusively white crops - rice and cassava - in slash-and-burn cultivation for subsistence and the market. Even forest product gatherers and harvesters gathered NWFPs from a limited number of species such as babassu palm (for the oil kernel and charcoal) and Brazil nut (see *Unasyiva*, 42[165], entitled Forest products) as they moved to a cash economy. Moreover, indigenous groups were encouraged (by legal and economic incentives) to convert the forests and savannahs they had managed for centuries into simplified cropland and pasture.

At the same time, in its effort to forestall deforestation, the environmental movement launched campaigns to "protect" the natural forest from use of any kind - an often extreme and untenable measure.

These patterns have begun to change, however, partly as the result of the international outcry over deforestation in the region and partly as a result of the search by local communities and commercial enterprises for alternatives that are more economically viable in the long term. Timber operators, criticized for forest degradation and wasteful logging practices, have responded by dramatically increasing the number of species they use and by testing innovative management techniques. Ranchers are trying to recuperate degraded pastures to avoid encroaching on remaining forests, and new settlers in the area now hope to find ways to overcome the short-term limitations (both social and technical) that had led to continued deforestation and the associated cycle of poverty and recurring migration. They have organized grassroots cooperatives and established agroforestry systems to produce timber

and fruit from native trees. Research institutions and extension agents are playing an increasingly supportive role in this transition.

The recent tendency to promote the planting or management of a number of perennial species and production systems that can be better integrated with the local ecology, rather than to focus on either restrictive ecosystem protection or conversion of natural forest to monoculture plantations or to non-forest land uses, reflects a significant change in the approach of agriculture and forest development policy-makers and technicians and environmentalists alike. Development agents of all kinds are seeking a broad continuum of environmentally sustainable use options. The challenge, however, is to find options that are mutually compatible among the actors with competing interests in the same forest lands.

This challenge became particularly acute in eastern Amazonia, where non-governmental organizations have begun pilot activities in forest land-use research and community intervention in the same municipality, Paragominas, in the southern area of Pará State. Representatives of both small farm settlements and large-scale timber extraction firms have tried to define alternative land-use models that are more protective of the forest resource base. These experiences suggest ways to help reconcile competing resource demands in the tropics.

[Improvements in timber harvesting practices can help increase returns to loggers and improve sustainability](#)

CAPTURING LOCAL KNOWLEDGE FOR EXTENSION

Local knowledge of the environment and indigenous systems of resource management, previously ignored or thought archaic, are now recognized as being essential to an ecologically sound strategy for forest utilization. Formerly, agronomic and forestry extension had relied on the introduction of extensive production systems and models. It has now become imperative to begin with a clear understanding of the local rationale for current land uses. This knowledge can only be obtained by working directly with local people over the long term, documenting existing practices and constraints as well as the reasons behind them, and promoting alternatives only when it becomes clear that they would be appropriate within these systems. Such initiatives must be equally sensitive to both local ecosystem resilience and culturally ascribed values.

A good example of this emerging approach is an effort under way on the Capim River, a remote tributary of the Amazon in Paragominas. In the past, families in these communities relied on a combination of subsistence agriculture, the extraction of NWFPs and hunting and fishing for their livelihood, and had only very limited contact with regional markets, located many hours down-stream. Recently, farmers have been induced to sell timber on the municipality's burgeoning wood market as a source of ready cash. Harvesting was done inefficiently and degraded areas were converted to pasture or simply left to regenerate as brushland. As a result, plant and animal NWFPs became increasingly scarce. An international team of researchers associated with the government agroforestry centre for the humid tropics (EMBRAPA-CPATU) was asked by the rural labour unions to assist them in finding ways to keep their forest resources from destruction.

The research team began by making a participatory inventory of fruit, game, fish and medicinal plants consumed by 45 households over the course of an entire year. In addition, the population ecology of four NWFP species (three fruit-trees and one medicinal oil source) selected by the community was exhaustively examined and tree distribution, regeneration and productivity were documented. In both cases, it was the community members rather than the scientists who helped identify study parameters and carried out the resource inventory and utilization studies.

Walks along a 40 km forest trail network with community members led to the identification of the most widely utilized products. After training, community members mapped the location of each of 200 trees, and monitored fruiting phenology over a three-year period. Satellite images were employed to pinpoint individual farmers' fields and distinguish adjacent forests that had been exploited and degraded as well as remaining areas of primary forest.

The participating household members maintained daily registers of products they consumed (by weight for game, fish and fibre products, and by unit for medicinal plants and fruits). Rather than assess the value of products solely in monetary terms, their equivalence in a locally essential commodity, cassava meal (*farinha*), was used to evaluate the importance of these products to household income.

This information, such as the *farinha* equivalent of NWFP consumption, was integrated into extension programmes. Activities included small group discussions, workshops for the whole community, exchanges between villages, theatrical presentations and the production of illustrated booklets (see [Box](#)). The objective in all of these activities was to ensure an understanding of and control over data that had been generated locally for use by the community in its struggle to protect and manage its remaining forests and to demonstrate and quantify the great value of the forest for the survival of local communities.

The Capim River experience exemplifies efforts by forest-dwelling communities to define effective management systems that can provide increased benefits while ensuring the conservation of the resource base. The virtue of the extension methods employed was to stimulate community members to give free reign to their knowledge and imagination and begin more long-term planning regarding how best to use the resources they control. Sensitivity to local knowledge and spatial awareness is critical in the definition of tree resources and products that should become the focus of management and marketing trials. Of course, quantitative analyses of the potential value, both marketed and non-marketed, of the full range of forest products will be essential if the communities are to be able to make rational, long-term decisions about the options for forest resource use. And unless the value of managing, harvesting and marketing NWFPs can be increased beyond that of timber, it is unlikely that the communities will choose them as the primary focus of forest utilization.

In the interim, pressure continues to mount in parts of Paragominas that remain forested, as timber harvesters expand their activities westwards. Efforts to reduce the destructive effects of logging practices are the subject of the second case-study.

DEMONSTRATING SUSTAINABLE TIMBER HARVESTING

Over the past decade, the degradation and destruction of forest resources in other parts of Brazil has resulted in greater emphasis being put on the Amazon basin as a source of timber. Paragominas is now the centre of the most intensely logged area of Amazonia; more than 200 sawmills operate around the clock during the seven-month dry season. The loggers are working their way westwards, leaving a trail of logging roads, new pastures, denuded banks along the Capim River and degraded local watersheds.

Ranchers and loggers of Paragominas come either from southeastern Brazil, where the transformation from dense coastal forests to fields for cattle and cropland occurred decades or even centuries ago, or from the central savannahs where forests are non-existent. Hence, they often perceive the tropical rain forest not as a resource in itself that is worthy of conservation and management but as an obstacle, and they hasten to fell it and convert the land to other uses.

Moreover, they are often inefficient harvesters. Until recently, most loggers gave little thought to the possibility of returning to the same land one day to harvest again. Their aim was to

extract the most valuable logs before the land was converted to pasture by burning. They made no effort to promote regeneration or to avoid degradation (e.g. by planning felling operations to avoid pulling down other valuable trees or by reducing the extent of road cutting). The returns to loggers and to the landowner, especially when supported by government fiscal incentives, were enough to support the costs of pasture expansion.

Lately, however, global concern over tropical deforestation has begun to be reflected in natural resource policy in Brazil - and incentives that favoured the conversion of forest to pasture have been progressively removed. Since the late 1980s, researchers associated with the Institute for Man and the Environment of Amazonia (IMAZON) have worked with loggers in the search for sustainable techniques for tropical hardwood harvesting and utilization. Foresters involved in IMAZON's Wood Project (Projeto Madeira) conducted a series of studies in Paragominas that led to a better understanding of the rationale behind the loggers' and ranchers' current behaviour as a basis to identify land-use alternatives. Instead of vilifying their current practices, the research team found them rational, given the mix of market incentives, technical information and equipment available in the region. As it was unable to address the wider issues of market incentives and land tenure, IMAZON embarked on a programme to improve the technical basis of forest management in the area.

By agreement with a landowner who was in the process of selling timber rights to loggers, IMAZON established a 50 ha research and demonstration plot for sustainable management techniques. Measures included modification of the silvicultural system, including a reduction of the rotation period from 90 to 30 years, the initial marking of trees to be cut, the removal of vines that would otherwise have pulled down or broken neighbouring trees, the use of wedges to control the direction of felling, and site planning to minimize road extension and damage. Compact skidders were employed in preference to heavy caterpillar tractors to avoid understorey damage and soil compaction. The additional effort involved in undertaking such management methods was carefully monitored.

The initial costs in the demonstration plot were slightly higher than those incurred on a neighbouring plot which simultaneously underwent traditional logging, and the harvested wood volume taken out of the forest was less than that removed under the traditional practices. However, under the traditional practices, with the higher volume of harvesting and significantly more damage to the remaining trees, a 90-year rotation cycle was necessary to allow the forest to restore itself. Under the improved practices, which had a 30-year rotation, the present value of site output increased significantly.

Furthermore, were current logging practices to continue, forests in Paragominas would be exhausted by the end of the next decade, resulting in a declining tax base and collapse in the local economy unless other non-forest sustainable systems could be developed. Under sustainable management, the forest could continue to provide raw materials indefinitely, thus providing continued employment, income and public revenues, as opposed to the current "boom and bust" scenario.

Once these studies had been completed, IMAZON began a series of extension activities designed to communicate the results to loggers and other groups. During the felling season, an on-site demonstration of managed extraction techniques was held with participation by managers of many local logging firms. With support from the World Wide Fund for Nature (WWF-Brazil), an extension video was produced and widely distributed for environmental education and training purposes. In the video, loggers express their enthusiasm to explore less aggressive, more sustainable management techniques, and opt for a greater utilization of timber that was formerly considered waste for furniture manufacturing so as to add value and increase local employment.

An extension manual describing appropriate practices is being prepared by IMAZON for wide

distribution and use by state and federal agencies (see [Box](#)). The manual contains a financial analysis suggesting that those who adopt the sustainable system will have higher initial costs but will be able to reduce the forest land area they must manage in the long term for the same value of timber production, thus reducing land and transport costs.

CONCLUSIONS

The loggers and forest-dwelling communities described in this article compete for the use of and control over the same resource base in Paragominas. Encouraging complementary land uses that reconcile the interests of competing demands for resources is a major challenge for tropical forest managers. The success of NWFP extension work with the Capim River communities and their neighbours will be in vain unless it is paralleled by efforts to promote sustainable timber extraction practices over reduced areas, thus exerting less pressure on land essential to forest-dependent communities.

The pioneering research and extension results described above represent a step forward in the search for sustainable options that can help reconcile conflicting demands on forest resources in the Amazon basin. But other avenues must be explored and successes must be paralleled by changes in policy and market forces, which currently provide few incentives to the adoption of sustainable forest management practices. Such changes require extension work, not only among loggers and forest dwellers but among policy-makers and the public at large, to alter perceptions of the value of forest conservation and wise use.

For further reference

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