

EXTRACTIVE RESERVES IN BRAZILIAN AMAZONIA: AN OPPORTUNITY TO MAINTAIN TROPICAL
RAIN FOREST UNDER SUSTAINABLE USE

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ABSTRACT

"Extractive reserves" are comunally managed areas in Brazil's Amazonian forest where traditional residents draw natural rubber, Brazilnuts and other non-wood products from the forest. A proposal to designate substantial tracts for this use offers a practical means of helping to maintain the climatic and other environmental functions of the forest, and reducing destruction of Amazonia's biological diversity and many untapped genetic and pharmaceutical resources. As a grassroots initiative the extractive reserve system stands a much better chance of resisting pressures for deforestation than do other types of forest management. The proposal deserves the support of Brazilian government agencies, international lending institutions, and others, but both the sustainability of the extractive system and the long-term continuation of government cooperation require that its support be based on the right reasons. Primary among these is maintaining areas of intact forest--a function with both economic and non-enconomic value for society. Forest maintenance needs to be viewed as a constraint on development rather than as a choice to be determined by traditional financial calculations.

EXTRACTIVE RESERVES

The Extractive Reserve Proposal

In 1985 an opportunity presented itself to maintain tracts of Amazonian forest under sustainable use. Brazil's National Council of Rubber Tappers (CNS) proposed the creation of a series of "extractive reserves," beginning with areas in two of the states most threatened by deforestation: Rondônia and Acre. "Extractive Reserves" are a new category of land use, granting legal protection to forest land traditionally used by rubber tappers, Brazilnut gatherers and other types of "extractivists." "Extrativismo" (extractivism) in Brazil refers to removing non-timber forest products such as latex, resins, and nuts, without felling the trees. Extractivists, principally rubber tappers, have been living in the forest collecting these products since the "rubber boom" in the latter part of the nineteenth century (Fig. 1). About 20 products are collected for commercial sale (Jaime de Araújo, public statement, 1988). Some examples are listed in Table 1. Many more are used to supply food, medicines and other products for the extractivists' own use, but do not enter the cash economy.

The extractive reserves are to be communally run, with the government retaining land ownership in a manner similar to Amerindian reservations (Allegretti, nd; Schwartzman and Allegretti, 1987). Although not issued separate deeds, individual families would retain their rights to tap in their traditional collecting territories ("colocações") within the reserves: the system is not a form of resource collectivization. The land cannot be sold or converted to non-forest uses, although small clearings for subsistence crops are permitted (usually not exceeding 5 ha/family, or about 1-2% of a reserve). The first two extractive reserves were decreed in Acre by the governor of that state in February 1988. Reserves are proposed in Rondônia, Amazonas and Amapá (Fig. 2). Reserves proposed as of November 1988 are listed in Table 2. Brazil had 68,000 rubber tapper families at the time of the 1980 census (Brazil, IBGE, 1982), probably occupying about 4-7% of the Legal Amazon at the typical density of 300-500 ha/family. Rubber tapper organizations claim that the number of tappers is much greater than that registered by the census, but independent confirmation is lacking.

The extractive reserve proposal is most advanced in Acre, followed by Rondônia. Both states are undergoing rapid deforestation (Fearnside, nd), making obvious to the rubber tappers there the need to defend the forest as a precondition for their own survival. These states also have the greatest proportion of "free" or "autonomous" rubber tappers, while most of the tappers elsewhere in Amazonia are still "captive" under the hated system of "aviamento" (debt peonage). Rubber tapper organizations are also strongest in Acre and Rondônia. Despite the greater impediments to extractive reserves outside of these two states, rubber tappers in other parts of the region stand to gain from supporting the reserves as a means of escaping from "aviamento" (Whitesell, 1988).

Provisions for extractive reserves are included in Brazil's new constitution, which took effect on 5 October 1988. Loans to Brazil that include funds for extractive reserves are under consideration by the Interamerican Development Bank (IDB) and the World Bank (IBRD).

ADVANTAGES OF EXTRACTIVE RESERVES

The reserve proposal is attractive for several reasons. It ameliorates a social problem for the rubber tapper population by allowing these people to continue their livelihood rather than being expelled by deforestation.

Displaced rubber tappers now either swell the ranks of urban slum dwellers in Brazil's Amazonian cities, or become refugees to continue their profession in the forests of neighboring countries such as Bolivia (de Almeida, 1987; Weyrauch, nd. (1979)). However, it is unlikely that sufficient land will be set aside to absorb all such people.

Amazonian development projects are usually either decreed from above by government decision-makers, or come from the private initiative of outside investors. In sharp contrast to almost all other Amazonian developments, the extractive reserve proposal originated at the grassroots level. The local origin of the proposal greatly increases the likelihood that the facilities and the sustainable extractive system will be maintained as planned. In settlement projects and other developments where all is planned and delivered from outside, the recipients often lapse into complaining about all that the government is not doing for them rather than organizing as a community to solve their own problems and maintain the access roads, schools, and other facilities implanted under the project.

The extractive reserves produce on a sustainable basis, using known harvesting techniques that proved themselves during approximately one century of continuous use in the areas in question. The ability of the system to supply useful products on a permanent basis is a major point in its favor. Cattle pasture, the land use that sooner or later takes over almost all deforested land in Brazilian Amazonia, is well known to be unsustainable (Fearnside, 1979a, 1980; Hecht, 1981, 1983, 1985). The fact that the benefits of deforestation are marginal makes finding effective ways to block the process of forest loss an obvious priority. Forestry management for timber production has one advantage from the point of view of convincing Brazil's government to promote it: timber management offers the country's power structure a greater vested interest in the forest's survival. Undoubtedly both extractive reserves and timber management projects should be promoted, and the remaining forest in the region is ample for both. Where conflicts of interest occur between these two options, however, extractive reserves would be preferable.

Forestry management projects, such as the International

Tropical Timber Organization (ITTO) scheme proposed elsewhere in Acre, may prove sustainable but have several disadvantages when compared to extractive reserves: 1.) their sustainability is unproven, 2.) they provide less benefit for the local population, 3.) they provoke greater disturbance of the forest, 4.) their top-down planning and administration reduce the likelihood that they will resist the constantly changing winds of official policies, thereby reducing the chances that a consistent management routine will be followed over the long term, 5.) their management routines are more susceptible to circumvention through corruption (a major impediment to sustained management schemes in Indonesia, for example), and 6.) they are less likely to resist invasion by migrants and speculators because of their reliance on paid guards rather than the people who live in the reserves and whose livelihoods depend directly on the forest's continued existence.

Production of economic goods, especially rubber, is the principal argument used by the rubber tappers in justifying their proposal to the government. The value of non-wood products extracted in Acre, Rondônia and Amazonas totaled US\$48 million in 1980 according to official statistics (Schwartzman and Allegretti, nd: annex 1). Valuable as this production is, it is not the real reason why the government should allocate land to this over other competing land uses. Pressure from other contenders will mount when the flood of migrants to Acre increases after completion of the reconstruction and paving of the BR-364

Highway from Porto Velho (Rondônia) to Rio Branco (Acre) in 1989 (and later from Rio Branco to the Pacific), and as the price of tropical hardwood continues to rise.

The production of economic goods is less of a justification than it appears to be because the major product--rubber--is subsidized. Rubber is much more cheaply produced on plantations in Southeast Asia than it is under any system in Amazonia because of the absence of the South American leaf blight fungus (*Microcyclus ulei*, formerly *Dothidella ulei*) in Asia. Largely because of this disease, Brazil produces less than one percent of the world's natural rubber (Goering, 1982: 11). *Microcyclus* attacks rubber plantations in Amazonia, lowering productivity and increasing costs. Rubber trees in natural forest suffer only light levels of fungal attack, but the long distances that must be walked between trees make labor requirements high per ton of rubber collected.

World prices for natural rubber have been at a low level for several years, with some Asian plantations even being cut as uneconomic. Natural rubber can be substituted for by synthetic rubber, particularly polyisoprene rubber, for an increasing number of uses (Grilli *et al.* 1980: 106); the cost of synthetics is heavily dependent on petroleum prices, so that the low oil prices of the 1980s have depressed rubber prices. In the long run, oil prices can be expected to increase as global supplies dwindle, thereby improving the relative position of natural rubber. Brazil imports roughly half of its natural rubber and produces the remainder domestically from plantations and extraction ("A Crítica, 24 September 1982). The domestically produced proportion has increased from its previous level of one-third (Moraes, 1979). Of the domestic production, the proportion obtained from plantations is steadily increasing as rubber planting spreads in Brazil's non-Amazonian states. Rubber prices in Brazil are approximately three times higher than the international price (*Guia Rural* Abril, 1987)--the subsidy thereby given to rubber barons (*seringalistas*), rubber tappers and plantation owners is thus shared by the consumers of rubber products throughout the country. This subsidy will become more and more onerous as domestic production expands. Brazil's precarious economy is already in a poor position to maintain such subsidies at their current levels, as indicated by the government's decision in 1988 to drastically reduce the staff and budget of SUDHEVEA, the agency responsible for rubber marketing and promotion. In 1989 the remaining portion of SUDHEVEA was merged with other agencies in a newly-created Department of Environment and Renewable Resources. Losing SUDHEVEA is a setback for rubber tappers, rubber "barons" and plantation owners: the agency has provided the institutional means of limiting imports and maintaining high domestic prices.

The rubber tappers would be wise to make a major effort to diversify the products they extract and sell. This will require collaboration with researchers (such as pharmacologists, chemists and botanists) to develop new products, especially medicinal plants. Great care must be taken that only sustainable extraction is practiced: it is by no means automatic that the products collected and the intensities of harvesting applied will always be sustainable.

Institutional arrangements need to be made to assure that the extractivists receive royalties from the future sale of the products, including synthetic copies and subsequent modifications of the original plant compounds. Marketing mechanisms need to be developed if extractivists are ever to enjoy a reasonable standard of living. As the misery of the rubber tappers during the rubber boom shows, when the value of the products accrues to intermediaries, extractivists remain poor regardless of the amount of wealth they generate.

While the monetary value of the extracted products is likely to be a secondary consideration for international financial agencies and government policymakers supporting the extractive reserve initiative, economic self-sufficiency must remain an important goal of the extractivists. This will require maximizing the variety and value of the products sold, limiting the drain of money to intermediaries, and minimizing the cost of establishing and maintaining the reserves. The first priority for use of any funds received must be to quickly demarcate as many reserves as possible. Development of infrastructure to improve living conditions in the reserves should come later, and should be kept as modest and self-sufficient as possible. The extractivists must be careful not to ask for too much: health centers and schools are important, but if installed in remote areas through the government bureaucracy and its contracted construction firms, the cost can be astronomical. The POLONOROESTE Project, financed by the World Bank, provides an unenviable example in Rondônia. If inefficiency and/or corruption results in unnecessarily expensive facilities, the level of economic return from the extractive system is unlikely to be sufficient to make the reserves appear reasonable as economic ventures. The great selling point that the reserves are self-sufficient and independent of constant government inputs will be lost. Such a loss would be gleefully seized upon by those waiting for the first sign that the extractive system has failed, so that the forest can be cut to give a rapid profit to outside investors. Active opposition to extractive reserves has taken on a violent character in Acre, where leaders of the rubber tappers' organization live under constant surveillance and threat of death by gunslingers hired by ranchers. The brutal assassination of rubber tapper leader Francisco ("Chico") Mendes on 22 December 1988 has brought this violence to world attention (see Fig. 1).

Not only must the extractive reserve proposal be supported, it must be supported for the right reasons. These reasons do not include the reserves' potential for financial gain. Neither should they be viewed as a means of supporting a dense population or of absorbing people migrating from other locations. Migrants who are new to extractivism lack the knowledge and attitudes necessary to make the system work sustainably. Even for experienced practitioners, only a sparse population is supported (presently about 1.0-1.7 persons/km²). The temptation is great to use extractivism as a sink for excess population: the government of the state of Amazonas has launched an "extractivist" project near Boca do Acre in an area that contained 500 families of rubber tappers when the project was announced--but this number will be increased to 5000 under the scheme (*A Crítica*, 15 July 1988). Great care must be taken that such developments, whether they are called "extractivist projects" or "extractivist reserves," do not become mere euphemisms for the settlement that has already become discredited by misadventures on the Transamazon Highway and in Rondônia. Extractivism runs the risk of becoming just as discredited if false hopes are pinned on this form of development as either a sponge for absorbing excess population or as a route to riches.

Improvement of living conditions for the extractivists has always been a fundamental reason for the proposal from the point of view of its originators: the National Council of Rubber Tappers and the Rural Workers' Union. Although minimal health and education are basic human rights, the government is unlikely to be persuaded to create extractive reserves as a means of providing these services to the rubber tappers while larger and more accessible populations elsewhere also lack minimal services. The strongest argument in favor of the reserve proposal is its maintenance of the forest. From the point of view of decision-makers, the reasons for creating the reserves are the same as those for not destroying the forest.

WHY NOT DESTROY THE FOREST

Although one of the principal reasons cited for not destroying the Amazon forest is that it is very valuable, in the sense of being worth a lot of money, good reasons exist for not destroying the forest even if the forest were not valuable in this direct financial sense. The ephemeral nature of most economic uses of deforested land exaggerates the contrast, but reasons for maintaining forest would remain even if its replacement were a miraculous crop that produced sustainable yields of US dollar bills. These reasons include the forest's role in macro-ecological processes such as the water cycle and the balance of atmospheric gases that affect global climate (Andreae *et al.* 1988; Eagleson, 1986; Fearnside, 1985, 1986, 1987; Salati and Vose, 1984). Although some of these indirect environmental impacts have heavy monetary costs, much of the damage is not easily translated into monetary terms. Neither is the loss of biological information, in the form of genetic material and the myriad pharmacological compounds present in the forest (Myers, 1984; Oldfield, 1981). Deforestation destroys both the compounds themselves and the indigenous knowledge of the medicinal uses of each plant. Both are prerequisites for tapping this resource. While most drugs are now produced synthetically in laboratories, the compounds that are copied artificially were almost invariably obtained originally from living organisms—from the mold that gave us penicillin to the willow that gave us aspirin. Amazonia holds the world's largest store of species. New drugs are continually needed because new diseases continually appear and because drug-resistant strains of old diseases (like malaria) are constantly evolving. So far no one pays for information leading to identification of new compounds from nature.

At present, interest among large pharmaceutical firms is limited, even in the absence of any arrangement for returning some of the profits to the extractivists. The statements submitted by pharmaceutical firms to the US congressional committee that assessed impacts of tropical deforestation, however, recognize the value of compounds from the forest as models for subsequent industrial synthesis (United States House of Representatives, 1983). Firms are somewhat more interested in the potential for obtaining ingredients for soaps and cosmetics. Part of the attraction of cosmetics for firms is the more rapid and inexpensive process of gaining approval for marketing, as compared to drugs (which are encumbered by requirements for extended clinical testing). These non-medicinal uses, while providing some potential income, lack the very important appeal that pharmaceutical compounds have in justifying the maintenance of forest on non-economic grounds.

The fact that pharmaceutical firms are not making any significant effort to screen Amazonian plants for new compounds is frequently put forward as evidence that the forest's potential usefulness is not so high. However, the tepid response of pharmaceutical firms is better explained by the costs and risks of the search for new compounds. The long process of testing not only makes future returns weigh little when discounted for financial decision-making, but also pushes the time horizon for product development beyond the term in office of most corporate executives. The attraction of a faster payoff favors investments in less substantive activities, such as refining the packaging and advertizing of products already manufactured.

Information on the potential value of the forest as a source of medicinal plants is scanty and largely anecdotal. The forest has inspired flights of fancy in this realm ever since the search for the fountain of youth almost 500 years ago. Under these circumstances, ample scope exists for exaggerated claims. Nevertheless, pharmaceutical uses represent a very real value, as evidenced by the recent discovery of anti-cancer agents in the Madagascar

periwinkle (*Catharanthus roseus*, formerly *Vinca rosea*), a tropical plant containing over 60 useful alkaloids. One drug (vincristine or leurocristine) extracted from the periwinkle has reduced mortality from lymphocytic (child) leukemia from 80% in 1960 to 20% today and another (vinblastine or vincalkeboblantine) has raised the 10-year survival rate for Hodgkin's disease from 2% to 58% (Caufield, 1985: 220-221; Humphreys, 1982; Myers, 1983). Analysis of the periwinkle, whose promise was indicated by use in folk medicine, revealed a class of compounds whose pharmacological activity could not have been guessed on the basis of existing chemical knowledge (Humphreys, 1982). While Amazonia might prove to be less of a pharmacological treasurehouse than some have claimed, at the very least the forest should not be thrown away before making a systematic evaluation of the compounds it contains. Because drug company executives are guided by their financial balance sheets rather than by the human interest, these companies should not be counted on to initiate a screening program with the speed and scale required.

As is the case for many potential uses of the forest, cost-benefit analysis for pharmaceutical screening is inherently unreliable because it is based on estimating the difference between very large and uncertain numbers. Even were better information available on the number of medicinal compounds obtainable and the costs of identifying and using them, market forces cannot be counted on to assure protection of the forest. The sale value of drugs often bears little relation to their true importance to humanity. Economic calculations are fundamentally flawed by the unwarranted assumption that everything on earth can be interconverted through the medium of money. Unfortunately, unique species and many of their products cannot be substituted for by any quantity of money, however great.

Some have argued that substantial tracts of natural ecosystems should be preserved even if the forest were not full of irreplaceable medicinal compounds and genetic stocks, and even if the forest were not a key component in regulating global climate. The fact that there is so much about the forest that we do not understand should induce sufficient humility to motivate saving at least some of it. Explicitly non-economic and non-utilitarian arguments for saving tropical forests have been made by Budowski (1976), Ehrenfeld (1976), Jacobs (1980), Janzen (1986), and Poore (1976). Such arguments are usually dismissed in Brazil as "poetry" or "very beautiful" (pejorative expressions in Brazil with reference to arguments). While some of the reaction against forest destruction is, in fact, without rational basis, a strong case can be made for saving substantial tracts of forest on the basis of human self-interest in spheres unrelated to direct use of the forest's products.

THE RACE TO JUSTIFY MAINTAINING FOREST

That the forest must not be destroyed is the conclusion regardless of the level of argument at which one views the problem. The same conclusion is reached whether arguments are based on the long-term economic interest of society, maintenance of macro-ecological processes, supply of unique and undiscovered products, or intellectual, ethical and other abstract functions. The question of whether Brazil should allow its Amazonian forest to be destroyed is not related to direct economic costs and benefits in the usual way. Normally in approaching such a decision, one first totals up the costs and benefits of each choice and then selects the option that corresponds to the highest ratio of benefit to cost. Here, however, one knows before any such calculation that the forest must not be destroyed: if the financial benefit is indicated as insufficient to justify saving the forest, then the conclusion is not that one should cut down the forest but rather that the economic equation must be altered

until conservation becomes "rational." Much of what is being done by researchers can best be viewed as a race to find ways to make saving the forest economically "rational." These efforts include identifying new products obtainable from the forest, finding economic uses for timber trees that could be managed sustainably, demonstrating the feasibility of sustained forest management, and documenting both the environmental costs of forest loss and the ephemeral nature of most land uses that replace it. Other actions could include altering the relative prices of sustainable and non-sustainable products to favor the sustainable ones (Fearnside, nd) and changing the discount rates used in evaluating forest use options (Fearnside, 1989). Discount rates provide economists with a rationale for disregarding the future costs and benefits following from present-day decisions. Applying high discount rates may be a rational way for investors to decide what to do with their money to maximize profits, but it is no way for a country to decide how to develop in the best interests of its people.

Finding ways to make sustainable uses profitable and non-sustainable ones unprofitable is essential (Fearnside, 1979b). The mechanisms chosen are not complicated or unknown--what is lacking is the will to apply them. Developing the arguments needed to generate that will is the immediate task. The situation is similar to that familiar to the readers of Agatha Christie mystery novels: through feats of reasoning from scanty facts the detective discovers who murdered the victim, after which the affair is turned over to the plodding and unimaginative police department to collect the evidence needed to make a court case. Once pointed on the right track, the similarly plodding corps of government economists and technocrats can find ways to alter the relative profitability of sustainable use of the forest versus the payoff from deforestation. Generating the will to point the government apparatus in this direction will require more than tinkering with the input parameters to traditional economic calculations--as by discovering a new product here and there. The economic attractiveness of maintaining forest would be improved substantially if deforestation were charged with the full financial cost of its contribution to environmental changes such as the greenhouse effect. In the end, however, even these much needed adjustments to economic calculations only provide better rationalizations for a decision that is fundamentally non-economic. What is needed is to throw the economic calculations out the window and face up to the fact that the *real* reason for maintaining forest is not economic.

FOREST MAINTENANCE AS A CONSTRAINT ON DEVELOPMENT

The necessity of maintaining forest should be treated as a constraint on development options that is accepted before cost/benefit or other economic calculations are made. This constraint should have a place similar to that of national security. Security considerations have led the Brazilian government to force consumers to pay the higher prices required for the country to gain a measure of independence in producing computers, automobiles, small aircraft, rubber, fuel alcohol and a host of other products. Rather than simply selecting the cheapest option for supplying these products, the government has placed non-economic considerations first and expected the economy to adapt itself to the new situation. The same logic applies to changes needed to control deforestation and favor sustainable use of the forest. Maintaining the forest is a given, from which the economic mechanisms must follow.

The proposed extractive reserves offer an excellent opportunity to act on this precondition in a way that is inexpensive, solves a number of other problems, and, above all, is likely to be effective.

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FIGURE LEGENDS

Figure 1 -- Rubber tappers (*seringueiros*) have drawn latex from naturally occurring rubber trees for over a century without damaging the sustainability of the productive system. Here *seringueiro* leader Francisco ("Chico") Mendes Filho taps a tree in Brazil's first extractive reserve at Seringal Sããão Luiz do Remanço, Acre. Chico Mendes was assassinated on 22 December 1988.

Figure 2 -- Brazil's Legal Amazon region.

TABLE 1: SOME PRODUCTS CURRENTLY COLLECTED BY AMAZONIAN EXTRACTIVISTS(a)

Scientific name	Common names		Plant part	Use	States where collected(b)	Value in 1981 (US\$1000(c))
	Port.	Engl.				
<i>Hevea brasiliensis</i>	Seringa	Rubber	Latex	Rubber	AC,AM,AP,PA,RO	27,400.9(d)
<i>Castilloa ulei</i>	Coucho		Latex	Rubber	RO	1,496.4
<i>Manilkara bidentata</i>	Balata		Latex	Non-elastic gum	AM,PA	229.9
"Manilkara• "elata•	Maçar-anduba		Latex	Non-elastic gum	AM,AP	212.6
<i>Couma utilis macrocarpa</i>	Sorva		Latex	Non-elastic gum	AM,PA,RR	1,635.2
<i>Mauritia flexuosa</i>	Buriti	Miriti palm	Petiole	Fiber	PA	34.0
<i>Philodendron bipinnatifidum</i>	Cipó-Imbé		Stem	Fiber	PA	12.3
<i>Urena lobata</i>	Guaxima	Bastard cedar	Stem	Fiber	PA	2.1
<i>Sida rhombifolia</i>	Malva		Stem	Fiber	PA	0.7
<i>Leopoldinia piassaba</i>	Piaçava		Petiole	Fiber	AM	277.2
<i>Astrocaryum aculeatum</i>	Tucum	Star nut palm	Petiole	Fiber	AC	0.5
<i>Stryphnodendron barbadetiman</i>	Barbatimão		Bark	Tanin	PA	0.4
<i>Rhizophora mangle</i>	Mangue	Mangrove	Bark	Tanin	PA	1.8
<i>Carapa guianensis</i>	Andiroba	Crabwood	Seed	Oil	PA	1.6
<i>Orbignya spp.</i>	Babaçu		Seed	Oil	PA	0.7

Copaifera spp.	Copaíba		Resin	Oil	AC,AM,PA	99.0
Dipteryx odorata	Cumarú	Tonka bean	Seed	Oil	AM,PA	289.9
Scheelea martiana	Licuri (Ouricuri)		Copra	Oil	AC	17.1
Astrocaryum murumuru; A. sciophilum	Murumuru		Seed	Oil	PA	0.5
Virola spp.	Ucuúba		Seed	Oil	PA,AP	41.1
Euterpe spp.	Açaí		Fruit	Food	AC,AP,PA,RO	593.9
Bertholetia exelsa	Castanha- do-Pará	Brazil- nut	Nut	Food	AC,AM,AP,RO,RR	10,982.9
Hancornia speciosa	Mangaba		Fruit	Food	PA	1.6
Euterpe spp. and other palms	Palmito	Heart of palm	Apical meristem	Food	PA,AP	854.8
Hymanaea courbaril	Jatobá (Jutaicica)	Locust tree	Resin	Medicine	PA	17.4
Lonchocarpus urucu	Timbó	Rotenone	Root	Poison	PA	2.8
Bixa orellana	Urucu	Anatto	Fruit	Colorant	PA	6.8

TOTAL						44,213.2

(Table 1, notes)

(a) Products listed in government statistics for 1981. Data source: Brazil, IBGE, 1984.

(b) Northern region only (AC=Acre, AM=Amazonas, AP=Amapá, RO=Rondônia, RR=Roraima); Does not include other parts of Amazônia Legal: Mato Grosso, Tocantins (formerly northern Goiás), and western Maranhão.

(c) Converted to US\$ at Cr\$96.65/US\$, the average of the official exchange rates for the first and last days of 1981.

(d) Value for 1981 not available; 1979 value calculated from cruzeiro total given by Balick (1985), citing Brazil, IBGE (1979). Converted using Cr\$31.73/US\$ as the average exchange rate derived as in note c.

TABLE 2: EXISTING AND PROPOSED EXTRACTIVE RESERVES(a)

No.	STATE	MUNICÍPIO	RESERVE NAME	AREA (KM ²)	NO. OF FAMILIES PRESENT	STATUS	LAND TITLE
1	Acre	Xapuri	Floresta	180	50	Existing	Indicated for disappropriation
2	Acre	Xapuri	Cachoeira	250	80	Existing	Disappropriated
3	Acre	Rio Branco	São Luiz do Remanço	396	130	Existing	Disappropriated
4	Acre	Rio Branco	Figueira	?	20	Existing	Disappropriated
5	Acre	Brasileia	Santa Quitária	440	150	Existing	Disappropriated
6	Acre	Sena Madureira	Macaua	1030	150(b)	Existing	?
7	Acre	Cruzeiro do Sul	Tejo	3000	407(c)	Proposed	Discriminated
8	Amapá	Laranjal do Jari	Iratapuru	700	12	Proposed	In litigation
9	Amapá	Laranjal do Jari	Cajari-2	820	228	Proposed	In litigation
10	Amapá	Mazagão	Maracá-1	750	76	Existing	Disappropriated
11	Amapá	Mazagão	Maracá-2	225	64	Existing	Disappropriated
12	Amapá	Mazagão	Maracá-3	2260(d)	81	Existing	Disappropriated
13	Amapá	Laranjal do Jari	Cachoeira	390(e)	74	Proposed	In litigation
14	Amapá	Laranjal do Jari	Cajari-31040(f)		202	Proposed	In litigation
15	Amapá	Laranjal do Jari	Matauaí	680(g)	71	Proposed	In litigation
16	Rondônia	Guajará Mirim	Ouro Preto	1700	95	Proposed	50% federal land; 50% undefined
17	Rondônia	Guajará Mirim	Pacáas Novos	1800	100	Proposed	Disappropriated
18	Rondônia	Costa Marques	Cautário	2300	100	Proposed	50% federal land; 50% undefined
19	Rondônia	Costa Marques	Pedras Negras	1800	80	Proposed	50% federal land; 50% undefined
20	Rondônia	Porto Velho	Jaciparaná & Mutumparaná	2400	120	Proposed	Disappropriated
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				22,161	2290		

(Table 2, notes)

(a) Situation in November 1988. Source: Instituto de Estudos Amazônicas, 1988.

(b) Source: Francisco Mendes Junior, personal communication, 1988.

(c) Including 282 Amerindians.

(d) Occupied area, 957 km².

(e) Occupied area, 195 km².

(f) Occupied area, 676 km².

(g) Occupied area, 450 km²