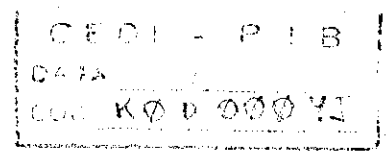




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EXTRACTIVE RESERVES: DISTRIBUTION OF WEALTH AND THE SOCIAL COSTS OF FRONTIER DEVELOPMENT IN THE AMAZON

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I. Introduction

Extractive reserves--the Amazonian rubber tappers initiative to create protected forest areas collectively managed by rubber tapper and other extractive communities--are a development alternative for the Amazon because they address the issue at the heart of environmental destruction in the region. That is the problem of radical concentration of wealth, and especially land, in the Amazon as in Brazil in general. Extractive reserves, at least in the western Brazilian Amazon will not produce the short term revenues that gold mines, or predatory exploitation of tropical hardwoods can. Any discussion of the economic viability of extractive reserves that does not keep this distinction clear runs the risk of obfuscating what extractive reserves are about. Any development model for the Amazon that does not address the issue of land concentration, however, runs the risk of simply perpetuating a situation in which development has extremely high environmental and social costs that are widely distributed, with relatively limited benefits that are concentrated upwards. In this paper, I discuss briefly why the distribution issue is important, and detail some of the social and environmental costs associated with the land uses to which extractive reserves are an alternative.

II. Development, Distribution of Wealth, and Natural Resource Destruction

It is no longer novel to point out that economic growth does not automatically improve the situation of poor people, nor that economic growth that impoverishes the already poor and widens the gulf between rich and poor leads to degradation of the natural resource base necessary for any long term sustainable, and equitable, development. "Economic growth, by itself, is no guarantee of progress against poverty," as the World Bank's Senior Vice President for Operations, Moeen Qureshi has noted. (Qureshi 1988) There is perhaps no clearer case of the growth-without-development scenario than Brazil since the 60s. Economic growth that has not improved, or has worsened concentration of land and wealth has had drastic consequences, socially and environmentally, for the Amazon.

Brazil has perhaps the greatest inequality of distribution of wealth in the world. In 1983, the richest 10% of the population accounted for 46.2% of the total national income, while the poorest 50% received 13.6% of the total income. The richest 5% of the population alone accounted for 33% of the income. (Jaguaribe et al 1986) No other country shows as great a disparity in the income shares of rich and poor (World Bank 1989; Durning 1989). This probably represents deteriorating conditions for a large part of Brazil's population: the real value of one minimum salary declined by one fifth between 1955 and 1986 (DESESP/CUT 1988). Some 65% of Brazil's economically active population make no more than two minimum salaries per month (Jaguaribe et al 1986). This situation has clearly not resulted from a lack of economic growth--to the contrary, Brazil ranked 49th among the capitalist economies in 1955, and 8th in 1980 (DESESP/CUT 1988).

The picture given by gross aggregates on income is reproduced in more detailed studies on the agriculture sector. Rodolfo Hoffman, in a painstaking study examining median agricultural income and various indices of absolute and relative poverty, concludes that while per capita income in the sector increased through the 1970's and early 1980's this was largely counterbalanced by increasing inequality of income distribution. (Hoffman 1988) The result of agricultural modernization, despite increased productivity per capita, and a reduction of absolute poverty, (1) was "land concentration, income concentration, a deficit in production of basic foodstuffs, the proliferation of underemployment in agriculture, and intensification of the rural exodus. (Hoffman 1988: 11)

According to official agricultural census data, land concentration, already extreme in 1960, was further exacerbated by 1980.

Figure 1: Land Concentration, 1960-1980

	1960	1980	
-10 ha	45	50	% of properties occupy
	2.4	2.5	% of total land
+1,000 ha	0.97	0.92	% of properties occupy
	44	45	% total land

-10 ha - lots of less than ten hectares (source: Anuario Estatístico, 1984)
 +1,000 ha - lots of more than 1,000 hectares

As the table shows, the percentage of the total number of properties under 10 hectares increased from 1960 to 1980, while the number of properties over 1,000 decreased marginally, and the shares of the total agricultural land occupied remained approximately constant. In 1980 the Gini coefficient for Brazil was .84 (Durning 1989), among the world's highest. In 1960, the .05% of

the owners that held lots larger than 10,000 hectares occupied about 15% of the land. In 1980, .04% of the owners held lots over 10,000 hectares and occupied 16% of the land.

Chronic and worsening inequalities in distribution of wealth have had several repercussions in the Amazon. One has been migration, both spontaneous and officially sponsored. (Schmink and Wood 1984; Aragon and Mougeot 1986; Millikan 1988) Another is the formulation of development policies for the region that, under the authoritarian and highly centralized regimes of the last 25 years, have favored landholding elites or corporate investors--fiscal incentives, tax policies that favor corporate investment in agricultural land and make good land outside of the Amazon unavailable to smallholders, subsidized credit. The environmental effects of these policies have been extensively discussed elsewhere (Binswanger 1987; Browder 1988; Fearnside 1989, 1989a; Mahar 1989) I will only note that smallholder and landless peasant migration on one hand, and large scale cattle ranching and agriculture are often treated as two independent causes of deforestation in the Amazon in a manner that may obscure the connections between them, as Alfredo Wagner de Almeida has noted. (Almeida 1989a; Partridge 1989) The areas of most rapid deforestation in the Amazon are also areas of rapidly increasing concentration of landholdings--Rondonia, the Acre river valley, the south of Para. In Rondonia, the state with the fastest rate of deforestation in the Amazon, the convergence of deforestation with land concentration is clear. In 1985, as rates of deforestation tended toward geometric increase, 53% of the rural properties were lots of less than 100 hectares and covered 13.1% of the land in the state, while 1.9% of the properties were on lots greater than 1,000 hectares and occupied 60.7% of the land. (Millikan 1988:80)

As land in the Amazon was incorporated into national markets, land previously occupied or held under diverse indigenous or peasant common property regimes, or other systems of customary rights, passed increasingly into private hands. (see Almeida 1984) Land previously occupied and worked as a use value has become an exchange value. (Schmink and Woods 1984; Hecht 1986) In this process, the legal titling of land took on a previously unimagined importance. For land to circulate freely in the market, not only must customary systems of land tenure be supplanted or suppressed, but legal titling must replace them. Since land title not only permits land to be bought and sold but also through the 70's and early 80's was a prerequisite for access to fiscal incentives, tax credits, and subsidized credit, gaining clear title to land was of paramount importance to new investors. Under the Land Statute of 1964, (Lei no. 4.504 November 30 1964) making productive improvements on the land is a crucial criterion for establishing claims to title, and clearing of forest is considered evidence of productive improvement. (Binswanger 1987; Mahar 1989) Existence of competing claims on the land immobilizes the land for commercial purposes and complicates obtaining clear title. Untitled occupants or posseiros who have been on the land for more than one year have certain rights under the Land Statute, and posseiros who have been on the land for five years or more may obtain title.

Conflicts over land have led to high and increasing rates of rural violence. Such conflicts are typically not resolved through institutional means in the Amazon (Branford and Glock 1985; Acao Pela Cidadania 1989; Amnesty International 1988). The judiciary system is weak, underequipped, and subject to political pressure from local elites. The tendency from 1964 to the present has been for rural violence and particularly assassinations of rural

workers, union leaders and their advisers to increase (Amnesty International 1988:6).

Figure 2 Rural Workers Assassinated in Brazil 1964 - 1985

Number of killings						
1964	14		1973	29	1982	58
1965	5		1974	22	1983	96
1966	8		1975	39	1984	123
1967	10		1976	44	1985	222
1968	3		1977	51		
1969	5		1978	37		
1970	11		1979	66		
1971	22		1980	91		
1972	19		1981	131		

(source: Movimento dos Trabalhadores Rurais Sem Terra, 1986)

MIRAD (the Ministry for Agrarian Reform and Development) reports that between January 1985 and June 1987, 458 peasants, union activists, Indians, and supporters were killed (Conflitos Agrarios MIRAD, cited in Amnesty 1988). The MIRAD 1986 report notes that the majority of the killings occurred in areas receiving fiscal incentives. (Amnesty 1988) Half of the assassinations reported from 1964 to 1985 occurred in the states comprised by the Legal Amazon (Movimento dos Trabalhadores Rurais Sem Terra 1986), i.e., in an area with under 10% of the national population.

In the same period deforestation increased very rapidly in the Amazon, as has been amply discussed and analyzed elsewhere. (Malingreau and Tucker 1987; Mahar 1989; Setzer 1987; INPE 1989; Fearnside 1989) Deforestation increased from about .6% of the Legal Amazon in 1975 (Mahar 1989; INPE 1989) to about 11.7% in 1988. (Fearnside 1989) Although there are now debates among researchers over the exact extent of deforestation, there is general agreement that the rate of increase in deforestation is alarming. The Parliamentary Inquiry Commission convened in March 1989 to investigate denunciations of the destruction of the Amazon forest and foreign participation in these denunciations concluded that the 230% increase in the area deforested in ten years was cause for concern. (CEDI 1989)

The two phenomena--deforestation and rural violence--are essentially part of the same dynamic. (see Table 1) They result from the incorporation of large

areas of frontier into the national land market under conditions of extreme inequality of wealth and access to state services. The new landowners come into conflict both with traditional Amazonian peasant populations and indigenous groups, as well as with smallholders and landless peasants migrating to the region in search of land. (Sawyer 1986)

Some work has been done on the environmental and social costs of this process. Browders' analysis of social costs of rain forest destruction (1988) has made a particularly important contribution, in specifying some kinds of government expenditures that have heavy social costs but private benefits. Other analyses have touched on the issue as well (Binswanger 1987; Hecht 1986; Hecht and Schwartzman 1989). In the following sector, I will briefly outline some types of costs of deforestation and social conflict and dislocation that have been engendered in a specific case: the opening of the state of Acre to the agricultural/cattle ranching frontier. I offer some preliminary calculations of costs of rural to urban migration, employment lost, government expenditures on colonization projects, urban infrastructure, and other expenditures related to colonization and rural to urban migration, as well as forest products foregone in deforestation. I offer these calculations to provoke discussion on how the costs of the kind of development that has occurred in the Amazon may be considered rather than a definitive estimate. These considerations are important in evaluating alternatives, and it was in relation to a first-hand understanding of the opening of the frontier in Northwest Brazil and its social and environmental costs that rubber tappers' organizations proposed the extractive reserves alternative. (National Council of Rubber Tappers 1985; 1989)

III. Occupation of Acre

The opening of the agricultural frontier in Acre in the first half of the 1970's occasioned rapid transformations in landholding and productive relations, demographic patterns and social conditions. (Silva 1982; Oliveira 1985; CEDEPLAR 1979; Sawyer and Carvalho 1986; Duarte 1987) By the end of the 1960's the rubber baron patrons, remnants of the decadent extractive-export economy of the rubber boom who ostensibly controlled most of the land in the state were undercut by a shift in government investment policy for the region. The Amazon Credit Bank, source of credit to the rubber trade, collapsed in 1966 and was replaced by the Bank of Amazonia (BASA), planned to finance new agricultural and livestock undertakings in the region. At the end of the 60's and the beginning of the 70's roads were opened from Rio Branco, the capital, to Porto Velho, connecting the state to the national highway network and from Rio Branco to Assis Brasil on the Bolivian border. From 1970 to 1975 as much as 80% of the territory of the state may have been sold to new investors from the south (Branford and Glock 1985). At the height of the land boom, from 1972 to 1976 land prices increased from 1,000% to 2,000%, depending on access to roads (CEDEPLAR 1979). Subsidized rural credit, available at negative real interest rates through much of the 1970's, (Duarte 1987), as well as extremely low initial land prices, probably account for much of this increase. (see Brandao 1988)

Rapid deforestation followed. The area deforested increased from 77,206 hectares in 1975 to 633,131 in 1987, an increase of 720% in little more than a decade. (GT PMACI 1989; FUNTAC 1989a) More than half the area deforested (including all unforested areas--urban areas, water surface, subsistence

gardens, etc.) is in cattle pasture, and pasture occupies more than 7 times the areas in commercial agriculture. (FUNTAC 1989a) Pasture yield is low--one head per one and one-half hectares, or .66 head per hectare. This was accompanied by other changes: land concentration, increasing rural violence, as new investors sought to clear their land claims by deforesting and expelling rubber tappers and posseiros already on the land, and rural to urban migration. Migration was impelled in part by land conflicts, but more generally by the shift in government investment policy away from the extractive economy and toward the agricultural frontier.

Land conflicts and overlapping claims to land title increased. In the 1960s, with the withdrawal of the rubber baron patrons, the area worked for "extraction" diminished by 65%, but the number of establishments declaring extraction as their economic activity grew more than 1,000% (GT Planacre 1989). This signaled the emergence of the "autonomous" rubber tappers, rubber tappers who remained in the forest after the disactivation of the traditional rubber estates, planting small gardens, hunting, fishing, collecting, and selling rubber and Brazil nuts to travelling merchants, the marreteiros. Through the 70s however, land concentration in the state became more acute. In 1982, the fifteen largest landowners surveyed occupied more than 26% of the territory of the state, and 80% of the state was classified as latifundia (Duarte 1987). The rural property situation has not changed. About 76% of the state has been classified by the Institute for Colonization and Agrarian Reform (INCRA). This area in 1986 was distributed in the following manner:

Figure 3: Distribution of Land in Acre, 1986

Type of Property	% of properties in state	% of total land area occupied
<u>Minfundia</u>	88	7
<u>Latifundia</u>	10	82
(<u>latifundia</u> by area)	(.05)	(26)
Rural Enterprise	2	11

(Acre Statistical Yearbook, 1983-1986)

Munifundio - property smaller than one rural module, the area considered adequate for one family's subsistence. In Acre, one rural module is 60 hectares.

Latifundio - either a property that is unimproved and unproductive (latifundio por exploracao) or a property more than 600 times larger than one rural module (latifundio por extensao, latifundio by area). Latifundia by area in Figure 3 are included in the larger category of latifundia.

Rural Enterprise - a property considered a productive enterprise, neither latifundio nor minifundio.

This process of land concentration unleashed serious land conflicts and the expulsion of thousands of rubber tappers to the rubber estates of Bolivia and the urban shantytowns. Much of the land bought by the southerners in the 70s was obtained through falsification of land title, "stretching" of areas (extending the boundaries of an area purchased to include neighboring areas), or other forms of land fraud. (Duarte 1987) The old owners of the seringais often held imprecise or irregular titles, since the exact extent of a rubber estate was of little importance in the extractive economy. Titles issued by Bolivia, the Republic of Acre, the state of Amazonas, the state of Acre, and the Federal Government all had potential validity and at times overlapped. The presence of autonomous rubber tappers with legal rights of possession of (as opposed to property in) the land represented a threat to the profitability of land obtained for cattle ranching or speculation. Some counties surveyed claims exceeding their total land areas--up to 160%.

The rubber tappers' movement--the rural workers' unions of Acre, and later the National Council of Rubber Tappers--emerged out of these conflicts. Through the 70's and the 80's rubber tappers in Acre organized to prevent expulsions and deforestation, confronting death threats, police repression, and assassinations. (Mendes 1989; Schwartzman and Allegretti 1987) This mobilization was in part responsible for the expropriation of various areas by the government for agrarian reform.

It was between 1976 and 1980 that most the expropriations of land for agrarian reform in the state were decreed--some 24 seringais, totalling 990,994 hectares (Duarte 1987:77-78). The majority of these lands were used to create "Directed Settlement Projects" (PAD)--852,892 ha.--which were intended to settle rubber tappers and colonists from the south. These projects have had high colonist failure rates, but also are inadequate to the land use patterns of rubber tappers. Resources such as rubber trees and Brazil nuts are arbitrarily parcelled out in dividing up holdings in 50 or 100 hectare lots, which consequently makes the rubber tappers resource use strategy inviable. Their experience with these projects led rubber tappers to seek a mechanism for gaining collective rights to individual lots, organized according to the extractive model of occupation already operating on the seringal. The solution proposed was the extractive reserve.

One result of the transformation in landholding and productive relations from 1960 to 1980 that has had heavy social costs is rural to urban migration. These include loss of income for some sectors of the migrant population, loss of jobs, and urban infrastructure costs.

Figure 4 shows percentages of rural and urban population in the state over the two decades.

Figure 4: Rural and Urban Population in Acre, 1960-1988

(in %)

	1960	1970	1980	1988 (estimated)
Urban	21	28	44	45
Rural	79	72	56	55

(sources: Anuario Estatístico do Acre, 1982; Anuario Estatístico do Acre, 1983-1986).

The decade of 1970 - 1980 thus saw an abrupt change in the composition of the state's population. The last date for which empirical data are available is 1980; the 1988 figures are based on estimated growth rates furnished by IBGE.

The difference in rate of change for the rural and urban populations between 1970 and 1980 is marked:

Figure 5: Annual Rate of Increase in Rural and Urban Population in Acre, 1970 - 1980

	1970	1980	70/80 (%)
Total	215,299	301,605	3.4%
Urban	59,307	132,174	8.3%
Rural	155,992	169,431	0.83%

(Anuario Estatístico do Acre, 1982).

The total population of the state increased 3.4% over the decade, which approximates the previously predicted natural rate of increase in the population of 3.6% (CEDEPLAR 1979: Annex I) Assuming an increase of 3.4% for population in the state, the difference between expected urban population increase at this rate over the decade and the actual 1980 census is 49,590 people. The expected rural population at the same rate over the decade is 48,494 greater than the population counted in the 1980 census. About 68% of the growth in the urban population of the state by 1980 can be accounted for by migration. (2) (CEDEPLAR 1979 Annex I)

These figures are probably conservative. The most detailed survey of migration in the region, the 1977 CEDPLAR survey, which surveyed 420 heads of household in a randomly selected sample of households in the state capital, Rio Branco, found that 86.7% of the population had migrated, and of this migrant population, 51.4% was born in Acre. (Sawyer and Carvalho 1986; CEDEPLAR 1979) Extrapolating these proportions to the urban population of the state in 1980, would suggest that 58,901 members of the urban population were

migrants from other parts of Acre. If the proportion of migrants from the municipality of Boca do Acre, in Amazonas state but geographically and economically closely linked to Acre and Rio Branco, are included, then more than 70,000 people in the urban population were migrants from the immediate region.

The actual natural rate of increase of the rural population may be higher than the average increase of population in the state: the fertility rate in the rural zone in Acre between 1960 and 1970 was 10.5, highest in Brazil and significantly higher than the 7.3 urban fertility rate in the state. (CEDEPLAR 1979: Table A-6, Appendicies) This could imply higher rates of rural to urban migration. A figure of approximately 50,000 for rural to urban migrants then seems reasonable.

IV. Social Costs

One measure of the social costs of migration is the relative incomes of rural and urban populations. Various studies dealing with rural to urban migration in Acre conclude that large part of the rural population in the 70's and 80's was displaced by transformations in land holding and productive relations, and fled to urban areas, particularly the capital, more from lack of options than from any real possibility of economically improved circumstances (CEDEPLAR 1979; Sawyer and Carvalho 1986; Oliveira 1982; Silva 1982; Duarte 1987) The position of rural union leaders in Acre is that migration is an act of desperation that impoverishes an already poor rural population. Accurate data on income for the rural population in the north (Amazon) region has not been readily available. The 1980 Census, and other more recent government surveys have specifically excluded income data on the rural population of the north region (Anuario Estatístico 1984). But these surveys do support the view that the urban population of the Amazon, even including centers such as Manaus, a major industrial zone by comparison to Rio Branco, is largely extremely poor:

Figure 6: Percentage of Resident Urban Population, North Region, Over 10 Years of Age Earning 1 Minimum Salary or Less: 1983

No Income (includes people paid in kind)	49%	
		(Minimum Salary in 1983 = \$35/month)
1/2 Minimum Salary or less	5%	
1/2 to 1 Minimum Salary	10%	
Over 1 Minimum Salary	36%	

Two recent surveys of rubber tappers in Acre have provided some empirical data on rural incomes in Acre. (Schwartzman 1989; Schwartzman and Hecht 1989; FUNTAC 1989)

The average annual cash income for rubber tappers on Seringal Cachoeira, Xapuri, AC in 1987 was \$1,250 per household, almost exclusively from sale of rubber and Brazil nuts. Urban migrant families surveyed in two neighborhoods on the periphery of Rio Branco had an annual average salary income of \$1,072 per household. This yields an average loss of cash income of \$178 per family per year.

The real household income produced by rubber tappers and other rural populations in the Amazon includes more than the cash income generated by rubber and Brazil nut sales. As Hoffman, (1988), among others has noted, one of the problems with rural income figures in Brazil in general is that non-cash household income is not recorded. Apparent decreases in absolute poverty may be misleading for this reason, to the extent that increased cash income may not offset losses of subsistence production. Surveys of Seringal Cachoeira and the urban migrant population show that both groups participate in agriculture and other activities that, while they do not necessarily produce cash income, do contribute to household income. The rural population has a much broader range of non-cash income sources. These include hunting, fishing, collecting, and small scale agriculture and livestock raising. The products of some of these activities can be quantified: rubber tappers typically know how much rice, beans, corn, and manioc flour they have produced, or how many deer or wild pig they have killed, and these either have market prices in local markets or can be assigned a price based on urban equivalent products. Counting all of the sources of household income that can be easily quantified (including rubber and Brazil nuts) yields an average annual household income of \$2,412. This does not include all of the non-monetized resources used by the rubber tappers: housing materials, fodder, a variety of wild and domestic fruits, increase in livestock, or manioc root production are difficult to estimate. Total urban income, including sources other than salaries, yields an annual average family income of \$1,151, or \$1,261 per family per year less than the rural population.

I assume for the sake of argument that only families displaced by deforestation in the state are affected by loss of income. The most detailed analysis of deforestation (and also the lowest) gives a figure of 532,143 hectares deforested for cattle ranching and agriculture. Assuming an average rubber tappers' holding of 300 hectares, this suggests 1,774 families were displaced, which represents an accumulated loss of yearly income of \$2.2 million at the end of the displacement process, for one of the poorest strata of society. It is quite possible that a larger portion of the 8,333 families that migrated in the 70's actually lost income, but further research on the income of urban populations is needed to clarify this point.

The loss of jobs is clearly another social cost of rural to urban migration. Families in the rural zone may have very little cash income, but typically the entire family labor force is productively employed. In the survey of urban households in Rio Branco, 25% of the households received more than half their income from the rural zone, and 15% received more than half their household income from other households in the city. (3) In the rural surveys, there were neither households dependent on income from the city nor dependent on other households for their survival. In both urban and rural populations it is misleading to speak strictly in terms of "employed" and "unemployed" people, since people do different activities at different times

of the year, different family members participate in different activities, and so on. In the urban group, underemployment is certainly a much bigger problem than absolute unemployment. However, jobs were certainly lost in conversion of seringais to cattle pasture. From the rural surveys, it can be conservatively estimated that each 300 hectare holding employed 3 people full time. (FUNTAC 1989) The average cattle ranch in the region employs less than 1 person per 300 hectares (Hecht and Schwartzman 1988). About 1,330 holdings worth of forest was converted to cattle pasture by 1988, implying the loss of 2,660 jobs.

One heuristic device to estimate the cost of job creation is found in data on the Amazon Investment Fund (FINAM) fiscal incentives administered by SUDAM (Superintendency for the Development of the Amazon). These included incentives not only for cattle ranching and agricultural, but industrial and service enterprises as well. This program allowed corporations to transform income tax owed to the government into investment in approved projects in various sectors. (Mahar 1989; SUDAM 1988) A major justification for the program was creation of jobs. Dividing the value of incentives disbursed by number of jobs predicted for approved projects from 1979 to 1986 yields an average cost per job of \$15,410. (SUDAM Amazonia: Indicadores Conjunturais, 1978-1986) This may be a low figure, since it is based on the number of jobs expected, and not the number of jobs actually created. An estimate of the cost per job created, based on total resources invested in SUDAM-approved, subsidized projects through 1985 is much higher--\$41,360 per job (Benchimol 1989: 79) Taking these two figures as heuristic indicators of a possible range of costs of job creation, the low estimate of the value of jobs lost in conversion of forest to cattle pasture is \$40.9 million, and the high estimate more than \$110 million.

Government expenditures are another measure of the social cost of migration and deforestation in the region. Some expenses are directly linked to rural to urban migration--police, running water, electricity, streets, waste disposal. It is clear that the need for services in Amazon urban centers far outstrips government's capacity to meet it. To cite one example, criminal courts in Rio Branco had in 1989 892 homicide or attempted homicide cases in process. At present rates it would take 35 years for just the cases already in progress to be tried and judged. (Acao Pela Cidadania 1989) Other costs involve government subvention of the very process of transformation in land tenure relations and, in Acre, the replacement of part of the extractive economy by cattle ranching. Subsidized credit for investment in land and pasture formation or tax credits for corporate cattle ranches and other regional development initiatives are perhaps the clearest examples. (Browder 1988) Government supported agricultural colonization projects, settlement projects (including expropriation of land and titling for areas in conflict), and the state services associated with these--agricultural research, extension, feeder roads--are other examples. In addition, in regional centers like Rio Branco, government is a major employer. The creation of patronage jobs, while not systematically documented, is widely recognized. About 25% of the total income of the urban population in our survey was derived from government jobs or pensions.

Figure 7 - Government Expenditures on Colonization, Infrastructure, and Urban Services (US\$ millions)

Colonization Projects

5 Projects -- 9,000 families x \$15,000	\$135
(a)	

FINAM Resources Disbursed 1979 - 1986, Acre	
(b)	\$6

Institute for Agrarian Reform and Colonization, Acre, administrative costs -	\$1.6
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Subsidy on rural credit
Acre, 1981 - 1983 (c)

1981 -	\$19
1982 -	\$18
1983 -	\$9

State Government Budget 1978,
selected expenditures (d)

Agriculture -	\$6
Housing and Urbanism -	\$1
Transport -	\$5.5

(a) source: Schwartzman and Arnt 1988,

(b) SUDAM Amazonia: Indicadores Conjunturais 1979-1986

(c) Anuario Estatístico do Brasil, 1984 (Credito Rural);
Browder 1988

(d) Governo do Estado do Acre, Orcamento Geral do Estado, 1978

Credit to the livestock and agricultures sector was available to ranchers in Acre throughout the seventies, at heavily subsidized rates (often negative real interest rates) and probably represents the single largest social cost of the conversion of forest for pasture. (Duarte 1987; Silva 1982; CEDEPLAR 1979) Colonization and settlement project costs are the direct result of transformations in landholding and productive relations outlined above. Through 1987, Acre had yet to attain self-sufficiency in food production.

State government expenditures are selected to illustrate government support for urban areas and to colonization. Agriculture expenses for the state include extension and promotion, credit, warehousing, and processing. Housing and Urbanism includes such items as "urban planning" and "support to urban development of municipalities". Transport includes the state road network, as well as urban roads. In the 1988 budget river transport received 1.4% of the transport budget, while construction, recuperation, and maintenance of state roads received 42%. Agricultural Development and Urban Affairs are two areas that grew considerably between 1978 and 1988: new secretariats of Agricultural Development and Urban Development and Environment were created. "Regional Development" did not feature at all in the 1978 budget, while in 1988 it was a \$9.7 million line item. Of the items considered above, Housing and Urban Affairs grows the most by 1988, at 18.3% per annum. Overall, the budget grew at 6.6% per year between 1978 and 1988, and increases in terms of dollars per capita in state outlays at 2.9% per year. This increase may be explained by attempts to provide services to the urban population and to foment the agricultural development of the state. Essentially all of this expenditure is paid out of the National Treasury, since the federal government, at least until federal revenue reform in 1989, supplied more than 90% of Acre's budget.

V. Costs Associated With Deforestation

One cost of deforestation is the production of extractive products foregone (Hecht and Schwartzman 1988). In Acre, this includes both rubber and Brazil nuts. This was partially already considered in estimating income lost in deforestation, since part of rubber tappers' income is from the sale of rubber and Brazil nuts. But this includes only what the rubber tappers actually receive, and not the value added in processing and comercialization. I consider here only Brazil nuts, although the same considerations apply to rubber.

In 1989, Brazil nuts bought for NCZ\$2 to 4 per lata (4) in the seringais were sold to the processing plant in Rio Branco for NCZ\$8. That is an increase of 100% to 300% in value, even without shelling or processing the nuts, and does not consider rubber tappers who traded nuts for overpriced merchandise. The area where virtually all of the deforestation in Acre has taken place, the Acre river valley, is also the area of greatest concentration of Brazil nut trees. In 1975, 99% of the Brazil nut trees in the state were concentrated in the municipalities of Rio Branco, Brasileia, and Xapuri (Anuario Estatístico do Acre 1982, p.7)--precisely the area of most intense

land conflicts and greatest deforestation. This region accounts for about 90% of the deforestation in the state.

An average rubber tappers' holding of 300 hectares produces about 3,096 kilograms of Brazil nuts per year. (FUNTAC 1989; Schwartzman 1989) There were about 1,596 rubber tapper holdings deforested in the area by 1987, yielding an annual production of about 4.9 million kilos. At 1987 prices, rubber tappers in Acre that sold their production for cash, rather than accepting goods in trade as many did, received about \$0.23 per kilo for Brazil nuts. Taking an average increase in value added from the seringal to the processing plant of 100%, or \$0.23 per kilo, the value added in this stage alone for Brazil nuts produced in the rubber tapper holdings extinguished by deforestation is more than \$1.1 million per year. Considering that the five year average for Brazil nut export prices is about \$1/lb, and that about 60% of the weight of Brazil nuts is lost in shelling and processing, the over 4.9 million kilos per year of Brazil nuts lost to deforestation would have had an export value of some \$4.3 million.

The production of Brazil nuts foregone by deforestation may be estimated in another way. The concentration of Brazil nut trees in Acre was in 1975 about one tree per 7 hectares (Anuario Estatístico do Acre 1982), all in the Purus Valley. Assuming 478,928 hectares deforested in this region, this would mean about 68,418 Brazil nut trees. A single Brazil nut tree produces about 69 kilos of nuts per year (Pesce 1985), which yields 4.7 million kilos--a figure quite close to that given by average production per holding.

I am concerned here to show the potential value of a sustainable product lost to deforestation, and not to assert that Brazil nut exports from Acre actually declined or that had no deforestation occurred, an additional 5,000 tons of Brazil nuts would necessarily have been exported. It is likely that significant quantities of Brazil nuts were not collected, at least before 1975. Brazil's total annual exports between 1982 and 1986 were between 30,000 and 40,000 tons (in shell equivalent), and imports to the US varied between about \$12 million and \$8 million a year. The world crop (of which Brazil produces some 90%) has varied enormously over the past 15 years (from under 30,000 tons to over 60,000), as have prices. The market for Brazil nuts is malleable, as new initiatives to create new markets for Brazil nuts and other tropical forest products suggest. Sustainable development initiatives for tropical forest regions should include market development for sustainably produced tropical forest products.

The argument here is similar to Browder's argument on the opportunity cost of timber destruction in establishing SUDAM-financed cattle ranches in the Amazon, (Browder 1988). Browder's analysis of the value of timber destroyed in creation of cattle pasture is in fact directly applicable here, as an additional opportunity cost of deforestation for cattle pasture in Acre. Browder notes that while marketable timber is perhaps the most valuable commercial asset in the forest, very little has been extracted by Amazon cattle ranchers, who typically burn marketable roundwood in converting forest to pasture. He estimates that if half of the marketable timber were exploited, this would represent about \$511 per hectare deforested for cattle pasture. (Browder 1988: p. 118) In Acre, considering the area deforested for cattle pasture alone, this would represent about \$204 million of timber destroyed.

Figure 8: Social Costs of Deforestation and Land Conflicts in Acre 1975 - 1987
(US\$ millions)

recurrent costs:

income loss by
rural families displaced
in deforestation - \$2.2

Brazil nut
opportunity cost, exclusive
of income to producers: \$1.1

subsidy cost of
rural credit: \$9

Institute for Agrarian
Reform and Colonization, (INCRA)
administration of colonization
and settlement projects: \$1.6

subtotal: \$13.9

One time costs:

FINAM funds disbursed: \$6

job loss: \$40.9

INCRA Colonization
Projects: \$135

timber opportunity
cost in deforestation
for cattle ranches: \$204

subtotal: \$385.9

Total for decade: \$524.9

The total social costs estimated here represent more than 7 times the total budget of the state in 1978, or 115 times more than the total exports of the state from 1977 to 1988, or almost 40% of the total exports of the Legal Amazon in 1987 (Benchimol 1989). This estimate is partial and conservative: the only government expenditures included are direct costs of the colonization projects and INCRA's administrative costs, which represent part of the costs of administering chronic land conflicts. Much of the state government budget has been dedicated to fomenting agricultural development, providing minimal urban services, and employing the excess population concentrated in urban centers. These costs are not included, in order to make the estimate more conservative.

This estimate is a heuristic device, but the processes from which it is abstracted are real. The assassination of a rural union leader has no assignable cost in economic cost/benefit analysis (although it does in parts of the interior have a known price), but its effect on regional development is substantial. Environmental protection and social equity are often held to have high costs. This may in some cases be so, but it is important in analyzing these, to consider all the costs of the alternatives.

I have attempted to show that much of the environmental destruction and rural violence in the Amazon are attributable to income and land distribution, in Brazil in general and to the reproduction of that skewed distribution in the Amazon. I have also endeavored to show that the process of land concentration and deforestation have had, in the specific case of Acre, substantial costs not typically considered. Creation of extractive reserves can at the minimum avoid some of these costs. But the significance of the initiative is not exhausted there: extractive reserves are in essence a proposal for ecologically sound and socially appropriate land reform in the Amazon. Since 1987, 15 reserves have been created in four states, totalling more than 2 million hectares, although in most of these areas, only legal declaration of the area as a reserve has occurred. The importance of these reserves to date is as an organizing tool, which has helped the National Council of Rubber Tappers to grow, and has brought it into contact with other social movements--populations affected by dams, colonists and landless peasants, indigenous peoples, and environmental groups and the national union movement--also increasingly concerned with natural resource and environmental issues, as well as with the current development model for the Amazon. (Almeida 1989) The creation of extractive reserves, alone, will not substitute for a broad program of land reform in addressing the concentration of landholdings in the Amazon, let alone the rest of Brazil. But in showing the fundamental congruence of land distribution and environmental protection in the Amazon, the extractive reserves initiative has delineated a potentially far-reaching alliance. It is in this direction that the real hope for sustainable development--growth with development--lies.

NOTES

1.) As Hoffman (1989) notes, the issues of decrease in absolute poverty and increases in productivity in the agriculture sector are complicated by the fact that existing data on income and productivity exclude "subsistence" production; i.e. any agricultural household income aside from cash income. It is possible that increased productivity and apparent declines in absolute poverty based on the cash incomes of agricultural households distort the actual situation, since increased cash income may not compensate for non-cash income lost. At least for extractive populations in the Amazon, our survey of household income formation suggests that a large part of the real household income is not cash income (see section IV).

2.) Rates of population increase are calculated according to the formula:

$$\left(\frac{f}{l} \right)^{\frac{1}{n}} - 1 = x$$

n = years x = rate

l = last year

f = first year

3.) The lata is the most common measure of Brazil nuts used by rubber tappers in Acre. One lata is approximately equivalent to 12 kilograms.

4.) The survey of household income formation of rural to urban migrants was carried out in Rio Branco in October and November 1987. Initially two neighborhoods on the urban periphery were selected--one older neighborhood, and one new "invasion", since older neighborhoods are more established, have more services, and may be assumed to house higher-income families. It proved impossible to work in the new "invasion" selected, so research was done in two older neighborhoods (Cidade Nova and Sobral). Twenty households were surveyed, ten from each neighborhood. In both neighborhoods, leaders of neighborhood associations were asked to introduce the researchers to families that had migrated from the interior of the state, and the first families interviewed were asked to indicate other migrant families. While the sample population was not randomly selected, household selection was aleatory, and the sample is representative of rural-to-urban migrants from Acre.

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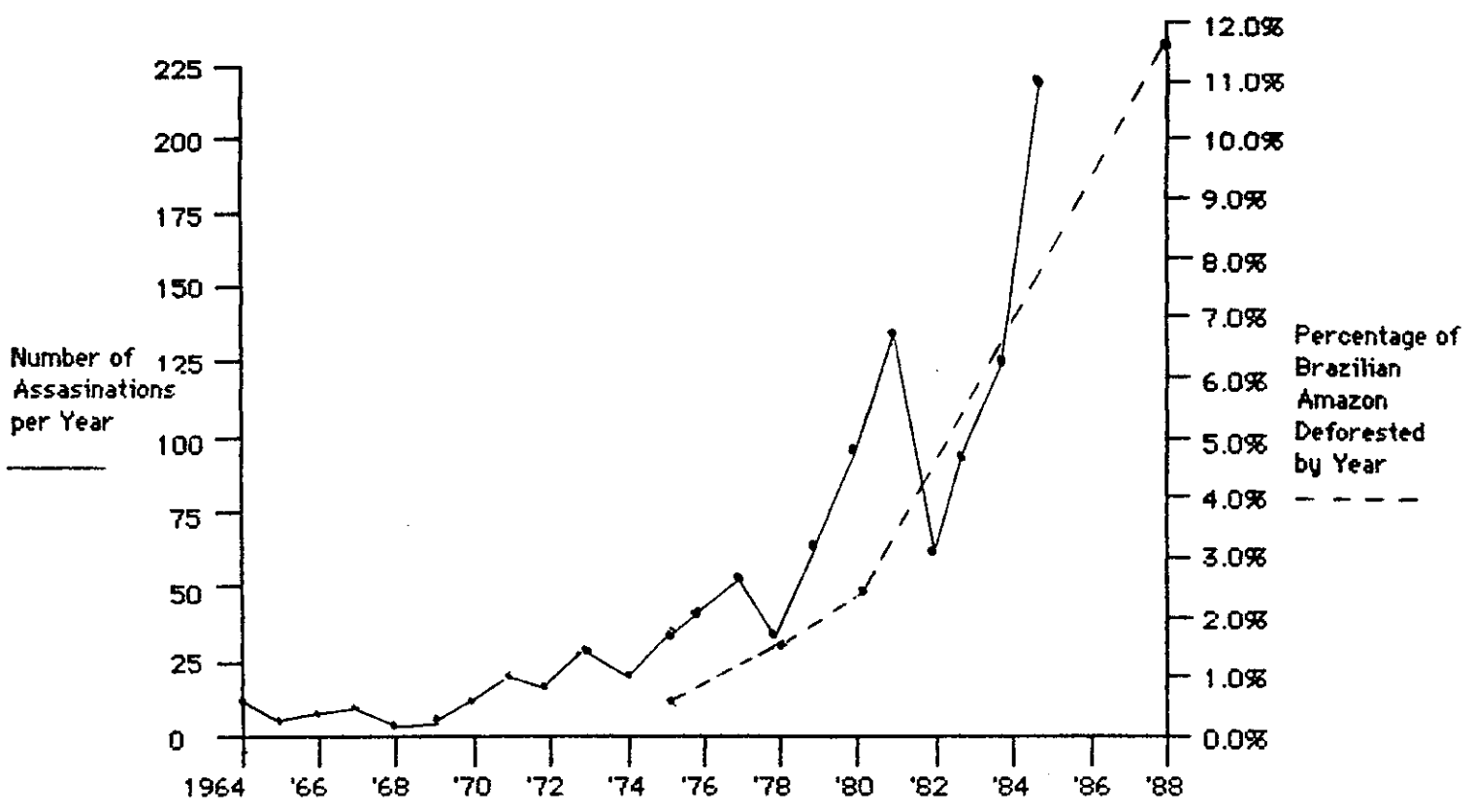
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