



**Instituto Sociedade, População e Natureza**

**Documento de Trabalho Nº 5**

**AMAZONIAN EXTRACTIVISM:  
PROSPECTS AND PITFALLS**

**Haroldo Torres  
George Martine**

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**Brasília, novembro de 1991.**

Haroldo Torres e George Martine são, respectivamente, Coordenador de Pesquisa e Presidente do Instituto SPN.

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## INDEX

	page
1. Introduction .....	1
2. Significance of Extractive Activities for the Composition of the Labor Force .....	2
3. Prospects for Native Rubber Extraction in the State of Acre.	8
3.1. The rapid decline of native rubber in Acre .....	9
3.2. The decline of the extraction of native rubber - an overview .....	12
4. Alternative Extractive Products in the State of Acre .....	13
4.1. Introduction .....	13
4.2. An outline of alternative forms of extractive production	15
4.2.a. Extractive production of Brazil nuts .....	16
4.2.b. Brazil nuts in the State of Acre .....	19
4.2.c. Overview of the prospects for Brazil nuts .....	21
4.2.d. Brazil nut domestication - risks and possibilities ....	21
4.3. The prospects for "sustainable development" through extractive activities: an overview .....	23
5. The Demographic Significance of Extractive Activities .....	25
6. Reflections on the Role of Extractive Activities .....	26
REFERENCES .....	29



## 1. Introduction

Concern with the greenhouse effect and the loss of biodiversity has drawn increasing world attention to deforestation in the Amazon region. Growing awareness of the ecological damage caused by all known forms of large-scale economic expansion in the region have stimulated the search for alternative activities capable of helping to safeguard the tropical forest. In the course of this quest, the attentions of environmentalists the world over have converged on a relatively small population within a relatively limited territory - the *seringueiros* or rubber-tappers of Acre. This was intensified after 1988 when the assassination of one of their union leaders - Chico Mendes - provoked an unprecedented avalanche of worldwide protests. The aftermath helped the rubber gatherers of Amazonia obtain a measure of political, economic and social support from a variety of national and international sources.

Ultimately, the widespread interest in *seringueiros* stems from an appreciation of their potential ecological importance; they are viewed as a category of producers who, in contrast to other recent occupants, are inherently concerned with the conservation of the Amazon rainforest. Given their past economic importance, their land-extensive production requirements and their symbiotic relationship with the rainforest, the *seringueiros*, along with indigenous populations, are deemed to be effective "natural" preservers of the tropical forest habitat; their interaction with the Amazonian environment is thus seen to be in stark contrast to that of small farmers, ranchers, gold miners, timber producers and other largely-predatory forms of recent occupation.

In this light, the expansion or survival of rubber-gathering is being construed as a critical issue for the preservation of the Amazonian rainforest. This paper addresses the social, economic and demographic significance of amazonian extractivism<sup>1</sup> over the medium range, with emphasis on rubber extraction in Acre. First, since the long-term prospects for the promotion of extractivism ultimately hinge on the generation of productive jobs, an effort is made to estimate the overall contribution of extractive activities to amazonian employment during recent years. Next, the prospects for the expansion, or even the maintenance, of current levels of rubber extraction in Acre are examined. Other possibilities for sustainable forest management, with emphasis on the outlook for Brazil nuts, are then analyzed. Finally, the current and potential contribution of extractive activities to the stabilization of

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<sup>1</sup> Throughout this paper, the terms "extractivism" and "extractive activities" refer to the extraction of products of vegetable origin (rubber, Brazil nuts, etc.) and do not cover any mining activities.



population in the area is analyzed. The paper concludes with a discussion of the medium and long-range importance of extractive activities for conservation of the rainforest within the overall framework of Amazonian and Brazilian development.

## **2. Significance of Extractive Activities for the Composition of the Labor Force**

Ultimately, attainment of the social and ecological objectives of the extractive reserve proposals depends upon its ability to generate and maintain sizable numbers of productive jobs at acceptable levels of income. If, over the long term, extractive reserves sustain only a token number of jobs, or if they have to be permanently subsidized by either national or international agencies, their life expectancies will tend to be limited. This is particularly true in light of the current trend towards liberalization of the economy, which will inevitably favor economic activities capable of competing freely on the open market and of dispensing the need for continuous subsidies. That particular issue is discussed at further length in the last section of this paper but, for the present, it accentuates the importance of reviewing how extractive activities and other rural forms of production have been faring in the past and present contexts.

As early as the 1970s, the labor force structure of the Amazon region was already undergoing a significant transformation.<sup>2</sup> Basically, as shown in Table 1, the composition of the economically-active population (hereafter referred to as EAP) shifted from a predominantly rural makeup to one in which urban-type activities began to prevail.<sup>3</sup> The significant increase in

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<sup>2</sup>. Due to the nature of available data, all statistical evidence presented in this paper refers to "the Northern Region", a collection of states and territories, rather than to "the Amazon Region". The former is a physical-geographic region defined by the Census Bureau (IBGE) and is composed of Acre, Rondônia, Roraima, Amapá, Amazonas and Pará, whereas the Amazon Region is generally construed to also include at least part of Mato Grosso and Maranhão.

<sup>3</sup>. "Urban" and "rural" activities are operationally defined here as activities which are normally and predominantly carried out in urban and rural areas, respectively. Operationally, data from the demographic censuses for activities in agricultural, ranching, forestry, renewable extractivism, lumbering (including charcoal production and sawmills), fishing and hunting and, mineral extraction were considered here as "rural". Urban activities include those in industry, commerce, services, transport, communications and warehousing, administrative activities and

Table 1  
Sector of Activity of Economically Active Population  
Aged 10 Years or More  
Northern Region of Brazil, 1970 and 1980.

Sector of Economic Activity	1970		1980	
	Number	%	Number	%
<b>Rural</b>	603,976	58.7	861,718	47.5
Agriculture	409,779	39.8	581,956	34.6
Livestock	21,289	2.1	41,255	2.3
Forestry	243	0.0	3,427	0.2
Extractivism	98,183	9.6	83,646	4.6
Timber	32,367	3.1	85,702	4.7
Mining	7,673	0.8	24,222	1.3
Hunting and fishing	34,442	3.3	41,510	2.3
<b>Urban</b>	402,281	39.1	892,865	49.3
Industry	42,273	4.1	117,641	6.5
Construction	53,175	5.2	102,358	5.7
Commerce	83,455	8.1	167,503	9.2
Services	138,855	13.5	347,940	19.2
Transport./Communic.	40,073	3.9	69,276	3.8
Administration	25,650	2.5	54,826	3.0
Defense	18,800	1.8	33,321	1.8
<b>Other</b>	22,363	2.2	58,016	3.2
<b>Total</b>	1,028,620	100	1,812,599	100

Source: IBGE, Censos Demográficos, 1970 and 1980.

defense. Others and ill-defined activities as well persons seeking employment were kept separate.

This classification, based on informants' "usual occupation" does not consider the possibility of dual or multiple activities. Hence it probably results in underenumeration of certain activities which are more likely to be carried out in tandem such as extractive activities with subsistence farming and/or hunting and fishing. On the other hand, this criterion presents a more accurate picture of the occupational structure.



urban industrial, commercial and services activities is in consonance with the recent literature on the subject (Sawyer, 1987; Torres, 1988; Martine and Turchi, 1990).

Concomitantly, it is evident that the 1970s, despite the huge government-induced efforts towards agricultural occupation of the Amazon region, witnessed a relative decline in the employment-generating capacity of rural activities, particularly those in agriculture, extractivism, and, fishing and hunting. The most dynamic rural sectors, in terms of generating employment were in timber and mining.

To what extent can these trends be attributed to flaws in the data? In general terms, it can be expected that rural activities will tend to be under-enumerated to a greater extent than urban ones. Moreover, within rural activities, those carried out within more ambiguous spatial perimeters, such as the land area covered by wide-ranging rubber-gatherers and hunters, or involving less-clearly defined boundaries between categories, such as extractive activities or hunting and fishing, will tend to be even more under-enumerated. On the other hand, there is no reason to believe that the 1980 data suffer more from this problem than those from the 1970 census; indeed, coverage should have improved, *ceteris paribus*, in 1980. Consequently, the overall trend, portrayed in Table 1, towards a significant relative decline in rural-based activities, particularly those from the extractive sector, can be considered to be correct.

As concerns the relatively small role played by extractive activities in the overall configuration of employment in the Northern Region, this again may be affected by undercounting but, not enough to make a difference in the nature of the conclusions drawn therefrom. For instance, if we assumed a 20% overall under-enumeration and a 100% under-enumeration in activities from the extractive sector - i.e. a differential underenumeration in the order of 67% - the participation of extractivism would still account for only 16% of the EAP of the Northern Region in 1970, and this would still decline to 8% in 1980. As concerns the participation of extractivism as a proportion of all rural activities, under the same conditions of differential underenumeration, the extractive sector would have declined from 28% to 17% between 1970 and 1980.

Turning now to the 1980s, hard data are largely unavailable for this more recent period. Considerable first-hand information and local studies indicate profound structural changes caused by the intensification of mining activities since the discovery of Serra Pelada in 1980, by the rise and decline of colonization projects, as well as by the relative decrease in industrial activities which resulted from the overall economic crisis faced by the country. To gain an overview of the principal trends which occurred during the 1980s, it is worthwhile attempting to project



the structure of the EAP to 1990. To this purpose, three different hypotheses are used. The information base for this exercise comes from a recent population projection for the Northern Region, obtained with the aid of a multiregional model which disaggregates the current most accepted population projection for the country.<sup>4</sup>

To obtain the three estimates of the EAP in 1990, the following steps were followed:

a. the overall rate of participation was assumed to have increased to 33.1% in 1990, following the trend observed in the previous decade, when this rate grew from 28.5% to 30.8%. This assumption is in accordance with data from Brazil's annual household survey (PNAD), which shows an increase in median age as well as in female participation in the region's labor force. As a result, the EAP in 1990 would include 2.93 million people (as compared to 1.81 in 1980).

b. the first hypothesis (H1) assumes that the same tendencies towards growth or decline observed for each of the activities in the 1970s would be maintained during the 1980s.

c. the second hypothesis (H2) assumes the same general tendencies as H1, except as concerns the categories of mining and industry. In the first case, based on Pereira's (1990) estimate that there are between 400-600 thousand miners in the Amazon region as a whole, it is calculated that the mining population of the Northern region would amount to 10% of the EAP in 1990 (this amounts to 293 thousand individuals, an estimate which can be considered conservative). In the second case, it is assumed that the slowdown of economic growth would have resulted in the maintenance of the same relative levels of participation for the industrial sector as it had in 1980.

d. in H3, the same rhythm of growth observed in all urban activities during the 1970s is projected to the 1980s, as in H1; however, in the rural sector, although the same overall growth as in H1 is projected, it is assumed that the only activities showing any growth are in the mining sector.

The results of these different projections are presented in Table 2. From the standpoint of the declining importance of the rural sector, in general, and of extractive activities in particular, H2 can be considered to be a conservative assumption. That is, it can be assumed that rural activities, as a whole, will make up less than 48% of the total in 1990 and that, within them, extractive activities will be even less important than shown in

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<sup>4</sup> The multiregional model was applied by Hakkert (1989) on the basis of the projection by Camarano et alii (1988).

these data. H3 is somewhat more radical in terms of redistributing the rural EAP towards the mining sector; nevertheless, it may end up being closer to the regional reality than the others. Be that as it may, the main points to be derived from this Table are that:

a) even under conservative assumptions, urban activities tend to be of vital and growing importance in the employment structure of the region;

b) extractivism, along with hunting and fishing activities, is losing ground in terms of the regional economic and employment structure. To a lesser extent, the same is happening with ranching and agricultural activities; this is particularly meaningful in view of the enormous effort made by the Brazilian government to promote these latter sectors, during the 1970s and early 1980s.

Finally, if one attempts to evaluate the level of modernization of labor relations in the region, using indicators such as: proportion of unpaid workers, participation in the informal sector, number of working hours, income levels, and so forth, it becomes clear that the Northern Region's employment structure continues to be archaic, particularly if compared to other regions (Martine and Torres, 1991).



Table 2

Projection of Economically Active Population (EAP)  
Aged 10 and Over by Sector of Economic Activity.  
Northern Region, 1990. (one thousand persons)

Sector of Economic Activity	H1		H2		H3	
	Number	%	Number	%	Number	%
<b>Rural</b>	1,264	43.1	1,411	48.1	1,264	43.1
Agriculture	851	29.0	781	26.7	679	23.2
Livestock	69	2.4	63	2.2	55	1.8
Forestry	7	0.3	7	0.2	6	0.2
Extractivism	78	2.7	72	2.4	62	2.1
Timber	157	5.3	144	4.9	125	4.3
Mining	6	1.6	293	10.0	293	10.0
Hunting and fishing	55	1.8	50	1.7	44	1.5
<b>Urban</b>	1,562	53.3	1,424	48.6	1,562	53.3
Industry	218	7.4	190	6.5	218	7.4
Construction	171	5.8	157	5.4	171	5.8
Commerce	284	9.7	261	8.8	284	9.7
Services	629	21.4	577	19.7	629	21.4
Transp./Comm.	111	3.8	102	3.5	111	3.8
Administration	95	3.2	87	3.0	95	3.2
Defense	54	1.8	50	1.7	54	1.8
<b>Other</b>	106	3.6	97	3.3	106	3.6
<b>Total</b>	2,931	100	2,931	100	2,931	100

Source: IBGE, Censos Demográficos, 1970 and 1980 and Hakkert (1989).

### 3. Prospects for Native Rubber Extraction in the State of Acre

The decline of native rubber extraction in the State of Acre has been described, both from a historical and a regional economics perspective (Santos, 1980; CEDEPLAR, 1979). Despite the aura of "stagnation" which, one gathers from these studies, has perennially surrounded this activity, rubber extraction has managed to subsist for the last six decades. Moreover, in Acre, rubber gathering continued to be, until recently, the state's main productive activity.

Traditionally, the relationship between the *patrão* (the boss of the rubber tapping area) and the rubber tapper is intermediated by the *barracão*<sup>5</sup> ("rubber depot") through non-monetary relations which generally involve advance consumption of goods and deferred "payments" in rubber. Since both the price of supplies and of crops are set by the boss, it is common for the rubber-tapper to spend years without effectively seeing any currency.<sup>6</sup>

The durability of native rubber extraction in this region has encouraged proposals of self-sustainable development through models such as those of "extractive reserves" (Allegratti and Schwartzman, 1987; Allegratti 1990).

The main thrust of the extractive reserves' proposal involves giving the *seringueiros* control of the marketing of their products through co-operatives, thus circumventing the *barracão* system, considered to be one of the principal barriers to the improvement of living conditions of this population. Under better conditions, the rubber tappers would be less likely to migrate out of the area. From an environmental standpoint, the appeal of this proposal is that, in addition to increasing real average income, such activities would help promote preservation of the physical environment. Within this perspective, rubber would continue to be the main productive base of extractive areas, at least in the short and medium range, even if the strategy of diversified "extractive reserves" were to prove successful.

The social and ecological intentions of this proposal are irreproachable. Nevertheless, given the growing disposition within Brazil to establish a true market economy, it is inevitable that

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<sup>5</sup> The term *barracão* is translated literally as rubber depot but it also refers to the traditional institutional arrangement governing relations between rubber tappers and their bosses with respect to supplies, credit and crops.

<sup>6</sup> For a discussion on the classical forms of exploitation in this system, see Santos (1980).



economic considerations come into play in evaluating the feasibility and continuity of such initiatives. Inevitably, the opportunity costs of such proposals will be measured against those of other alternatives. In this light, the economic prospects of the extractive reserve approach have to be analyzed objectively. There are strong indications that the traditionally long and gradual process of decline of the native rubber areas has begun to accelerate. Indeed, it can be estimated that rubber extraction could be completely divested of its economic importance within a relatively short time span, possibly in the next ten years. The basis of this argument is discussed in the following section.

### **3.1. The rapid decline of native rubber in Acre**

Over the course of the past decades, the extraction of native rubber has suffered strong competition from synthetic rubber, as well as from cultivated rubber produced in other countries. Nevertheless, the impact of better cultivation techniques in Malaysia and the technological advances in petrochemical industries have not completely eliminated rubber extraction in Brazil. This is due, in large part, to various forms of government intervention. The most recent policy, formulated by the federal government in 1967, but still valid today, established a policy of equalization of rubber prices. Due to such policies, aimed at sheltering the native rubber against external competition, the national consumer has paid up to three times the price of imported natural rubber during the last 23 years (Cota, 1989; Homma, 1989).<sup>7</sup>

Variables such as the rates of economic growth, exchange rates and petroleum prices have, over time, also been crucial for the native rubber producers. The network of relations involved can be schematically presented as follows:

a) economic growth increased the demand for rubber. The elasticity of the demand for rubber in relation to the GNP has remained high, due to the continued growth of the automobile industry;

b) this increase in demand favors native rubber only if exchange rates are favorable. The fluctuation of exchange rates is the most relevant variable concerning the demand for native rubber. For example, during the period between 1980 and 1983, this demand increased considerably in spite of a strong market retraction, due to a significant exchange devaluation.

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<sup>7</sup> Evidently, this policy has been criticized by other segments of society. It is possible that the new economic policies, which gives more emphasis to competition, will be more sensitive to these discrepancies and thus, more likely to import cheaper rubber.



c) the price of petroleum affects the competitiveness of synthetic rubber.<sup>8</sup>

During the second half of the 1980s, the same model which had favored the sustenance of native rubber tapping showed signs of a reversal. Imports increased significantly during the 1984-86 period when economic growth was rekindled and continued in 1987-89 when the valuation of the US dollar grew at a slower pace than inflation in Brazil. To make matters worse, there has been a substantial increase of national production of cultivated rubber since 1987. The resulting fluctuations in the consumption of native, cultivated and imported rubber in Brazil are presented in Table 3.

Table 3

Consumption of Rubber in Brazil, by Source, 1972-1989.  
(three year averages)

Year	Absolute Values (in 1000 tons)			Relative Values (%)		
	Native	Cultivated	Imported	Native	Cultivated	Imported
72-74	62.95	4.86	91.54	39.50	3.05	57.45
75-77	54.64	6.76	140.21	27.10	3.35	69.55
78-80	66.37	10.11	164.11	27.59	4.20	68.21
81-83	84.80	13.46	117.76	28.81	6.23	54.51
84-86	89.61	19.42	202.00	28.81	6.24	64.95
87-89	53.57	36.64	271.75	14.80	10.12	75.08

Source: SUDHEVEA (Data obtained from IBAMA, Brasília).

It can be observed from these data that, between 1972 and 1986, the average production of native rubber amounted to approximately 30% of national consumption, while that from cultivated rubber was around 5% and imports were responsible for 65%. However, during the last three-year period (1987-89), the production of native rubber fell to only 15% of the national consumption level; the decline was significant even in absolute terms. Meanwhile, participation of cultivated rubber doubled, in absolute and relative terms, thereby capturing 10% of the market, and the imported products increased their share to 75% of the total.

<sup>8</sup> In practical terms, synthetic rubber cannot be considered a perfect substitute for natural rubber. For this reason, we have not emphasized its value in this paper. For more details regarding this subject see Homma (1989).

The data also show that cultivated rubber has taken, in absolute terms, a fair share of the market from native rubber. This is apparently due to the fact that the production costs of cultivated rubber are lower than those of native rubber (Cota, 1989, Homma, 1989). In addition, most of the new plantations are located within the country's major consumption center, the economic region dominated by the city of São Paulo. The more important new producing areas are the western regions of São Paulo (especially near the city of São José do Rio Preto) and the States of Mato Grosso and Bahia.

If the government maintains the policy of price equalization and makes up - in real terms - for the devaluation of the local currency which occurred in the recent period, it can be expected that during the next few years, cultivated rubber will tend to expand exponentially. Planted rubber trees only begin to produce seven years after they are planted. A large part of the rubber trees planted in the Center-South regions have not yet begun to produce. This can be observed in the area of São José do Rio Preto (Table 4).

Table 4

Number of Rubber Trees Planted and Producing in  
the Area of São José do Rio Preto, 1980-89.

Year	Planted	Producing
1980	261,324	-
1985	2,443,270	-
1989	4,930,695	496,685

Reference: Coordenação da Assistência Técnica Integrada, Divisão Agrícola de São José do Rio Preto. Cited in a newspaper article from "O Estado de São Paulo", 4/11/90, page 13.

Assuming that no plagues or other natural obstacles which are common to rubber production occur, these numbers indicate that the production of this area in the state of São Paulo will multiply 10 times over during the next 7 years, even if no new trees are planted. Similar phenomena can be identified in other regions.<sup>9</sup>

<sup>9</sup> The Michelin Industry is presently developing a plantation project in the State of Mato Grosso, with the ultimate goal of guaranteeing the self-sufficiency of the enterprise. It is expected that when all of the trees reach their adult age, rubber extraction from this plantation will be of the order of 15 thousand tons a year - equivalent to half of Brazil's current total production. ("O Estado de São Paulo", 4/11/90, page 13) Production from this area



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Homma (1989) has argued convincingly that the process of "domestication" of a major part of rubber production is inevitable. According to this author, when efficient productive techniques are adopted in the domestication process, substitution of the extractive product tends to be successful in the very short range. In fact, recent information would indicate that the rapid substitution of extractive rubber production by the so-called "rational plantation" methods, which took place at the international level at the beginning of this century, is starting to occur in Brazil; here, cultivated rubber in the Center-South region, motivated mainly by price equalization policies, is beginning to supplant extraction of the native variety in the Amazon.

### 3.2. The decline of the extraction of native rubber - an overview

Available sources indicate that, in the next few years, there will be an accelerated decline of rubber extraction. This would suggest that, in the absence of new compensatory public policies, the extraction of native rubber in the State of Acre will become more and more marginalized, from an economic standpoint. The main consequences of this declining importance of native rubber, at the regional level, are as follows:

a) an intensification of subsistence agriculture within former extractive units;

b) the disintegration of traditional relations in the *seringais* and thus a reduction of the importance of the "boss" and the *barracão*;

c) an intensification of migration from rubber tapping areas<sup>10</sup>;

d) an accelerated process of agrarian transformation which, on the one hand, contributes to an expansion of agriculture and cattle raising, while on the other, causing a reduction of extractive rubber areas (CEDEPLAR, 1979);

e) a decrease of regional income, which will have a significant impact on the rubber tappers and their families;

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alone would thus correspond to 80% of the total production of Acre in 1989.

<sup>10</sup> There are indications that such movements, which were already important in the 1970s, became intensified during the 80s, especially in the traditional extractive regions of the Juruá Valley (Torres and Caetano, 1989).



f) an intensification of female and child labor in subsistence production without a significant increase in income (CEDEPLAR, 1979).

In short, the reduced economic importance of rubber-gathering is likely to have serious negative consequences for the rural population of places such as Acre. On the other hand, the prospects of the growth of employment in urban areas of the region are not promising; indeed, they would tend to decline with the marginalization of the *seringais*. In this context, alternatives for increasing employment will have to be sought within the rural areas themselves. We now turn to a discussion of a few of the more promising alternatives.

#### 4. Alternative Extractive Products in the State of Acre

##### 4.1. Introduction

Available data regarding the production and commercialization of extractive products are unreliable and tend to underestimate the real volume of such production. The main problems facing the researcher are those of ascertaining which products, to what extent, and in which regions, are being underestimated in existing data. Despite awareness of their possible limitations, available data regarding commercialized extractive products in the State of Acre and the North Region are presented in Table 5.

As can be observed, the commercialized extractive products concentrated in the Northern Region are native rubber (*Hevea* spp.), Brazil nuts (*Bertholletia excelsa* HBK.), açai fruit (*Euterpe* spp.) and palmito or palm heart (often from the *Euterpe* species of palm).

Wood and lumber production are not taken into consideration in this analysis since it seeks to examine the possibilities of extractive activities which are not ecologically damaging; that is, the analysis is restricted to the economic possibilities of activities which fit within the parameters of "sustainable development".<sup>11</sup>

The principal extractive products under examination here are geographically concentrated as follows: rubber in the State of Acre; Brazil nuts in the South of Pará; açai fruit and palmito (which only partially warrants the "renewable" label) in the areas surrounding Belém in northern Pará. This spatial pattern is due to

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<sup>11</sup> The commercialized production of charcoal, firewood, and timber in the Northern Region in 1980, was more than double all other extractive products combined. In Acre, however, this volume was not very relevant, reaching only 0.02% of the total.

the ecological characteristics of the extractive species as well as to the proximity to Belém, the region's principal market and port of export.

Thus, native rubber is, by far, the dominant renewable extractive product in the Northern Region, responsible for 52% of its total commercialized product. If the extractive production from Acre were excluded from Table 5, production of the principal extractive products (rubber, Brazil nuts, açai fruit and palmito), would be somewhat better distributed spatially over the Northern region, despite continuing concentration in the State of Pará.

Table 5

Relative Participation in the Value of Production of the Main Extractive Products Commercialized in the Northern Region and in Acre; 1980 and 1985.

Extractive Products <sup>1</sup>	1980		1985	
	North. Region %	Acre %	North. Region %	Acre %
Hevea (Coagulated)	52.11	94.51	52.44	89.32
Brazil Nut	17.05	5.42	10.02	9.52
Açaí fruit	12.62	0.04	29.29	0.06
Palm Heart	9.42	-	4.35	-
Hevea (Latex)	3.94	-	0.91	0.83
Sorva	1.68	-	0.84	-
Others	3.18	0.03	2.15	0.28
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>
<b>Absolute Value <sup>2</sup></b>	<b>3,945,306</b>	<b>1,292,587</b>	<b>5,151,635</b>	<b>879,409</b>

Source: IBGE, Produção Extrativa Vegetal, 1980 and Anuário Estatístico do Brasil, 1986.

Notes <sup>1</sup> Extractive products, excluding wood.

<sup>2</sup> Values in Cr\$1.000 of 1980 deflated by IGP.

In 1980, Acre was responsible for nearly 60% of the value of rubber production in the Northern Region. Within Acre, rubber was responsible for 95% of the renewable commercialized extractive product and approximately 90% of the total commercialized extractive product, including timber. In 1985, the value of rubber production fell significantly, yet it still corresponded to 89% of the total value of renewable extractive products in the state. This



alone is sufficient to illustrate the degree to which the state of Acre depends on rubber extraction.

The only other extractive product with a scale of commercialization in the Amazon region is Brazil nuts, which was responsible for 5,4% of the renewable commercialized extractive product in the State of Acre in 1980 and 9,5% in 1985.

#### 4.2. An outline of alternative forms of extractive production

The literature provides several references to the utilization of different extractive species within the *seringais* of Acre, which are occasionally sold in the Rio Branco market. Examples include *andiroba* (*Carapa guianensis* Aubl.), *tucum* (*Astrocaryum tucuma* Mart.), *copaiba* (*Copaifera reticulata* Duke), *licuri* (*Syagrus coronata* (Mart.) Becc.), *urucum* (*Bixa orellana* L.), etc (CEDEPLAR, 1979; Allegretti, 1979; Cunha, 1988). However, there are no data regarding the relative importance of these products. In all probability, these are products which may have some market value but are primarily destined to subsistence consumption.

Self-sustainable development proposals have always sought to identify, from such lists, feasible "alternative" products (Allegretti, 1990). In strict economic terms, however, there are very few forest products which would be able to occupy a market as wide as that held by rubber, or even reach a similar scale of production over the short or medium range. Faced with the concrete perspective of a collapse in the production of native rubber, it is not easy to find alternative products that will have a "futures" market, such as that which rubber has enjoyed over the years.

Even the most potentially strong markets are probably smaller and more segmented than the native rubber markets which already exist. Consequently, the policies and actions aimed at finding an appropriate substitute for rubber, within the limits of extractivism, will have to eschew the idea of any single "savior" commodity and opt to work with a wide variety of products. In this light, there may be an urgent need to look into the prospects of "poly-extractivism". That is - along the lines of "poly-agriculture" - which has traditionally provided sustenance for millions of small farmers, one could promote a mix of extractive products having different cycles, maturation periods and commercial possibilities, which would not only provide employment, but also generate income the year round.

However, it should be emphasized that any proposals directed at uncovering and operationalizing such alternative activities are, by nature, of a long-range variety. There are, at the present time, precious few potentially-identified markets, nor can workable methodologies aimed at identifying such markets be easily found. One problem to be considered in this connection is that, among the non-extractive agricultural products, the dynamics for the future



activities are generally dictated by the capacity of potential products to become integrated into the so-called agro-industrial complex.<sup>12</sup>

In the case of extractive products, these possibilities would be determined by several market factors, in addition to the qualities inherent to the product itself (such as flavor in the case of nutritive products). Other questions related to the handling of technical problems in the areas of processing and commercialization (perishability, transportation, uniformity, etc.) would also be essential determinants of product feasibility.

Even more significant in the present context is the fact that, in a capitalist economy, the growth rate of a given market is likely to be more important than its real size at any particular moment. Extractivism, by definition, is unable to increase its supply on a wide scale. Paradoxically, the integration of a given extractive product into the "agro-industrial complex" may signify that this product - despite being widely accepted in the market and having the capability to cause the demand to escalate - will inevitably be substituted by a cultivated or synthetic product. In other words, even though the extractive product requires a market which is attractive and stable, this market cannot be too "good" or dynamic, or it will provoke its own demise. In short, the success of a given extractive product tends to hasten its own substitution.<sup>13</sup> The importance of this paradox for the present analysis cannot be over-emphasized.

#### **4.2.a. Extractive production of Brazil nuts**

The Brazil nut would appear to possess several of the characteristics which are required for success in the extractive product market. First, it strikes a good balance between profitability and scale. That is, it has a reasonable market which has shown a gradual expansion over time, yet which is not sufficiently spectacular to be threatened with takeover by modern concerns. It has persisted to this day because market growth did

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<sup>12</sup> Manioc is a typical case. In spite of its high rate of consumption in the diet of some Brazilian regions, its importance on the market has suffered a significant decline during the last few decades. This fact can be attributed mainly to the difficulties of integrating manioc into the "agro-industrial complex" (Delgado, 1987).

<sup>13</sup> Moreover, to the extent that the marketing techniques used by large modern companies create their own "needs", the substitution of traditional production processes becomes even more inevitable.



not impose its substitution but, at the same time, it has generated a reasonable income for local gatherers and producers.

Unfortunately, however, there are strong reasons to believe that such advantages will soon be neutralized, since the domestication of the Brazil nut is imminent, as will be seen below. Prior to this discussion, however, the particularities of the Brazil nut in the Northern Region will be described briefly.

The production of Brazil nuts has fluctuated during the last two decades, with a tendency to decline in recent years. It is difficult to evaluate to what extent this decline is related to cyclical factors or to the discontinuation of extractive production. In any event, Table 6 shows that extractive production has experienced no significant increase throughout the 1966-85 period.

Table 6

Production of Brazil Nuts in the Northern Region,  
Brazil 1966-1985. (period averages)

Period	Production (tons)
1966-70	46,123
1971-75	49,534
1976-80	47,830
1981-85	42,028
1986-87	35,534

Source: IBGE, Anuário Estatístico, 1972-1986.

During the more recent period, the most significant feature of Brazil nut production has been the geographical change in the locus of production. The data shown in Table 7 indicate that production has decreased in Pará, Amazonas and Rondônia, but increased considerably in Acre and, to a lesser extent, in Amapá and Roraima.

These data are generally consistent with Homma's hypothesis that, in expanding agricultural frontier areas (States of Pará and Rondônia), extractive production tends to decrease (Homma, 1989). Nevertheless, the data show considerable fluctuation and, if one considers only the last two years shown (1985 and 1987), the State of Amazonas also comes up as a major loser. At the same time, such losses in extractive production are replaced by increases in other extractive areas which are not undergoing agricultural expansion (i.e. in Acre).

Table 7

Production of Brazil Nuts by State  
(Northern Region, 1980, 1985, 1987)

State	1980	%	1985	%	1987	%
Rondônia	1,201	3.0	563	1.3	784	2.2
Acre	6,624	16.4	14,761	33.0	8,737	24.6
Amazonas	8,811	21.8	10,754	24.0	5,489	15.4
Roraima	244	0.6	974	2.2	815	2.3
Pará	22,611	55.9	15,417	34.4	17,954	50.5
Amapá	965	2.3	2,270	5.1	1,755	4.9
<b>Total</b>	<b>40,456</b>	<b>100</b>	<b>44,739</b>	<b>100</b>	<b>35,534</b>	<b>100</b>

Source: IBGE, Produção Extrativa Vegetal, 1980 and Anuário Estatístico do Brasil, 1986.

Overall, this process of substitution weakens the basis of the extractive economy for various reasons:

a) the new *castanhais* (forests containing Brazil nut trees) are farther away from the main export center (Belém), causing significant increases in transportation costs;

b) the new loci of Brazil nut exploitation presents a tree density inferior to that of the Marabá region of Pará; the latter was the main center of Brazil nut production during the last 60 years but it has now begun a transition to farming and cattle raising. Lesser tree density results in an increase in production costs;

c) the pre-existing chain of commercialization must be re-established on a new basis, which may imply an increase in marketing costs and probably results in lower profits for producers.

In sum, the spatial re-organization of Brazil nut extraction has to be viewed within a scenario of reduction of productivity, which means an increase in production costs, and an increase in transportation and marketing costs. Trends in more recent years, according to first-hand accounts, would seem to predict an even more gloomy future for Brazil nuts; unfortunately, the lack of factual information prevents further analysis of this period.



#### 4.2.b. Brazil nuts in the State of Acre

As seen above in Table 7, Brazil nut production in Acre more than doubled between 1980 and 1985; in relative terms, it increased its share from 16% to 33% of the total production of the Northern Region during that period. Although the latest available data, (those for 1987) indicate a significant reduction during the 1985-87 period, Acre still accounted for one-quarter of total production. However, when this is compared with data on value of production from Table 5, a different picture emerges. In 1980, Acre accounted for 16% of total production but for only 5 of the total value of production; in 1985, when its participation in physical production had reached 33%, it's share in the value of production was still only 10%.

In other words, Acre's share of the value of production in 1985 was less than one-third of its share of physical production. This occurs for two main reasons:

a) Acre is much farther away from Belém than the producing areas in southern Pará. The greater distance implies lower prices paid to the local producer to compensate for increased freight costs;

b) the traditional commercialization structure (*aviamento*) in Acre is based on the system which prevailed in the rubber economy and is thus particularly archaic and exploitative; to some extent, this contributes to lower prices paid to the producer (Santos, 1980).

At any rate, Acre's Brazil nut production cannot be considered insignificant; to some extent, it has taken up the slack from the reduced production of other areas (such as Marabá), caused by the intensification of land occupation and the worsening of local land conflicts in the 1970s and 80s (Emmi, 1988).

In Acre, Brazil nut trees are found in the Purus Valley, but not in the Juruá Valley (CEDEPLAR, 1979), which contains most of the traditional and non-traditional rubber-extracting areas. This ecologically-determined feature limits the possibility of Brazil nuts becoming an alternative for rubber extraction in the entire state. However, the natural geographic division of labor suggests that the relation between rubber production and Brazil nut production is more balanced in the areas where both species occur.

The commercialization and processing of Brazil nuts has always been centralized in Belém (Emmi, 1988). This is because:

a) Belém is the main port for exportation, centralizing the produce of various regions.

b) the main share of production comes from the interior of Pará, especially from Marabá;

c) the processing of Brazil nuts is relatively sophisticated. A processing unit can employ up to 600 people, which suggests the existence of a typically industrial scale of production and produce classification techniques (Beltrão, 1982).

For these reasons, in spite of contributing an important share of the total production of Brazil nuts, Acre is not able to retain significant portions of the value which the product acquires during its final commercialization.<sup>14</sup>

Another important characteristic of the extraction of Brazil nuts in Acre concerns the articulation of this activity with rubber tapping. Inside the *seringais*, the extraction of Brazil nuts presents important features:

a) the season of Brazil nut collection is compatible with rubber collection. While the former occurs primarily in the rainy season, the latter takes place in the dry season (Velho, 1972; CEDEPLAR, 1979; Nascimento and Homma, 1984; Homma 1989). This timing makes it possible to coordinate Brazil nut collection with rubber tapping;

b) both men and women participate in the productive process. Typically, men collect the *ourijos* (the bur itself) while the women crack the bur and separate the nuts (seeds). Preparation for home consumption is also done by women;

c) the product is delivered to the owner of the *barracão* in a process similar to that which occurs with rubber (CEDEPLAR, 1979). Thus, the idea of eliminating the *barracão*, which is part of the proposed package in the extractive reserves concept, could also increase the income derived from the sale of Brazil nuts;

d) the annual Brazil nut harvest is relatively irregular and the cycles are not well defined. This is because the fruits of the Brazil nut trees only appear 12 to 15 months after the flowering (Homma, 1989). This characteristic hampers the adoption of extractive activities linked to the Brazil nut as an exclusive occupation of the producers.

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<sup>14</sup> Processing technologies which increase the product's aggregate value would significantly increase the income of the producers (Kinzo and Sallas, 1990).



#### 4.2.c. Overview of the prospects for Brazil nuts

In light of the above discussion, it is reasonable to believe that, on a short-term basis, Brazil nuts do have a relatively meaningful potential for production and income generation in Acre, particularly in the Purus Valley. This is due to the following reasons:

a) although Brazil nuts have played a secondary role in relation to rubber, there is considerable potential for expansion, as occurred between 1980 and 1985;

b) Brazil nut trees in Pará are being taken out of production, which allows reasonable expectations of price increases during the next years;

c) the road linking Rio Branco to the rest of the country permits the disruption of traditional links with the "aviamento" network centered in Belém; this requires only that a portion of the produce be channelled for consumption in Brazil's South-Southeast region;

d) processing, now being industrialized in Belém, should be attempted on a smaller scale in Acre itself, in order to retain a higher aggregate value in the region;

e) Brazil nut consumption abroad could increase due to great international interest in so-called "forest products".

Nevertheless, as suggested earlier, this embryo of a dynamic economy could be affected, on a medium and long-term basis, by the domestication of Brazil nut production. These possibilities are discussed in the next section.

#### 4.2.d. Brazil nut domestication - risks and possibilities

The main agricultural characteristics which hamper the cultivation of the Brazil nut in its natural state are: the long time lag between planting and the beginning of production (14 years); a low density of trees per hectare (10), due to tree size and a low correlation between fruits and flowers; and, great difficulty of seed germination (Nascimento and Homma, 1984). Nevertheless, the agricultural research carried out by the Research Center for the Study of Agriculture in the Humid Tropics (CPATU/EMBRAPA) shows that there are auspicious possibilities in this field:

"The size of the tree was reduced from 60 meters to an average of 12 meters. The time span for the first fruiting was diminished from 14 years to an average of 6 years, and the tree begins to reproduce within two and a half years. The low correlation between fruits and flowers was increased to a more



adequate level. The low level of germination of only 25% a year and a half after seeding was increased to 75% five months after the planting." (Nascimento and Homma, 1984: 180)

Success in domestication of the Brazil nut would imply, according to CPATU, an increase in productivity from 36 to 5000 liters per hectare. This is an incredibly high figure which, if borne out, could completely revolutionize the production process. For example, even if productivity were much smaller than that predicted by CPATU, a relatively small area would be sufficient to eliminate the entire current extractive production of Brazil nuts in the Amazon.<sup>15</sup>

Clearly, the success of production carried out under the ideal conditions of experimental agriculture is not necessarily repeatable in the field. The required financial, technical and human resources are not always available under field conditions. An obvious practical difficulty is that, even if technically successful, production only begins six years after planting.

In 1984, CPATU's technology was already being implemented over a land area of 4,500 ha (Nascimento and Homma, 1984). Various reports have recently provided information about advances in cultivation of Brazil nuts, particularly in devastated pasture lands of Pará. The Jari project in Pará has begun the large scale planting of Brazil nut trees; the National Bank of Economic and Social Development (BNDES) recently liberated resources for planting 3,500 ha of Brazil nut trees in the municipality of Itacoatiara, Amazonas.

Despite such developments, the possibilities of Acre significantly increasing its Brazil nut production do not seem realistic. Furthermore, the conditions under which Pará's native extraction was dismantled and the significant increase in production costs involved in transferring this activity to other regions apparently favors the implantation of cultivated Brazil nut groves which can now utilize the technology created by CPATU within Pará itself. On the other hand, it is still a moot point whether or not cultivated nuts are going to run into other uncontrollable technical difficulties; prior experiences with large-scale cultivation projects in the Amazon are not particularly promising in this respect.

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<sup>15</sup> There are no references, in the agricultural literature on Brazil nuts, to the occurrence of plagues which could jeopardize its production. The planting of perennial species on a large-scale in the Amazon has demonstrated that plagues are very common, and, in many cases, make commercial production impractical. This has occurred in the case of rubber (*mal das folhas*), cocoa (*vassoura de bruxa*) and pepper (*mosaico*).



The legal obligation to practice reforestation recently imposed on lumber dealers throughout the Amazon region, and on charcoal producers for the metallurgic sector implemented in the region of Marabá, may represent an additional extra-economic stimulus for the implantation of cultivated groves of Brazil nut trees in degraded pasture areas (Sawyer et alii, 1990). The possibility of intercropping could also reduce the costs of the implantation of such groves (Nascimento and Homma, 1984).

It should be emphasized, however, that the implantation of cultivated Brazil nut groves, although less advanced than rubber, is being developed with technology and financing modalities which, in general, benefit large producers. Consequently, the expectation that it might provide an alternative source of occupation and income for *seringueiros* is unrealistic, particularly if one anticipates recreating the social framework of individualistic freedom and open space which marks rubber extraction.

All these elements, taken together, suggest a certain precariousness in the notion of utilizing Brazil nut extraction as an alternative product complementing native rubber extraction. On the whole, it is impossible to foresee the timing and the impact of these changes.<sup>16</sup> Most likely, the extraction of Brazil nuts will continue to conform, over the short and medium range, to the pattern described earlier. In other words, production will dislocate towards interior areas where production costs are higher and productivity lower. Moreover, there is no guarantee that the technology which was developed in experimental conditions will be successful in practice.

#### **4.3. The prospects for "sustainable development" through extractive activities: an overview**

The only significant markets for extractive products today are those for rubber and Brazil nuts. Altogether, the prospects for rubber extraction in Acre are rather bleak. Among alternative products, only the Brazil nut presents a promising scale of production; even here, however, the future is precarious. In both instances, moreover, extractive production is threatened by the domestication process. In the case of the Brazil nut, this process, although improved, is still not totally guaranteed.

The nature of the current dilemma is well depicted in a recent study of extractive activities (Homma, 1989). Through various recent historical examples, Homma shows that extractive production

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<sup>16</sup> Only the results of the next agricultural census, which will probably be held in 1992, will be able to provide a more precise picture of these transformations.



is not compatible with the market's need for continual expansion. Nor is it compatible with the requirements for standardization and productive rationalization and with the need for increased productivity imposed by the market. A successful extractive activity tends to be substituted by cultivated or synthetic products.

Another possibility which should be considered more attentively is that of "poly-extractivism". In this model, each differentiated market would not present enough bulk to justify the product's domestication but the sum of such products would be sufficient to guarantee a decent income for the producer. The control of price mechanisms could also influence real possibilities of extractive activities. For instance, although Acre's production has increased significantly, the price paid for the Brazil nut in Pará is higher than that in Acre; this suggests the possibility of price improvements through efficient interventions at the level of marketing channels and product processing. It is also important to consider interventions which would allow increases in the aggregate value of Brazil nuts, thus benefitting producers. In the short or medium-term, it would be efficient, from the point of view of assuring income generation, while other interventions with long-term effects were being processed.<sup>17</sup>

In other words, although the possibilities of "sustainable development" through extractive activities are inherently limited, specific interventions could improve their chances of success. Proposed interventions should, however, adopt a long-term perspective, in view of the tendency to substitute extractive production by cultivation or by synthetics in the long run.

Other proposals for agricultural and semi-agricultural production in small productive units have been proffered. Combinations of temporary plantations and lumber species, sophisticated forest management models that include the forest "enrichment" with species of commercial value, etc., are already being experimented with on various scales (Nascimento and Homma 1984). Together with an emphasis on cooperative systems, appropriate credit allocation and continuous research, such efforts could help maintain a balanced relationship between the small productive units and the environment.

Another possibility would be to plant Brazil nuts on a small scale in the interior of secondary growth *capoeiras* (cleared areas covered over by scrub or secondary growth) of the *seringais*. This would provide an additional source of family income and assure, on a long-term basis, a certain stability in relation to the

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<sup>17</sup> For example, the incentives to plant Brazil nut trees in deforested areas, utilizing the existing new techniques.



extractive activity's decline. However, "technical" feasibility is not necessarily accompanied by the appropriate social conditions required for implementation. Several technical assistance efforts for productive family units have failed due to cultural barriers, as well as to political and administrative obstacles. Efficient technical assistance and financing cannot always be guaranteed. Nor is there any assurance that rubber-tappers will be interested in cultivating a new tree that takes six or more years to bear fruit. The possibility that investment resources will be utilized for consumption, as it is commonly practiced, is also rather high.

In short, any technical intervention must also consider the cultural realities of the Amazon basin. One specific point merits attention here: monetary categories have a distinctive meaning in the context of the extractive economy. Thus, proposals such as the organization of a credit system with modalities of payment which involve complicated notions such as the management of rotating funds, or the like, are simply not meaningful in this region, at least not on a short-term basis.

## 5. The Demographic Significance of Extractive Activities

The main thrust of the above discussion has been directed to ascertaining the economic feasibility of extractive activities, particularly as concerns the probable decline of rubber and its possible substitutes. This section briefly examines the question from the standpoint of the magnitude of the population affected by ongoing and future changes in such activities. In this respect, this section is concerned with the overall significance of extractive activities in the formulation of Brazil's social and ecological agenda, using the example of Acre.

The total population of Acre at the time of the last census (1980) was 301,303, of which 169,134 lived in rural areas. During the 1970s, Acre's urban population had grown at a rate of 8% yearly, while the rural population had practically stagnated. The Microregion of Alto Purus had a total rural population of 87,514 in 1980, slightly smaller than its 1970 rural population; by contrast, the urban areas of this region more than doubled in size, growing at a rate of over 9% a year during the decade.

Projections for the 1980s, based on symptomatic variables, would suggest a continuation of out-migration from regions of extractivism to colonization areas and urban areas during the 1980s. One estimate of out-migration from rural areas of Acre during the 1980s sets the figure at 59,800 individuals or, approximately 10,000 families (Torres and Caetano, 1989). Comparing this figure with the possible impacts of the implementation of extractivist reserves, it can be estimated that to settle these families on 350 ha plots, as suggested in the extractive reserves proposal, would require a total area of 3.5 million hectares. This



requirement, equivalent to 23% of Acre's total land area - only a proportion of which is actually covered with native rubber trees - would attend the needs of only those families which migrated from a rural to an urban area in Acre during the 1980-90 decade.

Seen from another angle, the absorption of the demand created by rural out-migration, during the 1980's alone, would probably require a land area equivalent to a large section of the territory of Acre which is actually covered with an exploitable density of rubber trees. Although estimates of the land area which is covered with rubber trees in Acre are tenuous, simulations can be used to illustrate the dilemma. Assuming that some 10% of the land area in Acre has been deforested, and that approximately half of the remaining area had enough rubber trees to sustain *seringueiros* and their families, then it would require half of that area just to cope with the state's contingent of rural-urban migrants during the 1980's.

Data from the 1991 Demographic Census may provide somewhat different figures from those quoted in this paper concerning population growth and migration during the 1980s. Nevertheless, it is unlikely that the order of magnitude being suggested here will be found to be outlandish. Hence, the overall impact of extractivist reserves for the absorption of potential out-migrants is likely to be considerably less significant than that idealized by the proponents of this model.

The inherent contradiction between the need to increase family size in the traditional extractivist economy and the inability to provide employment for adult offspring presents an additional set of difficulties. The rubber tapper is torn between two necessary yet competing time-consuming activities - rubber tapping and subsistence farming. If he spends his time in subsistence farming, rubber production declines; if he concentrates on tapping trees, food supply declines beyond the demands of his consumption unit (CEDEPLAR, 1979). Under these circumstances, a large family is a prerequisite to successful extraction. Yet, the high fertility patterns, the low age at marriage and, the primitive land-extensive technology utilized by the *seringueiros*, couple with low productivity levels to shorten the nuclear family's life cycle and increase the demand for new lands. In light of the inherent limitations in land availability, out-migration becomes an almost inevitable response. In short, the extractive reserves model encounters many of the same contradictions and frustrations which beset assistance to subsistence farmers in general.

## 6. Reflections on the Role of Extractive Activities

The attention bestowed on rubber tappers by researchers, policymakers and donors during recent years reflects an obvious convergence of social and environmental concerns. To the extent



that *seringueiros* represent a category of producers closely attuned to the need of preserving the rainforest while eking out an existence from it, their preservation and even their proliferation become a priority issue. If, as proposed in the extractive reserves model, the living conditions of *seringueiros* can be improved, without the constant and large-scale infusion of public resources, then the joint socio-ecological objectives inherent in this type of assistance to *seringueiros* become doubly defensible.

The information presented in this paper, however, tends to suggest that the future of rubber-tappers, from the standpoint of their place in a competitive market, is rather limited. For the last few decades, rubber extraction has survived, in large part, due to protectionary measures implemented by the government. The current evolution of planted rubber in the Center-South of Brazil will inevitably tend to reduce the political support for such measures - particularly in view of the current politico-economic stance being adopted in the country, which increasingly favors the free play of market factors.

The substitution - in part or as a whole - of rubber tapping by other extractive products, either singly or in conjunction with others, also fails to provide optimistic perspectives. The other important extractive product of the Amazon region - Brazil nuts - has already been dislocated, in part, from Pará to Acre, but in the process, productivity and price paid to the producer have declined. The phantom of domestication also hovers over Brazil nuts; although newly-designed cultivation techniques are not yet time- or field-tested, ongoing experimental production appears highly promising from an economic standpoint.

Other alternatives to rubber and Brazil nuts are even more exploratory. But, if and when other promising options are uncovered, it can be expected that the same basic dilemmas will have to be faced with each new product. That is, the first problem is one of discovering products which will have a sufficiently large market to generate a scale of production capable of involving significant contingents of manpower. If and when such a product is discovered, it inevitably attracts the attention of agro-industrial enterprises who, if the product has real commercial value, will attempt to "domesticate" it and to alter the traditional cultivation and commercialization methods.

In short, the destiny of extractive activities would appear to be that of remaining small and marginal to the market mainstream, in order to avoid being overtaken by more powerful economic forces. A corollary is that the very marginality of such activities dictates that the size of the labor force which it will employ, and the size of the total population which it will benefit, inevitably tends to be restricted. This aspect merits serious consideration in the Brazilian context. Even though Amazon residents represent but a minor segment of the total Brazilian population, they



nevertheless include some 10 million people, some 40% of which still reside in rural areas. The exercise carried out above on the land needs of migrants in rubber-tapping activities illustrates the large gap between the magnitude of land which would be necessary to implant a scale of extractive activities which would have some impact on migrant-absorption, on the one hand and, the concrete possibilities in Acre on the other.

The inherent economic limitations and the reduced absorptive capacity of extractive activities will inevitably force a re-evaluation of their overall role in social development and ecological preservation. It is one thing to promote the generalization of a model which will not only preserve the natural tropical environment but also sustain itself from one generation to another; it is another to support activities which tend to be decreasingly self-sufficient and which tend to reproduce and multiply the same set of subsistence problems with each new generation. Viewed in strictly conservational terms, the costs of supporting rubber tappers as preservers of the forest - against the encroachment of other more powerful intruders - will inevitably have to be weighed against those of other strategies. Viewed in strictly social terms, the costs of employment creation and maintenance in rubber extraction will inevitably be weighed against those of creating jobs in other economic sectors more directly linked to the mainstream market, possibly in other regions.

In short, this analysis suggests that while the technical possibilities for extractive activities should continue to be intensely researched, the medium and long range potentialities for their absorption of significant contingents of Amazonian manpower should not be overestimated. The worldwide attention drawn to the *seringueiros* is undoubtedly welcome in that it focuses attention on the social plight of the Brazilian and amazonian rural poor. Nevertheless, it has helped fuel unrealistic expectations regarding the potential role of extractive activities, even when supported and redesigned along new and creative lines, in both social development and environmental preservation.

Meanwhile, the concentrated focus on the Amazonian rainforest has also helped to deviate attention from Brazil's other severe environmental problems. Indeed, world opinion knows little of the fact that Brazil is nowadays largely urban; nor is it aware that the environmental problems which affect the majority of its residents on a day to day basis stem from processes of industrialization and demographic concentration much more severe than those faced by now-developed countries in the past. Such problems should absorb an increasing proportion of environmentalists' attention in order to promote adequate solutions to those problems which directly affect the majority of the Brazilian population.



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**Documentos de Trabalho de 1991:**

- Nº 01: **DESENVOLVIMENTO, DINÂMICA DEMOGRÁFICA E MEIO AMBIENTE: REPENSANDO A AGENDA AMBIENTAL BRASILEIRA** - George Martine.
- Nº 02: **AS ESTATÍSTICAS E O MEIO AMBIENTE** - Charles Curt Mueller.
- Nº 03: **CAMPESINATO E ECOLOGIA NA AMAZÔNIA** - Donald Rolfe Sawyer.
- Nº 04: **CRIANÇA, PROBLEMÁTICA SÓCIO-AMBIENTAL E DESENVOLVIMENTO NA AMAZÔNIA** - George Martine e Haroldo Torres.
- Nº 05: **AMAZONIAN EXTRACTIVISM: PROSPECTS AND PITFALLS** - Haroldo Torres e George Martine.
- Nº 06: **A AMAZÔNIA E OS TEMAS ECOLÓGICOS GLOBAIS: MITOS E REALIDADE** - Herbert O.R. Schubart.
- Nº 07: **DINÂMICA, CONDICIONANTES E IMPACTOS SÓCIO-AMBIENTAIS DA EVOLUÇÃO DA FRONTEIRA AGRÍCOLA NO BRASIL** - Charles Curt Mueller.

**Documentos de Trabalho de 1992:**

- Nº 08: **OS CONFLITOS INERENTES À QUESTÃO AMBIENTAL: O BRASIL E A CARTA DA TERRA** - George Martine.
- Nº 09: **EMERGÊNCIA DAS INDÚSTRIAS SUJAS E INTENSIVAS EM RECURSOS NATURAIS NO CENÁRIO INDUSTRIAL BRASILEIRO** - Haroldo Torres.
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- Nº 14: **AGRICULTURE, URBAN BIAS DEVELOPMENT AND THE ENVIRONMENT: THE CASE OF BRAZIL** - Charles Mueller.
- Nº 15: **COLONIZATION POLICIES, LAND OCCUPATION AND DEFORESTATION IN THE AMAZON COUNTRIES** - Charles Mueller.