

*DEFORESTATION AND LIVELIHOODS
IN THE BRAZILIAN AMAZON*

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São Paulo, 1997

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SUPPORT: UNRISD - United Nations Research Institute for
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INTRODUCTION

The Amazon region has become the most conflictive area in all of Brazil. On the one hand, it comprises half of the country's land mass and is perhaps the region with the richest natural resources in a country which desperately needs to make the best of its potential in order to develop. On the other hand, there is a growing awareness that Amazonia demands a type of development different from what has been planned and practiced in other regions of the country, since the current accumulation of capital is reproducing the same social inequalities and environmental devastation already existing in other regions of Brazil. This new type of "development" is now called "sustainable development."

This concept, however, is defined in different ways by different social groups and classes, according to their world views and economic interests. For large industrial and entrepreneurial groups operating in Amazonia, it represents the continuous extraction of profits from natural resources, regardless of the interests of Indians and other traditional forest peoples. For some radical environmentalists inside and outside Brazil, sustainable development is the total preservation of the ecosystems, particularly through the creation of protected areas. For Government institutions it often represents a panacea used in the international forum, a set of good intentions to be asserted in order to obtain loans from bilateral and multilateral banks.

For some important sectors, such as the Armed Forces, in the environmentalist discourse, there is a threat of "internationalizing" the region's natural resources. According to this view, the industrialized nations are using their proposals for conserving Amazonia's biodiversity as a mask to hide their political and economic interests in the appropriation of the region. Pressures

by Non-Governmental Agencies to restricting these loans to the Government are seen as signs of this strategy.

Some groups argue that if Amazonia were as important to global environment balance as environmentalists in industrialized countries claim, Brazil should be financially compensated for not being allowed to fully exploit its natural resources within its own territory. They also argue that, since part of the foreign debt was used to deplete the tropical forests, particularly during the military regime, the cancellation of a part of the debt would be a sign of the seriousness of industrialized nations to attack some of the roots of environmental devastation in the region. From this point of view, the proposals for "debt swap for nature" made by some environmentalist groups should be rejected.

Very seldom, however, are any serious critiques on the current "developmental process" in Amazonia made. The adjective "sustainable" frequently refers only to ecological sustainability, thus leaving aside the urgent need to also consider the social and cultural sustainability of the traditional forest people, such as the Indians, the rubber-tappers, peasants and other populations living along the vast river systems.

The most significant challenge, however, is how to build sustainable communities and societies in a region that is known for its high biological and cultural diversity.

This paper is a follow-up on a previous Unrisd document entitled The social dynamics of deforestation in Brazilian Amazon (Diegues, 1992), in which the main processes underlying deforestation in the region are analyzed. This present paper is intended as an in-depth analysis of these processes in two specific regions of Amazonia: Rondônia and southeastern Pará. It will be argued that, although overall governmental policies apply to the entire Amazonia, historical, social, economic and ecological factors have produced distinct results in these two areas.

PART 1

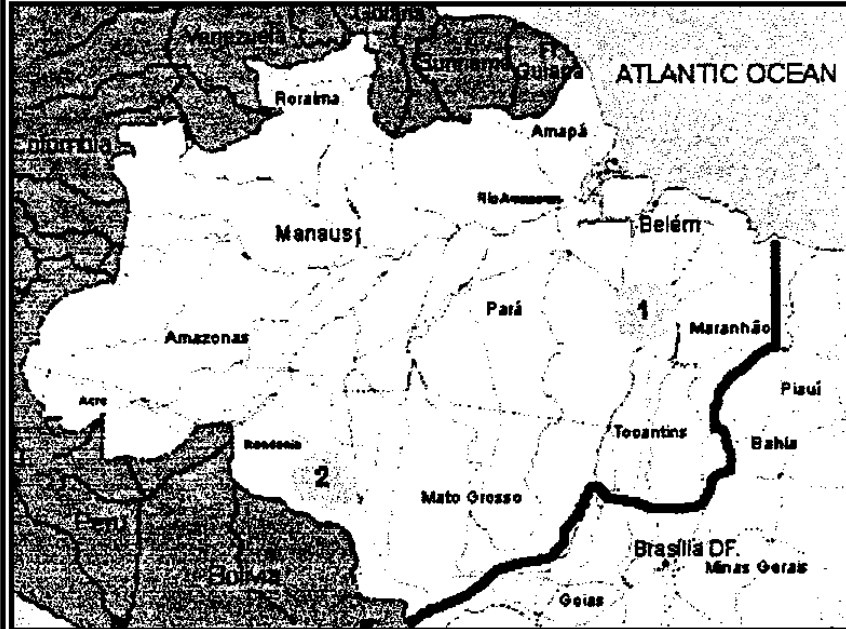
SUMMARY OF THE GENERAL SOCIO-ECONOMIC PROCESSES LEADING TO DEFORESTATION IN THE AMAZON REGION

Brazil has 8, 5 million sq km, and the region known officially as legal Amazonia comprises 5 million sq km, meaning over 60% of the total of the country's territory. Approximately 3.5 million square kilometers are covered by humid tropical forests (*map 01*). However, Amazonia is important not only as the largest part of the Brazilian territory under forest cover but also because it contains one of the largest mineral reserves in the world. One of the mining areas in the region, the Grande Carajás mine, contains the largest reserves of high-grade (66%) iron ore in the world: an estimated 18 billion tons. At an extraction rate of 35 million tons per year, the reserve will last over 500 years. The region has also important deposits of manganese, copper, bauxite, nickel, gold and tin. In addition, in a country of urgent need for electricity, Amazonia has a 100,000 megawatt potential for electricity production, equivalent to 60% of the potential for the entire country. (Junk and de Nello, 1987). In addition, most of the rivers in other areas in Brazil have been intensively exploited for energy production.

On the other hand, Brazil has over 30% of the remaining tropical forests in the world containing high biological diversity and high potential for wood and non-wood extractive products.

Living in this complex environment are over 143 Native Amazonian tribes, riverine communities and other "forest peoples" living in modes of production which require large tracts of land.

Map. 1
Legal Amazonia: Case Studies - Southeast Pará-Rondonia



- 1. Southeast Pará
 - 2. Rondonia
- Border of Legal Amazonia

As has been extensively described in the paper, Social Dynamics of Deforestation in Brazilian Amazonia, (Diegues, 1992) the Amazon forest and its traditional dwellers are under increasing threat from a style of "development" transplanted from the richer southern regions of Brazil.

In fact, it is questionable whether development has even taken place in the south. On the one hand, there are alarming social and regional disparities, increasing marginalization of the greater part of the rural and urban poor, deterioration of almost all social indicators such as illiteracy, health conditions, etc. On the other, there is an increasing concentration of wealth and land, along with high rates of stagflation aggravated during the last decade by a gigantic foreign debt.

The recent occupation of Amazonia must be seen in the context of accumulation of capital and modernization and not simply in terms of so-called "development," since the recent appropriation of the region's renewable and non-renewable resources by national and international capital has resulted in an increasing depletion of the natural resources and in the marginalization of the local population.

The most important process underlying this deforestation is the rapid economic incorporation of this last significant frontier in Brazil into the overall Brazilian economy, due to its possibilities for rapid capital accumulation.

Two dimensions of this process should be emphasized. First, there was the ideological dimension in effect during the 20 years of military rule (from 1964 to 1984). According to this ideology, the so-called "geographical vacuum," representing half of the Brazilian territory, had to be occupied at any cost. Since the 1970s this strategy had a clear geopolitical dimension, expressed in huge economic programs, such as the National Integration Program. Long and costly highways, such as the Transamazon and the "Northern Perimetral Highway" (running close to the northern frontiers of the country) were initiated and partially completed. In order to occupy the region with Brazilians, the government stimulated the arrival of landless peasants from the Northeast and from areas with land conflicts in the South.

Hundreds of thousands of peasants from those areas poured into the region, most of whom lacked the farming experience necessary for survival in a totally different, aggressive tropical environment. Some of these newcomers arrived spontaneously, attracted by the publicized availability of cheap land, while others came in groups to set up organized settlements, as was the case in the State of Rondônia.

As described in the previous paper (Diegues, 1992) most of these settlements failed because of the low fertility of the forest land, lack of services (marketing, extension-work and social infrastructure), a different environment from that existing in the regions the peasants came from and, principally, because of land conflicts. In fact, the recent occupation of Amazonia has resulted in the highest number of land conflicts, proportionally speaking, in Brazilian history. It opposes, on the one hand, the traditional dwellers (the Amerindian tribes, the riverine populations and extractive populations) and, on the other, the newcomers, such as farmers and Brazilian and multinational cattle ranching and mining interests.

By the mid-1970s the military Government's strategy had changed. Instead of agricultural settlements of small farmers, large development projects were planned and implemented. Grandiose mining projects (Grande Carajás), large dams (Tucuruí and Balbina) and industrial centers (São Luís do Maranhão and Manaus) based on mineral processing and free zones, as well as large agribusiness projects, were established.

These projects benefited not only from a number of tax incentives, but also from the plentiful cheap labor available, composed principally of those farmers who had abandoned their plots of land.

The second aspect is that this strategy for occupation was based on the assumption that the Amazon could be an instrument for solving overall structural problems brought about by the "Brazilian economic miracle" of the 1970s, based on economic modernization and accumulation of wealth in the southern regions.

In fact, in the mid-1960s, the already highly concentrated land-tenure system became even more unequal as the result of the labor saving

technology (called modernization) implanted in the south, which forced the labor force off the fields. Many of the small farmers and tenants in the wealthy southern states were forced to sell their plots as intensively mechanized soy-bean production expanded, which required larger areas of land and less labor input. Many farm workers, especially sharecroppers and other tenants, lost their sole source of income. As a result, for example, 2.5 million peasants migrated from the rural areas of the state of Paraná alone during the 1970s. Many migrated to Rondônia, where they began clearing the forests.

Attempts to introduce land reform met fierce opposition from the big landowners. The federal Government's modest attempt at land distribution in 1985 was also a failure. Opposition to land reform has also increased deforestation in Amazonia, as many big landowners, fearing land reform, burned large tracts of forest to "improve" the land, as a means of escaping agrarian reform in their latifundia. According to Brazilian legislation, clearing of a forest is a sign that the land owner is using the land productively, and thus should not be expropriated.

The "ideology of occupying Amazonia" was backed up by a series of incentives for large livestock-raising and agricultural schemes in the region, since latex extraction and nut harvesting by traditional populations were considered backward economic activities which failed to effectively occupy, or utilize, the territory. Since 1966, when special subsidies and incentives were created, 581 projects have been approved for agriculture and cattle raising (Oliveira, 1990). These projects cover an area of over 9 million hectares, the average area per project being 16,300 ha in Pará and 31,400 ha in Mato Grosso. A study carried out in 1986 concluded that of 92 projects analyzed, only three were really profitable. Multinational enterprises not only bought land in the region, but benefited from incentives as well and from the infrastructure established in the region by the Government. One study (Eglin and Theyry, 1982) identified 19 multinational groups in Amazonia, owning approximately 7,342,000 ha of land, used for logging, cattle raising, agriculture and speculation.

Pasture for cattle is the main use of the deforested land in Amazonia and the impact of this cattle raising on the forest environment is much more severe than that of small farming activities. According to Hall (1989) less labor-intensive forms of land use have the highest impact on the Amazon Forest, as is the case of logging and ranching. Many studies have shown the non-sustainability of cattle ranching in the region (Hecht, 1982, Fearnside, 1989). These studies show that the initial enrichment of soils (from cutting and burning of biomass) is basically detrimental to the total available supply of nutrients in the ecosystem. Lacking the defenses of the diversified natural system, within a few years many pastures were invaded by pests and weeds. Many ranchers overgrazed in some areas and then abandoned the deteriorated pastures. The high costs of chemical fertilizers (Amazonia has no known phosphate deposits) and of weed control meant that ranchers found it more profitable to clear new forest than to recuperate old pastures (Goodland, 1988). It is clear, then, that large agricultural and cattle-raising projects (combined with land speculation) were responsible for most of the deforestation, as compared with forest cutting by small farmers or slash-and-burn agriculturalists. In fact, large projects have often expanded their holdings by buying out or forcing small farmers off their lands. Small farmers were frequently used by large companies to clear the forest, plant food crops for one or two agricultural seasons and then grow pasture (Gall, 1978). Logging companies also received special incentives in the lumber extracting areas of the state of Pará. In the State of Pará alone, lumber extraction grew 4000 percent during 1970s (Schmink, 1988) and logging roads opened up access for clearing the forests.

The failure of the previous strategy is reflected, for example, in the large number of small farmers who abandoned farming to become gold placer miners (*garimpeiros*) often roaming from one of these open mining sites to the other. Today this quasi-nomad population comprises over 600,000 persons. Gold prospecting, undertaken by both placer miners and firms is a widespread practice along many rivers areas of Amazonia, causing serious health and environmental problems.

In recent years, and especially since the 1980s, the main strategy for the economic occupation of Amazonia has changed, priority being given to mining and processing of minerals. The best-known example is the Grande Carajás Project, initiated in 1980 in southeastern Pará and described in Part 1, above, of this study. This ambitious mining program, occupying an area larger than France, was undertaken by the Vale do Rio Doce Company, owned by the Federal Government, in cooperation with several multinational partners, including JICA (Japan International Cooperation Agency).

Another aspect of the problem caused by these strategies and programs is the increase in the region's population, which rose from 2,561,782 inhabitants in 1960 to 8,640,200 in 1989 (Census by the Brazilian Geographic and Statistical Institute). Between 1970 and 1980, the annual population growth in Amazonia was 5,04%, compared with 2,49% for the country as a whole. However, this high increase in population was unevenly distributed and is now concentrated in the capital cities in the North (notably Manaus and Belém), in the State of Rondônia and in southeastern Pará, as result of these so-called "development strategies." There is a generalized pulling effect on the population of other states (through migration of poor farmers) as well as on traditional populations from Amazonian river areas, attracted by large economic projects. The increase in the urban population has been higher than that in the rural regions, since over 65% now live in urban centers. The slums areas in and around the cities have increased dramatically, even though job opportunities and most of the social services are highly deficient. One example of this situation is the population increase in Manaus, where a Free Trade Zone was established, but which provides relatively few jobs for the migrants.

As mentioned above, the impact of "modernization" on the forest was tremendous, as it resulted in an indiscriminate depletion of the forest in many regions. Measurement of this deforestation process, carried out by INPE (the Brazilian Space Research Institute) has shown that, by 1988, some 5.2% of the Amazon region had been deforested (this does not take into consideration earlier deforestation in the states of Pará and Maranhão). More

recent information from the same institute indicates that, by 1989, the deforested area may have reached as much as 8% of the total region. The World Bank indicated that, by 1988, the deforested area comprised 12% of the region, which means an area the size of France (map 02).

The impact of forest clearing is serious, not only in ecological terms (loss of biodiversity, aggravation of the greenhouse effect, soil erosion, etc.) but also social and cultural. The livelihood of the traditional population (Indians, rubber tappers and riverine populations) has been deeply affected. As enormous numbers of rubber and nut trees have been felled, income and employment opportunities have been lost, forcing people to migrate to the urban areas. As productivity decreased, after a few years of land cultivation, small farmers also abandoned their plots and moved farther north to try for a better life. In many cases the land was sold to speculators from the south or to large neighboring cattle ranches. Many of these migrants have become wage earners on large plantations or headed for the placer mines in search of gold. The most serious threat, however, is to the Native Indian communities, as their reserves are being invaded by individual miners and logging and mining companies.

One of the principal Government strategies has been the creation of national parks and other protected natural areas. The first protected area in Brazil was created in 1937, in the south. The first National Park in Amazonia, however, was only established in 1974 (Itaiutuba National Park) covering over 1,000,000 ha. Many other large protected areas have been created since then in Amazonia, particularly during the period of the large projects. In fact, in 1970, the National Integration Program (PIN) and protected areas were included in 15 such projects. This strategy was also supported by international agencies, such as the World Bank, as the result of pressure from the environmentalist movement in Brazil and other countries. SEMA (Special Secretariat for Environmental Protection), created in 1973 and, later, IBAMA (Brazilian Institute for Environmental Protection), created in 1989, were the main institutions responsible for establishing protected areas in Amazonia. This region presently has the highest number

of protected areas (75), comprising 28.302.572 ha, the largest area under protection in Brazil (CIMA,1991).

According to CIMA, 1991, the strictly protected areas (National Parks Ecological stations and Biological Reserves) represent around 111.054 skm or 2.2 %of the whole Amazonian region. However, when other protected areas are included (National/ State Forests, Extractive Reserves, Indian Reserves) , representing 749.285 Km² there are around 18.7% of the whole Amazonian region is under some kind of environmental protection.

The impact of these environmentally protected areas, although important in protecting species and ecosystems, was detrimental to the livelihood of many traditional peoples, since, by the existing legislation, they must be removed from the territory where so-called natural protection has been established. One significative example of this paradox is given in the analysis on southeastern Pará. In this connection,the "extractivist reserves" are an exception,but they were created through strong social pressure by the "seringueiros".

Another Government strategy is the establishment of economic-ecological zoning. Many studies have been undertaken to establish a zoning plan, but none has yet been effectively implemented. The first attempt was Planaflores, the first steps of which have recently been carried out Rondônia, but which has not yet been implemented. The difficulties for this task are analyzed in the second part of this paper.

In addition to these plans and strategies, the Northern Channel (*Calha Norte*) project should be mentioned, as it is 6,500 km long and 160 km wide, approximately following the western Amazonian border. It was conceived by the Army, within the ideology of national security, in order to safeguard Brazil's northwestern border with several other Latin-American nations. Innumerable Native Indian tribes live in this area, and it contains substantial mineral resources. Non-government institutions, such as the Roman Catholic CIME (Indigenous Missionary Council) fiercely oppose the plan, as it will affect the livelihood of the Amerindian tribes and open the doors to large Brazilian and international mining companies. It should be

mentioned that among those living there are thousands of Ianomami Indians, presently protected by the large Ianomami reservation. This reservation was recently approved, in spite of the relentless opposition by mining companies and other strong interest groups. In spite of this protection, thousands of Ianomami are suffering and dying as a result of the contact with the gold miners who have invaded their reservation.

By the end of the 1980s there were signs that the government was intending to change some of the most damaging policies leading to deforestation in Amazonia. In April 1989 President Sarney announced a new program for the region, called Our Nature (*Nossa Natureza*). This initiative came at a moment when the federal government was under heavy opposition due to a number of different events. A few months before, the well-known leader of the rubber tappers, Chico Mendes, was murdered and his death brought about a major national and international reaction. It is likely that the Government was concerned with the possible suspension or cancellation of a number of multilateral loans, including the follow-up of the Northwestern Development (POLONOROESTE) Program, due to pressure from environmentalists at home and abroad.

The Our Nature Program had a very nationalistic tone, reaffirming Brazilian sovereignty over Amazonia. It presented an accurate analysis of the principal environmental problems in operation in the region, notably, uncontrolled deforestation and violations of Indian reservations. It thus called for environmental protection and research activities and established national forests and parks. Some investments by SUDAM (the Federal Government Supervising Organ for the Amazon Region) were suspended and limits were placed on round-log exports. No targets were set for the demarcation of Indian reservations, however, nor was any mention made of hydroelectric dams or land reform. By that time it was clear that nothing important would come from this program. By 1990 it was also clear that no money had been allocated for the program. The only important government action was the creation of IBAMA (The Brazilian Environmental Institute)

which replaced IBDF (Brazilian Institute for Forest Development) and Sudepe (Superintendency for Development of Fisheries).

In March, 1990, the newly elected president, Fernando Collor de Mello, took office, in the midst of a political crisis, annual inflation of over 4,500%, high foreign debt and a reduction in the GNP. Dr. Lutzemberger, a highly respected environmental activist was appointed by Collor to head a new environmental secretariat, known as SEMA. The President had committed himself to solving the most pressing environmental questions, particularly in the Amazonia. A total ban on incentives and on the export of hardwood logs was established. There was also a commitment to remove gold miners from the Ianomami reservation and to halt the construction of new pig-iron smelters along the Carajás Railway. From the beginning, Lutzemberg fought for a new style of development for Amazonia, and attempted to halt the paving of the highway extending from Rio Branco, in the Brazilian state of Acre, to Pucalba, in Peru. He favored forest management and extractive reserves. By that time deforestation was actually slowing down, but more as a result of deepening financial crisis than of direct governmental action.

Lutzemberger soon ran into enormous opposition from various social sectors, and the environmentalist movement began criticizing him of being very active in his speeches outside Brazil and less effective in solving the crucial environmental problems in the country, particularly in Amazonia.

One of the strongest oppositions to Lutzemberger's approach to Amazonia came from the newly elected governors of the states which comprise Amazonia, most of whom favored development of the region at any cost. These governors, backed by the same social forces that had benefited from the previous incentives, also received support from some sectors of the Army, which consider that the national and international actions of the NGOs are directed by the governments of industrialized nations to diminish the sovereignty of Brazil over the Amazon region. Lobbying by these governors and some members of the Congress elected

from Amazonian states is very strong, and it appears that some of the incentives which had been eliminated are now making a return.

One of the most recent proposals for Amazonia was presented to the G7 by the Brazilian federal government at the Houston Summit in 1990. The so-called Pilot Program consists of a series of very loosely connected proposals and actions. Strengthening of governmental conservation organs, ecological/economic zoning regulations, demonstration projects, establishment of new protected areas and extractive reserves are the major topics in this Pilot Program.

Almost one year after the formal approval of the Pilot Programme, the G7 countries were reluctant to fund the entire program, estimated at 1.566 billion dollars over a period of six years. They thus approved only 50 million dollars to begin the first phase. This position has exacerbated the xenophobic feelings of some sectors, including the Brazilian army, which has accused the industrialized countries of not showing any real interest in assisting the region.

The Friends of the Earth, which has been advising the European Community since 1990, is playing the role of catalyst in bringing together Ngos and independent groups to analyze the document and propose changes. The principal criticisms to the Pilot Program are summarized in the document entitled *Mind the Gap: the draft pilot program for the Brazilian Amazon: considerations and recommendations* (1991). According to this document, "the most important aspect overlooked by the present proposals is a strategy to link up with national and international economic practices which affect deforestation in the Amazon. Economic measures should be used to ensure the effective implementation of the proposed activities. Without coordination with forest policies, the pilot program would fall short of being a broad framework for channelling resources for the Amazon's preservation, and could even miss its specific targets." (p.06)

The document correctly proposes the establishment of a regional Amazonian economy, replacing the current frontier economy. This is necessary to maximize the internal benefits of sustainable development.

Otherwise, foreign markets will prevent local populations from taking advantage of the opportunities offered by the Pilot Program.

The document is also unclear as to how the proposed measures will link to the need of changing government policies, particularly incentives in the area. It does not effectively allow for the participation of the people, as most of the funds will be used by public institutions. The role of the NGOs is restricted to the so-called category-A demonstration projects (small-scale, community-based projects). On the other hand, most of the funds in this item will be channelled to large growth-projects selected by SUDAM.

The document also establishes a commitment to the establishment of extractive reserves for rubber-tappers. No policy commitment was made, however, to make them economically viable, particularly in view of the low price of rubber paid to the rubber-tappers, the need to stop invasions into their lands and the improvement of social facilities in rubber-tapping areas. Also, little attention was given to the question of the Native Indian tribes and the riverine populations.

Although the Program mentions the need to reinforce local research institutions, no priority is given to devising strategies directly linked to the sustainable development of Amazonia.

In spite of these constraints and limitations, the Government is taking the NGO's contributions more seriously than in the past. One example of this cooperation was the preparation for the 1992 UNCED in Rio, when the newly created Brazilian Ngos Forum has actively participated, with Government Officials in the preparatory meetings of the Conference. In fact, the number of the Environment NGO's has increased significantly just before the UNCED Conference, when they numbered around 1.000 groups, which assembled and formed a Forum coordination body..During the organization of the Forum, some traditional and more preservationist NGO's have objected to the participation of social movements and workers unions, but were defeated. In this sense, the Forum reflected a more social oriented enviromental view which strongly linked poverty and environmental issues.

The reaction of organizations of the local populations against deforestation, large projects and land occupation is becoming more and more effective. The rubber-tappers have created their own movement (National Council of Rubber Tappers) and are active particularly in Acre and Rondônia. The Indians have also created their own organizations, such as the Tikuna Tribe General Council and the Indigenous Peoples' Union, which in 1985 joined the rubber-tappers to create the Alliance of the Forest People. These reactions exist in both areas studied and are described in Parts 1 and 2.

The Amazonian forest issue was discussed again in Brazil during the preparations for the United Nations Conference on Environment and Development that took place in Rio de Janeiro in June 1992. Due to a deepening economic and political crises that led to the impeachment of President Collor, and the reduction of fiscal incentives, the rate of deforestation in the Amazonian region decreased considerably. The temporary slowing down of the rate of deforestation and particularly the good working relationships between the Government and Ngos strongly contributed to reduce the level of criticism of Brazilian NGO's concerning the official policies in Amazonia.

In 1991, the Government prepared a national report on the situation of the Environment in Brazil, incorporating critical views of NGO's and scientists. The document, entitled *Subsídios Técnicos para a Elaboração do Relatório Nacional do Brasil para a Cnumad, CIMA* (Technical Inputs for the National Report to UNCED), prepared by an Intermisterial Commission in 1991 was very critical of the causes of the environment degradation, particularly in the Amazonian Region. The document recommended the completion of the Ecological Economic Zoning and an increase of the area under protection and stressed the need for a sustainable development strategy.

During the UNCED Conference, 'in 1992 the strategy of the Brazilian Government was to avoid any particular reference or recommendation concerning the Amazonian Forest. The pressure of some tropical countries such as Malaysia, Brazil and others resulted in the

approval of a mild and generic Protocol on the Tropical Forests lacking any specific measure for conservation or sustainable development.

It is important to note that according to the National Institute for Space Research - INPE, the deforestation rate decreased from 1991 to 1994, but in 1995 it increased considerably. According to data collected from NAA satellite, the number of burning spots in the Amazonian forest jumped from 8.500 in 1994 to around 40.000 in 1995. According to the same Institute one reason for this increase was the extremely dry winter in the period 1994-1995 that facilitated the forest burning. Another reason is the stabilization of the financial situation that might have induced an increase in agricultural activities. The National Institute for Agrarian Reform to a certain extent continues its policy of distributing tracts of land around the TransAmazonian Highway, leading to more land clearing. One additional reason is the lack of surveillance, as IBAMA has only 82 men to control logging and deforestation in the entire area and therefore each man has to control around 60.000 Km², an area twice that of Belgium. (*Veja*, n.45, nov. 1995)

In the last few years logging became the activity most destructive of forests in the whole area and today Amazonia produces around 54 % of the wood produced in Brazil, exceeding the traditional southern regions. In the beginning of the seventies there were 292 logging industries in the whole Amazon Region and today, there are over 2.000 only in the State of Pará (*Veja*, n. 45, november 1995). After devastating the States of Rondonia, Acre and more recently Pará, the sawmills are quickly moving to the state of Amazonas, where the Provincial Government is creating a logging center in Itacoatiara (296 Kms from Manaus), through a series of financial and locational incentives.

The present government of President Cardoso which took office one year ago has no precise strategy to handle the Amazonian issue, apparently leaving to the State Governments the initiative to implement policies concerning the development of the region. This strategy does not seem to be conducive to forest conservation and to the amelioration of the

standard of living of the forest dwellers. As result, State capitals such as Belém and Manaus continue to attract the inhabitants of the rural areas and towns that are being depopulated. At the same time, the number of slum areas are rapidly increasing in the provincial capitals.

In terms of policy, the Government has created in 1992 a new ministry, called the Ministry of Amazonia and of the Environment. However, financial and organizational constraints continue to limit the Federal Government action in the region. IBAMA, (The Brazilian Institute for the Environment, the executive branch for the new ministry) is still very centralized in Brasilia and needs a general reformulation. In fact, this reformulation seems to be condition for further financial assistance of the World Bank. The present government is giving some priority to the economic-ecological zoning of the region, but no results of this exercise have yet appeared.

In spite of the fact the environmental movement and concerns reached a peak in the UNCED Conference and have decreased since then, it is important to note that in the Amazonian region the recently created local NGO's such as Imazon, Vitoria Amazonica, Saude e Alegria, Poema, etc are very active in the region. Also research institutions such as the Federal University of Para, the Nucleo de Altos Estudos Amazonicos (NAEEA), the Instituto de Pesquisas Amazônicas (INPA), and the Museu Goeldi Institute are increasingly incorporating environment issues in their undergraduate and graduate programmes.

However, it remains to be seen how far the present government will be able to commit itself to a new style of development, in view of the strong social forces opposing major changes in the region.

The overall social, economic and political crisis affecting Brazilian society is very profound and it seems that Amazonia is not a major priority for the Government.

PART II

SOCIAL DYNAMICS OF DEFORESTATION IN SOUTHEASTERN PARÁ AND RONDÔNIA; A COMPARATIVE STUDY

The macro-processes responsible for the deforestation are basically the same for the entire Amazon region: the process of accumulation of capital taking place in the region has the same features throughout this vast area. However, in two large regions, the State of Rondônia and southeastern Pará, the land and the occupation process have specific ecological, historical and social characteristics which will be treated in the analysis of these two areas. **ECONOMIC MODEL AND WAYS OF LIFE: CONFLICTS AND ALTERNATIVES IN SOUTHEASTERN PARÁ***

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1

PUBLIC POLICIES AND ENVIRONMENTAL CHANGES

For the purposes of this paper, southeastern Pará will be defined as the large region situated between the Xingu and Tocantins Rivers, covering parts of southern Pará, western Maranhão and northern Goiás (*see map 01*). It is a region which opened up to the rich southern markets in the 1960s through the construction of the Belém-Brasília Highway. The limits of the area under study are not strictly physical, as it includes areas actually outside the rough outlines described above, but relevant to an understanding of activities in mining and mineral processing (the Grande Carajás Program, for example). In this regard, the study also covers important urban areas, such as São Luís do Maranhão, where large mineral processing plants, ports and other infrastructure are located. These areas are closely connected with the Grande Carajás project, the most ambitious economic program in the entire Amazonia.

In southern Pará one can find a complex array of problems, caused by government intervention, public policies and projects of great magnitude. Observing the changes which have occurred in the area, two sets of questions stand out. The first is in relation to the nature and the role of economic processes which influence new forms of land occupation and are responsible for increasing deforestation within the region. The second set of problems is related to the impacts of these large projects on local

communities and to the changes in their livelihoods and life styles. As Amazonia's environmental problems have to do with social issues, the central question at stake is the simple impossibility of stopping environmental devastation and re-establishing a balance among the diversified ecosystems without facing and solving matters related to social tension. Solutions, therefore, necessarily imply a deep revision of the economic model which has transformed Amazonia, and southeastern Pará in particular, into a zone of conflict and environmental destruction.

The business initiatives which based their accumulation on land and migratory flows moved significantly toward southern and southeastern Pará in the 1970s. New Government policies were then defined for the region during the military regime. The opening of the agricultural frontier has revealed two aspects, both produced by the same logic, namely, private appropriation of land and the establishment of a market for labor and goods. This is why social and environmental problems must be understood within the broader movement of accumulation along the Amazonian frontiers, through private appropriation and speculation of land which had previously been occupied by peasants. As result, the capitalist order has been imposed upon the life style of local communities. Government policies themselves enter into contradiction. Those which benefit entrepreneurial management of space and resources are inconsistent with the dynamics of the expansion of small farm production which was stimulated by the arrival of migrants. And the immigrants were brought into the area through government policies (CASTRO, E. & ACEVEDO, R., 1987). The heterogeneous aspects of regional ecosystems have been subordinated to the political goal of recreating in southeastern Pará a system of businesses in agriculture and cattle raising, with homogenizing results. State actions refused to acknowledge the differences and contradictions between groups which settled along the frontier, and denied the popular tradition of consolidated polyvalence among different categories of extractive workers. This tradition, however, comprises a body of accumulated wisdom on integrated processes related to the forest

and the water upon which the livelihood and reproduction of these social groups are based.

The federal government intends to invest heavily, ensuring the material and administrative infrastructure for large-scale national and international projects. Through SUDAM (the Federal Government Supervising Organ for the Amazon Region), various other federal and state agencies were created in order to support the implementation of the program. Such is the case of the National Integration Program (PIN) by means of which several highways were constructed, including the Cuiabá-Porto Velho, the Cuiabá-Santarém, the Porto Velho-Manaus and the Transamazon Highway itself, which became an important component in the transportation network in southern Pará. Many colonization experiences were set up along the Transamazon, organized by the National Institute for Colonization and Land Reform (INCRA), although the project as a whole was not entirely successful. One of its principal aims was to decrease tensions involving land in other regions around the country by stimulating migration towards Amazonia. The major beneficiaries, however, were the large landholdings, mainly through the "Program for Land Redistribution and Incentives for Agro-Industry in the North and Northeast" (PROTERRA), which had set aside entire municipalities of southern and southeastern Pará for cattle raising. Subjacent to this process there was a policy of treating land as capital, throwing private companies and family groups into a race for ownership of land or registration of existing land tenures. As land titles were one of the pre-requisites for obtaining tax benefits, in principle, the larger the property, the more money a company could get. In the town of Marabá, family groups which had become wealthy from Brazil-nut production and cattle raising and were threatened by the arrival of private business groups, were able to reorganize their political influence and benefit from the land policy.

These recent changes in southern Pará defined new actors in the process of land concentration. Older ranchers, such as nut plantation owners (mostly renters of land) and large land owners were joined by new business

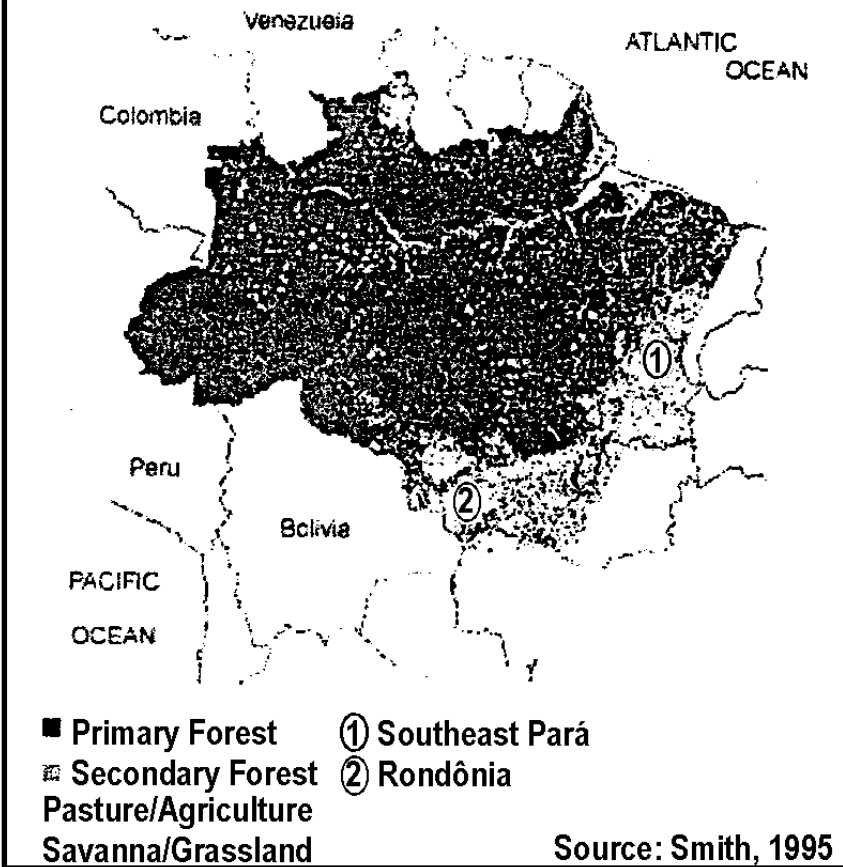
competitors and post-1960 farmers, who together unleashed the more recent processes of land concentration and speculation.

Financial support for farming and cattle-raising projects represented a synthesis of the earlier government policy for land occupation during the 1970s. In the following decade, large companies and the government increased investments for mining projects and industrialization of the agricultural frontier, aiming at the exploitation of natural resources concentrated there, especially in the Carajás Mountain Range. Throughout these two decades, tax and financial benefits remained the key for private enterprises and delineated the profile of the companies to be benefitted: enormous latifundia, few direct investments, low productivity and technology for logging.

According to Costa, until 1985, "628 of the large companies which settled [in the area] (584 large farming and cattle-raising activities and 44 farming industries) were benefitted with tax incentives reaching US\$ 847,600,000. The result, after 20 years of this policy, is that 87.7% of the companies either showed no profit or even suffered systematic financial losses." (Ibidem, 1990)

A look at the geography of this occupation gives a condensed overview of the process of devastation and consequent impoverishment of the soil (*see map 02*). This expansion in the frontier areas showed a clear relationship between pasture, deforestation and land conflicts. Greater areas dedicated to pasture did not correspond to higher levels of development or productivity. The creation of pastures is considered land improvement. Thus, logging in the jungle increased land values and at the same time prevented squatters from settling there. Alliances between the farming and logging industries also occurred in Pará, which is the number one supplier of sawed wood in Amazonia, while the highest rates of growth in lumber processing are seen in southern Pará. "Development Plans for Amazonia" (PDAs/SUDAM) have used the association between cattle raising and wood extraction as a mechanism for accelerating the arrival of large businesses.

Map 2 Cleared areas in the Brazilian Amazon



This is why occupation of lands belonging to Native Indians and small extractive producers was rapid and concentrated in southeastern Pará.

The federal government has thus functioned as the organizer and guarantor of a business model of occupation. Despite the discourse on security and regional development and proposals for solutions to social problems, the policies adopted reveal the basic exclusivity of large economic interests. The result was the appropriation of resources via an uncontrolled race for land and easy profits provided by speculation. Under this logic of intervention, projects for the extractive mining industry were conceived during the 1980s, including the Grande Carajás Program. This program was responsible for coordinating the phase of intervention within the region, and outlined the basic structure of governmental action, locating numerous important projects in southern Pará, such as the exploration of iron, gold, manganese, copper, silicon, and pig iron, as well as hydroelectric plants such as the Tucuruí Dam.

2

LAND CONFLICTS AND CHANGES IN LIFE STYLES IN SOUTHERN PARÁ

Follow-ups on changes observed within Amazonia in general, and especially in southeastern Pará, have revealed the close correlation between official policies and the increasing loss of forest cover. The voice of small producers (native Brazilian tribes, rubber-tappers, nut growers, fishermen, squatters and small farm owners), who have been the major victims of disorganization of their traditional ways of life and threats to their survival, was forced to silence by the authoritarian military regime (1964-1984). During the 1980s, their voice could be heard again in international discussions on environmental questions. Recently public opinion, including scientists, journalists and other sectors of national and international society, have turned their attention to the problems of Amazonia due to the aggressive devastation which is jeopardizing this enormous rainforest in its diversity and its biological particularities. Much of this vast region has yet to be studied in depth, but is already threatened by various types of pollution. In addition, professional associations, including labor unions and agencies which give support to small growers in Amazonia, have described the drama faced by those who have continued to struggle to keep their land and its resources and, consequently, their own life styles. At least since the 1970s, therefore, the environmental question has been at the core of these groups' social struggles.

The micro-region of Guajarina, occupied for many decades, and the Marabá and Araguaia-Tocantins regions, recently but intensely occupied, show the highest rates of deforestation in the state. In this latter region, the most affected towns are Marabá itself, São João do Araguaia, Conceição do Araguaia, Santana do Araguaia, Paragominas, and São Domingos do Capim. All are areas with extensive farming, cattle-raising companies and sawmills.

Of the total forest cover affected in the three regions mentioned, 2,856,804 ha have been devastated. In other words, “15.26% of the area, which is approximately equal to the deforestation authorized by Forestry Institute (IBDF) for the entire State of Pará for the period between 1966 and 1986 (2,883,733 ha)”. (Souza, 1988) (*see table 01*). In 1983, overall deforestation in southern Pará was approximately 22% of the state territory.

TABLE 01

DEFORESTED AREAS IN SOUTHEAST PARÁ: 1979-1983

DEFORESTED AREAS			
SOUTHEAST PARÁ MUNICIPALITIES	SURVEY 1979	SURVEY 1983	% OF THE MUNICIPALITIES
MARABÁ	403.688	649.243	10,54
Itupiranga	25.638	43.812	2,75
Jacundá	31.656	<i>no inf.</i>	5,22
Marabá	122.068	470.074	12,57
S. J. Araguaia	178.313	135.357	15,80
Tucuruí	46.013	<i>no inf.</i>	8,97

see next page

TABLE 01

DEFORESTED AREAS IN SOUTHEAST PARÁ: 1979-1983

DEFORESTED AREAS			
SOUTHEAST PARÁ MUNICIPALITIES	SURVEY 1979	SURVEY 1983	% OF THE MUNICIPALITIES
ARAGUAIA PARAENSE	514.409	871.240	17,47
Conc. do Araguaia	347.914	119.571	16,82
Sant. do Araguaia	166.495	255.841	12,02
Redenção	—	124.979	21,07
Rio Maria	—	100.638	24,02
Xinguara	—	270.211	23,82
GUAJARINA	732.413	<i>no inf.</i>	11,38
Bujarú	4.281	<i>no inf.</i>	2,36
Capitão Poço	52.688	<i>no inf.</i>	21,39
Irituia	50.419	<i>no inf.</i>	23,81
Ourém	7.650	<i>no inf.</i>	1,52
Paragominas	436.012	<i>no inf.</i>	16,04
S. D. Capim	181.363	<i>no inf.</i>	14,54
Rondon do Pará	—	<i>no inf.</i>	—
TOTAL	1.650.510	1.520.483	

Source: IBDF

According to Fearnside (1988a) the major processes causing deforestation, which should be stemmed by mechanisms such as public policies, are: a) land speculation, since the cheapest way of increasing the value of the land has been the creation of pastures, after which legal land ownership is facilitated; b) means offered by special tax incentive programs granted by the federal government to sawmills, cattle raisers and farmers, and mining companies; c) the construction of highways and railways opening up new paths to further occupation; d) subsistence production, which, however, is considered to be an activity with minor impact on the forest coverage (idem, 1989). Actually, both the big companies and the peasants, for different reasons, cause clearings in the forest. There are, however, basic differences as to the intensity of the impact, depending on the area affected and the rate of deforestation. The big sawmills, for example, use intensive technology (tractors, trucks, chains) to open up logging roads and drag the trees. Since the small producers have reduced financial capacity, they clear relatively little land for planting. In addition, the system of family work implies tractional methods which attempt to maximize production while using rudimentary technologies. The understanding of how different actors operate upon the regional space in southern Pará is essential for the developing of actions able to arrest and correct deforestation processes.

2.1. Violence and Conflict in The countryside: Small Producers' Resistance and Political Action

From the social and environmental points of view, cattle raising and colonization have been a failure. Many conflicts could have been resolved by land reform, which is one of the key points in the struggles of

the peasant movements throughout the country. Concrete steps in the direction of reform, however, was repeatedly frustrated at moments when it seemed to be institutionally established. Violence has intensified the struggle for land. In 1981 over half of the land conflicts in the entire country occurred in Pará. The area known as *Bico do Papagaio* (the Parrot's Beak, due to its contours on the map), including portions of the states of Pará, Maranhão, and Tocantins, is the region in Brazil with the highest rate of political assassinations, missing persons and collective tensions. "During the first half of 1985, no less than 36 squatters from only three towns in the Carajás area (Marabá, São João do Araguaia, and Xinguara) were murdered by gunmen in land conflicts. Sixteen of these deaths occurred within a two-weeks period in May, 1985." (CEPASP, 1986)

TABLE 02

CONFLICTS HAVING RESULTED IN DEATHS IN
GRANDE CARAJÁS: 1985-1987

DATE	SITE	DESCRIPTION
<i>Janary-April 1985</i>	<i>Fazenda Castanhal Pau Ferrado (Xinguara - PA)</i>	- 05 peasants killed by gunmen; - 05 gunmen killed
<i>May-July 1985</i>	<i>Fazenda Surubim (Xinguara - PA)</i>	- 08 peasants killed by gunmen
<i>June 1985</i>	<i>Fazenda Castanhal Ubá (S. João do Araguaia - PA)</i>	- 08 peasants killed by gunmen

see next page

TABLE 02

**CONFLICTS HAVING RESULTED IN DEATHS IN
GRANDE CARAJÁS: 1985-1987**

DATE	SITE	DESCRIPTION
<i>January-June 1985</i>	<i>Fazenda Fortaleza (Xinguara - PA)</i>	- 12 peasants killed by gunmen
<i>August 1985</i>	<i>Santana do Araguaia - Pará</i>	- 06 gunmen killed by peasants
<i>September 1985</i>	<i>Fazenda Surubiju (Paragominas - PA)</i>	- 05 peasants killed by gunmen
<i>September 1985</i>	<i>Fazenda Princesa (Marabá - PA)</i>	- 05 peasants killed by gunmen
<i>October 1985</i>	<i>Fazenda Caponema (Santa Luzia - MA)</i>	- 02 peasants killed by gunmen
<i>October- November 1985</i>	<i>Fazenda Canadá (Xinguara- PA)</i>	- 04 gunmen killed
<i>April 1986</i>	<i>Fazenda Diadema (Xingu - PA)</i>	- 05 gunmen and 01 peasant killed

see next page

TABLE 02

**CONFLICTS HAVING RESULTED IN DEATHS IN
GRANDE CARAJÁS: 1985-1987**

DATE	SITE	DESCRIPTION
<i>May 1986</i>	Imperatriz - MA	- Father Jósimo Tavares is killed by gunman
<i>June-October 1986</i>	Fazenda <i>Agropecus</i> (S. João do Araguaia - PA)	- 08 peasants; - 02 policemen and - 02 gunmen killed
<i>Dezembro 1986</i>	Fazenda <i>Forkilha</i> (S. João do Araguaia - PA)	- land owner and - driver killed
<i>Março 1987</i>	Conceição do Araguaia - PA	- 02 policemen hired by landowners are ambushed by peasants
<i>Abril 1987</i>	Marabá - PA	- Sister Adelaide Molinari is murdered
<i>Abril 1987</i>	Fazenda <i>Bela Vista</i> (Conceição do Araguaia - PA)	- gunmen killed by peasants

see next page

TABLE 02**CONFLICTS HAVING RESULTED IN DEATHS IN
GRANDE CARAJÁS: 1985-1987**

DATE	SITE	DESCRIPTION
<i>Maio 1987</i>	Fazenda <i>Canaan</i> (Xinguara - PA)	- 02 peasants killed
<i>Junho 1987</i>	próx. Belém - PA	- Paulo Fontelles, lawyer is murdered by gunmen
<i>Outubro 1987</i>	Goianésia - PA	- Community leader and son are killed by gunmen

Sources: MIRAD (1986, 1987); *O Liberal* (19/08/1987); *O Globo* (28/05/87); Amnesty International, 1988. In: Becker, 1990.

Table 02 shows the level of violence against squatters due to land struggles in the area of the Grande Carajás Program. This area had long faced enormous social problems, but the investments in production and infrastructure brought by this program have increased conflicts and decreased the real and symbolic value of human life.

Small agro-extractive producers and indigenous groups respond with grassroots movements and have built up political force through day-by-day struggles for improvements in their ways of life. The changes which the ecosystem is undergoing are dictated by the demands of production and contrary to the demands of the environment as a whole. That is why social movements in the Amazon have taken up ecology as a political issue more

easily and more effectively than have the urban movements. The groups involved realize that the threats to environment mean a death sentence. The destruction of the diversified ecosystems makes them incapable of sustaining the agro-extractive mode of production.

As result, the grassroots movements there have refused to participate in the above-mentioned programs and have began to respond to current political processes with new collective strategies of struggle, with a view to restoring their basic ways of life. In this paper, some clarifying questions about the violence occurring in the frontier will be presented, as well as mentioned of the collective resistance which is occurring and the alternatives proposed.

3

GRANDE CARAJÁS PROGRAM: THE NEW CHARACTER OF STATE INTERVENTION AND SOCIO-ENVIRONMENTAL IMPACTS IN SOUTHEASTERN PARÁ

In 1980 the federal government announced the Grande Carajás Program whose goal was to give priority in allocating funds and tax exemption for the exploration of natural resources in eastern Amazonia. It aimed at exploiting mineral resources, energy, forests and agro-industrial potential. To ensure sources of energy to the undertakings involved, negotiations were intensified for the construction of the Tucuruí Hydroelectric Dam. Together with the Carajás Railway, other costly infrastructure projects in this new phase of state intervention in Amazonia were also called for. The Grande Carajás Program is part of a larger program of intensive capital investments which became known as "grand projects" or "impact projects." On the whole, there were 33 large industrial and infrastructure projects with investments exceeding one billion US dollars in various parts of the country, to be implemented during the 1980s. They included projects dealing with mining (especially in Amazonia), electric power (from varying sources, including atomic, hydroelectric, alcohol or charcoal), communications (railways, highways, telecommunications, naval construction, ports, and airports), steel and petrochemical plants. Most of the investments were to be made in the Amazon Region, especially for the projects included in the Grande Carajás Program.

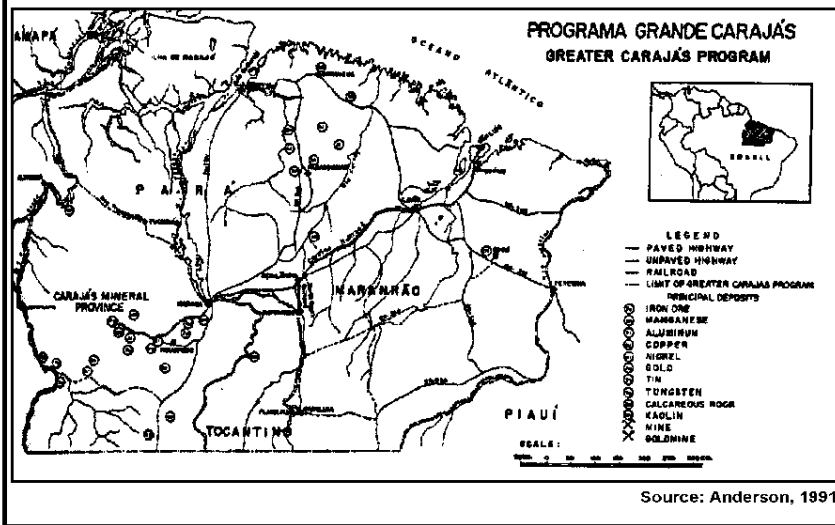
The mining projects implanted were a milestone in this new moment of expansion of industrial capital on the Brazilian frontier. They were closely related to the world economic order, in which state companies in underdeveloped countries were seeking to advance on the international market via association with transnational corporations. This logic explains why Brazilian companies, such as the Vale do Rio Doce Company (CVRD), are so interested in the success of the Grande Carajás Program.

There is no doubt that "the exploitation of resources in the Brazilian Amazonia, under national control, has vital importance for the state which, protecting the implantation of these grand projects in the region, also assures the expansion of the state's own companies and even help them become multinational." (Becker, 1990)

The state also guarantees the appropriation of large portions of the regional territory. The Vale do Rio Doce Company is one of the largest land-concentrating agents in Amazonia. The success or failure of this new pattern of land and resource management depend significantly on the capacity for regulating internal interests (both economical and political) and on making technological and economical demands compatible, since they compete intensely with one another in today's world market.

As an indication of the importance of land appropriation in the current phase of state intervention in the region, it can be noted that the Grande Carajás Project directly affects 220 small towns located in the states of Pará, Goiás, and Maranhão. It encompasses an area of no less than 90 million hectares, meaning approximately 10% of Brazil's entire territory. (*see map 03*). This program originated from a Vale do Rio Doce Company project, which was taken over by the state. To make it viable from the viewpoint of planning and financing, an Interministerial Council for the Grande Carajás Project was created. This was a new board, which took over the existing development agencies (SUDAM and SUDENE) and even state and municipal departments. Decisions were made entirely outside the regional centers of power.

**Map 3.
Southeast Pará - Greater Carajás**



Benefitting from both the highway and river transport systems, the Carajás Railway is the backbone of frontier expansion, structuring a new geography of occupation in the area influenced by this project.

To extract iron from the Carajás Sierra, the Vale do Rio Doce Company has constructed a mining-railway-port complex. At the top of the sierra there is an extraction and processing plant, a closed town to house the workers and which is the starting point of the railroad which connects the town of Paraupébas, in Pará, to the Port of Itaqui, in Maranhão, a distance of 890 km away. The Interministerial Council, which oversees the Grande Carajás Project, conceived an industrial development plan based on pig-iron plants, without having made any prior studies as to its social and environmental impacts. These pig-iron plants are planned for construction in a number of towns along the railroad, including Paraupébas and Marabá in Pará, and Açailândia, Rosário, and Santa Inês in Maranhão. These projects unleashed new processes of deforestation, since the charcoal to be used in the plants is extracted directly from the natural forest. They therefore cause environmental devastation in the areas under their influence.

There is no doubt that the Grande Carajás Project is a much more powerful agent for unleashing significant changes than the previous programs and projects, whose territorial extension, volume of investments, sectorial diversification and labor force were much smaller. The features of the frontier change as the companies arrive, bringing along with them the commitment to schedules dictated by world market patterns to measure time and efficiency. They are also one more front taking over large stretches of land and causing conflicts and restricting opportunities for small producers. The companies have spread onto the land of several indigenous groups, increasing the tension between the migrant workers, who follow the growth of these large enterprises in search of work, and the ethnic groups who inhabit the areas under the authoritarian jurisdiction of the Grande Carajás Project.

Studies have confirmed the mineral potential in the enormous Grande Carajás Project area. Besides bauxite, the essential raw material for

the aluminum plants located along on the tertiary plateaus along the Middle and Lower Amazon and near Paragominas, the Carajás area holds great quantities of other minerals for industrial uses. These include iron, manganese, nickel, tin, copper, and gold, as well as lead, zinc, chromium, asbestos, silver, and carbonic ores (Santos, 1982). Object of surveys since the late 1960s, these ores have drawn the attention of Brazilian and international capital towards the region. As cattle raising was engaged in as the road to expand new economic frontiers, the discovery of new ore deposits altered approaches and interests and gave a new direction to interventions in the region.

In return for its investments, the government had hoped that exports would become more dynamic and therefore contribute toward paying the foreign debt. In the government's official discourse, the local community would benefit from new jobs to be offered, which were generally overvalued and presented as elements of impact projects favorable to development. After a few years, data revealed that there had been no improvement in the level of living for either the native or the migrant population. On the contrary, while these projects did attract large numbers of workers during the peak periods (35,000 workers at the Tucuruí Dam, 30,000 in the construction of the Carajás Iron Project, for example), direct employment fell to approximately 1/8 to 1/10 when construction had terminated and the facilities began operations, thus leaving an immense labor force to roam back and forth through the frontier areas in search of land or jobs.

The most important of the Grande Carajás Project projects, located in the south of Pará, are the Carajás Iron Project, the Tucuruí Dam, the Camargo Correa Metal Plant, the Carajás Railway and the pig iron plants. Diversification of activity has facilitated strategies for control of the area. All have changed the environment significantly, each functioning as a new deforestation agent within the region. Costs and benefits must be calculated in some manner other than through the traditional methods, which are those adopted by the companies which execute the projects. Data on the effects of these projects on human working and living conditions of the local

communities in southern Pará must urgently be included in cost/benefit evaluations, including how the population has had to remake its habitat, as new actors arrive and establish new priorities and new claims for the land and the natural resources.

3.1. Modernity in the Jungle: Vale do Rio Doce Company and Ore Potential in Carajás

In order to understand the economic and political relationships occurring in southern Pará, the role played by certain entrepreneurial agents, such as the Vale do Rio Doce Company, must be carefully assessed, since these latter have brought about important changes in the dynamics and the geopolitics of the region. With the arrival of the Carajás Iron Project, the Vale do Rio Doce Company also solidly settled in the area and, since the 1970s, it has invested heavily in mineral research. It has filed requests for licenses for research and mining throughout the Amazonian territory, wherever there is a possibility of finding mineral deposits. Advantages assured by a logic of big business came not only from the appropriation of land, but also from the astonishing volumes of mineral resources found in the area. Research in southeastern Pará has shown that, beyond quantity and diversity, there is a fabulous concentration of ores of a number of minerals for industrial use. One of the largest iron deposits in the world is located in the Carajás Sierra, with a potential of 18 billion tons. According to specialists, and considering today's technology, this means an extraction capacity of over 300 years. At Igarapé Azul there is a manganese reserve with capacity estimated at 65 million tons. In answer to the increasing demand from the American and Japanese markets, annual production was expanded from 500,000 to 700,000 tons in 1989. There are also estimated deposits of 47 million tons of nickel. Through the Carajás mineral area, the Vale do Rio Doce Company intends to become Brazil's largest gold

producer, and presently plans to expand its production from 3.1 tons in 1989 to 12.2 tons in 1992.

Half public and half private, the Vale do Rio Doce Company was founded in 1942. Its major shareholder is the Federal Treasury, and its origins go back to the first phase of basic industry in Brazil. It has been very powerful as one of a group of public companies dealing in mining, transport, forest exploration, and geological and technological research. It is the world's largest iron exporter, with well-known expertise as a holding company, controlling 86 subsidiary companies and having participation in 66 others (Becker, 1990: 187). The Vale do Rio Doce Company is among the country's 30 largest export companies (Gazeta Mercantil Newspaper, 19 May 1989).

According to information supplied by the Financial and Market Resources Board, the Vale do Rio Doce Company produced 14,555 million tons of iron during the first two months of 1989. Of this total, 9,656 million tons went to the foreign market and 4,897 million tons to the Brazilian market. A breakdown of this production gives the following profile: 9,253 million tons by the Sulminas System and 5,300 million tons by the North System (the Carajás Iron Project), exported to 30 countries. The Vale do Rio Doce Company expects to export 35 million tons of high content hematite annually from the Carajás iron mines.

In view of the situation of the market during the 1970s and the 1980s, the Vale do Rio Doce Company's growth indicated the need to diversify its performance on the mineral market. The potential of the Carajás Region assured this possibility, giving the company a firm position in international competition.

Many questions must be answered. If, for example, from the Vale do Rio Doce Company's viewpoint, there are current gains and good perspectives in the future for exploitation in the Carajás region, what can be said of the investments from the workers' point of view? What is the total salary mass integrated into the local economy? With their accelerated land concentration, what effects do these projects have on the native and migrant

populations? As they result in deforestation and pollution of water resources, how do they interfere in the inhabitants' way of life? Who wins and who loses with these investments?

4

THE GRANDE CARAJÁS PROJECT: CHANGES IN THE WAY OF LIFE OF LOCAL COMMUNITIES

To answer these above questions, we will take a look at three cases of communities which are under the impact of these grand projects located in the south and southeast of Pará. The first refers to the changes caused by labor opportunities in the area under direct influence of the Carajás Iron Project. The second case reveals the changes imposed by the construction of the Tucuruí Dam on small communities of growers who live near the rivers and the way they resist while seeking survival alternatives. The third case is an attempt at understanding how the pig-iron plants, located in Marabá, Pará, and Açailândia, Maranhão, modify labor processes and the way of life of communities which were originally agricultural and have since been integrated into either coal extraction, steel plants or small temporary urban and rural services. The fourth case discusses the creation of environmentally protected areas and the impact on local populations.

4.1. The Carajás Iron Project and Changes in the Labor Force

The beginning of the construction of the Carajás Iron Project (*Projeto de Ferro Carajás - PFC*) in 1978 drew large groups of migrants, who headed principally to the towns of Marabá and São João do Araguaia, in southern Pará. Pressure for employment in the large projects located at top of the Carajás Sierra gradually increased with the growth of villages at the foot of the mountain, near Rio Verde and Paraupébas. The town of Paraupébas itself is the result of political decisions made by the Vale do Rio Doce Company, which believed it had the migratory flow under control. Expectations were that the population of Paraupébas could be held to 5,000 inhabitants, enough for its need for labor. As the labor force was attracted to the outskirts of the work sites, the Vale do Rio Doce Company attempted to keep people away from the center of the project, where the Carajás Urban Settlement and the industrial plants were to be installed. Paraupébas was intended as a center for recruiting workers for the construction companies contracted by the Vale do Rio Doce Company. Admission to the "Fortress" of Carajás is still rigidly controlled at the entry gate, the old regimentation hut where workers were classified and selected or rejected by the companies. Depending on the intensity of registration, which varied according to work schedules, crowds of workers would gather there or settle in the vicinity in the hopes of a job. The frontier regions, however, operate according to their own logic and rarely submit to decision by decree. In the case of the region around Paraupébas, the earlier processes of expropriation of land, caused by concentrationist policies, had forced great numbers of workers toward the new labor fronts, causing tensions still present today, resulting from unemployment and the relentless struggle over the jobs available. Thus, "while Paraupébas was being built, the news spread of opportunities for jobs and access to land. In lands in the Getat project, the "spontaneous" settlement of Rio Verde was born. It stretched along the highway from

Parauebas, interrupted only by an enormous army base. Attempts to control invasions were unsuccessful" (Becker, 1990: 206). The present-day composition of Paraueba's population expresses the manner that the city was born. Although located in southern Pará, only 8.4% of its inhabitants were born in the state. The rest came from 16 other Brazilian states, principally Maranhão (36.2%), Goiás (12.9%), Piauí (10.1%), Bahia (6.4%) and Ceará (4.7%). (Roberts, 1990)

This type of agglomeration, comprised of persons from the most distant corners of the country, has grown up in several labor fronts within Amazonia. The workers and their families are forced from one place to another by the impossibility of reproducing their ways of life where they are at any given moment. They cross state, municipal and property lines, frequently having to face the lack of jobs with the same violence and boldness as those who push them on to new destinations. This was true of the placer miners who built *Serra Pelada* (literally, the Naked Sierra). The Vale do Rio Doce Company had set up a strategy to keep strict control over its rights to mine this immense deposit of gold ore. Even so, it was unsuccessful in its several attempts to avoid agglomeration of the thousands of men who had gathered there from all over the country, and who, slipping and sliding up and down the muddy hillsides, forever dreamed of a stroke of luck, a way out of their fate of misery. In 1983, when gold mining reached its peak, there were some 60,000 gold placer miners in Serra Pelada (DNPM, 1986). The discovery of the gold deposits coincided with the beginning of the Carajás Iron Project, when the flow of migrants had intensified and headed toward Eldorado.

While Parauebas was designed and constructed to be a confined area for the labor force, initially for the construction phase and later for maintenance services, the Carajás Settlement was planned to house the families of the Vale do Rio Doce Company staff. There are evident discrepancies between these two urban worlds. Without a doubt, the most visible aspect is the architecture of houses, streets, and facilities, such as water, health care, education, and leisure. Parauebas looks like many other

towns, built up as the result of the pressure of population growth in frontier areas, where large numbers of the inhabitants live in shanty-towns and frequent simple service and commercial facilities, and where entire neighborhoods consist of night clubs and other bawdy services. Carajás, on the other hand, is the portrait of a well-planned town, with strict moral controls over the work sites, where cleanliness, sanitation and healthy food are given high priority. There are attractive residential areas, although rigidly stratified according to each employee's rank in the occupational structure. There are a good-quality school and hospital, as well as leisure services such as athletic and recreational facilities and a theater with activities planned by a specialized team.

This easily identifiable contrast could lead the observer, however, to less visible but more essential differences between these two worlds. The magnitude of these differences, imposed by such a massive project on the frontier, cannot be adequately understood without a quantitative and qualitative analysis of the resulting employment structure. One must understand who these individuals are and what their role is in the labor market. What has been the history of their life and work? Under what conditions do they come to and remain in this clearly segmented world. Let us examine this question from various angles. Of almost 30,000 jobs existing at the peak periods, the Vale do Rio Doce Company began drawing its needed employees from different social strata (*Table 03*). This was the *great Vale do Rio Doce family* in Carajás, all of them residents of this urban nucleus with approximately 6,000 inhabitants in 1986. The company's control over this urban space assures its control over population changes and trends. Are these trends related to the growth of the processes of production?

TABLE 3**TYPES OF JOBS (1988)**

POSITIONS	NUMBER	PERCENTAGE
Administrators	08	0.42
Technicians	73	3.93
Supervisors	264	4.21
Non-qualified workers	1.348	72.55
Apprentices	165	8.88
TOTAL	1.858	100.00

Sources: NAEA/UFPA, 1988.

Even during other periods, 3,000 workers were employed indirectly in the project, hired by sub-contracted companies. According to the same source, the 10 largest absorbers of labor in 1998 were Belauto (350), Cosam (250), Sacramento (240), Cobrasa (169), CSN (145), Poi (130), Pitágoras (115), Hospital (108), Bertillon (80), and Lavandaria (60). According to data collected by Roberts (1990) from the Superintendency of the Carajás Mines, in July of 1990, it can be seen that significant changes occurred. Only 1,600 persons are registered as Vale do Rio Doce Company employees, while the 88 sub-contracted firms hired 4,299 workers.

Medium-level personnel, in contrast, come from Federal Technical Schools (including SENAI, the National Training Service). However, to attend the demand for less-qualified occupations (1,348 employees), the company developed a recruitment policy in the region aimed at cities like Belém, São Luís, Marabá, Conceição do Araguaia and Paraupébas. One

result of this policy is that, on the short term, the Vale do Rio Doce Company has absorbed almost none of the local labor force. There are perspectives for medium and long term, however, when the Professional Training Center begins turning out qualified technicians in the fields of mechanics and electricity, some of whom are workers from the region itself. Paraúpebas, then, is an important recruitment center, but only for the companies working for the Vale do Rio Doce Company, which offer jobs on a relatively precarious basis.

The separation between the strata in the company's employees, residing either in Carajás or in Paraúpebas, represents the reproduction of their differences in origin. From 1988 on, the Vale do Rio Doce Company adopted a policy to recommend its contractors to recruit workers only with fixed residence in Paraúpebas or who showed some possibility of settling there permanently. The aim was to prevent populations from living in the mountains unless they were employees of the Vale do Rio Doce Company, as *Vila Temporária* (a nearby village whose name, as can be seen, means Temporary Town) was being glossed. Doing that, the company sought to consolidate a quiet urban life for the sierra regions.

The jobs offered by the Vale do Rio Doce Company are an example of a situation known in the Sociology of Labor as characteristic of a protected market, due both to the advantageous salaries, in comparison with the general market, and the profile of stability which it created. This is another distinctive feature in relation to employment offered by the sub-contractors. The wages and working conditions (food, working hours, health services and labor safety) which they provide are very precarious. As an example, a study by the University of Pará and the Center for Amazonian Studies (NAEA) shows the considerable differences in years on the job between the different types of employees (Vale do Rio Doce Company's own registered personnel and those of the contracted companies). Among the former, most have had over two years on the job (58.6%). Most of the latter, on the other hand, have been working for less than a year (59.8%). Instability in renewing contracts can also be observed between the

companies and the Vale do Rio Doce Company, a fact which makes employment even more precarious.

The sub-contracted companies show a high rate of exploitation of work, responsible for the miserable living conditions of their workers. These differences are at the core of the employment structure in the Carajás Iron Project, which follows a logic of corporate stratification, illustrated by the layout of the city. Observing the town of Carajás, one can see a sequence of houses forming a continuum, where each end corresponds to the poles of the functional hierarchy. First are the residences of superintendents, managers, followed by housing for workers in intermediate positions, and finally those for the less-qualified personnel. This closed town, which can be visited only with a permit issued by the Vale do Rio Doce Company, all of whose residents depend for their livelihood on the one single company, contrasts with the urban setup of Paraúpebas, where residents face an instable labor market and few opportunities for improving their quality of life. A field survey taken at random among 100 residences in Paraúpebas shows that, of the 232 adults interviewed, 21.1% worked for companies contracted by the Vale do Rio Doce Company. Their wages ranged from one to three minimum monthly wages, except for employees of Sacramento (a security firm) which paid 7 to 8 minimum monthly wages. 13.5% worked in the informal services market and 12.6% in commerce. The remaining persons interviewed were occasional workers or totally unemployed (Roberts, 1990). Data relating to unemployed workers who sought the Employment Bureau in Paraúpebas shows the following profile: 50% were from Maranhão; most were between the ages of 20 and 30; 92% were men; 57% were single, and 46% had lived in Paraúpebas for less than one month (Roberts, 1990). In the struggle for survival, some of the unemployed workers combine small urban odd jobs with periods of prospecting in the placers or farming on the outskirts of Paraúpebas. This is the flow of the masses in the frontier areas toward urban spaces. In their baggage, the hopes of a job or a piece of land to improve their living conditions. Slowly the dream of one day being a Vale

do Rio Doce Company employee, in a more stable market, fades away in the memory of those men living in the Amazon frontier.

Another distinctive feature between Vale do Rio Doce Company's recruitment policies and those of the contracted companies is age. The minimum age for employment at Vale do Rio Doce Company is 21, with the maximum concentration ranging from 21 to 40 (90% are in this bracket), while, in the latter, 13% of the workers are under 20, with 90% also under the age of 40.

Although this great enterprise has been a pioneer in the industrialization process and has considerable participation in the region's income, its results are debatable from the point of view of the absorption of economic benefits by the local community. In regard to employment, the incomes which continue to circulate in the local economy originate from the jobs offered by the contracted companies, which pay low wages. According to information obtained from interviews, part of the salary mass of Vale do Rio Doce Company's employees goes toward improvements in properties in their states of origin to materialize projects for the future. In Paraupabas, only the taxes charged for mineral extraction remain in the area. In 1991 Paraupabas was the town with the highest taxes in southern Pará. It would be useful to assess how this money has been spent by the local authorities and how internal power relations change accordingly, including between the Vale do Rio Doce Company and other external instances, such as political and economic forces in other towns (Marabá, for example) and the state government. Despite the massive revenues which come in from taxes, there are high expenses and social tensions (arising principally from land disputes) which must be entered on the debt side of the ledger on the final profit and loss statement.

4.1.1. Land Concentration and New Conflicts

For a more precise assessment, it is sufficient to take a look at the complex land tenure situation in local municipalities, caused mainly by great extensions of land owned by the Vale do Rio Doce Company. The strategies utilized for controlling the population can then be perceived more clearly. To guarantee its implantation, the company was backed up by the National Security Council (CSN), which had assured that works were carried out even before the land was legally in its hands.

"Getat (Executive Group for Land in Araguaia-Tocantins) was created in 1980, directly subordinated to the National Information Service (SNI). The official justification for this organ was the need to resolve land conflicts in the area. In our opinion, however, its aim was to organize a real defense belt around the Carajás Iron Project by controlling land distribution in an area of 45 million hectares surrounding it. This fact becomes evident in an analysis of local management."
(Becker, 1990)

Official documents by the National Mineral Research Department (DNPM), describing areas requested by companies for mining activities, reveal that, between 1979 and 1988, the Vale do Rio Doce Company was successful in taking control over 230,289 ha in the localities in the Carajás Mining Region. Mining areas function as important indicators in analyzing the evolution of forms of land concentration. Another category of land must also be examined, however, especially what is referred to as "protected areas", set up by the companies with government support, under multiple justifications. The areas intended by the Vale do Rio Doce Company illustrate quite clearly its actions on the territories in the region. Its interests are concentrated on two large areas. The larger "is located in Pará and comprises a polygon around the Carajás Sierra and surrounding area, with approximately 1,244,00 ha." (Almeida, A. 1986) These interests advance

onto indigenous lands and areas already occupied by small growers and prospectors. The resulting conflicts take several directions. To retain the population which had been drawn by the Grande Carajás Program, the Vale do Rio Doce Company organized the settlements in response to the pressures of the organized peasant movement. There thus appeared the Getat/Inca colonies, known as Carajás II and Carajás III, where 1,600 families settled in 1983-84. The objective was to prevent the settling of squatters around the mining area in the Sierra owned by the Vale do Rio Doce Company. In 1985, another colony, named Jader Barbalho, began to be settled by the National Land Reform Institute in an area, whose name means Hourglass. Over 600 families were moved there. Peasants claimed that the plots should have 100 ha, rather than the 50 ha each family was actually given. Referring to the presence of small growers in the Carajás Sierra, known today simply as Environmental Protection Area (APA), the president of the Rural Workers Union in Paraupébas points out the conflicts and contradictions between speech and action.

“When rural workers fought to maintain the APA area, it was a very tough period. Workers were arrested and had their houses burned by Vale do Rio Doce Company security guards. The rural workers refused to give up, so the Vale do Rio Doce Company decided to propose a deal: the area claimed by the Company would be fenced in. But the deal was not respected, since, a few days later, the area occupied by the workers was registered as Vale do Rio Doce Company land, with no mention of the occupation by the workers. Since then, the area has been an Environmental Protection Area. This was between 1989 and 1990.”

The narrative continues by identifying relations between corporate interests and their legitimation by environmentalist discourse.

“When IBAMA (Federal Environmental Institute) tried to talk to the workers it was to tell them that they could no longer farm there, since the area belonged to the Vale do Rio Doce Company's environmental protection area. They would therefore have to look for another place to work, since they had no right to indemnity. They stayed anyway, and are still there today. IBAMA's area is located in the Sierra (at the Carajás Urban Nucleus) rather than near the workers' land. It is therefore referred to as Ibaminha da Serra (little IBAMA of the Sierra).”

In those workers' settlements it could be observed that, as the initial period of institutional support ended, settlers were left to their own fate in places of difficult access, a fact which prevented them from getting their farming products to consumer markets. The bad road conditions caused enormous losses to agriculture. As a result, the land had to be abandoned. The Rural Workers' Union of Paraupeba estimates that 70% of the settlers had sold or simply left their lots by 1989 (Roberts, 1990). These lots were bought by other small growers or by richer planters, who have frequently pressured the land market with the aim of expanding their properties. Land grabbers also began to negotiate the abandoned lots, skyrocketing speculation. Whether this was a state-corporate strategy or not, aimed at making small-scale production in mining areas inviable, the fact is that, in these areas, it was the pastures that expanded rather than farming. Also, areas under control of peasants themselves had lower rates of desertion than those belonging to third parties.

Despite vicissitudes and tensions resulting from the fight for a piece of land in these zones pushed back by the agricultural frontier, there was a remarkable advance in rural production. Data provided by (Agency for Control of Epidemics (SUCAM) reveals that some 16,000 people were involved in farming, almost three times more than the direct jobs made available by the Vale do Rio Doce Company and its contracted companies, among a population estimated by the Census Office (IBGE) at 44,150 people

(1990). As the average family has 5 members, approximately 3,200 small grower families are responsible for a significant part of the food consumption in the town. This production is consumed basically by the lower class population, and thus provides no profit to the traders who control food distribution in the Carajás Sierra, which is supplied with grain, meat, fruit and vegetables imported from the south of Brazil.

Finally, it is important to underscore the fact that the pattern of land occupation in the municipality of Paraupébas, with latifundia, mining projects, and small farming activities, led to deforestation processes causing the degeneration of various ecosystems. The Grande Carajás Project also stimulated lumber exploitation (thus increasing the demand for already rare species in southern Pará) and charcoal manufacturing to supply the pig iron plants in Marabá. The losses to the environmental balance, with the extraction of minerals, must still be accounted as costs, which will certainly never be returned, neither by the precarious jobs generated nor by the taxes paid to the municipality.

During the last 15 years, as a result of this tension over appropriation of land and natural resources, extensive areas were declared Forest and Biological Reserves, National Parks and National Rainforests, cramping the available territories even more. There are no doubt positive elements in the institutionalization of these reserves, but the political game by which environmental problems have been dealt with in the region reinforces alliances between the Brazilian Environmental Institute (IBAMA) and the big companies. The former, although a representative of the federal government, often collaborates in the siege against the small growers, not only in southern Pará but in many other areas in Amazonia. This is perhaps the most recent challenge faced by the indigenous nations and small producers of different kinds, such as rubber-tappers, nut harvesters, fishermen and peasants. It is a challenge which has been answered by alternative proposals in the search for new forms of long-term use of natural resources, in the more rational combination of farming and extractive

activities, and the possible improvement of the forms of collective organization of economic production and ways of life.

4.2.1. Forest Destruction and the Mosquitos Plague

In the 212,000 ha reservoir, 2,500,000 m³ of first-class timber were submerged, for which the project was severely criticized by public opinion, not only in the Amazon region itself, but nationwide. In fact, the Federal Agency for Development of the Amazon (SUDAM) carried out an analysis in 1977 regarding the possibility of profiting from the lumber potential which was about to be flooded, and concluded that the project was not viable. Of the 161,000 ha area included in the study, SUDAM found a commercial potential of some 30,000,000 m³ of profitable wood, "eight times the volume of wood consumed yearly by all the industries in the state of Pará, according to Federal Forestry Institute (IBDF) (1986). Of this amount, only 6.4 million m³ have no known use on the Brazilian market at present." (Souza, 1988)

This irresponsible type of decision is regrettable in itself. When the composition of the forest is examined, however, things can be seen as more unfortunate yet, as hardwood trees of many different species, typical of the tropical forest, were destroyed, as well as a great number of nut trees (which are also hardwood), which provided the traditional source of food for the local community. This hardwood was also one of the principal extractive products in regional trade. In 1985, when the reservoir began to be filled, 181,000 of the 212,000 hectares of forest cover in the region were submerged. Despite the outrage which this stirred up in sectors of civil society, the federal government issued a set of normative procedures which ended up legitimating the threat to the nut tree plantations. In 1980, Normative Instruction n°. 001, of April 11, 1980, Art. 52, Sole Paragraph, issued by the Brazilian Institute for Forest Development (IBDF) permit the "trade and industrial consumption of trees of these important species which had been removed from areas where great projects of *public interest* were to be settled." CONCEX Resolution n°. 138, issued on April 09, 1983, permits the selling of nut trees on the foreign market (Souza, 1988: 130). Pinto was correct in predicting at that time that official permission to bring these species to the export market would eventually generate a demand inevitably

leading to the generalization of this kind of exploration in other areas. The federal government's incapacity to maintain control over the different actors involved, impelled by the intensive exploitation of native species, has made many species of trees extinct in the area. The threat to the survival of the nut trees has even reached zones where these species are abundant, as in the region known as the Nut Tree Polygon, encompassing many towns in southern Pará. This area has undergone the most rapid and most devastating destruction of extractive zones anywhere in recent years. Nut trees were burned by farmers and small growers or felled for sale by wood-processing companies. What is left is useless land.

In addition to the loss of the nut trees, other impacts on the ecosystem caused by forest devastation are beyond assessment. The presence of biomass at the bottom of the reservoir has implied expenses which Eletronorte has preferred not to disclose, as a number of measures had to be taken to avoid damaging the complex system of turbines by plant life in decomposition. Damages to the water and, consequently, to the living conditions of the community under the influence of the project, however, did become public. Among the problems, the most serious are related to the water. In 1988, a plague of mosquitos broke out. It was serious enough to spur protests by the Committee of Families Affected by the Tucuruí Dam (CAHTU), with the result that the mayor of Tucuruí declared a state of emergency. The areas affected were located in the districts allocated to the populations who had been evicted from their previous homes by Eletronorte and settled by programs according to the guidelines of the Federal Government's National Institute for Land Reform (INCRA).

4.2.2. Threats to the Way of Life and the Movement to Defend the Livelihood of small farmers

As can be seen, the construction of the Tucuruí Dam brought about significant changes in the level of living of the inhabitants in this area, the most important being the fact that forms of relationship with the new actors, the companies, especially Eletronorte, have become a part of their everyday life. Relations were permeated by confrontations and negotiations which have lasted for over a decade. There has been constant tension over the concept of land use and over the right to citizenship. The political aspects involved in these questions must be brought to light, to enable the reader to understand the social movements and the nature of the struggles which began in the region simultaneously with the beginning of the construction of the dam. Besides giving a new direction to the internal dynamics of these groups, these movements have developed ways to defend their forms of work and reconstruct their own sense of identity. (Castro, 1989: 42)

The affected population was composed only of native groups, but also of small rural producers who used to combine their farming with nut collecting and fishing. They were therefore polyvalent workers, a typical system in several Amazonian areas. Some of these growers would plant their crops during the less rainy, reflux periods along banks of the Tocantins River and its affluents.

The company had conducted socioeconomic studies to aid in the decision as to the number of families to be evicted and the conditions and forms of work they would need to survive. Nevertheless, their socio-cultural systems, occupational standards and land use were all ignored, as well as their rules of tenure and relationship with the surrounding society. Based on authoritarian patterns of relating with local communities, Eletronorte began the process of expropriation, justifying its actions by Federal Decree n°. 78, 659 (Nov. 1, 1979) which declares as public utilities the lands it was interested in, located in three towns: Tucuruí, Jacundá, and Itupiranga.

Tensions arose during the process of eviction between the Company and the local dwellers, as the land belonged to the latter for many generations. The small growers organized themselves politically, intending to guarantee their threatened rights. The result was the Committee of Representatives of Expropriated Families of the three towns. They demanded the rights of some 4,500 families and a more transparent Resettlement Policy (ARCA Magazine). Despite the pressure from the population, however, action by the company to settle those families in other areas, as determined by the government agencies responsible for land matters (the Land Reform Institute and the Pará State Land Department - ITERPA) were considered arbitrary and most of the small producers refused them. Serious conflicts ensued. Most of the producers, for example, rejected the proposed indemnities as being insignificant and already wasted away by inflation. Since their life projects had suddenly been frustrated, these families went through periods of great insecurity, as they were prevented from working and producing while being displaced from one area to another.

“Far from their former culture lived along the rivers, when their daily sustenance came from fishing, fruit and crops, the first group of families, resettled in the Moju Settlement, on Highway PA-263, had only dry, unfertile land to work. In the first years they were forced to buy goods which they themselves had produced or were formerly close at hand, such as flour, fish, and fruit. They also had to abandon their traditions in the use of medicinal plants and, in short, had to invest time and energy to create a new habitat for living and working.” (Castro, 1989)

“We used to live on our own land, in Breu Branco. We had a house near the center of town, on a street. There was land there, and our house. For us there were always plenty of fish, game was easy to hunt, life was different. The land would give us everything from beans to watermelon, maxixe and everything else we needed. But here we plant beans, bananas and other plants, but nothing

grows.... If we want to eat, we have to buy, a kilo of beans, a kilo of fish, in the town...." (Resident of Area 6, Lot 5, on Highway PA-263).

Many families who had settled along this road were victims of a strong chemical substance which Eletronorte sprayed in a strip 100 meters wide along the power transmission lines from Tucuruí to Belém (Highway Tordon 101 Br and Tordon 155). With this substance, the company intended to prevent the thickest vegetation from growing back. The transmission lines cut across land where there were houses and crops, and during the winter of 1982 many diseases broke out, bringing death to many, causing poisoning to some people, especially children. There were also losses of crops and animals. Many families were forced to abandon their lots. There were public outcries, and a task force was formed by civil associations which perceived the severity of the disaster against the human community and the forest.

In other settled areas problems arose over the infertile and dry soil, bad roads and lack of social substructure, such as schools and health centers. In short, the members of the community claimed the right to maintain their previous standard of living, as the losses suffered had been considered enormous. Today these people continuously speak of how their standard of living worsened, as can be seen from this interview:

"... everything we had went with the change.... The land we received [from the Federal Land Reform Institute], you couldn't work on it.... We had to leave our land and look for a job to raise our children.... We left our cattle with other settlers, and they got sick and died. Here, to tell you the truth, we have nothing. The land doesn't produce bananas, corn or rice." (Resident in Area 9, Lot 8).

This comparison between the population's way of life before and after the dam and the new kinds of relations which the community had to establish with its surroundings is unavoidable.

"Where I used to live I could get anything... cattle, manioc, rice. Everything you planted you could harvest, such as bananas, guarará, oranges,

lemons, papayas, pineapples... even pork and poultry. This land here is completely different. There I used to plant and harvest rice. I could sell and eat and there was enough corn feed the chickens. There was a lot of corn. Here there is only manioc and nothing else..."

(An Area 12 resident, Lot 16, Km 58 on the Funai/Tucuruí Road).

It can easily be seen how attached these people were to their former homes. They knew their territories well - the river, the "igarapés", the jungle, the land around their houses. All these aspects came back to them during the interviews as they remembered their homelands. The memories link the past that is gone forever to the present which they are still building. Their once intimate relationship with nature and the particularities of the jungle inspires legends, such as that of "amazon porpoise" [*o boto*] or the one about "*matinta pereira*" or about "*saci pererê*", magic beings that people believe are inhabitants of the forest and protect the wild game against ambitious hunters. This continuity found in the symbols of these people can be especially perceived in the creation and recreation of the group through their work in the forest, very different from salaried work, as the former is no much more closely associated with life as a whole.

Other depositions by residents identify different kinds of problems such as those related to production, housing, urban services or access by road to the markets where their products are consumed, since in their prior homes, goods were transported by river. They emphatically disagree with the present difficulties in owning land, the size and location of rural land and the design of the houses and towns, which are not adequate to the tropical climate. This is a community with numerous diversities which, notwithstanding, Eletronorte tried to treat homogeneously. The resistance movements and the struggle put up by these residents will eventually restore this diversity, and specify the varying claims and priorities defined by the workers' associations. This process also revived the organization of labor unions and, later, the political parties through which the population is able to

participate in public life. The results achieved upstream from the dam must be credited to these families, as they managed to restructure part of their way of life, forcing the company to pay for at least part of the burden involved in restoring to their lives, improvements which took several generations to consolidate.

Downstream from the dam, problems took on a different aspect. Since 1984 fishermen and small growers in lowlands (abundant in the islands in the Tocantins River) and on solid land, were concerned with the changes in the quality of the water and the balance of the fauna and flora systems which would ensue there after the floodgates were closed. They were uneasy about the possibility of continuing their present forms of work and the maintenance of their standard of living. Families in this area did not suffer from direct and immediate expropriation of their land, but they were unable to continue their modes of life and work, both of which had always depended on the river.

“We had no idea that this dam would bring us any problems... We had always worked on the fishing shoals... taking in marapás, hakes, prawns, and avius... and extracting açai and palm hearts which were abundant. We used to sell from a full boat near the river bank, and go down the Tocantins River as far as Belém.”
(Resident near the river in Cametá, Pará)

In 1987 the situation worsened. Impacts on the environment, particularly on the quality of the water, became dramatic. The population began noticing changes in the color of the fish, a lessening in the time the fish could be kept out of water, and even fewer numbers of fish. There were also changes in the production of small farms and lowland extraction. Upstream, as we have seen, the outbreak of a mosquito plague forced the residents to evacuate the area, and once again working conditions became more difficult, if not close to impossible. (Castro, 1989: 64)

4.2.3. Greater Social Resistance and New Issues

Initially dispersed, but gradually working more and more closely together since the mid 1980s, rural workers upstream and downstream from the dam began to make common decisions involving the environment in the Tocantins area and the reproduction of their ways of life. This association strengthened negotiations with the company and government agencies, imposing recognition of their political representatives. The movement grew quickly, in association with other organizations in the struggle for citizens' rights, including respect for traditional relationships toward the forest and the river. As a result, the alliance of indigenous groups affected by the Tucuruí dam was founded.

“The construction of an identity among families affected by dams on the Tocantins river illustrates a long period of learning of political skills, often through a process of trial and error. The most immediate element which reinforced the population's political and cultural organization was the right to live and work on the land they occupy. In the process, they learned that political achievements depend on how collective actions are conducted. This was a process which involved the maturation of these persons into political subjects, acting within conditions determined internally and externally to their environment.”
(Castro, 1989, 68)

These hydroelectric projects (the example of Tucuruí was later followed by an even greater social and ecological disaster, the Balbina Dam, in the state of Amazonas) have resulted in deep alterations in the way of life of regional populations, destruction of the environment (forests, rivers and fauna), concentration of the land, modification in the structures of work and impoverishment of the small rural producers.

4.3. Pig Iron Plants and Deforestation Along the Carajás Railway: From Small Producers to Wage Earners

Not only Paraupébas, Marabá and Tucuruí were affected by the changes brought about by the Carajás Iron Project and the Tucuruí Dam. The construction of the Carajás Railway and of Highway PA-275 also played an important role in the deforestation of the region. Values of adjacent land always skyrocket after roads are opened or improved. The two roads mentioned improved access to new areas, not only for the large land owners and companies, but for new migrants as well. The results were dramatic, as land prices were already high when the Grande Carajás Project announced new investments and repeated its usual strong ideological appeal to the progress that *should* ensue. As a result, land values rose even more. Fearnside (1989) warns that the "sudden increase in land prices is due not to the effort of the present owners but to the expansion of the highway systems, which are paid for by taxpayers everywhere in the country." Experience has shown, moreover, that even before construction begins on a large project, impacts start to occur, as workers migrate to the area in the hopes of employment. In general, these effects are not assessed in the Environmental Impact Analyses, required by law for any type of construction project. Costs of the mobilization of the labor force are paid for by the community, as the demands for services (health, education, settlement, sanitation, etc.) increase considerably. The conditions are then present for the formation of a reserve of cheap, available workers. First workers came in search of land and gold. More recently they have settled in urban concentrations, results of the process itself, in the desperate search for jobs.

New villages appear on the map as the highway, river and railway complex is laid down. A number of roads were built in southern Pará with funds from varying sources, including the Vale do Rio Doce Company, thus facilitating transportation between the Carajás Sierra and Marabá. This route

includes towns such as Paraupabas and Rio Verde, as well as mining areas, including Serra Pelada, Curionópolis and Eldorado. At the crossroads between Highways PA-275 (Paraupabas to Eldorado) and PA-150 (Eldorado to Marabá), many side roads have been built, which have redefined the local geography. Eldorado is a town which was born when road construction began. The road leads to the south of the state of Pará and on to pre-Amazonian areas in Maranhão, a region between Imperatriz and Açailândia. The road goes to Marabá, where there is a bridge over the Tocantins River, which provides easy access to the Belém-Brasília Highway and southern Brazil, by Highway BR-222. The Transamazon Highway, which also goes through Marabá, heads toward the northeastern and central-western regions of Brazil. From this geographic perspective, the Carajás Railway takes on new importance. It becomes the backbone of the recently established industrialization process in southern Pará. It also shows "a remarkable and inevitable creation of areas which go under the name of farm lands but which, in reality, are clearly destined for land speculation, as the result of the progressive destruction of the forest" (Ab'Saber, 1987). Ab'Saber (1987) then goes on to tell of soils which "are transformed into broad pastures and secondary forests dominated by "*embaubais*" and "*capoeiras*," trees which grow very slowly. Thus the strip of Amazonian and pre-Amazonian regional forests between transitional forests and meadows and pastures is threatened with total destruction within a short period."

As a result of the construction of Highway PA-70, the town of Morada Nova was built in 1968, and the works for the highway-railway bridge increased the density of the population. The termination of the works posited a difficult decision for the workers: stay or move on. For those who stayed, the need was to find a piece of land where they could plant their subsistence crops and wait for better days. A survey conducted in 1987 in the city limits of Morada Nova showed that, of the 400 families entitled to receive milk from the Federal Government's Nutrition Program, 90% of the heads of the households were unemployed. They were able to earn some

money doing odd jobs or they tried their hand at small-scale agriculture (NAEA, Research Report, 1990).

The most important factor in this area depends on the official policy of industrialization, with the establishment of pig-iron plants fueled by charcoal. The Grande Carajás Program called for industrial installations along the Carajás Railway for steel products, agro-industry and foresting activities. Backed up by the Vale do Rio Doce Company, Grande Carajás Project's Interministerial Council approved a set of projects aimed at the installation of charcoal-fueled steel plants, to be located in Paraupébas and Marabá, in Pará, and Açailândia, Santa Inês, Rosário, and Perdizes, in Maranhão. The principal issue in the debate in setting up these industries concerned the type of charcoal to be used. This charcoal is obtained in eastern Amazonia by burning vegetation in forest reserves. This process represents one more threat to the Amazonian biomass, through the same rudimentary processes which have destroyed the Atlantic forest in Brazil, from north to south. The pig-iron plants installed in Minas Gerais, the country's major center for such plants, have been faced with the limits imposed by nature, as the native forest is slowly disappearing. By the time the charcoal, responsible for 50% of the cost of pig-iron production, reaches the plants, its prices are already high. Even so, according to estimates by the Minas Gerais Society of Forest Engineers, lumber production in the state will have been totally discontinued within 10 years.

Reforestation plans have been continually thwarted in Brazil. In Minas Gerais the area reforested by companies comprises 2 million ha, representing only 2% of the state's total demand for wood (Pinto, 1989). If the discourse of management and reforestation by the companies had any practical results, it would probably not be necessary for them to go to the Amazon, thousands of kilometers away, in search of charcoal. They might not even be so interested in migrating to Amazonia.

Official data has shown that when there reforestation does take place, it recovers a much smaller area than that destroyed. Data on Brazilian steel plants show that, in 1984, 83% of the charcoal used came from the

burning of native forests (Codebar-Sudam, 1986). Preliminary calculations of consumption of charcoal, requested by the Grande Carajás Project, estimate the need for 1.1 million tons/year to operate only 9 pig-iron plants and 2 cement plants. This corresponds to 16% of the Brazilian domestic production for all steel plants everywhere in the country (CODEBAR/SUDAM, 1989).

The argument to the effect that charcoal, used as a reducer in combustion furnaces, is responsible for the high quality of the iron produced is backed up by government technicians and businessmen, who add that the use of coal obtained initially from the native forests will gradually be replaced by charcoal taken from forestry projects implanted on lands already devastated. The Vale do Rio Doce Company reinforces this argument by demonstrating the viability of development without ecological destruction by its reforestation know-how. This possibility is debatable, however, from the viewpoint of the maintenance of the diversified ecosystems, which are the essence of the rainforests. It is a well-known fact that the economic viability of reforestation depends on the homogeneous character of the planting process. This is a problem in itself, since the Grande Carajás Project, while projecting homogeneous planting of eucalyptus and pine in some the areas along the railway, is also making plans, for the very near future, to fence off land in an area now densely populated with landless peasants. Moreover, the Grande Carajás Project is devising programs which could cause ecological problems which have not yet been clearly studied in Amazonia.

A report recently published in the country's newspapers has informed that a private foundation is soon to be created for the purpose of obtaining international funds for selling forestry programs. Six large companies have already joined the project: the Vale do Rio Doce Company, Varig Airlines, Jari Forestry, Aracruz Cellulose, Simão Paper Company and Ripasa. The Vale do Rio Doce Company is interested in making the Forest Nuclei Program viable in areas along the Carajás Railway. The program calls for investments of US\$ 5,000,000, and proposes reforestation by planting eucalyptus in an area of 1 million hectares over the next 10 years (*Gazeta*

Mercantil, 8 March 1991). It is, therefore, a new moment in which the logic of investment in the Amazonian environment would seem to be offering a new product, the so-called "forestry farms". This idea may be new as project, but it is absolutely consistent with the current model, which calls for massive projects of land concentration, which generate social tensions. As an aggravating circumstance, it works against the diversity of the ecosystems, indicating a period of homogeneous planting, which, in previous experiments, has proven to be an inviable model.

The steel plants may be the hardest blow to the heart of the forest. Plants installed in Marabá (Cosipar and Simara) consume charcoal brought from nearby towns, such as Jacundá, Tucuruí, Itupiranga, Paragominas and Paraupbas, all within a 300-Km radius. Plants located in Açailândia (belonging to the Pindaré Valley Company and the Viena Maranhão Steel Plant) have bought coal from farther away, sold by suppliers near the frontier in southern and southeastern Pará, where pig-iron and lumber companies from Açailândia have recently acquired a great deal of land. They thus reinforce the deforestation belt which can be easily identified on the maps. In Açailândia the situation is even worse, since its soil has been degraded by cattle raising and wood extraction. The installation of pig-iron plants there takes for granted the use of wood brought in from other municipalities, especially from the south of Pará, which may take place by one of two ways. The first is the direct purchase of coal from suppliers in Pará, who are sometimes lumber companies which have furnaces as part of their own installations (highly concentrated in Paragominas, for instance), or they may be small growers who make charcoal as a backyard operation. The second means is to buy wood from third parties or extract it on their own lands and send it to Açailândia (Field Research, 1990). The wood-cutting sector in Açailândia became an important factor in the deforestation process, which also encompassed neighboring towns in Maranhão. Interviews held with lumber businessmen in Açailândia have confirmed how companies rushed to buy land in all regions of Pará. The manager of the Cikel Company, one of the largest companies, which owns a modern plywood plant in Açailândia,

declares they have bought an area of some 60,000 ha in Santa Inês, Maranhão, which will enable them to continue in the lumber business. Despite these advances, however, he believes that within 10 years he will have to leave the sector or adapt his plant to another type of production, and leave the wood in the forest. He comments:

"...I think that, having to go farther for raw materials, the trend for the companies will be to implant new factories for more sophisticated products. When raw materials are abundant... people will look for what's easiest. When they get more rare, though, they have to diversify their production...." (Field Research, 1990)

At present, in Açailândia, the last existing forestry reserve, located in Itinga, on the border with Pará, is used as an area of forestry management by the Pindaré Valley Steel Plant. It holds a type of contract with the Galletti Brothers, the principal economic group in town, whose technical basis for accumulation has come from wood extraction and processing since 1972. However, the technique used is highly controversial. The trees are felled according to their age (calculated by trunk diameter). As a result, the thinnest trees are removed first and used to produce charcoal, bringing about a biological imbalance which the forest cannot recover. On the other hand, the sawmills are interested in the hardwood species, which have larger diameter. The handling and reforestation programs announced by the pig-iron companies are very likely to result in devastation of the forest coverage, but this practice is legitimated officially, since it is backed up by the dominant ecological discourse. This discourse has disguised the ecological disaster it causes with speeches about forest management and reforestation.

4.3.1. New Workers on the Frontier: Pig-iron Workers and Charcoal Producers

The rush for land, as well as the traditional occupation process experienced by the small producers who arrived when the construction of the Belém-Brasília road began, resulted in the elimination of the subsistence farmers, who have been constantly pushed back toward southern Pará in search of new work areas. The creation of a labor market in Açailândia, Marabá, and in other regions of southern Pará is a consequence of the breakdown of small production. Wood extraction and cattle raising invade these areas at first, followed by massive expropriation processes. Workers, both men and women, most of whom are young, make up the labor force to serve the sawmills, civil construction, temporary work on the farms, wood extraction and mineral prospecting. To survive, they have to adapt to different work processes. The interview below tells something of the history of a 28-year-old man as a worker. His story is typical for this region:

“...Uh, I left gold mining because I caught malaria and it was painful work... I was looking for a job in a sawmill in Paragominas and I thought that a sawmill wouldn't do either... But I worked in several of the m: São Francisco, Eletrolar, Madeireira do Gás, Cláudio... Later I got a job in the construction of the North-South Highway. For a while I was a hod carrier, too, and then I was a truck lubricator...”

(Worker in a pig-iron plant in Marabá)

Most of the population have a common origin: small-scale agriculture. They plant subsistence crops, supplying the local market, and finally they move away in search of other work to do, as they have no land.

“Well, when I started to work my Dad was a planter, so I started to help him... I was 12 and I stayed there for a long time. I kept working in

small farming. But I realized my friends were going away.... I left too. I decided to be a gold miner. At first everything was fine, at Cumaru. I spent 6 months there and then I came back to planting... but my Dad has no land..." (A Paraupebas resident)

During this process of organization and re-organization of the territory, followed by other processes which establish and break down labor relations, a first-generation labor force was hired to work in the pig-iron mills. Statements given by workers in the plants in Marabá and Açailândia show that they inevitably bring their experiences, dreams and frustrations as small farmers into the factory. They face everyday life in the plants, where time is regulated by the rhythm of the furnaces and where clearly delineated ranks are set up between layers in the hierarchy. Many issues are related to this moment as an industrial working class is forged in Amazonia. Looking back through the years as wage earners, how do these workers perceive the Grande Carajás Program and the process of development? From their social standpoint, what expectations have they built up for a new way of life? Fundamentally, what has changed in their traditional relations to the earth and to nature? And what dimensions of territoriality are being re-arranged? From the observations we have been able to make until the present, the essential elements for understanding the dynamics on the frontier can be described from the point of view of the new salaried workers who went to work in the pig-iron plants, namely, metal workers and charcoal makers.

The first point to underscore is that the number of workers made available for the pig-iron plants is insignificant, in comparison with the funds and incentives offered by the federal government. On the other hand, the occupational profile gives more importance to the physical effort required than to the candidate's professional qualification. This is reflected by the low wages paid to the workers. A study on the area of the Carajás Railway questioned the assertion, commonly made by both government officials and the workers themselves, to the effect that there is a "direct relationship between training and absorption of workers by the market. In

other words, [the dominant opinion is that] the local labor force has not been adequately employed in the grand projects due to lack of training." (UFMa/Sudam, 1989) In order to better understand the nature of the jobs generated and thus better evaluate the Grande Carajás Program, a number of questions must first be answered. (a) How are these new relations of labor and power established in the border areas; (b) How do the forced migrations affect the traditional knowledge which the individuals bring with them; (c) Does this kind of enterprise begin to create an industrial working class or, since the contracting of these workers brings with it no possibility of climbing up a professional ladder, is their employment seen merely as a temporary job for short-term wages? (d) Do labor and market conditions impede considering the Grande Carajás Project in terms of development?

In fact, what takes place is a formal relationship between companies and workers, and between a job and the worker's identity as an industrial metal worker. The official declarations that metal industries are tantamount to progress are, in fact, present in the workers' imagination, although in a fragmentary and contradictory form. Some who dreamed of being metal workers have faced the concrete difficulties seemingly inherent to the work, such as the high temperatures and the risks of accidents. They have thus developed another discourse, which can be seen in the words of one pig-iron plant furnace operator:

"I've got to get another job, but not in a metal plant this time. Never again... this is not a job for anybody. If you have to work, you'll work at anything, but in there is only repression. It's unbearable. A lot of the workers submit because they're afraid of being fired. The foreman is always threatening us to 'give us the balloon.' The balloon means to cut your day's pay.... so you work for nothing. Did you get that?"

For workers coming from a rural environment, whose life has been regulated by natural cycles (summer and winter, high and low rivers, etc.)

with given standards for reckoning time, the work in a factory plant is seen as a place of repression, of slavery.

“...In these companies you can find work, but the problem is that employees are in slavery... We are captive there because there are only two plants in operation, so we have to put up with anything. We can't leave because if we do, we won't find any other job, which is even worse.”

The absolute need for a job forces the urban population to look for work in the pig-iron plants. Research data reveal that most residents in the Industrial District of Açailândia-Piquiá have already worked at least in one of the two plants in the area. Almost all of them also had previous jobs in sawmills. These are everyday life experiences which are incorporated into the cultural references of a migrant community. They frequently refer to that experience when speaking of how the factories operate, conditions for labor and health of metal workers, air pollution and deforestation, union claims and struggles. Fear seems to materialize in their narratives about the stages of the labor process in the plants, the fire spewing out of the furnaces, the melted slag, the company's unconcern for health and safety. One supervisor referred to the usual behavior of the workers who first go to work in the plant, such as the fear they have the moment the mouth of furnace is opened. A moment of dread and tension as the temperature goes up to 1000 degrees centigrade. This can also be the moment when the worker backs down and gives up his newfound job. One worker states it like this:

“...Some day, I will get away from the mouth of the furnace. This is my only desire...”

In analyzing the impacts of the grand projects on people's ways of life, the field and the role of these transformed, violated subjectivities must be set down. These are people living in conflict with the past, with the experiences accumulated when they worked in extraction and in the days as small farmers. In the past they were able to feel the relative autonomy of

their farming, a situation which implied a different relation to nature, a different territoriality. The wear and tear on the body, the exhaustion caused by long working hours and the rotation of the shifts impose other habits and undoubtedly influence the representations of these populations on the place occupied in their lives by work in the pig-iron plants.

On the other hand, rapid turn-over is unable to hide these workers' dissatisfaction with their jobs, their working conditions and, especially, the low wages. One furnace operator said that his salary was not enough to replace the "kilos [he] sweat off in front of the furnace." In the words of a worker who unloads bins of charcoal rolling into the plant:

"I was registered at the company and there I pulled a cart full of charcoal to mix the bauxite, limestone, crushed rock and everything else that goes into a pig-iron furnace. This work was just too awful. The overseer didn't care about us because it wasn't not an important job, like a furnace operator. We earned almost nothing there. It's so disappointing because you can't buy anything with it... It's humiliating. It ruins most of us. Being a factory worker is just not worthwhile."

These references to the low wages paid by the companies came up again and again in numerous interviews. A worker from Açailândia tried to describe the relationship between the quality of this kind of job and the speeches about progress given by the Grande Carajás Program managers.

"I heard that the Grande Carajás Project was aimed at benefitting people, especially the workers. But I haven't seen any benefits at all so far. Only those who already have money are benefitting, isn't that right? The wages we earn, even if we work overtime (when there is overtime) is nothing, especially if you have 2 or 3 or 4 kids. You can't even feed them. What can you do with a salary like that? This is what you call the Grande Carajás Project..."

Rapid turn-over is the other facet, a visible expression of the instability and uncertainty in this labor market. To become a metal worker as a professional choice - and the workers in Marabá cite the example of the

strong, combative and respected metal workers in other places in the country - is rare nowadays, considering the conditions provided by these companies with plants along the railway. This is the assessment made by the directors of the Metal Workers' Union in the State of Pará, Marabá Section. Not surprisingly, the highest turnover rates are found among the workers said to be less qualified and who, therefore, earn lower wages. The monthly average rate of admittance and dismissal is approximately 40 workers out of a total of 200 men working on and around furnaces. Another impressive average rate is that of permanence in the plant: three months.

In the workers' perception, if rapid turnover is the most noticeable aspect of work in the plants, it also opens the door to many who roam from one place to the other in the region in search of an "easy" way to find a job. It is important to understand the logic of all this movement throughout the broader area. Groups, friendships and relationships are continually built and reorganized. This is a world open to constant ins and outs of persons and families who must now go through life constructing and reconstructing the many aspects of their daily existence. A furnace operator's assistant expressed this way of living simply by identifying himself as a "man working in the middle of a road". In other words, he is "more likely to go back and forth than to stay". Another dimension of life in the region is that almost everything tends to be temporary, including, or perhaps especially, the labor market (Castro, 1990). What are the particularities of this dimension of life, and how is information passed on from one person or group to another? There is no doubt that information on job fronts, new companies and openings, and trends in recruitment does get around. In short, information on what is important, from the viewpoint of the strategies which maintain the logic and the dynamics of the this market, is circulated throughout the entire population.

4.4. Environmentally Protected Areas, Large Projects and Impact on the Livelihood of the Traditional Population

Amazonia today is a region with many conflicts between the traditional population and environmentally protected areas. There is a growing tendency to attract dwellers to the large mining facilities and national parks. As was mentioned in the introduction to this article, many of these environmentally protected areas were established in the same regions as the large projects, frequently in compliance with recommendations of financial institutions such as the World Bank, to counterbalance pollution and the ravaging of nature. The so-called Environmental Impact Analyses, now required by federal law before any large project is implanted, and paid for by the companies themselves, have actually ignored the very existence of small-scale producers in the respective areas. According to the rationale of a corporation, the suffering of a few scattered human communities, displaced from their homelands, is easily justified in the name of progress of the nation.

One example of the double impact of large mining projects and environmentally protected areas occurred in region of the Trombetas River, near Óbidos, where descendants of black slave live (Acevedo and Castro, 1993).

In 1979, the Brazilian Institute for Forestry Development (IBDF), later transformed into the Federal Environmental Institute (IBAMA), established the Trombetas Ecological Reserve in an area settled in the 19th century by Blacks who had escaped slavery and who built there a free community (in Portuguese a *quilombo*). With the establishment of the Ecological Reserve, the means of livelihood of these communities, such as harvesting nuts, hunting, fishing and slash-and-burn agriculture, all became illegal acts, although they had been part of their traditional life for well over 100 years (see Acevedo and Castro).

“Twenty-five families living near Lago Jacaré (Alligator Lake) were threatened with expulsion if they refused to leave the area voluntarily. And there were precedents for this type of action, when 90 families were violently evicted by the Rio Norte Mining Company, receiving an insignificant compensation for their property... The repressive tactics of the Institute for Forestry Development caused a revolt among the population and helped them to organize an association. They also realized that the Brazilian Federal Police were acting jointly with the mining company, since there was a police station inside the company's compound. In the reports of the Forestry Institute, the role of the police was to ensure surveillance over the Environmentally Protected Area and the mining company's land against the traditional dwellers.”
(1993: 162-163)

The Forestry Institute (IBDF/IBAMA), with the aid of the Federal Police, confiscated the community's working tools, such as axes, knives and fishing and hunting equipment. The local population then began referring to both government agencies and the company as “foreigners”.

In addition to the Trombetas Ecological Reserve, on the left bank, the Environmental Institute created another reserve, the Saracá-Taquara National Forest, on the right bank, and restricted most of the traditional activities of the population which remained in the area. In the opinion of the local community, the establishment of these ecological reserves has engendered generalized poverty, in comparison with times past, when they lived in plenty. A 69-year old Black women described the situation in the following words:

“I wake up at night and I cry, remembering that I was born and grew up here in times of abundance. Now, if I want to eat an egg I have to steal it. The Forestry Institute does not even let me have an egg to eat.”

For these descendants of former slaves, the practices of the environmental authorities have meant a new type of slavery, as their lands and their sacred waters of the streams are ravaged.

Some occupants have been displaced from one place to another by the Santa Patricia Mining Company, the Federal Forestry Service and Alcoa (Aluminum Corporation of America).

“We live here in a continuous struggle, ever since they set up the ecological area across the river from us. The police are throwing people off their land. They come and pack up people's belongings against their will. Sometimes they set fire to the thatched-roofed houses...”

The families who abandoned their homelands were forced to live in along the banks of the rivers in squatter areas, close to the companies' headquarters. They are disparagingly referred to as “the Blacks from along the river” by the companies' administrators, implying that they are nomadic, lazy and unproductive.

It is clear from this description that there is a comfortable alliance between large corporations and state interests in depriving the traditional populations of their livelihood, as they are considered an obstacle to modernization in the jungle. Modernization is seen by the mining company administrators as the antithesis of traditional ways of working and making a living. For the administrators of environmentally protected areas, ecological modernization means natural forests without their traditional inhabitants, making a clear separation between man and nature. In other words, ecological modernization will be the consequence of economic modernization. One gets the impression that the existing state and industrial bureaucracies consider that there is no place for the traditional dwellers in the forest, regardless of their historical contribution to the conservation of nature.

Groups who live in the *quilombos* (land of ex-slaves) along the Trombetas River, however, are trying to organize associations to fight

against the expropriation of their lands and culture. In 1989 they filed a suit in the Federal Courts and called attention to the question at the Lelio Basso International Forum, held in Paris in October, 1990.

5

INDIGENOUS PEOPLES IN SOUTHEASTERN PARÁ AND DEFORESTATION*

If the so-called “Grand Projects” have had an intense negative impact on the population in southeastern Pará, these processes of accelerated social and economic changes have had even more disastrous aspects from the point of view of the indigenous peoples, whose traditional habitats have been seriously affected. Their living conditions have worsened, and the permanent challenge in their lives today is how to deal with adversities while maintaining their distinct societies, with their own history and identity.

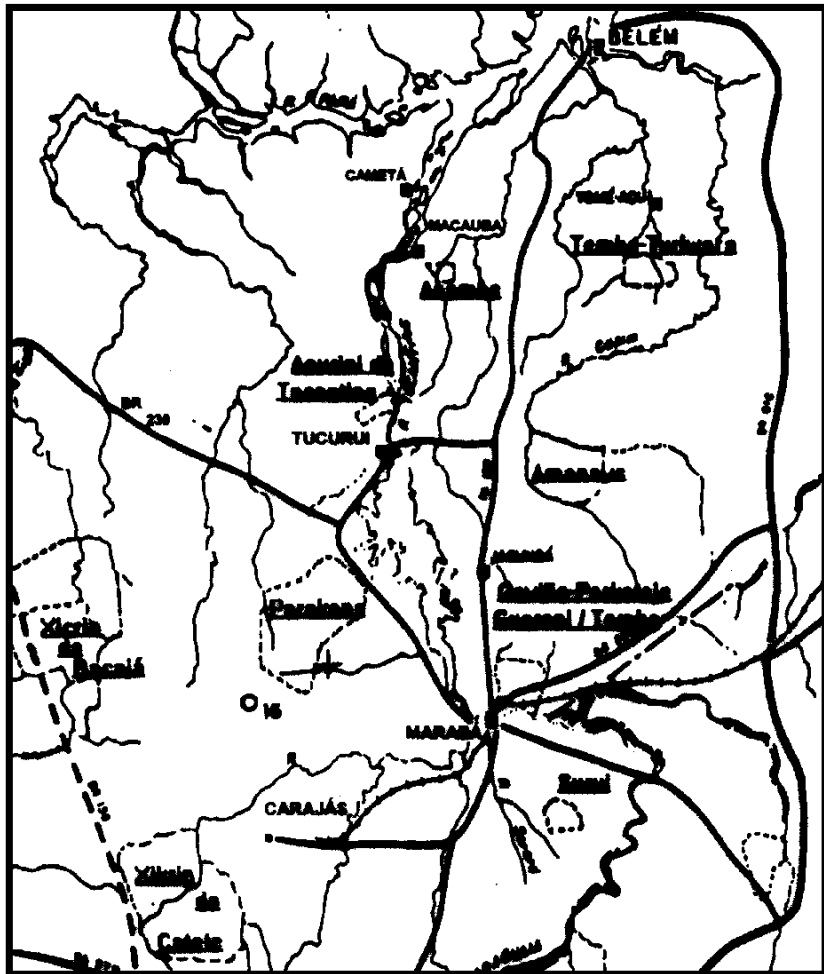
Indigenous peoples have been under heavy pressure from the intense environmental degradation of the land, and have been developing specific strategies on their own to face the on-going changes.

Since their traditional lands are located in areas where the "grand projects" in southeastern Pará have been established, three peoples in particular (the Parakanã, the Parkatejê and the Xicrin) have been directly affected and another two (the Tupi groups Aikewar and Asurini) less directly, although no less significantly (*see map 04*).

To provide the reader with a clearer understanding of each group, a detailed description is given in the Appendix.

* By Iara Ferraz of the Center for Work with Native Peoples (CENTRO DE TRABALHO INDIGENISTA).

Map 04
Indian Reservations in Southeast Pará



Source: CEDI, 1986

The Parakanã are a people of Tupi origin who inhabit the area between the Tocantins and Xingu Rivers. For the last 15 years they have been divided into two main groups, which were first contacted and displaced by the white people during the construction of the Trans-Amazon Highway. Since then their numbers have been decreasing as the result of diseases transmitted by the road workers. Beginning in 1976 they were again displaced by the construction of the Tucuruí Dam. During which process they lost part of their land. Today (1991) there are only 402 Parakanã, living in two villages: Marudjewara and Bom Jardim.

The second group affected by large projects is the Parkatejês, also called Gaviões, [meaning Hawks in Portuguese].

Between 1970 and 1983, the tribe known as the Mountain Hawks [*Gavião da Montanha*] were evicted from their territory along the right bank of the Tocantins River to allow construction of the Tucuruí Dam. Although they have traditionally been rivals of the Parkatejê, they joined with some of them on the outskirts of Marabá, beside a highway in an area they were given in 1943, known as the "Indian Nut Tree Region" formerly "Mãe Maria Indigenous Area" (*Mãe Maria* meaning Mother Mary in Portuguese). At the end of the 1960s another group was transferred from Imperatriz, in the State of Maranhão.

Beginning in the mid-1970s, this land rich in nut trees, which is the basic source of subsistence for the group, began to be destroyed to give way to massive governmental projects. In addition to the highway which had already been cut through the territory, a high voltage transmission line was strung through it by a subsidiary of the Tucuruí Dam Project and, more recently, the Carajás Railway was also built there. Cutting through the southern part of the indigenous area, the railway gave rise to a small town, soon surrounded by squatters and landless people who moved in.

The Xikrin Indians of the Cateté River, like the other Kaiapó groups who were relatively isolated from the economic fronts in southeastern Pará until the end the 1970's, saw the southern section of their territory cut through by a state highway and invaded by a large farming and cattle-raising

company which was allowed to build in the area because of the connections between its owners and persons in high places in the federal government. While all the remaining Kaiapó sub-groups presently have to face intense and predatory extraction of gold and wood from their territories, the Xikrin of Cateté must endure the power of sawmills and lumber enterprises. Owing the land to the east of the Carajás mine, the Vale do Rio Doce Company had to come to terms with the Xikrin to safeguard its public image. It thus allocated funds for permanent assistance to the group (according to Federal Senate Act 331/86, which also gave the company real rights to explore the so-called "Carajás Mineral Region", an area of over 412,000 hectares). These funds, also made available for the Parkatejê do not ensure the integrity of these indigenous territories, however.

The three cases can be seen as paradigmatic of the direct consequences which arise from the "development-at-any-cost" model, which brought about deterioration and rampant violence in southeastern Pará. The other two Tupi groups in the region are the Aikewar (also known as the "Surui of Pará"), whose territory is located to the South of Marabá, near the lower Araguaia River, and the Asurini, on the Trocará River, to the left bank of the Tocantins River, 24 km upstream and to the north of the Tucuruí Dam. They have all remained in what could be called the outskirts of the grand projects in the region, but they have been less seriously affected.

A drastic reduction in their territory confined the Aikewar into an area where their fundamental sources of survival were taken from them, as well as their historical points of reference. Sites for hunting, extraction, ancient hamlets and graveyards remained in the hands of sharecroppers who settled there during the 1940s and who claim to be owners of the nut plantation. They had been hired as mercenaries by the armed forces to fight the guerilla there during the 1970s. The promise of revising the limits of the territory as a "reward" failed to benefit the Aikewar. The area, as delimited by the Indian Department in 1983, reduced the claimed land to half its former size, benefitting the neighboring large land owners.

When these areas were occupied by farm workers who moved to this so-called "nut tree polygon," the land conflicts were intensified, and there were numerous violations and impunity which tragically characterize this region known as the "Parrot's Beak".

Finally, the Asurini of the Trocará River saw their tiny territory divided by the construction of the Transcarnetá Highway (PA-156), opened in the mid 1970s. The Asurini have repeatedly blocked the bridges along the road, demonstrating against the aggression to their land, which is now threatened by the construction of the transmission lines.

The industrialization process in the Marabá area, financially motivated by the "Grand Carajás Project" and the installation of pig iron and manganese alloy plants, fueled by native charcoal, increases the pressure for re-allocating the lands located there, since they are the few areas where forests can still be found.

The Social Movements of Indigenous Peoples

For the first time in the history of Brazil an Indian group decided to call and host an international meeting of Indians and non-Indians affected by the construction of dams. The meeting was held in Altamira, Pará, in February, 1989, and it was hosted by the Kaiapó. Invited guests included Sami, Inuit and Brazilian Indians, representatives of the federal government, state electric power companies, the World Bank and environmental organizations from all over the world. On the agenda was a request for explanations by the Brazilian government regarding the electric power sector and, particularly, its plans for the Xingu River in view of the recent announcement of the construction of a hydroelectric complex. Meanwhile, in other places in Amazonia, such as the upper Envira River and the Jutáí River, more distant groups refused contact and fled deeper into the jungle.

Between these two extremes of resistance, one of organized confrontation in compliance with “modern” forms and the other of avoidance, there is a variety of local situations in varying degrees of communication with the rest of the country. In both cases, the presence of an active indigenous policy, able to confront official government policies regarding the “Indians” can be clearly seen (*see* Carneiro da Cunha, 1989).

During the 1970s, the “development” of Amazonia involved direct aggression against the rights of the indigenous peoples. New allies appeared in distant urban centers (mainly in the south of the country), particularly from independent agencies, and served as channels of mediation for the struggles and claims of these indigenous peoples. These agencies serve as direct consultancy institutions (legal, educational, etc.) in contrast to government activities (particularly the Indian Department) or in other activities aimed at calling the attention of public opinion or producing and, indirectly bringing to the Brazilian native peoples notions of civil rights and their violations.

Progressive sectors of the Churches have also redefined their activities. Through the Roman Catholic Indigenist Missionary Council (CIMI), created in 1974, the first assemblies of Indian chiefs began to take place on the regional and national levels. Among several groups, such as the Xavante, Parkatejê, Tikuna, and Kaiapó, a stronger identity could be observed as a result of these encounters, including land repossession and delimitation, or autonomy in relation to the economic tutorship imposed by the Indian Department. Struggles and massacres took place during this period in Xingu, and leaders of the Kaingang and Guarani, in southern Brazil, and the Pataxó in the northeast, were murdered.

Although it is not officially acknowledged, the Terena Indians in the state of Mato Grosso do Sul created the Union of Indigenous Nations (UNI), whose objective was to constitute a permanent, nation-wide federation to serve as a channel of communication among Native peoples in Brazil (*see* Vidal, *op. cit.*).

Since the beginning of the 1980s, besides the informal associations, aiming at specific actions, a number of legally registered institutions appeared, organized as local and regional bases of mobilization. The objective of these associations was to effect the correct delimitation of Indian lands and serve as organized movements to bring together groups which are often ethnically different, to face common problems (such as the attempt to delimit the Potiguar's land in the State of Paraíba in 1980, or that of the Apinajé, in Tocantins, in 1986). There are also formally constituted associations (which today are in the dozens), and they express the new strategies of direct confrontation. They are, therefore, historical landmarks for these variegated social groups, as they introduce them as subjects, political actors, recognized and respected on the national and international scenes.

Impelled by this nation-wide movement for and taking part in recent meetings (in Altamira and Brasília, among others), representatives of the native tribes in Southeastern Pará have attempted to found a regional association to defend their interests, especially in regard to land matters, and autonomous sale of their Brazil nut production.

6

CONCLUSIONS FOR SOUTHEASTERN PARÁ

The complex reality in southeastern Pará calls for extensive research which will enable those involved to re-think and re-pose questions and challenges. One set of problems deals with the relationship between traditional livelihoods and environment, which is presently the object of considerable debates. During the last decades the former have certainly changed in Amazonia, but they have not been totally disorganized. From the observation of several cases, one can see how social actors take on roles in history by constructing their resistance against large businesses which settle in their areas. To face the new political situation, forest peoples and farmers re-create forms of mobilization and find new alternatives for using the forest's resources and developing sustainable farming. Their assumptions are universality, totality and cooperation, different, therefore, from immediate and local proposals, dictated by business interests.

Among indigenous and agro-extractive groups, interesting forms of managing hunting and fishing activities can be observed, as well as the use of other natural resources. This form of living, however, has been seriously challenged, as it can hardly withstand the movement toward modernization represented by the "developmentalist model". Some interesting collective experiments have developed from this combat between different modes of production. Intensive and diversified planting is an

example, where oils, essences and tropical fruits are industrialized. These experiments have been carried out by farmers in the Araras Nut Tree Area, under the coordination of the Union of Rural Workers and CEPASP. Experiments with permanent planting is also the basis of research in southern Pará, carried out by the Tocantins Agro-Environmental Center (CAT).

Based on this perspective, the National Council of Rubber-Tappers is attempting to make explicit the close relationship between ecological and socioeconomic questions, proposing that land reform be part of environmental conservation policies. Environmental degradation is a problem which calls for urgent attention, and must be understood in terms of social problems, particularly land conflicts. This involves not only land distribution but an effective agricultural policy as well, one capable of going beyond the traditional concept of peasants, and incorporating the wide variety of workers involved in agro-extractivism. These experiments aim at organizing an economy based on complementary activities, including production from the forest, reforestation, forest management, and temporary and permanent agriculture.

Experiments go further. In Gurupá, a town on the Transamazon Highway, the use of resources has taken a turn. Attempts are now made to integrate popular wisdom and traditional knowledge with scientific and political experience. CAT itself, mentioned above, is an example. In the Araras settlement, in the town of Marabá, peasant families are trying to replace the areas of traditional nut trees which have been devastated by replanting nut trees together with fruit plantations. Another highly important question is marketing, price policies and financing.

The wage-earners who work in companies in southern Pará have not attained the same level of political organization as the peasant and indigenous movements. The seasonality and flexibility of this kind of work are hindrances to the construction of a workers' identity, which is the basis of any political organization. The workers in Carajás have seen their ways of life deeply altered, since the majority come from rural areas. They are forced

to compete with one another in a limited job market, moving from one job to another, a fact which continually reaffirms the provisional character of the identify which the companies impose on the labor force, due to the high turnover of workers. At the same time, the local population's relationship with nature, which, during their childhood, had been an important value, has been largely eliminated by environmental devastation in the urban areas and by the production processes, including sawmills, pig-iron plants, charcoal processing and mining, among others. A certain amount of resistance is necessarily present, but is highly limited by the dynamics of the labor market.

This reality has brought about a new economic policy toward nature in Amazonia. Social actors in southern Pará, whether peasants, Indians or wage workers, have attempted to make environmental issues more visible. In fact, they have now become a central point at meetings, seminars, and workers' congresses. In April, 1990, in the town of Paraupbas, a seminar entitled "Search for Alternatives to Agricultural Activities" was held. Among the results was a document sent to the State Governor with the following claims: an agricultural system directed to degraded areas; organization of land use and penalties for activities which are unproductive or harmful to the ecosystems; the establishment of a Rational Plan for Extractive Exploration, aimed at preserving the nut tree forests; information on environmental legislation for the rural workers, so that the agricultural companies can be cited for illegal procedures; mechanisms to stop the production of charcoal based on the felling of the native trees; a policy for control over the sale of lumber; inspection and delimitation of areas for placer mines, to avoid pollution of the rivers. By means of their contact with society in general, these organized groups are the guardians not only of the forms of land appropriation but of the environment as a whole, because they preserve their reproduction and way of life.

7

DEVELOPMENT ALTERNATIVES FOR THE RURAL ENVIRONMENT IN SOUTHEASTERN PARÁ¹

The increasing awareness that ecological imbalances also create social imbalances calls for the definition of socio-economic alternatives for Amazonia.

Since the core of the present paper is the problem of deforestation, that is, the improper use of forest resources, alternatives must necessarily relate to the rural environment.

The Amazonian rural environment is highly diversified and complex. On the one hand, it involves populations which are ethnically and socially dissimilar, including Indians, ethnically mixed groups and migrants. Many varied occupations can also be found, such as extractors (rubber tappers and nut harvesters), farmers, fishermen, handicraftsmen and industrial workers.

It seems clear that alternatives to the unbalanced use of natural resources in Amazonia will only come from those who have immediate economic interests and/or survival interests in any measures for change. In

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the public eye the ecological disasters which threaten Amazonia and Brazil as a whole have not reached a critical point which would enable mobilization for long-term modifications. Society in general still reacts in function of short-term issues and those who think differently still have little strength to convince and mobilize.

Immediate interests of the large companies imply extensive and detrimental use of natural resources, such as minerals, timber, water resources and even tillable lands. The migrant farmers have also been affected by this same tendency during the last two or three decades. There are threats to their survival and reproduction, threats to access to the land and to the very possibility of staying on it, threats resulting from the thwarting of land reform by large economic groups. The ecological discourse has encountered an ally in the struggle for land reform and has become one with immediate interests of the population's very social reproduction. The result has been the constant and resolute participation of various types of workers in defense of the environment, as was seen be observed in the previous chapters, above, including farmers and fishermen affected by the Tucuruí Dam, growers from the nut tree polygon, squatters in southern Pará, settlers along the Transamazon highway and growers from Moju. The social process which mobilizes these groups around the defense of the environmental balance is therefore most significant and any broader action undertaken by urban society, by intellectuals or even by the State must include contact with and participation of this movement.

Images transmitted by the TELSTAT satellite in orbit over the Marabá region show an enormous, totally black area surrounded by a mosaic of white and light-gray squares and rectangles. This is the Gavião Indian reserve, an area of some sixty thousand hectares. The Gavião were evicted from their traditional lands and moved there so that space could be cleared for cattle raisers and large farms. In the 1960's they were pushed towards the Belém-Brasília and PA-70 (now BR-222) Highways then under construction. Only the Gavião Indians managed to preserve their environment, as the black blotch on the map shows. They even managed to resist onslaughts by

Eletronorte, which was stringing high-tension lines, and the Carajás Railway, built by the Vale do Rio Doce Company.

This fact suggests that the farther one goes from the traditional land use and the closer one gets to models of occupation promoted by official policies established since World War II, the more difficult it becomes to preserve the environment.

The Indians undoubtedly bear the task and responsibility for socializing the means for preserving the ecology. This is a difficult task, as everything around them urges toward savage exploitation of nature (by "civilized" men) with immediate commercial and speculative objectives. The Indian peoples, like any other society on the American continents or elsewhere, are sensitive to transformations which take place around them. Somehow they will be able to maintain their habitat to the extent that they maintain themselves relatively immune to harmful influences by the surrounding society, thus preserving their own cultural environment. How is this possible within the present political and socioeconomic context? Delimitation of Indian territories is certainly a basic factor in the maintenance of the indigenous cultural environment. These territories support the structures of a new economy which can be integrated into the cultural values of the different Indian peoples, as well as into the surrounding market. That is, they can develop a form of production which will be at one and the same time consistent with traditional knowledge, valued in the capitalistic market, and associated with forms of social redistribution of products consumed locally or taken to market.

It is also the task of those who survive the transformation of the natural environment and who are partially responsible for the devastation of the Amazonian forests to administer the sustainable use of natural resources. Small rural producers, small cattle farmers and peasants are increasingly realizing that their survival as social categories depends on the ecological economy, economy meaning frugality in the use of natural resources and well-panned management. The concept of wide-open spaces and unlimited land resources, popularized during the euphoric periods of expansion on the

Amazonian frontier, is diminishing as the wire fences extend farther and farther through the jungle, which have now become vast cemeteries of nut trees and pastures. The dilemma today is no longer between settling in this land or going farther in search of other temporary land. It has become between settling there for farming or in slums on the outskirts of the cities. Wiser peasants, more socially organized - that is to say, those who are capable of determining their own history - are aware that nature must be preserved and that this is especially true regarding the forests. At least they are of more aware of this challenge than anyone else in Amazonia.

Means to face up to this challenge must be found on short term. All societies, independent of their level of technological and economic development, have always found answers to their problems of survival, but the process often took centuries. Today rapid answers to such urgent problems must be found. Science and planning are indispensable partners of those who intend to preserve and manage a environment in degeneration. This is true for Indians as well as for peasants, but the research agencies and academic institutions themselves do not have the right to run from this challenge and responsibility.

One thing is clear: neither the system presently in use by the small producers of sustenance crops (rice, manioc, corn and beans), nor simple forest extractivism, is able to provide for both conservation and the raising of living standards of the rural population which participates in the market. Even the champions of the extractive reserve policy, based principally on the experiments carried out by the rubber-tappers, now admit the need to associate agriculture and extractivism, whether of latex, nuts or other forest products, at least in view of the present-day lack of new scientific and technological advances. Farmers know perfectly well that, on the long run, forest preservation is incompatible with the present practices of cultivation. But what can be done?

Among today's researchers and those who study small, family-based production, there is a consensus that new agro-forestry and agro-forestry-pasture systems must be developed. The terms have not yet been

clearly defined, but the issue has been the object of debates. The question seems basically to center around practices which associate varying numbers of short-cycle cultures, permanent food cultures, management of forests and replacement of forests. This may all sound quite simple, as this consensus is noticeable and is the posture most commonly found among peasants' associations and experts. It must therefore be stimulated by all means of communication, publicity and education.

Difficulties arise when attempts are made to define systems more clearly. The tradition in agricultural and cattle-raising research in Brazil has always been to concentrate efforts on sectorial or specific studies on products². Private institutions were founded with the sole purpose of engaging in research on a single product - coffee, rubber, cocoa or sugarcane, for example. Due to its economic importance, organizational structure and outstanding autonomy, a typical example is the Executive Council for Cocoa Planting Plan (CEPLAC). In a certain way, this research organization followed models of colonizing societies interested in exploiting only certain products basic for their economy and trade. Except in the field of anthropology, almost nothing has been invested in studies on systems used by peasants and native groups. This fact demonstrates how simple it is to blame the farmers as the major agents responsible for disturbing the forest environment, as often happens. It is curious to observe that the tendency to reverse this research model is not endogenous, but is inspired on new models set up in the countries from which the first colonizers came.

It is not only agricultural and cattle raising, nor forestry research, however, that should be questioned and reformulated, it is all research on environment. A certain consensus seems to be converging as to the need to approach the environment scientifically, from numerous angles. As systems, the various forms of using natural resources (land, flora and fauna) involve physical, technological and socioeconomic dimensions which are interactive and

² HEBETTE, J. and FREITAS, M. "A Questão da Agropecuária na Amazônia: Vagariosidade no Avanço Científico e Tecnológico". In: *C & T no Processo de Desenvolvimento da Região*.

cannot be broadly understood by any one specific field of study nor by any of the classical academic fields. All technological research must take into account economic and social limitations and their historical roots, models of social organization and national and regional policies. Obviously, the point is not to dilute scientific thought into a shapeless amalgam but to integrate the various studies and their scientific fields into a global view, and this requires more detailed and more specific study on some fundamental questions.

The rural environment has to be thought of as a whole. It involves much more than extractive and farming activities, it involves everything associated with these activities, such as administration, trading, health and educational services and professional, political and cultural associations, all of which are commonly found in towns and villages. There is no environmental policy which does not imply action on this diversity of groups, which suggests the importance of the municipality as a reference for research and management. It must be observed, however, that the borderlines of municipalities, in their present form, have nothing to do with the ecosystems in which they are inserted. Studies and actions related to municipalities must, therefore, be placed in the broader ecosystem.

The most recent studies and actions proposed by the broader development organizations interested in the Amazonian ecosystems point to balanced exploitation through "agro-forest-pasture" activities. This approach implies the study of sub-systems and their integrated management. Among these, forestry, agriculture and cattle raising systems are among the most important.

The forestry system is perhaps the most complex to be studied and managed, due not only to its universally acknowledged complexity, but because of the lack of knowledge in terms of economic feasibility and the non-existence of forest management practices in the region, despite the quality of some experiments. It is inconceivable that, in the Amazonian region, so little has been invested in forestry research and experimentation. It is well known that the Amazonian forests have an incredible genetic

diversity, although many of their potentialities have not yet been identified. Some of their resources (such as leaves, roots, oils, barks and wood) are traditionally used in medicine and pharmacy, energy production, mechanics and cosmetics. These resources leave the forest and are exported in their raw state, without having been processed or transformed. The technology for extracting these products is extremely elementary and wasteful. The irrational form of timber exploration is typical, but it is not the only example. If destruction of the forest is to be prevented, palliative action is not enough. Economic and financially profitable measures must also be taken; if simple wood extraction is to be restricted for example, other economic exploitation forms must be found. And this calls for extensive research.

The forest cover of Amazonia, which was essentially original until only recently, should be guaranteed by means of systematic recovery of the vegetation. Business groups have been in favor of homogeneous reforestation, generally with imported species. The risks brought by this kind of procedure have been documented in terms of dissemination of pathogenic agents. The most recent studies have shown the need for heterogeneity of species, in accord with the evolution of the local ecosystems and the diversity of uses.

Reforestation could be made favorable to a variety of needs and diversification of economic uses, including fruit, firewood and wood for construction, furniture and equipment. Peasants could produce local fruit and marketable oils, such as walnuts, cupuaçu, açaí, pupunha, cocoa, andiroba and copaiba. Some experiments have attempted to shorten the productive process, for Brazil nuts, for example. Regional trees which grow quickly, such as the *freijo*, are also mentioned.

Local agriculture has been studied more than the forest itself. As has been said before, however, the studies actually carried out are in regard to products or to determining factors (soil, climate, etc.) but not to farming systems. Monetary gain, a basic condition for the survival of small scale farmers, involves two aspects, productivity and markets.

One commercial aspect is easy to study but difficult to deal with in practice, namely, the elimination of unnecessary middlemen. A test

performed by the Agro-Environmental Center of Tocantins (CAT) during three harvest periods demonstrates that it is possible to duplicate earnings from rice by selling directly to the trade center in the region. A sustained practice such as this involves obtaining and managing specific financial credit, for which solutions have been sought.

The productive aspect of family farming is more complex. One basic fact is that the problem cannot be dissociated from animal raising. As this is very limited or almost non-existent in many places, it would seem valid to highlight it. It must be stressed how important subsistence cultures are. First of all, they are the basis of any community's daily diet. Secondly, they ensure a yearly revenue on short term. Improvement of production depends on the choice and introduction of new species, the proper use of chemical or organic fertilizers and diversification of products (which sometimes involves surprisingly numerous possibilities). Studies on family production systems are just beginning in Brazil, and many more should be carried out. Perennial cultures must also become the object of study, under both their agricultural and economic aspects. As mentioned above, all homogeneous cultures in Amazonia (black pepper, cocoa and rubber trees, among others) are subject to problems such as the spread of fungi and other pathogenic agents. Problems in trading are also considerable, due to the oscillation in prices. Choosing products according to soil and climactic conditions is as essential as diversification, in order to assure economic feasibility.

Small-scale animal raising is a crucial element in the economic improvement of rural populations. If well managed, it could substantially enhance the ratio between revenue and productive area and, consequently, could decrease deforestation due to the spread of cultures. It is also a remarkable natural source for sustaining soil fertility and an important factor to enrich the human diet, specifically through milk and other dairy products, eggs and meat. Animal raising can also be a form of savings and insurance against the unforeseen. Cattle raising seem an inevitable part of the future of

rural areas. When no farming credit is available, higher earnings may come from animal raising and greatly affect the producers' life.

The ideal system for the economic and social feasibility of farming, plus environmental sustainability, consists of the three sub-systems studied above. Alternatives to environmental degeneration will undoubtedly move in this direction, which implies incentives and practices which assure soil fertility and hydric balance. Studies and experimental research will also be needed on how *capoeiras* (secondary vegetation) develop and are re-integrated for productive use, for both farming and forestry.

As stated above, the rural world is not restricted to the agricultural world. In modern society, the permanence of small and medium-sized farming production depends upon a diversified economic situation where services, handcraft and manufacturing all play important roles. Cattle raising, which is typical in the countryside, is of little value at the market, as only its by-products, such as milk and cheese are valued. Products must therefore be processed locally. Processing tends to take place far from cattle-raising areas, concentrated in the villages and small towns. It may be diversified, involving cereal processing, flour and ration production, fruit processing and wrapping, ceramics, etc.

Little importance has been given to the environmental dimension of these human groupings throughout Amazonia. Peasants are obviously aware of phenomena such as climactic conditions, air pollution, the multiplication of insects and the spread of diseases. However, they have no means to regulate the functioning of these aspects of the environment. Some municipal governments have been voted in by grassroots movements, and the participation of these groups of local residents in the management of city property and affairs have brought innovations to the region. At issue, therefore, is the organized participation of the peasant population in political processes.

The phenomenon of indiscriminate deforestation also reflected the political and administrative weakness of the Brazilian Institute for Forestry Development (IBDF). According to the Brazilian Forestry Code (Law No. 4771/65), at least fifty-percent of all rural landholdings in the country's Northern region must be protected as a permanent forest reserve. The Forestry Code also explicitly prohibits the clearing of primary vegetation on steep slopes, and along the margins of rivers and streams. However, in Rondônia, such regulations have generally not been enforced.

highly speculative land market on the frontier.⁹ Large-scale land speculators were able to secure access to huge properties, based on the use of deforestation and cattle pasture as a means of establishing land rights. Fraudulent land titles and corruption of INCRA officials soon became common practice in Rondônia.¹⁰

During the 1970s, INCRA also distributed large tracts of public lands (consisting of properties of 1,000 to 3,000 ha) at nominal prices to cattle ranchers and other "entrepreneurs." Several of these tracts of land (e.g. *Gleba Corumbiara*, *Gleba Burareiro*) included substantial portions of Rondônia's more fertile soils. Meanwhile, land-seeking migrant families continued to be settled on, or spontaneously occupy, soils of marginal agricultural potential.

An illustration of the degree of land concentration in Rondônia may be found in INCRA's most recent statistics on the land tenure. According to the 1985 rural land cadastre, there were 57,713 rural properties in Rondônia accounting for some 13.6 million hectares - an area virtually equivalent to the state's total surface area - excluding reserves, urban areas, and other land in the public domain. Within this area, 53% of the properties were in areas of less than 100 ha and accounted for 13.1% of the total land area. An estimated 43.7% of landholdings were in the 100 to < 1,000 ha category, accounting for 26.2% of the land area. In contrast, only 1.9% of the rural properties were in holdings of 1,000 ha or more, yet they controlled an estimated 60.7% of the total land area.

⁹ Although INCRA's land policies stipulated that no more than 2,000 ha could be sold to an individual or group inside of, and 3,000 ha outside of, national security areas, there were various means of circumventing this legislation. For example, limits on large landholdings could easily be avoided by registering adjacent plots in the name of relatives or friends as "paper owners."

¹⁰ Large properties purchased on the private land market frequently included rubber-tapping estates (*seringais*). In fact, many of these areas did not have formal land titles, but rather long-term lease agreements (emphyteusis rights) between the government and rubber bosses (*seringalistas*).

the demand for land by incoming migrants far outstripping the rate of settlement by INCRA, the process of frontier expansion in Rondônia became increasingly based on land invasions by migrants seeking to establish "squatter's rights."

INCRA's land rights policies contributed to land invasions by recognizing forest clearing as a means of legitimizing land claims, regardless of soil quality and other physical characteristics. While INCRA's land rights policies could be used to grant titles to "bona fide" settler families within areas of fertile soils, the potential for acquiring land through forest clearing contributed to the indiscriminate occupation of areas with very limited agricultural potential (e.g. low fertility soils, steep slopes, poor drainage, etc.)⁸

The difficulties of limiting small-farmer colonization to areas of more fertile soils were exacerbated by the fact that migrant families were forced to compete not only with each other over access to limited resources, but also with more powerful land speculators and cattle ranching interests. In addition to members of Brazil's rural poor, Rondônia's land boom attracted a variety of "land grabbers" [*grileiros*] and livestock entrepreneurs, seeking control over large properties for land speculation and establishment of cattle pasture.

In this regard, INCRA's land policies directly contributed to highly unequal patterns of land tenure on the frontier. By legitimizing the use of deforestation as a means for establishing for access to, and control over land, INCRA's land rights policies stimulated the expansion of a private, often

⁸ In the case of squatters (*posseiros*), INCRA could officially recognize land claims on the condition that (a) the claim was located on public lands (*terras devolutas*), (b) the area had been occupied for at least one year and farmed with family labor, and (c) the claimant legally owned no other land in Rondônia. In such cases, INCRA would eventually arrive on the scene to survey, draw official boundaries, and issue provisional land titles (*autorização de ocupação*) that allowed access to short term credit. After two years, these deeds could be converted to "definitive titles" (*titulos definitivos*). The main criterion used by INCRA to determine "squatter's rights" (*usucapião*) was the amount of forest cleared by the prospective owner.

Settlement Projects (PADs) in 1975. In 1974, INCRA also created the PIC Paulo Assis Ribeiro in the southwestern portion of the territory.

When compared with much of the rest of the Amazon Basin, it may be argued that Rondônia does possess a relative abundance of higher fertility soils. However, it is estimated that only nine-percent of the state's land area possesses soils with potential for annual and perennial crops at relatively low input levels, and that only 2% are "high fertility" soils capable of most agricultural uses (Furley 1980). The agricultural aptitude of the majority of Rondônia's soils, like elsewhere in Amazonia, is severely limited by such factors as low fertility, high acidity and aluminum toxicity, low cation exchange capacity, and poor drainage capabilities. Moreover, soils with greater agricultural potential are often highly interspersed at the local level with soil types of inferior quality.

Given these physical characteristics, it is not surprising that a large proportion of migrant families were settled in areas that were inappropriate for small-farmer agriculture. This problem was exacerbated by the physical layout of INCRA's colonization projects in Rondônia, which consisted of a series of rectangular plots (usually 500 x 2,000 m for 100 ha properties) laid out in a grid-based design along straight lines four km apart, serving as access and penetration roads. Not surprisingly, INCRA's rigid demarcation of plots ignored local-level variances in soil quality, as well as topographic and hydrographic characteristics.

In addition to the physical layout of INCRA's colonization projects, the problems of land occupation and deforestation in areas of poor soils should be understood within the context of several other key factors. Given the magnitude of Rondônia's migratory boom, the implementation of carefully-planned colonization projects soon became an impossibility.⁷ With

⁷ In fact, the first comprehensive reconnaissance surveys of natural resources in the region, conducted through the RADAMBRASIL program, were completed only in the late 1970s--well after the creation of most small-farmer settlement projects in Rondônia (RADAMBRASIL, 1978, 1979).

rose from 31.2% to 67.8% of the total population, with major metropolitan areas accounting for the bulk of the increase (Sawyer 1984). However, given the probabilities of socio-economic marginalization in already overcrowded cities, literally thousands of Brazil's rural poor opted for migration to frontier regions such as Rondônia, in a desperate attempt to re-establish their access to land.

In 1970, the Brazilian state initiated its first attempts at organizing small-farmer settlement in Rondônia. The Ouro Preto PIC (Ouro Preto Integrated Colonization Project), was created by INCRA along the BR-364 Highway in central-eastern Rondônia in an area of relatively fertile soils. The project initially had the modest objective of resolving the problems of some 300 families that had been attracted to Rondônia, and later abandoned, by a private colonization enterprise (Martine 1978). Although less ambitious than the Transamazon Highway colonization schemes, PIC Ouro Preto was similarly conceived as a model colonization project, with planned activities including surveying, distribution and titling of individual plots, technical assistance, road construction, rural credit, marketing cooperatives, housing, and basic services in health and education.

As the news of INCRA's settlement activities and the availability of reportedly fertile soils in Rondônia spread in other regions of Brazil (often through friends and relatives of early migrants), rates of in-migration to the territory began to increase rapidly, forcing INCRA to accelerate its settlement activities. Although initial plans were to include only 500 families in the PIC Ouro Preto, by 1974 INCRA had already distributed plots to an estimated 4,000 migrant families (Martine 1978, Mueller 1980).

With a rapidly increasing demand for land from incoming migrants, INCRA soon expanded its settlement activities by initiating additional colonization projects. In 1971, INCRA created the PIC Sydney Girão, located largely for geopolitical motives along the northwestern border with Bolivia near Guajará-Mirim. The majority of subsequent projects were located along the axis of the BR-364 Highway: PIC Gy-Paraná (1973), PIC Padre Adolfo Rohl (1973), and the Marechal Dutra and Burareiro Directed

During the 1970s, the majority of migrants arriving in Rondônia originated from rural areas of Brazil's Center-south region, in contrast to earlier migrants who were predominantly from the Northeast. The most common states of origin were Paraná and Mato Grosso, although significant numbers of migrants also moved from Espírito Santo, Minas Gerais, São Paulo, and other states. Prior to moving to Rondônia, the majority of migrant colonists had previously been small landholders, sharecroppers, tenant farmers, or rural wage laborers (Lopes 1983, Calvente 1980, Millikan 1988).

During this period, the process of explosive migration to Rondônia was fundamentally linked to the problems of growing rural poverty and landlessness in Center-south Brazil. Although such problems were often associated with archaic land tenure systems and deeply-rooted socio-economic inequalities, the explosive levels of migration to Rondônia witnessed during the 1970s also reflected a particular moment of capitalist development in Brazil: i.e. the process of agricultural "modernization" in the rapidly industrializing Center-south region (Calvente 1980, Graziano Neto 1982, Millikan 1988).

During the 1960s and 1970s, the modernization of the agricultural sector in the Center-south region played a critical role in the federal government's plans of rapid industrialization and economic growth. Based primarily on export and industrial crops (e.g. soybeans, oranges, wheat, and cotton), modernized agriculture relied heavily on capital-intensive production techniques (with a pronounced bias towards such inputs as heavy machinery, chemical fertilizers, biocides, and high-yield variety seeds). In terms of its social impacts, the rapid expansion of "modernized" agriculture in Brazil was associated with increasing disparities in the distribution of land and rural incomes, abandonment of traditional tenant-farming and sharecropping arrangements, and the use of a reduced contingent of seasonal wage laborers (*boias frias*) (Graziano Neto 1982, Quandt 1986).

In demographic terms, the most important consequence of increasing rural poverty and landlessness was a massive increase in rural-to-urban migrations. Indeed, between 1940 and 1980, Brazil's urban population

security" lands, with the responsibility of reviewing existing claims, defining land-use categories, surveying, and transferring public lands to private ownership through colonization projects or other forms of land distribution (Moran 1981, Bunker 1985).⁶

Shortly after the initiation of the PIN, a progressive disillusionment with small-farmer colonization in the Amazon Basin began to be expressed by Brazilian authorities. Although supposedly deriving from various "technical difficulties," including an alleged lack of entrepreneurial capacity among migrant settlers, the federal government's growing disinterest in the Transamazon colonization schemes was closely linked to pressures exerted by powerful economic interests, based largely in Brazil's industrial Center-south. Indeed, the completion of roads and other infrastructure associated with the PIN made it clear that considerable profits could be garnered through investments in the Amazon, particularly through speculative cattle ranching (Wood and Schmink 1979, Bunker 1985, Hecht 1985).

In contrast to the Transamazon Highway, Rondônia was not initially envisioned by the post-1964 military regime as a major focus of small-farmer colonization in the Brazilian Amazon. However, the opening of the BR-364 Highway and the news of the availability of cheap and fertile lands in Rondônia (which partially reflected government propaganda about a new "El Dorado" in the Amazon) triggered an unprecedented migratory boom in the region. According to government statistics, Rondônia's population increased from 70,000 to 111,000 between 1960 and 1970, but jumped to 500,000 inhabitants in 1980. During the 1970s, Rondônia's human population increased at an average annual growth rate of 15.8% (compared to 2.48% for the entire country).

⁶ The creation of the National Integration Program was followed in 1971 by the promulgation of Decree-Law No.1.164, declaring that for reasons of national security and development, the federal government could establish control over all lands within a 100 km-wide belt on both sides of federal highways in the Amazon region. Furthermore, the law would apply to areas within 150 km of international borders (Mueller 1980).

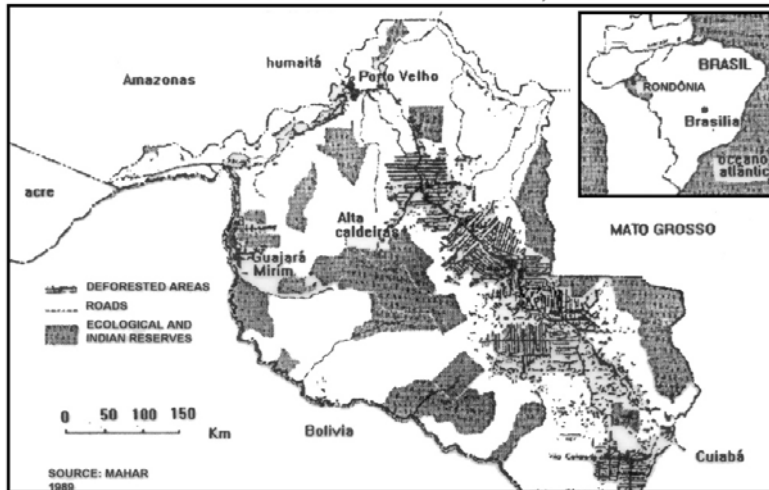
Following the military coup of 1964, Brazil's new leaders, beginning with the administration of General/President Castelo Branco, initiated a series of policies that greatly augmented the level of direct state intervention aimed at "integrating" the Amazon Basin into national society. Government policies increasingly prioritized the construction of roads and other infrastructure, in conjunction with the promotion of private enterprise in sectors such as livestock and mining (often through generous subsidies and fiscal incentives). Geopolitical concerns with "national security" and the occupation of distant border regions within what was perceived to be a "vast emptiness" were also important underpinnings of military planning doctrines (Hecht 1985, Bunker 1985.)

In 1970, the Brazilian government launched the National Integration Program (PIN), which included an unprecedented small-farmer colonization scheme for the Amazon Basin. Under the PIN, the main focus of small-farmer settlement would be along a newly constructed highway, the Transamazon (BR-230), an east-west penetration road south of the Amazon River that would link Recife on the Atlantic coast to the Peruvian border.

In 1972, the first government-directed colonization projects were initiated along a newly-constructed stretch of the Transamazon Highway between Estreito and Itaituba. According to the ambitious goals of the PIN, 100,000 families (three-fourths of them impoverished Northeasterners) would be settled between 1971 and 1974. Within small-farmer colonization projects, the PIN anticipated, in addition to land distribution, the provision of transport infrastructure, housing, rural credit, storage and marketing facilities, and basic services in health and education (Moran 1981, Smith 1982).

The principal government agency responsible for the execution of the PIN's colonization projects was INCRA (National Institute for Colonization and Land Reform), created in 1970 through the merger of two federal agencies concerned with land tenure and registration: IBRA (Brazilian Institute for Land Reform) and INDA (National Institute for Agrarian Development). INCRA was given control over all "national

Map. 5
CLEARED AREAS IN RONDONIA, 1983



1.1. Migration, Land Occupation, and the Role of the State

Although deforestation in Rondônia has only recently become the focus of international attention, rapid forest clearing in the region can be traced to the early 1970s. By 1975, when the first interpretations of LANDSAT's remote-sensing data became available, it was estimated that 1,216.5 km² of tropical forests had been cleared or 0.5% of the state's total surface area. By 1980, the cumulative area cleared was estimated at 7,579.3 km², or 3.1% of Rondônia's surface area (IBDF 1982, Fearnside 1982) (see map 6).

During the 1970s, the onset of rapid deforestation in Rondônia was closely associated with the region's emergence as a major "agricultural frontier" in the Brazilian Amazon.⁵ This process of frontier expansion was catalyzed by the construction of the Cuiabá-Porto Velho Highway, a jungle penetration road linking the northwest frontier with Brazil's more industrialized Central-south region.

Completed initially in 1960, although only opened to regular traffic later in the decade, the construction of the Cuiabá-Porto Velho Highway (BR-29, later renamed BR-364) reflected strategic objectives of the federal government during the Kubitschek administration (1955-1960), in which the construction of a network of federal highways in the country's interior would complement increased import-substitution industrialization and the decentralization of Brazil's population away from coastal cities. The construction of federal highways was considered a vital means not only for population decentralization, but for expanding markets of consumer goods industries based in the Center-south and creating access to raw materials in the country's hinterland.

⁵ See Foweraker (1981) and Sawyer (1984) for a discussion of contemporary frontiers in Brazilian society.

1. Contemporary Frontier Expansion And Deforestation In Rondônia

Before the arrival of the first Europeans in the 17th century, the region of the present-day state of Rondônia had been occupied for millennia by indigenous peoples. From the colonial period until the mid-twentieth century, Luso-Brazilian occupation of the region was marked by intermittent exploratory activities, territorial disputes between the Portuguese and Spanish crowns, and the "boom and bust" cycles of extractive commodities, particularly native rubber.³

Although highly exploitative of migrant labor and devastating to indigenous peoples, most of these early activities did not result in large-scale disruption of Rondônia's tropical rainforests. Indeed, at the beginning of the 1970s, the vast majority of Rondônia's primary vegetation, dominated by various types of tropical forest interspersed with areas of savannah, natural grasslands, and other types of vegetation, was still intact.⁴ Until the 1960s, physical access to Rondônia depended upon river transportation, requiring long journeys by boat to this distant region.

³ For references on Rondônia's early history, see Millikan (1988, chapter 1), Ferreira (1961), Gall (1978), Lopes (1983), and Wilson (1985).

⁴ Various types of tropical forest constitute the predominant natural vegetation in Rondônia, covering an estimated 85% of the region's land area. The three major sub-groups of forest vegetation (in order of their abundance) are: open tropical forest, dense or evergreen tropical forest, and semideciduous tropical forest. Other major vegetation types include seasonally-flooded swampy forests, natural grasslands (*campos*) and savannas (*cerrado*). As such, the total percentage of the state's forests that have been cleared is proportionately higher than the calculations of the percentage of the total land surface that has been deforested.

deforestation in Rondônia. During the 1980s, the World Bank-financed Northwest Program (POLONORESTE), designed as a means of promoting the "orderly socio-economic development" of Brazil's Northwestern frontier, while safeguarding fragile tropical ecosystems and indigenous peoples, was often blamed for having contributed to a "social and ecological disaster of tremendous dimensions" (Rich 1985). The World Bank has also been actively involved in the design of the "socio-economic and environmental zoning" plan, which serves as the basis for a revised strategy for regional planning and a follow-up loan for Northwest Program.

This study also examines the contributions of popularly-based movements of indigenous peoples, rubber-tappers, small-farmers, and other non-governmental organizations to alternative strategies for the wise management of natural resources and the democratization of development planning.

The concluding section of this paper provides a critique of prevailing theoretical models for explaining tropical deforestation, suggesting the importance of an analytical framework that examines local level human-environmental interactions within their social, political, and economic context.² Based on the lessons that can be learned from an analysis of the social dynamics of deforestation in Rondônia, the paper concludes with a discussion of alternative policies that may contribute to the goals of social justice and the protection and sustainable management of Rondônia's endangered tropical forests.

² Several recent studies have proposed analytical frameworks, drawing upon the contributions of political economy and human ecology, for understanding relationships between peasant survival strategies and environmental degradation in developing countries. Some of the more interesting examples include: Blaikie (1985), Blaikie and Brookfield (1987), Collins (1987), de Janvry and Garcia (1988), Painter (1987), Schmink and Wood (1987), Watts (1983, 1984).

tropical forests, the underlying social dynamics of their devastation often are poorly understood.

This paper is organized in the following manner:

The first section examines the factors underlying Rondônia's emergence as a major "agricultural frontier" in the Brazilian Amazon, a phenomenon closely associated with the onset of rapid and indiscriminate deforestation in the region. Particular attention is given to the causes of a migratory boom initiated in Rondônia during the early 1970s, the dynamics of land occupation on the frontier, conflicts over land and social impacts of deforestation, and the role of the state.

The second section of the paper analyzes relationships between rapid deforestation, land use trends, the survival strategies of migrant colonist households, and processes of socio-economic differentiation on the frontier. In particular, this section analyzes the ways in which rapid deforestation and unsustainable land uses have become "situationally rational," given the survival and accumulation strategies of local populations, within the context of the dynamics of land, labor, and commodity markets on the frontier.

The third section of this paper provides a preliminary analysis of two recent strategies that have been promoted in Rondônia as alternatives for deforestation and models for "sustainable development": (a) "socio-economic and environmental zoning," and (b) extractive reserves. In this section, it is argued that despite the merits of such alternative proposals, many of the fundamental socio-economic dynamics underlying the impoverishment of the region's natural resource base and its human populations have remained essentially intact. Given the fact that several variants of "economic and ecological zoning" and extractive reserves are currently in vogue within Amazonian planning circles, the experience of Rondônia provides some important lessons concerning both the possibilities and problems associated with these strategies.

In this study, considerable attention is given to the World Bank's role vis-à-vis regional development planning and the social dynamics of

PART III

THE AGRICULTURAL FRONTIER AND DEFORESTATION IN RONDÔNIA*

The Brazilian state of Rondônia, covering an area of 243,044 km² in the southwestern Amazon Basin, has recently been cast into the spotlight of growing international concerns over deforestation in the Amazon Basin. Images from Rondônia of charred tree trunks and barren landscapes where once stood lush tropical forest have appeared in a wide variety of newspapers, magazines, and television documentaries. By 1987, cumulative forest clearing had already reached 4,152,100 hectares, 17.1% of Rondônia's total surface area (Fearnside, 1989). Recent estimates suggest that by 1990 approximately 5.1 million hectares of primary tropical forest (over 21% of the state's total surface area) had been cleared.¹

Scientific and public concern over the adverse consequences of large-scale tropical deforestation includes the threat of decreased biological diversity and species extinctions, modification of hydrological cycles, changes in regional and global climate, degradation of soil resources, and threats to the physical and cultural survival of indigenous peoples and other local inhabitants. Yet, despite growing international debates over the fate of

¹ Source: Secretariat of Planning, State of Rondônia, 1990.

elites, particularly merchants, service professionals (e.g. doctors, lawyers, etc.), and the upper strata of public employees. In such cases, there is a fundamental transformation in the function of land on the frontier. While in the first case, land-use practices are primarily oriented by the survival strategies of colonist households, the growing control over land within what were originally small-farmer settlement areas has been characterized by the use of land for speculation and short-term accumulation, with cattle pasture as the predominant land use.

To a somewhat lesser extent, plots within small-farmer settlements have also been sub-divided, rather than sold in their entirety. In contrast to the consolidation of plots by land speculators, the purchasers of fragmented landholdings have typically been sharecroppers and other land-seeking migrants.⁹ This phenomenon can be understood in terms of (a) resistance among colonist households to complete expropriation from their holdings whenever possible (i.e. where an outstanding debt does not require selling the entire landholding), and (b) the "closing" of the agricultural frontier, whereby access to land by migrant families has become increasingly difficult (Lopes, 1983; Sawyer, 1984; Millikan, 1988).

⁹ For further discussion of sharecropping and tenant farming in Rondônia, see Calvente (1980), Lopes (1983), and Millikan (1988).

whereby settler households are forced to liquidate their assets in order to pay off outstanding debts. However, underlying such immediate disasters have been such difficulties as the marginalization of colonist households in areas of inferior agricultural potential, declining terms of trade, chronic malaria, etc. Such trends are analogous to what Bernstein (1981) has described as a "simple reproduction squeeze" that often confronts contemporary peasantries, albeit under conditions specific to this Amazonian frontier.

During the implementation of the Northwest Program, the escalation of colonist attrition was associated with various problems. The dynamics underlying the "simple reproduction squeeze" faced by migrant colonists essentially remained intact. As mentioned above, to the extent that government-promoted agricultural practices relied upon capital-intensive production techniques and volatile commodity markets, they reinforced the structural problems of declining terms of trade.

The combined effect of declining terms of trade and the phenomenon of rising land values resulted in a situation in which the potential capital gains from the sale of colonist properties were far superior to the economic returns possible through agricultural commodity production. For example, a recent World Bank study estimated that a petty speculator could net US\$ 9,000 equivalent if he cleared 14 ha of forest, planted subsistence crops and pasture for two years and then informally sold his rights of possession--a substantial sum of money in a region where the daily farm wage is US\$ 6.00 equivalent (FAO-CP, 1987; Mahar, 1988). Unfortunately, such studies have tended to underestimate the extent to which colonist attrition has resulted from the structural problems described above, as opposed to merely an act of land speculation.

In Rondônia, high rates of colonist attrition in Rondônia can be directly linked to increasing deforestation and the use of cattle pasture as a predominant land use. Moreover, both trends have been associated with processes of land consolidation within small-farmer settlements (Fearnside, 1984; Millikan, 1984). This can be explained by the fact that when plots of original colonists are sold, they are frequently purchased by local urban

a certain stigma of laziness associated with being a *quiçaceiro* ("grower of secondary forest");

6) Cattle pasture is often a preferred land use in areas where, due to such limitations of soil fertility, slope, and drainage, the successful cultivation of perennial crops is considered by colonists to be inviable;

7) Although beef consumption among colonist households is relatively low, secondary products (milk and cheese) may represent an important contribution to the household diet;

8) If the colonist household chooses to sell its plot, the establishment of cattle pasture is the easiest means of maximizing the amount of cleared land, a vital aspect of the potential resale value of land;

9) The ownership of cattle has traditionally been accorded a certain level of status within Luso-Brazilian culture.

3.5. Colonist Attrition and Deforestation Trends

Another alarming trend identified within small-farmer settlements in Rondônia has been the high rates of colonist attrition. Within several older colonization projects in central Rondônia, as much as 70% of the original settler population had already sold their plots (Millikan, 1984; FAO-CP, 1987). In a survey of 72 individual plots located along one access road in the PIC Ouro Preto, Coy (1987) discovered that 14 years after their initial settlement in 1972-73, 63% of the original colonists had already sold their properties. Within the small-farmer settlements created through Northwest Program, alarming rates of colonist attrition were also documented (Torres 1988). For example, approximately 55% of individual plots within the PA Urupá had been sold after only three years, and that 40% of the plots in PA Machadinho had changed hands after only one year (FAO-CP, 1987).

In Rondônia, high rates of colonist attrition have been triggered by financial crises (e.g. a major family illness or accident, bank debts, etc.)

3.4. *The Expansion of Cattle Pasture*

As mentioned above, cattle pasture has become the predominant land-use within small-farmer settlements in Rondônia. For colonist households, the advantages of cattle pasture vis-à-vis other potential land-use strategies can be summarized as follows:

1) The establishment of cattle pasture requires minimal amounts of capital and labor. Most pastures are seeded in previously deforested areas where annual crops have been cultivated for one to two years. As such, the capital and labor demands for the establishment and maintenance of cattle pasture are significantly reduced. Indeed, one hectare of pasture on cleared land in Rondônia may be established with about two man-days of labor, and twenty kg of grass seeds, at a total cost of roughly twenty-three dollars (FAO-CP, 1987);

2) For migrants attempting to establish access to land through "squatter's rights," the introduction of cattle pasture within deforested areas represents the easiest means of demonstrating that the land is "occupied," given the reduced amounts of capital and labor involved;

3) The ownership of cattle represents a vital source of reserve capital for colonist households in Rondônia. This is particularly important when considering the constant threat of a major financial crisis (e.g. a family injury or illness, outstanding bank debts, etc.) against which colonists often possess no other source of insurance;

4) In contrast to the difficulties of transporting agricultural crops, cattle do not depend on well-maintained roads to reach local markets;

5) Most colonists would rather convert plots cultivated for one to two years in annual crops to cattle pasture, rather than allow them to revert to secondary vegetation (*capoeira*). In addition to other advantages of cattle pasture, colonists often consider it less onerous to clear primary forest than recycle secondary growth for a new cropping cycle. Moreover, there is often

mahogany (*Swietenia macrophylla*) and tropical cherry [*cerejeira*] (*Amburana acreana*). Colonists receive extremely low prices for timber sold and stocks of the most valuable species have been almost completely exhausted within many settlement areas.

3.3. Migrant Colonists and the Use of Forest Resources

In many cases, the utilization of tropical forest resources has represented a valuable contribution to the survival strategies of colonists in Rondônia. Given the problems associated with agricultural commodity production, a considerable number of colonists have engaged in the petty extraction of native rubber (*Hevea brasiliensis*) and Brazil nuts (*Bertholletia excelsa*) as complementary sources of income. Colonists often learn that forest products such as Brazil nuts and açai (*Euterpe spp.*) can represent important sources of food. Hunting and fishing also constitute an important means of securing protein in local diets, especially in the early stages of settlement.

In general, the use of forest resources by migrant settlers has been restricted to a small number of species of flora and fauna, which are often exploited on an unsustainable basis. A major problem is that recent migrants have arrived in Rondônia with virtually no previous knowledge of Amazonian ecosystems. Settlers are discouraged from viewing tropical forests as a valuable resource by government policies that encourage forest clearing as a land improvement, while neglecting the potential for sustainable forest management. Moreover, relationships of unequal exchange between colonists and purchasers of forest products have also influenced the desirability of various extractive activities.

Within small farmer settlements, the most significant product from tropical forests, in economic terms, has been timber. Although Rondônia's tropical forests possess a wide variety of potentially valuable timber species, local sawmills have until recently been primarily interested in a few species that command the highest prices on national and world markets, particularly

agricultural sector. In January 1988, wages as a manual worker at Bom Futuro were four times those of a wage laborer in the agricultural sector.

represent a panacea for the problems of survival on the frontier. The average daily wage for an agricultural laborer is only about US\$ 6.00. Participation in wage labor markets often involves substantial opportunity costs vis-à-vis on-farm production. The success of most forms of petty commerce is problematic, given the considerable amounts of start-up capital required, as well as their uncertain profitability⁷.

With the discovery of placer mines (open-air ore deposits) of both gold and cassiterite in Rondônia, numerous colonists have abandoned (at least temporarily) their agricultural plots within settlement areas. During 1987, for example, one of the world's largest deposits of cassiterite was discovered near a tributary of the Candeias River, adjacent to the project area of PAD Marechal Dutra. The discovery of the cassiterite placer, named Bom Futuro (Good Future), triggered a massive process of migration to the mining site, whose population reached an estimated 25,000-30,000 people in 1988. The majority of manual miners were members of colonist households from various settlement areas in Rondônia.

Although some colonists were able to accumulate considerable savings in the placer, the possibilities for manual miners at Bom Futuro soon became much less promising than its name suggested. The readily available cassiterite ore was soon exhausted and manual miners have increasingly had to compete with local entrepreneurs with mining claims for jig operations and large mining enterprises. The mining site at Bom Futuro rapidly became the focus of a major malaria outbreak in Rondônia and violence in the "placer" has been commonplace. It is currently estimated that the total population at Bom Futuro has dropped to slightly over 2,000 people⁸.

⁷ Among colonists interviewed in PIC Gy-Paraná, the most common examples of engagement in petty commerce were as (a) owners of trucks that functioned primarily to transport the agricultural crops of neighboring colonists and (b) operators of small retail stores within settlement areas (*boliches*). However, such activities were practiced only by a small minority of those colonists interviewed.

⁸ One of the significant aspects of the placers and other non-agricultural labor markets on the frontier is that they significantly influence both the cost and availability of wage labor in the

Low crop prices and high input and labor costs have stemmed the use of chemical inputs and additional labor needed for pest and disease control;

6) During the early to mid-1980s, the federal government drastically reduced both the supply and interest subsidies for agricultural credit programs associated with Northwest Program - due to a growing economic recession and IMF pressure for increased fiscal austerity within the context of renegotiations of Brazil's massive foreign debt. (Agricultural credit programs were "parallel" projects financed entirely by the Brazilian government). By the mid-1980s, EMATER estimated that only some 15% of all colonist households in the state still had access to agricultural credit. Additional problems associated with the use of agricultural credit included the following:

- a) In order to receive long-term rural credit for perennial crops, colonists must hold a definitive land title. However, as previously mentioned, a considerable percentage of Rondônia's migrants are either squatters or possess only provisional titles to their plots;
- b) The use of agricultural credit requires complicated bureaucratic procedures that are both time-consuming and costly for colonists (especially since several trips to banks in local towns must be made). Moreover, credit has often been liberated by banks with significant delays - reducing its real value (due to inflation) and creating severe difficulties in maintaining an agricultural calendar.

3. 2. Off-Farm Income Formation

Given the above difficulties, the economic viability of agricultural commodity production in Rondônia has been increasingly undermined. Given such constraints, many colonist households have increasingly engaged in alternative strategies of income formation, such as wage labor, small-scale mining, and petty commerce. However, such activities do not necessarily

2) In Rondônia, there has been a clear tendency for the costs of inputs (fertilizers, pesticides, etc.) to rise substantially in relation to the general price index. Such trends have been associated with various factors, including elevated transport costs from distant production centers in the Center-south and limited competition among local retail merchants in Rondônia. At the national level, the extremely high costs of "modernized" agricultural inputs has also been associated with the oligopolist production structure of the country's agro-industrial sector (Graziano Neto, 1982);

3) Prices for perennial crops tended to be unstable and/or deteriorate in relation to input costs. Depressed crop prices have been associated with various factors, including (a) oscillations in world markets, which strongly influence domestic prices in Brazil. In recent years, world prices for coffee, cacao, and rubber have been unstable and frequently deteriorated; (b) inter-regional price disparities; (c) exploitative relations of exchange at the local level, where intermediaries and other forms of merchant capital maintain virtual monopoly within isolated settlement areas;

4) Yields of major perennial crops have been adversely affected by several factors, especially the limited agricultural potential of most soils occupied by colonist settlers, and the susceptibility of major crops to insect pests and pathogens. The application of pesticides, herbicides and other inputs aimed at pest control has been prohibitively expensive in most cases. Such problems have been exacerbated by the Brazilian government's promotion of agricultural systems which, in addition to demanding large amounts of capital and labor, have been biased towards monocultures;

5) The cultivation of cacao in Rondônia has been highly affected by the persistence of an endemic fungal disease known as "witch's broom" (*Crinipellis pernicioso*). In the case of domesticated rubber, a significant barrier in Rondônia has been South American Leaf Blight (SALB), caused by the fungus *Microcyclus ulei*. Coffee plantations in Rondônia have been negatively affected by coffee rust (*Hemileia vastatrix*) insect attacks from "broca" (*Hypothenemus hampei*) and miner bugs (*Perileuoptera coffeella*).

The negligible long-term productivity of most cattle pastures in the upland terra firma of the Amazon Basin suggests a tendency towards continued forest clearing once productivity levels have declined (Goodland, 1980; Hecht, 1982, 1985; Fearnside, 1980). The prevalence of cattle pasture within small-farmer settlements suggests that, all other things being equal, cumulative forest clearing has been significantly higher than would have been necessary under alternative land-use strategies.

3.1. Difficulties Associated with Perennial Crop Cultivation

In attempting to understand such phenomena, it is necessary to examine land-use trends in small-farmer settlements within the context of the survival strategies of migrant colonists. In particular, it is important to understand the difficulties associated with the cultivation of the perennial crops systems envisioned in Northwest Program, in terms of their adaptability to the realities of small-farmer households. In summary, difficulties associated with the cultivation of perennial crops among migrant farmers have included the following major factors⁶.

1) The cultivation of perennial crops, especially in the systems promoted by government agencies, has typically required major labor and capital inputs, often implying the necessity for agricultural credit and contracting of non-household labor. One of the criticisms that can be made of Northwest Program is that a pre-existing bias of government agencies responsible for agricultural research, rural extension, and rural credit towards capital and labor intensive production systems remained largely intact during the program's implementation;

⁶ See Millikan (1988, Chapter 5) for a more detailed analysis of deforestation and land-use dynamics within small farmer settlements in Rondônia. See also Fearnside (1984).

sustainable farming systems... based principally on tree crops." (FAO-CP, 1987:03). These crops were principally coffee (*Coffea spp.*), cacao (*Theobroma cacao*), and rubber (*Hevea brasiliensis*)⁵. The expansion of perennial crop cultivation was the centerpiece of a strategy for small-farmer based "sustainable development" that also included agricultural credit, rural extension, agricultural research, and improvements in health and educational facilities.

In contrast to such optimistic predictions, a 1986 World Bank-sponsored land-use survey covering 2.2 million ha in central Rondônia discovered that 46% of the cleared land (representing approximately 30% of the total surface area) was devoted to cattle pasture. Roughly 30% of the deforested land was listed as being under annual crops, while an additional 16% of the cleared land was classified as abandoned or in bush fallow [capoeira]. In contrast, only 8.5% had been planted in perennial crops. (FAO-CP, 1987). The study reached the sobering conclusion that:

"despite the intentions and safeguards in the plans for the Northwest Program, deforestation has accelerated sharply and uptake of sustainable farming systems has been less than expected."
(FAO-CP, 1987: 01)

The predominance of cattle pasture within small-farmer settlement areas is particularly significant when considering its implications for soil degradation and its status as a highly extensive land use (i.e. in terms of inputs of capital and labor, and value produced, per unit of land cleared).

⁵ Statements expressing optimism over the potential of perennial crops in the Amazon Basin (and elsewhere in the humid tropics) have argued that, in comparison to annual crops and pasture, they provide better protection of the ground surface from excessive solar radiation and raindrop impact, more efficient mechanisms of nutrient-recycling, and maintenance of higher levels of organic matter and moisture retention. Since they represent a relatively labor intensive land-use strategy, perennial crops are often considered a means of minimizing destructive forest clearing. Moreover, the relatively high market value of various perennial crops is often viewed as a means of justifying the costs of agricultural inputs used to prolong cultivation and increase yields (Alvim, 1978, 1981).

for domesticated rubber) which made land speculation a means of obtaining income by renting to the state government.

During the implementation of Northwest Program, the alarming processes of indiscriminate deforestation and land occupation in Rondônia were also associated with the following factors:

1) The continuation of INCRA's land rights policies that considered forest clearing to be a legitimate means of establishing land titles;

2) The construction of rural roads and the creation of small-farmer settlements in areas characterized by poor soils and fragile ecosystems, often occupied by rubber-tappers and indigenous peoples (e.g. Highway BR-429 and associated settlement schemes in the Guaporé Valley), independently of the Northwest Program (Fearnside, 1986);

3) Continued invasions of Amerindian reserves and other protected areas by land speculators, squatters, timber companies and prospectors in placer mining, due to continued political pressures and technical limitations of the Indian Department and the Federal Government's Forestry Development Institute (IBDF) during the Northwest Program. In several cases, invasions of reserves were sanctioned by influential politicians and other high-level government officials strongly influenced by, (and in some cases directly linked to) mining, timber, and ranching enterprises.

3. Land Use and Deforestation Dynamics in Small-Farmer Settlements

At the outset of Northwest Program, World Bank planners confidentially believed that "environmentally-damaging and economically wasteful forest felling on lands without long-term productive potential" could be avoided by promoting the "widespread adoption by migrants of

land, the demand for land by incoming migrants (augmenting a trend characteristic of the 1970s) increasingly outstripped the government's distribution of small-farmer plots. While an estimated 20,000 migrant families were waiting to receive land from INCRA in 1980, the number of landless families was estimated to have doubled by 1985.⁴

Given the limited availability of higher fertility soils, the growing numbers of land-seeking migrants in Rondônia continued to exert greater pressure on areas of marginal agricultural potential. Despite the existence of large landholdings in areas of higher fertility soils and their frequent use for speculative purposes, the political will to expropriate such properties for small-farmer settlement was typically not forthcoming from INCRA, nor did the World Bank exercise pressure on the Brazilian government in this regard. Not surprisingly, a major difficulty encountered in the new settlements in the Northwest Program was the identification of available lands for settlement that were considered by the World Bank's staff to be of suitable agricultural potential. Indeed, a simple, yet difficult to admit problem for the World Bank was that the majority of areas predominated by higher fertility soils were already occupied, either by increasing numbers of migrant settlers or large-scale land speculators (Dourojeanni, 1985).

During the early to mid-1980s, another major factor contributing to indiscriminate land occupation and deforestation in Rondônia was rapidly escalating land values. The asphaltting of the Highway BR-364 and other aspects of infrastructure for the Northeastern Development Program [POLONOROESTE], combined with the increased demand for land by small-farmer migrants and land speculators, contributed significantly to rising land values. The traditional use of land as a hedge against inflation was further augmented during the 1980s by Brazil's deepening economic crisis. Furthermore, rising land values were stimulated by the government's promotion of subsidized credit schemes (particularly the PROBOR programs

⁴ Sources: Lopes 1983, Ministry of Land Reform and Development (MIRAD), 1985.

an estimated 5.74% (13,955 Km²) of the state's surface area. By 1985, an estimated 11.3% (27,658 Km²) of the state had been deforested (Malingreau and Tucker 1988). As previously mentioned, by 1987, cumulative forest clearing in Rondônia was estimated at 4.2 million hectares (17.1% of the state's total surface area) (Fearnside, 1989)².

During the early to mid-1980s, the rate of arrival of new migrants also increased drastically, from 49,205 to 165,899 new arrivals between 1980 and 1986.³ The acceleration of migration to Rondônia during Northwest Program resulted from several factors. The asphaltting of the Cuiabá-Porto Velho Highway and other road infrastructure facilitated physical access to Rondônia and the occupation of previously-isolated lands. During this period, the Governor of Rondônia and other officials also carried out a major propaganda campaign in Brazil, portraying the new state as an "El Dorado" in the Amazon region for landless farmers and other downtrodden members of Brazilian society.

The implementation of Northwest Program also coincided with a deepening economic crisis in Brazil during the early to mid-1980s. During this period, Rondônia's migratory contingent increasingly consisted not only of the displaced rural poor, but urban-based migrants fleeing from worsening conditions of poverty and underemployment within urban areas in Center-south Brazil. Many urban-based migrants moved to Rondônia in search of employment in frontier towns, gold prospecting in recently-discovered placers, and other non-agricultural activities.

Although it has been estimated that during the early to mid-1980s, slightly less than half of Rondônia's migrants arrived in search of agricultural

² It should be noted that analyses of tropical deforestation based on LANDSAT image data (particularly manual interpretations of multi-spectral scanner (MSS) polychromatic images--as have been frequently used in Brazil) often result in a sub-estimation of forest clearing, since they frequently fail to both identify small clearings and differentiate between primary forest and secondary vegetation (Fearnside, 1982).

³ Source: Secretariat of Planning, NURE/SEPLAN, Rondônia, 1988.

result of uncontrolled invasions and contact with outsiders, at least half of the Suruí died between 1971 and 1974, mostly from influenza and measles (Mindlin, 1985).

2. Land Occupation, Deforestation, and the Northwest Program

During the 1980s, the state of Rondônia became the focus of a major regional development initiative financed by the World Bank. The Northwest Program (Northwest Brazil Integrated Development Program - POLONORESTE) was created by the Brazilian government in 1981 with an initial budget of US\$ 1.55 billion, including over US\$ 400 million in loans from the World Bank. At the core of Northwest Program was the asphaltting the 1,500 km Porto Velho-Cuiabá Highway (BR-364), a strategic objective of the federal government. However, the program included several components aimed at promoting the "orderly socio-economic development" of the frontier, supporting small-farmer colonization, protecting the region's fragile ecosystems, and supporting Amerindian communities (IBRD, 1981)¹.

Although the asphaltting of the Cuiabá-Porto Velho Highway was completed ahead of schedule, the gap between planning and reality in the Northwest Program was becoming increasingly apparent by the mid-1980s. During the early to mid-1980s, forest clearing in Rondônia increased dramatically. By 1982, the cumulative area deforested in Rondônia reached

¹ A major subject of debate between the World Bank and the Brazilian government was the latter's refusal to allow Bank funding of the Amerindian component of Northwest Program. Despite serious questions concerning the government's willingness to protect the land and human rights of indigenous peoples in the Northwest region (Cultural Survival, 1981), the World Bank approved a plan by the Indian Department calling for demarcation of indigenous lands within the Northwest Program region, together with basic assistance in the areas of health, education, and agriculture.

valves" for social tensions generated elsewhere in Brazilian society, and the ideological role of small-farmer settlement programs as a source of legitimization for a state whose policies contributed to widening socio-economic disparities (Hecht, 1986; Millikan, 1988; Hecht and Cockburn, 1989).

The most consistent losers in frontier land conflicts were indigenous peoples, rubber-tappers, and other existing local populations. Of particular importance is the fact that INCRA's land distribution and titling policies not only neglected characteristics of the region's physical landscape, but its pre-existing "cultural landscape" as well. Colonization projects were created and lands were titled regardless of the presence of indigenous peoples, rubber-tappers, riverine peoples and other existing populations.

Similar to the case of Acre, many rubber-tappers in Rondônia were forcibly evicted (and in some cases assassinated) by cattle ranchers engaged in clearing large tracts of land for pasture. When rubber-tappers (*seringueiros*) were displaced from their working areas (*colocações*) situated in regions destined for small-farmer settlement, the only compensation they might receive from INCRA was a small plot of land within colonization projects.

Although Brazil's National Indian Foundation (the Indian Department) was responsible for identifying, demarcating, and protecting Amerindian lands, invasions of indigenous territories typically occurred before contact had been made by the Indian Department and tribal lands adequately safeguarded. In most cases, indigenous lands were significantly reduced prior to their demarcation, while Amerindian communities entered into demographic collapse as a result of land conflicts and the impacts of introduced disease.

An important example of the shock between the expanding frontier and indigenous peoples occurred in the early 1970s, when a series of invasions by landless settlers and speculators took place within the traditional territory of the Suruí Indians. When the Suruí were first contacted in 1969, it was estimated that their population numbered 600 people. As a

1.2. Social Conflicts and Deforestation in Rondônia

In Rondônia, the processes of rapid frontier expansion and deforestation initiated during the 1970s were rife with social conflicts that typically involved land speculators, cattle ranchers, landless migrants, indigenous peoples, rubber-tappers, and other populations. The chaotic process of land occupation created a situation in which violence and a general climate of lawlessness often prevailed. The most notorious conflicts involved landless migrants and powerful land speculators. As Gall (1978:04) observed during the early 1970s:

“The companies arrive in the jungle with airplanes, agronomists, lawyers, political connections, government money, and hired henchmen, known as “capangas,” whose job is to protect disputed land boundaries from invasion by new squatters and to evict families from land claimed by the company.... Sometimes the squatters are paid to leave. Sometimes their houses are burned by the “capangas” and their subsistence plots sown with pasture grass from overflying company planes to stop squatters from growing more food. Sometimes, the “capangas” maim or kill recalcitrant squatters and sometimes the squatters wait in ambush for the “capangas” and successfully resist eviction. Conflict and violence have quickly become legendary in these regions.”

Although powerful economic interests were frequently successful in establishing access and control over large landholdings, using such methods as outright violence and corruption of government officials, there were some cases in which INCRA intervened on the side of squatters [*posseiros*]. Such practices were most likely when large numbers of squatters occupying lands in the vicinity of existing colonization projects created a serious "social problem." In such cases, the creation of a "peasant space" on the frontier must be understood in terms of the geopolitics of land occupation and national security in the Amazon, the role of frontier regions as "escape

4. Alternatives to Deforestation: The Challenge of Sustainable Development

In recent years, several alternative proposals have emerged for controlling rapid deforestation and promoting the "sustainable management" of Amazonian ecosystems. Within official planning circles, various types of resource use zoning, also known as "economic-ecological zoning", or "agro-ecological zoning" are particularly in vogue at the moment. This alternative paradigm for regional planning in the Amazon has been placed at the center of discussions in such forums as the Brazilian government's negotiations with the Group of Seven countries for an ambitious program to protect the country's tropical forests (Brazilian Government [*Governo do Brasil*] *et al.* 1991; SUDAM, 1991). The United Nations Development Program is also currently planning a major project to promote "economic-ecological zoning" within various Amazonian countries.

Another alternative proposal for the conservation and sustainable management of Amazônia's natural resources in Amazônia has been "Extractive Reserves." In contrast to various models of resource-use zoning, the extractive reserves proposal emerged within a grassroots movement in the Amazon, the rubber-tappers' movement in Brazil, and was largely popularized after the violent assassination of Chico Mendes.

To the extent that both strategies are being widely discussed as new paradigms for sustainable development and environmental conservation in the Amazon Basin, the experience of Rondônia provides some useful insights into both possibilities and obstacles associated with the implementation of zoning plans and Extractive Reserves.

4. 1. *Land-use Zoning and the Planafloro Project*

Since 1986, the state government of Rondônia, in conjunction with World Bank and FAO consultants, has been working on a revised regional development plan for Rondônia that would provide the basis for a follow-up loan to Northwest Program. Largely as a result of the impressive level of public attention focusing on this earlier project, World Bank and government planners have attempted to address some of the grave social and environmental problems associated with Northwest Program. The "Rondônia Natural Resources Management Project" or PLANAFORO (*Plano Agropecuário e Florestal de Rondônia*) also known as the "Rondônia Agricultural, Forestry, and Livestock Plan") started receiving the first disbursement of a World Bank loan of US\$ 167 million loan (out of a total five-year budget of \$228.9 million).

A central component of Planaflo is a strategy for "socio-economic and environmental zoning" (*zoneamento socio-econômico-ecológico*). The basic concept of this zoning plan is that agricultural and forestry activities should be tailored to the potential and limitations of natural resources at the local level. Its objectives include (a) intensification of small-farmer agriculture in areas that are already deforested, but underutilized (b) limiting the expansion of large-scale livestock activities, (c) improving the protection of existing Amerindian and natural reserves, (d) creating new land tenure and resource-use categories, such as "state extractive forests" in areas occupied by rubber-tappers, and (e) promoting sustainable logging activities.

A preliminary version of a "socio-economic and environmental zoning" map, dividing the state into six macro-zones at a scale of 1:1,000,000, was completed in September, 1987. The zoning plan was given additional status in June 1988, when the Governor of Rondônia signed Decree n° 3782 of June 14, 1988, that "officialized" the preliminary version of the zoning map. According to the World Bank (1989), the six macro-zones and their official objectives may be summarized as follows:

- *Zone 01*: covers approximately 6,195,000 hectares in the most densely-populated portion of central Rondônia, where official colonization and other forms of land settlement have been concentrated. In this zone, sustainable cultivation is to be promoted in areas of moderate to high fertility, based on intercropping of perennial crops and agroforestry. The zone also contains areas of quite poor soils, where no further settlement should be encouraged.

- *Zone 02*: covers some 3,015,000 hectares in areas of moderate to poor soil fertility, where agricultural extension and other technical support would be provided to migrant farmers occupying lands outside of official colonization projects. This zone also includes extensive livestock operations.

- *Zone 03*: covers approximately 589,000 hectares along the margins of the Mamoré, Madeira and Machado Rivers in northern Rondônia, occupied by river-dwelling populations that practice fishing and agriculture along flood plains and upland terra firma.

- *Zone 04*: covers some 3,500,000 hectares in areas "with potential for sustainable extractive production derived from tree and plants (e.g. native rubber, Brazil nuts, palm nuts, gum, perfumes, and pharmaceutical products, with forest cover totally maintained" (World Bank 1989:14).

- *Zone 05*: covering some 2,435,000 hectares, "has the potential, given proper Government support and control for sustainable forest management with selective logging and replacement/reenrichment of exploited species" (*ibid*).

- *Zone 06*: covering some 6,400,000 hectares, "includes a wide variety of the State's most fragile ecosystems without potential for any currently known sustainable use, with Amerindian and biological reserves, and national forests. In this zone, critical conservation units and reserves need to be demarcated and protected and forest cover totally maintained" (*ibid*).

One of the major concerns of the World Bank in negotiations over Planaflores has been to promote an institutional framework in Rondônia compatible with the agro-ecological zoning plan and the objectives of

sustainable management and conservation of natural resources (viz Mahar, 1988). These measures should include (a) the legal institutionalization of the zoning plan, (b) the elimination of deforestation as a criterion for obtaining land title, (c) the adoption of suitable land regularization policies and practices, by INCRA and the Rondônia State Land Institute to develop and administer land policy, (d) the elimination of economic and fiscal incentives which encourage inefficient resource allocation, non-sustainable private investment and environmental degradation; and (e) the reformulation of medium-term state and federal investment programs for Rondônia to reflect land-use capabilities and other ecological considerations, to make them compatible with agro-ecological zoning (World Bank, 1989).

4.2. The Zoning Plan and Planaflo: Preliminary Comments

Despite their innovations, there are important questions regarding the potential of the zoning plan and Planaflo to reach their social, economic, and environmental objectives, including their ability to halt current patterns of indiscriminate deforestation and natural resource-use in Rondônia. Some of important questions requiring further attention, with regard to the socio-economic and environmental zoning plan and Planaflo, are summarized below:

1) In the three years since the zoning plan was "officialized" by the Governor of Rondônia through the signing of Decree 3782 of 06/14/88, there have been substantial difficulties in guaranteeing its implementation. A major problem has been the failure of various government agencies to respect the zoning plan. The role of INCRA with regard to the zoning plan has been especially problematic. INCRA has continued to promote settlement and land titling within areas of infertile soils (Zones 1.3 and 1.4) and within zones occupied by rubber-tappers and river-dwelling peoples (Zone 04 and

03, respectively), as well as areas to be set aside for sustainable timber management (Zone 05). The vast majority of Rondônia's territory is still officially under the jurisdiction of INCRA, which generally does not recognize the legitimacy of the zoning plan or the State Land Institute.

In a similar manner, Brazil's federal environmental agency, IBAMA, has not recognized the zoning plan as legally-binding. For example, during 1990 it approved a major logging operation on the upper Candeias River within an extractive area included in Zone 04. Commercial fishing continues to be allowed in several areas occupied by rubber-tappers (Zone 04) and river-dwelling peoples (Zone 03), depleting fishery resources which represent a major source of protein in local diets.

The Rondônia State Highway Department (DER-RO) has also opened roads within areas that should be protected according to the zoning plan. Recent examples include (a) extension of Highway BR-421 near Campo Novo and the Karipuna Indian Reserve (Zones 04 and 06) and (b) construction of the Machadinho-Tabajara road (Zone 04). Although an environmental impact study was carried out in the latter case, its recommendations have not been implemented.

In several locations, areas destined for sustainable forest management and environmental protection in the zoning plan (particularly Zones 04-06) have overlapped with areas occupied by small-farmers and cattle ranchers (although many lack definitive land titles). In such areas, landowners and politicians have protested against restrictions on forest clearing, invoking the Brazilian Forestry Code, which permits private landowners to clear up to 50% of their landholdings.

2) The preliminary version of the zoning plan excludes several areas occupied by rubber-tappers from Zone 04 (non-timber forest extraction). Such areas have often been included in zoning categories that are incompatible with the needs of rubber-tappers (e.g. Zones 02, 05, and 06). Such trends reflect a general failure to consult with local rubber-tapper organizations and scant field research during the preparation of the zoning

plan, as well as the need for participation of local populations in revisions of the zoning plan and/or creation of Extractive Reserves at the federal level.

3) Although the zoning plan and Planaflo place considerable emphasis on strategies for agricultural intensification within fertile but underutilized soils, project planners have failed to acknowledge the fact that many of these areas are controlled by large speculator landholders (as described in Sections 01 and 02, above). Indeed, the Planaflo project contains no significant measures for carrying out expropriations and land reform in Rondônia. Furthermore, the project does not call for land expropriations or the granting of land-use concessions to associations of rubber-tappers, as determined in the Extractive Reserves proposal (as described in Section 3.2). The federal government has made it clear that land reform is not a current priority in Brazil. The regional office of INCRA in Rondônia lacks financial resources and the political will to carry out necessary land reform measures for the implementation of the zoning plan and Planaflo (i.e. agricultural intensification and Extractive Reserves).

Given this situation, landless farmers continue to be settled in areas of inferior agricultural potential, often in areas inhabited by rubber-tappers or adjacent to indigenous and forest reserves. Furthermore, it is highly unlikely that speculative landholders will be interested in alternative land-use practices, such as the agroforestry systems envisioned in Planaflo.

4) Despite the World Bank's recent statements about environmental policy reforms in Rondônia, such measures do not yet appear to have been satisfactorily implemented. For example, forest clearing continues to be a mechanism for establishing private claims to undemarcated public lands, when carried out in conjunction with the implantation of agricultural crops, including cattle pasture. According to Administrative Rule Ruling No. 839 of June 10, 1988, issued by the Ministry of Land Reform and Development (MIRAD), it is possible, on undemarcated public lands in Brazil's Northern Region, to establish land rights to areas of up to 540 hectares through forest clearing and the implantation of cattle pasture. Moreover, as emphasized above, INCRA has continued to issue land titles

with little or no regard to the zoning plan. The federal government has recently initiated special credit lines [Fundo Constitucional do Norte] and fiscal incentives policies (Presidential Decree no. 101 of April 17, 1991) for the Amazon region. The social and environmental implications of these recent policies require careful evaluation, particularly in relationship to Planaflo and the zoning plan.

5) The provisions of the zoning plan and Planaflo project with regard to migrant farmers raise a number of important questions (in addition to the issue of land tenure and land reform, mentioned in #3), e.g., to what extent can practices of agroforestry, secondary forest management, and recovery of degraded lands be made economically-attractive to colonist farmers? What are the market prospects for alternative cash crops to be promoted through Planaflo? While the World Bank suggests that small farmers will be encouraged to diversify out of cacao and coffee (due to poor market prospects), the Rondônia State Government's documents on Planaflo state that the cultivation of both crops will increase considerably. Which version is correct? In the past, the Brazilian Agricultural and Livestock Research Enterprise (EMBRAPA) has devoted very little human and financial resources to research on agroforestry systems. How much information has been generated by existing research activities that are immediately applicable to the realities of small farmers and the objectives of Planaflo? What agroforestry research remains to be carried out? How can activities in agricultural research and technical assistance be adapted to varying social and ecological conditions within settlement areas (soil type, topography, available family labor, etc.)? According to the World Bank, support services will be focused exclusively on areas of more fertile soils. What about the settlers that have already been settled in areas of inferior agricultural potential?

6) With regard to the timber sector, the zoning plan and Planaflo raise some important questions regarding the problem of sustainable management. Given the lack of technical knowledge and the difficulties of controlling logging operations in Rondônia, what are the prospects of

promoting sustainable logging practices throughout the state? If carefully-monitored selective logging is limited to only a few pilot areas, local timber enterprises may not be interested in competitive bidding, given the fact that higher, short-term profits can be reaped by continued unsustainable logging elsewhere. As described above, several areas included in Zone 05 are in fact occupied by rubber-tappers, and in some cases, indigenous peoples. The Planaflo project calls for opening up logging operations in remote areas, where roads may facilitate invasions by squatters and land speculators. Even if logging operations are "sustainable," they may engender other non-sustainable land-uses and social conflicts. Finally, will "forest management" be limited to logging activities in Zones 01, 02, and 05, or will efforts be made to explore the potential of the myriad of secondary forest products?

7) Within the zoning plan and Planaflo, there is very little mention given to the energy and mining sectors. How will future hydroelectric projects adequately balance social, environmental, and economic considerations, given past experiences, such as the Samuel Hydroelectric Project? How effective will government agencies be in controlling the social and environmental impacts of cassiterite and gold mining, which have already created major social and ecological problems?

8) In Rondônia, several indigenous areas remain to be demarcated and several existing reserves have been invaded by loggers, miners, and land speculators--often with the tacit approval of politicians and government officials. Similar problems have existed within several forest and biological reserves during Northwest Program. Will government officials have the technical means and political will to protect these areas?

9) The Planaflo project will provide support for health and educational services for only two years and will be limited to small-farmer colonization projects. Within areas occupied by rubber-tappers and River-dwelling populations, the Planaflo program anticipates no support for health or educational services. Given the highly precarious situation of health and educational services in Rondônia, the provisions of Planaflo for these sectors appear to be highly insufficient.

10) The Planaflo project implies a significant strengthening of government agencies, particularly those involved in land, agricultural, forestry, and environmental issues. Despite the existence of a major training component in Planaflo, it is important to observe that most government agencies are highly deficient in qualified technical and administrative personnel. At present, there is a hiring freeze within most government agencies. How will the Planaflo project address this problem of human resources?¹

4.3. *Extractive Reserves in Rondônia: The Case of Rio Ouro Preto*

¹ In June 1995, an alliance of 30 non-Government organizations has presented a complaint to the World Bank Inspection Panel, set up in 1993 to review WB projects. According to the Document "Pedido de Investigação apresentado ao Painel de Inspeção do Banco Mundial sobre o Planaflo", published by the NGO's Forum and Friends of the Earth, many important objectives of the Plan are not being achieved, and some basic conditions for the funding by the WB have not been fulfilled. In addition, the document denounces the fact that, in spite of many letters sent by the Forum of Ngos to the World Bank, no measure was taken to force the Rondonian Government to comply with the signed agreement. The main complaint is that INCRA (The National Institute for Agrarian Reform) is not following the economic-ecological zoning proposed by Planaflo and approved by the Rondonian Government. According to the Inspection request, Incra has approved settlement programs in environmentally protected and indian areas, favouring mainly large landowners. A formal agreement between the INCRA and the Rondonia Government is one of the conditions for the loan that would make the Planaflo function as far as land allocation for settlement is concerned, but it never occurred.. The document also denounces the invasion of protected areas by settlers, the building of roads within protected areas, the lack of demarcation of Indian lands, the non-establishment of agreed extractivist reserves (*reservas extrativistas*) and the lack of support to indian and local populations through economic and social welfare programs.

The document also draws the attention of the Bank to the lack of technical competence of local executing agencies and the over-optimistic views provided by the operational staff of the Bank to the Board of Directors.

A few days after the presentation of the documents, the Bank sent officials to assess the veracity of the claims, although by the end of September 1995 no decision about the complain was taken by the Bank. Some results, however, have already appeared, as the agreement between INCRA and Rondonia Government has been signed (on the 28 July 1995), and four new Extractive Reserves have been created on July 14th (Curralinho, Pedras Negras, Pacaas Novos e Rio Cautario).

One of the innovative proposals that has recently emerged for promoting the sustainable management and conservation of natural resources in the Amazon Basin is the concept of Extractive Reserves. In contrast to historical trends of authoritarianism and centralized decision-making in regional development planning, in which traditional populations of rubber-tappers, river-dwellers, and *caboclos* have been largely excluded, the proposal for extractive reserves emerged at the grassroots level, within a social movement of local Amazonian inhabitants. As is well-known, the center of the rubber-tappers' movement in the Brazilian Amazon has been the state of Acre, where, since the 1980s, the local population has organized to resist invasions of extractive areas by cattle ranchers and land speculators.

The Extractive Reserves proposal is also unique in that it combines objectives of social justice, socio-economic development, and sustainable management and protection of Amazonian ecosystems. The basic concept of "Extractive Reserves" is summarized below:

"The creation of "Extractive Reserves" can be applicable to areas occupied by an existing population within Amazonian ecosystems that depends upon the sustainable use of forest and other natural resources, utilized at least partially on a common property basis. In such areas, tenure rights are regularized collectively through a land-use concession, transferred by the government to a legally-constituted community association. Within extractive reserves, natural resources are utilized according to a management plan that guarantees social benefits for its members and the ecological integrity of the region. Community development initiatives in direct marketing, local processing, health and education should also be encouraged."

To date, four Extractive Reserves have been created in the Brazilian Amazon, covering an area of 2,162,989 hectares occupied by an estimated total of 6,250 families. These four areas include the Chico Mendes and Alto Juruá Extractive Reserves in the state of Acre, the Rio Cajari

Extractive Reserve in the state of Amapá and the Rio Ouro Preto Extractive Reserve in the state of Rondônia. Created by Presidential Decree n° 99.166 of March 13 1990, the Rio Ouro Preto Extractive Reserve covers an area of 204,583 hectares in the region of Guajará-Mirim, near the Bolivian border.

The creation of Extractive Reserves has represented an important step in recognizing the historical rights of rubber-tappers and promoting alternatives to recent trends of environmental devastation in the Amazon Basin. However, there remain important challenges to attaining the social, economic, and environmental objectives envisioned in the extractive reserves proposal. Some of the principal difficulties currently facing rubber-tappers in Rondônia and elsewhere in Amazônia include:

1) Highly unfavorable terms of trade, whereby prices for rubber and other marketed products have declined drastically in relation to the prices of goods and services purchased by the local population. Such trends may be traced to a number of factors, including (a) downward pressures on rubber prices due to national and international competition from plantation and synthetic rubber (b) government policies on rubber prices, whereby the official price of natural rubber has not kept pace with inflation. Government agencies have also failed to ensure that large purchasers and processing plants pay the official price to rubber-tappers, (c) exploitation by rubber-extracting companies and local intermediaries, which pay artificially low prices for rubber and highly inflate the costs of merchandise sold to rubber-tappers. In some cases, rubber-tappers still pay "rent" for the rights to tap rubber (usually about 150 kg of rubber annually), although such practices are illegal.

2) Precarious health conditions. In most rubber-tapping communities, malaria, hepatitis, diarrhea, gastrointestinal disorders and a wide variety of other health problems are commonplace. Government-supported health services within extractive communities in Rondônia are practically non-existent.

3) Lack of educational services. Despite the high demand for primary education and literacy courses, there are virtually no government-supported schools within rubber-tapper communities in Rondônia

Within the context of the above difficulties, a considerable number of rubber-tappers have recently abandoned their extractive areas, in search of employment in urban areas, mining sites (placers), agricultural plots, cattle ranches, etc. It may be argued that if it were not for the limited employment opportunities elsewhere, a much larger number of people would have already ceased to work as rubber-tappers.

In short, a number of critical steps must be taken in order for Extractive Reserves to reach their social, economic, and environmental objectives:

- a) alternative marketing systems must be established that improve terms of trade for rubber-tappers within economic transactions;
- b) alternative sources of income must be identified to eliminate the current excessive dependence on rubber, while at the same time ensuring the wise management of natural resources;
- c) strengthening of the subsistence base of local communities, as a means of decreasing dependence on marketed commodities and improving the nutritional status of the rubber-tapper families;
- d) establishment of essential programs in basic health care and education that are adapted to the realities of the local population.

Quite clearly, such urgent measures imply significant responsibilities for government agencies. Unfortunately, government performance in such activities has been rather dismal. Despite the impressive level of attention that has been given to Extractive Reserves as an alternative strategy for sustainable development and conservation in the Amazon, very little has been done by the federal and state governments aside from the signing of official decrees.

The case of Rio Ouro Preto in Guajará-Mirim, Rondônia is an alarming example of the absence of government support for Extractive Reserves. In particular, IBAMA has failed to fulfill its responsibilities to (a) guarantee enforcement of the reserve against illegal encroachments; (b) promote land expropriations within the reserve, a necessary step for rubber-tapper organizations to receive resource-use concessions from the federal government; (c) ensure that until alternative sources of income are secured, that rubber-tappers receive a reasonable price for native rubber. Within the Rio Ouro Preto and other Extractive Reserves in Brazil, the government has initiated no coordinated effort to promote primary health care, education, alternative marketing, research on alternative sources of income, sustainable natural resource management, etc.

Many initiatives in such areas have originated from rubber-tapper organizations themselves and support organizations. In the state of Acre, where the rubber-tappers' movement is strongest, a number of innovative programs have evolved in promoting community health and education, alternative sources of income, marketing and processing cooperatives, etc. In Rondônia, rubber-tappers have traditionally been less organized, largely due to the fact that Rural Workers' Unions (which, in Acre, historically organized rubber-tappers) have focused their efforts on migrant colonists rather than rubber-tappers. Nevertheless, local rubber-tapper associations and support organizations are making increasing progress in community mobilization.

In the case of Guajará-Mirim, the National Council of Rubber-Tappers, with technical support from the Institute of Amazonian Studies (IEA), has worked intensively with local rubber-tappers to promote community organizing and grassroots development. Recently, the Rubber-Tappers Association of de Guajará-Mirim (ASGM) was founded. The association has already become quite active in a number of areas, including: (a) initiating alternative marketing strategies; (b) creation of rural schools and health services, in conjunction with local government agencies and by negotiating an unprecedented agreement with the state government, via Northwest Program; (c) pressuring IBAMA to fulfill its role in terms of

enforcement, land expropriations and price guarantees for marketing of rubber; and (d) promoting agroforestry and alternative extractive activities, oriented by social, economic, and environmental criteria.

Despite the positive steps that have been taken in Guajará-Mirim, it should be emphasized that community organizing in the region is still at an initial phase. Major difficulties remain in terms of gaining support from government agencies, private foundations and other institutions for community-development efforts in the region. At the same time, rubber-tapper leaders and their supporters have become the target of intense pressures from several individuals (including local politicians) with vested interests in cattle ranching, mining, commercial fishing, etc.

4.4. Social Movements, Democratization, and Sustainable Development

In the state of Rondônia, landless farmers, rubber-tappers, and indigenous peoples have often entered into conflict amongst themselves in struggles over access to land and other resources. As described above, small-farmers have often found it to be "situationally rational" to adopt environmentally-unsustainable land uses. There are also examples of rubber-tappers and indigenous peoples that have recently engaged in activities resulting in environmental degradation, given their struggles to survive on the "modern" frontier. Within this difficult context, what sorts of social responses to deforestation have emerged in Rondônia? Some recent examples include the following:

1) Although still largely at an incipient level, small farmers, rubber tappers, and indigenous peoples have become increasingly organized in Rondônia, in terms of making demands on government authorities and working within their own communities. Several community development projects have included concepts of sustainable resource management. Recent

examples include an agroforestry and beekeeping project among the Rural Workers' Union of Ouro Preto, the community development initiatives of rubber-tappers in Guajará-Mirim, and a natural resource management and health project initiated by the Suruí Indians of Rondônia.

2) Small-farmers, rubber-tappers, and indigenous peoples have also increasingly collaborated with human rights and environmental organizations in Rondônia. To date, such collaboration has focused mainly on denouncements of human rights abuses and invasions of areas occupied by indigenous people and rubber tappers. However, such organizations are also addressing larger policy questions, such as the Planafloro Project. During 1990, several NGO meetings were promoted by the Union of Indigenous Nations, the National Council of Rubber-Tappers and Rural Workers' Unions, with support from various environmental and human rights organizations, in order to analyze the Planafloro project and propose alternative policies.

During June 1991, a meeting was organized in Rondônia to discuss Planafloro, which included the participation of World Bank staff representatives, state and federal government officials, and representatives of 12 non-governmental organizations (representing indigenous peoples, rubber-tappers, small-farmers, human rights activists, and environmentalists). During this meeting, an unprecedented agreement was reached which guarantees participation of NGO representatives in the design, monitoring, evaluation, and in some cases, implementation of project activities. Furthermore, the government agreed to take a number of emergency measures to ensure the protection of various indigenous and extractive areas, as well as other forest reserves. Such developments demonstrate the growing influence of non-governmental organizations in their efforts to democratize regional development in Rondônia.

3) In recent meetings involving indigenous peoples, rubber-tappers and small-farmers in Rondônia, there has been a growing recognition that despite historical conflicts among them, all three groups have essentially been victims of the same unjust system of "savage capitalism" on the

frontier. Given improved communications between these groups, there has been a growing tendency to work together as allies. For example, recent demands for land reform by landless farmers in Rondônia have emphasized the need to expropriate large unproductive landholdings in areas of higher fertility soils (both in Rondônia and elsewhere in Brazil, as a means of stemming additional migration to the state), while respecting areas occupied by indigenous peoples and rubber-tappers.

5. Conclusions for Rondônia

In analyzing the social dynamics of deforestation in Rondônia, this paper has emphasized the importance of such diverse factors as (1) landlessness and poverty in the source regions of migrants, particularly in Center-south Brazil, (2) the geopolitical concerns of military strategists with the occupation of a "vast emptiness" in the Amazon Basin, which would simultaneously serve as an "escape valve" for social inequalities elsewhere in society (3) government policies with regard to colonization, land titling and road construction that have promoted indiscriminate deforestation, regardless of agricultural potential or the presence of existing inhabitants (indigenous peoples, rubber-tappers, etc.) within specific areas. Moreover, this paper has attempted to illustrate how environmentally irrational behavior may be understood as "situationally rational," given the survival and accumulation strategies of local populations, whereby long-term ecological costs are generally externalized.

In Rondônia, regional development programs have typically failed to address such factors which contribute to rapid deforestation and the unsustainable use of natural resources. With regard to the World Bank-financed Northwest Program, specific problems have included:

- underestimating the difficulties of promoting "orderly socio-economic development" in such a volatile frontier region as Rondônia--particularly one which constitutes an "escape valve" for enormous socio-economic disparities elsewhere in Brazilian society;
- failure to challenge INCRA's land titling and settlement policies, which directly contradicted Northwest Program's objectives of careful settlement and protection of Amerindian and forest reserves;
- underestimating the intensity of struggles over access to resources within Amerindian reserves and forest reserves, and the

political underpinnings of what were often viewed by the Bank as primarily "administrative weaknesses" of the responsible government agencies;

- exacerbation of problems such as declining terms of trade through agricultural policies that promoted capital- and labor-intensive production systems oriented towards unstable commodity markets;
- virtual absence of consultations with local grassroots organizations of colonists, indigenous peoples, rubber-tappers, etc.

Although the World Bank and government agencies have taken measures to address many of the criticisms of Northwest Program, many of the underlying causes of indiscriminate deforestation, unsustainable land use, and social marginalization in the region have remained essentially unchanged. Major difficulties have been identified in guaranteeing respect among government agencies for the "socio-economic and environmental zoning" plan, and there are several examples of government policies that continue to promote deforestation and unsustainable resource use. In the case of the Rio Ouro Preto Extractive Reserve, very little has been done by government agencies (particularly IBAMA) to promote its social, economic, and environmental objectives.

6. Alternative Strategies

Given the above observations, what alternative strategies might contribute to the protection and sustainable management of Rondônia's tropical forest lands? Although clearly no panacea exists for the problems described above, the following comments outline some of conditions that would be necessary for more sustainable natural resource management practices to occur in Rondônia:

1) Although processes of rapid forest clearing and land degradation have typically become "situationally rational" for migrant colonists, environmentally-sound land-use practices need not, by definition, be situationally irrational. There are numerous cases in which innovative agricultural systems (e.g. use of inter-cropping and agroforestry techniques, biodigestors and other organic fertilizers) are being used by colonist households. More systematic efforts must be made to document such promising land-use practices and the conditions under which they have been implemented--nor the degree to which they might be replicated elsewhere.

2) In addition to improvements in small-farmer agricultural systems, there is an urgent need to develop strategies for the sustainable management of tropical forests within settlement areas (Hecht *et al.*, 1988). To date, tropical forests have been viewed more as obstacles to be removed rather than as a valuable resource to be carefully managed. Similarly, strategies promoting the sustainable management of secondary vegetation (*capoeira*) as well as the reforestation of abandoned pastures and other degraded lands need to be given top priority.

3) The successful introduction of alternative resource management strategies (e.g. agroforestry systems) in small-farmer settlement hinges upon both their suitability to local ecosystems and to the particular needs and constraints of colonist households. For example, an agricultural strategy that minimized the use of expensive capital inputs and labor would, all other things being equal, tend to be viewed more favorably by colonists.

4) Given the fact that several of the factors undermining the relative desirability of land-use practices occur not at the level of production, but of exchange, it would follow that agricultural strategies that are less susceptible to problems of unfavorable terms of trade will be more acceptable to colonist households. For example, low-input systems oriented towards buoyant regional or national markets (as opposed to capital-intensive, export-oriented monocrops) should be encouraged.

5) There is an urgent need to focus agricultural development on higher fertility soils, while promoting conservation and the use of alternative

resource management strategies in areas of inferior agricultural potential. As such, the problem of current land tenure patterns in the state and the need for land reform within Rondônia needs to be seriously addressed.

6) Well-intentioned planning initiatives in natural resource-use zoning must also seriously evaluate the forces underlying current processes of indiscriminate land occupation on the frontier. As a first step in reversing this process, state policies that consider deforestation (and the use of cattle pasture) as an "improvement" to land as a criterion for establishing ownership rights (regardless of its agricultural potential) should be immediately revised. At the same time, sanctions should be devised to control the distribution of large tracts of land for speculative cattle ranching, while stemming processes of land consolidation and absentee landlordism within small-farmer settlement areas.

7) In the search for more environmentally-sustainable land-use alternatives, there is much to be learned from indigenous peoples, rubber-tappers, and other local populations (i.e. *caboclos*) who have accumulated a tremendous wealth of knowledge in the management of tropical forest ecosystems (Posey, 1983; Padoch *et al.*, 1985; Hecht *et al.*, 1988). Unfortunately, such populations, when not entirely invisible to development planners, have often been viewed as "backward" and in need of "integration" into modern society.

8) The physical and cultural survival of indigenous peoples, as well as other Amazonian populations, beginning with recognition of their territorial rights to the regions they occupy, represents an urgent necessity, not only as a source of technical knowledge for development planners, but also as a means of ensuring the conservation and sustainable management of these tropical forest lands. Of course, the survival of indigenous peoples and other Amazonian populations raises important ethical questions for Brazilian society as well. The increasing (albeit incipient) level of political mobilization among indigenous peoples, rubber-tappers, and their supporters, together with the existence of a more open political climate in Brazil, provides room to be "cautiously optimistic" in this regard.

9) In areas occupied by rubber-tappers, urgent measures must be taken to ensure: (a) the creation of new Extractive Reserves, based on consultations with local communities, support groups, and on-site field research (b) legal guarantees for areas occupied by rubber-tappers, to be respected by government agencies such as INCRA, IBAMA, DER-RO, etc; (c) implementation of necessary land expropriations and demarcations within Extractive Reserves; (d) definition of strategies for enforcement activities, including training and credentials to allow the participation of local communities; (e) implementation of health and educational services, planned in conjunction with local communities; (f) in conjunction with local communities, the National Council of Rubber-Tappers, and support organizations, definition of strategies for research in natural resource management, technical assistance and extension, credit for community associations, studies on alternative markets, etc; (g) support for the community organizing efforts of the National Council of Rubber-Tappers.

10) Although the "socio-economic and environmental zoning plan" is certainly in need of revisions, urgent measures must be taken to ensure its enforceability, especially with regard to the policies of government agencies such as INCRA and IBAMA. Other mechanisms for minimizing environmental impacts of human activities, such as environmental impact studies (EIAs, RIMAs) and management plans, need to be strengthened by state and federal agencies.

11) Within the Northwest Program, the existence of grassroots organizations was largely ignored, despite the fact that their activities (e.g. improving the terms of trade and social services within settlement areas) have often been compatible with project objectives. Quite clearly, development planners in regions such as Rondônia need to listen more closely to the needs of their "target populations," including active support for existing forms of grassroots mobilization. Despite the World Bank's much-publicized reforms, it has often failed to ensure that systematic measures are taken to guarantee substantive consultations with representatives of local populations in the planning, monitoring, and evaluation of Bank-financed

projects. With the growing level of mobilization among indigenous peoples, rubber-tappers, small-farmers, human rights activists, and environmentalists in Rondônia, there is room for optimism that an incipient process of "democratizing development" has been initiated. Hopefully, this process will bear fruit in terms of achieving the interlinked objectives of social justice and the wise management of the Amazon's precious and endangered ecosystems.

In the final analysis, even the most well-planned development programs are likely to be frustrated as long as frontier regions such as Rondônia continue to represent an "escape valve" for social inequalities originating elsewhere in Brazilian society. Indeed, it is worthwhile remembering that if the entire Brazilian Amazon were divided into fifty-hectare plots, there would still be insufficient land to settle the country's estimated ten to twelve million landless rural families. The alarming problems of tropical deforestation and land degradation in Rondônia are a salient example of the need for Brazil's socio-economic inequities not to be reproduced on the Amazonian frontier, but resolved in their places of origin. Ultimately, the future of Rondônia's endangered tropical forests is linked to the future of democracy itself in Brazilian society as a whole.

PART IV

GENERAL CONCLUSIONS: SOME COMPARATIVE CONSIDERATIONS

First of all, deforestation should be viewed as a consequence of rapid and extensive accumulation of capital in Amazonia by Brazilian interests, especially from the south of the country, and by multinational groups. The region is seen by them as an endless repository of natural resources and a source of quick profits which should be tapped as soon as possible. The Brazilian government sees the region as a way to solve land-tenure problems in the south as well as a source of funds to pay the foreign debt. Environmental concerns and local populations (native Indians, rubber tappers, etc.) are often seen as obstacles to the economic occupation of Amazonia. The ideology of "national security" is used to justify this occupation, which is still important for the military. From the point of view of this ideology of progress at any cost, traditional uses of the land by local populations are seen backward and should be replaced by modern uses.

After the 1980s, large-scale mining became the main strategy for occupying and using the natural resources of Amazonia. The Grande Carajás Project, one of the largest mining operations in the world, is an example of this new rationality that involves different social actors, including the

Brazilian federal government, domestic and multinational enterprises, small farmers, squatters, large land owners and indigenous populations.

Comparing the occupation of Rondônia and southeastern Pará, the two most important frontier regions in terms of land use and conflicts, some basic points should be emphasized:

1) In both regions the role of federal government policies (such as tax incentives) has been critical for occupation. Until the beginning of the 1970s the idea was that the region should be occupied by landless migrants. By the end of the 1970s, still during the military regime, there was an important policy shift, aimed at establishing large economic centers for growth based on agribusiness and mining operations. The southeastern Pará region was deeply affected by the new strategy of creating growth areas. However, migration into the region continued because of problems of land tenure and unemployment elsewhere in Brazil. Migrants have been attracted not only by potential prospects for accessing land but by employment opportunities in urban areas and mining. The main government occupational policy was the system of organized settlements by the Federal Land Reform Agency (Instituto Nacional de Colonização e Reforma Agrária - INCRA) and, in the 1980s, high priority was given to the growth area in the northeastern, funded by the World Bank as a solution to problems created by broad deforestation and agricultural disorganization (land tenure, marketing problems, etc).

2) Although Rondônia does have some highly fertile soils, they were rapidly occupied by the first migrant farmers and cattle ranchers registered by The Federal Land Reform Agency. With continued migration, small farmers have spontaneously occupied or been settled by the Federal Land Reform Agency in areas with lower agricultural potential. In many cases migrants have occupied forests, indigenous reserves and areas occupied by rubber-tappers. Within the settlements made, projects for sustainable agriculture have been hindered by poor soil, low prices for crops, worsening trade terms, malaria and poorly adapted farming methods. Due to

limited economic viability of growing agricultural products, many settlers have engaged in non-agricultural activities. The predominant land use among migrant settlers has thus increasingly been cattle raising, due to its advantages over crops. Cattle raising, however, has resulted in extensive deforestation and does not appear to be sustainable on long term. Moreover, many colonists have become disinterested in planting and sold their land to speculators, who deforested even more land for cattle grazing.

3) In southeastern Pará the role of large agribusiness was far more relevant than in Rondônia. Landless and unemployed populations from neighbouring provinces attracted by mining activities flocked to the region, particularly to the Grande Carajás area. Due to the limited labor market, many of them became placer miners and squatters, dramatically increasing the number of land conflicts. The main threat to this region is the expansion of industrial charcoal-making leading to high deforestation and decrease in food production, since large numbers of peasants are likely to be hired in charcoal production.

4) The effects of deforestation on the eco-systems in these two regions, although different from one another, are leading to similar results. At present both Rondônia and large portions of southeastern Pará are the areas of Amazonia most threatened with deforestation. The overall immediate causes responsible for deforestation, such as government policies and tax incentives, are similar in the two areas. However, the main cause of deforestation in Rondônia is the establishment of poorly planned rural settlements and, to a lesser degree, of livestock ranches. In southeastern Pará the main factors are large agribusiness and mining schemes.

5) The impacts of deforestation are felt differently by the various social groups. In both areas most of the small producers combine several economic activities to make their livelihood. The strategies of the different social groups are changing, however. In Rondônia the principal victims of deforestation practiced by other social groups are the Indians, the rubber tappers and the riverine populations. Even small farmers and squatters,

although they also clear away large stretches of land, are victims of government policies and are used by big landowners to deforest an area, grow food for a few years and then plant pasture, only to subsequently abandon or sell the land. In the 1980s the Government implemented the Polonoroeste Program, funded by the World Bank, to counteract the negative trends of current development. The most recent attempt is Planaflores, based on economic-ecological zoning. To the present, however, the results of these interventions have produced only limited results.

Most of the newcomers to southeastern Pará are attracted by the Grande Carajás mining project and urban activities centered around it; many small farmers have also been attracted by charcoal production for the pig-iron plants.

6) The changes in these groups' strategies for survival also differ from one region to the other. In Rondônia, in many areas where soil fertility is low, settlers often sell their land after several years of cultivation and migrate farther north in search of new forested areas and more fertile soils. Others, after failing in agricultural activities go to work in the placers or migrate to the towns to look for non-agricultural jobs. The rubber tappers are often forced off their traditional land and made to move to urban areas as unskilled laborers. Riverine populations are often affected by mercury pollution and a decrease in fish production, which is their main source of protein. Most of the newcomers in southeastern Pará are attracted by urban or mining jobs. When no jobs are found there, they frequently squat on forest land or join newer industrial activities such as charcoal making. Joining the placer is also an alternative for them. The livelihood of nut collectors (*castanheiros*) is deeply affected by deforestation, and they generally end up migrating to urban areas as underemployed workers. The most affected group in both areas are the Indians.

7) The social reaction of the population in the areas studied varies according to the degree of interaction with the forest, the degree of impact and principally the degree of social organization. In Rondônia, the most

organized groups are the rubber tappers who have set up the National Rubber Tappers' Council. They operation with a specific strategy based on extractive reserves as a means to ensure access to land and conserve the forest resources, using mainly non-wood products. They are now making contacts for independent technical assistance from universities and Ngos, to develop new types of uses of the forest based on agro-forestry, new extractivism, etc.

In southeastern Pará, small farmers and squatters are joining the Rural Workers Unions in their fight for land rights. These rural unions are urging peasants not to engage in industrial charcoal making, both for ecological and land-tenure reasons. The Indian population of this region is more resistant to the invasion of their land by sawmills, placers, etc. In many cases they receive a small portion of the income of loggers and placer miners. Big land owners and investors are well organized through institutions such as the UDR (Rural Democratic Union) and the Businessmen's Association of Amazonia.

In southeastern Pará there are new problems caused by the installation of huge mining and mineral-processing plants. There is a concomitant proletarianization of migrants, but the inclusion of workers into this new industrial world is problematic, as there is a rapid turnover due to large numbers of farm laborers coming in from neighbouring areas. They frequently shift between agricultural and forest activities to temporary urban and industrial jobs. Members of the Vale do Rio Doce Company's professional staff, on the other hand, come from outside the region and have better job security.

8) The federal government's strategy has been dubious. On the one hand, its policies have promoted deforestation. On the other, the government has recently created numerous, large environmental protection reservations. The establishment of environmentally protected areas has had a negative impact, however, as many traditional groups are forced to move from their homeland and suffer severe restrictions to their previous economic activities,

which include fishing, hunting and agriculture. Another strategy is the attempt to introduce some kind of ecological and economic zoning, but no results are available. The government often establishes its policies in reaction to the pressures of active NGOs from the United States and Europe, which succeed in pressuring international organizations such as the World Bank to modify some of their investment policies. Although the government has introduced a new discourse based on sustainable development for Amazonia, it has not been put into practice. The current models for occupying Amazonia are basically the same as those used in the rich southern part of the country, producing both environmental destruction and an increasing marginalization of the local populations.

9) NGOs and other groups associated with social movements, such as the National Rubber Tappers Council, are proposing new strategies based on agroforestry, new extractivism, etc. This National Council, for example, has set up an Information and Research Center to identify priorities and support participated research and management programs. Some of the identified alternatives are:

a) *natural forest management*, directed especially toward wood and non-wood products. There are several million hectares of land in the Brazilian Amazon in the form of National Forests, Indian Reserves and Extractive Reserves, where the forest cover is protected by law. Sustainable use of these forests could be the cornerstone for sustainable use of resources in general. Little research has been carried out in natural forest management and further studies and experiments are thus needed. The management of these forests could be undertaken by the social groups that occupy the forests, such as the Indians and rubber tappers, through their social institutions.

b) *Agroforestry*

Agroforestry systems involve combinations of forest management with agriculture and livestock raising. The concepts of agroforestry are similar to land-use systems that have already been used by traditional populations in the region. Agroforestry offers a number of economic, social, and ecological advantages, including higher productivity through more efficient use of resources, fewer economic risks, lower losses from pests and diseases and more efficient use of labor. Agroforestry systems can be used on Indian reservations and extractive reserves, as well as by new colonists and river-dwelling populations. The joint efforts of the Information and Research Center of the Rubber Tappers Council and other Brazilian institutions show promising possibilities;

c) *Neo-extractivism*

Neo-extractivism is based on the use of appropriate technology for increasing the number of products extracted from the forest by increasing the density of useful species in certain areas.

Apart from these technological proposals, other measures could include:

10) Planning of Land Use. Well-intentioned attempts at planning of land use must seriously evaluate the social forces underlying the current process of indiscriminate land occupation and forest clearance in Amazonia. Any planning of land use put into practice should include real participation of all segments of the local society, especially those with low social visibility, such as peasants, rubber-tappers and Indians.

11) In the search for environmentally sustainable alternatives for land use, there is much to be learned from the indigenous peoples, rubber tappers and other local peasants who have accumulated a wealth of knowledge in managing tropical forests.

12) The physical and cultural survival of indigenous peoples and other Amazonian populations, beginning with the recognition of their

territorial rights, is an urgent necessity, not only as a source of technical knowledge for development planners, but also as means of ensuring the conservation and sustainable use of natural resources. The increasing, albeit incipient, level of political mobilization among indigenous peoples, rubber-tappers and their supporters, together with a more open political climate in Brazil, would seem to permit cautious optimism in this regard.

13) In areas occupied by rubber tappers, urgent measures must be taken to ensure: (a) the creation of new extractive reserves based on consultations with local communities, support groups and on-site field research; (b) legal guarantees for areas occupied by rubber-tappers, respected by government agencies; (c) definition of strategies for reinforcement activities, including training and credentials to allow the participation of local communities; (d) implementation of health and educational services; (f) definition of strategies for research in natural resource management, technical assistance, extension work, alternative markets, etc., in conjunction with local organizations.

14) Large development projects such as dams should be carefully planned and implemented, taking into account not only ecological concerns but the will of local populations affected by such projects.

15) In the final analysis, even the most well-planned development programs are likely to be frustrated as long as these two frontier regions continue to represent an "escape valve" for social inequalities originating elsewhere in Brazil.

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