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BRAZIL

Integrated Development of the Northwest Frontier

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This report is based on the findings of a mission which visited Brazil during the period from October 15 to November 7, 1979. The mission was composed of:

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The findings of subsequent missions have been employed to update the discussions of: demographic trends, Amerindians, agriculture and transportation.

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CURRENCY EQUIVALENTS

Cruzeiros/US\$ at End of Period

1975	9.07
1976	12.35
1977	16.05
1978	20.92
1979	42.53
1980	64.21
1981 January	68.44

Source : Central Bank Bulletins

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COUNTRY DATA - BRAZILAREA
8,512,000 km²POPULATION
119.0 million (September 1980)
Rate of Growth: 2.8% (from 1970 to 1979)DENSITY (1979)
14.4 per km²POPULATION CHARACTERISTICS (1978)Crude Birth Rate (per 1,000) 36.0
Crude Death Rate (per 1,000) 9.0HEALTH (1977)Population per physician 1,700
Population per hospital bed 253INCOME DISTRIBUTION (1972)% of national income, highest quintile 66.6
lowest quintile 2.0DISTRIBUTION OF LAND OWNERSHIP% owned by top 10% of owners 45.0
% owned by smallest 10% of owners 1.5ACCESS TO SAFE WATER (1975)

Percentage of population 77.0

ACCESS TO ELECTRICITY (Most recent estimate^{a/})% of population - total 63.0
- rural 19.2NUTRITION (1977)Calorie intake as % of requirements 107.0
Per capita protein intake (grams/day) 62.7EDUCATION (Most recent estimate)Adult literacy rate % 75.7
Primary school enrollment % 90.0GNP PER CAPITA in 1979^{b/} US\$1,687GROSS NATIONAL PRODUCT IN 1979ANNUAL RATE OF GROWTH (% constant prices)

	<u>US \$ Mln.</u>	<u>%</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>
GNP at Market Prices	198,790	100.0	4.5	5.8	5.7
Gross Domestic Investment	46,176	23.2	-0.6	9.4	7.3
Gross National Saving	36,313	18.3	1.1	11.2	4.4
Current Account Balance	10,021	-5.0	.	.	.
Exports of Goods, NFS	16,697	8.4	-0.4	17.8	7.4
Imports of Goods, NFS	21,915	10.9	-7.6	9.5	7.8

OUTPUT, EMPLOYMENT AND PRODUCTIVITY IN 1977

	<u>Net Domestic Product</u>		<u>EMPLOYMENT</u>		<u>NDP per Worker</u>	
	<u>US \$ Mln.</u>	<u>%</u>	<u>Mln.</u>	<u>%</u>	<u>US \$</u>	<u>%</u>
Agriculture	16,746	12.4	15.6	35.8	1,073	34.6
Industry	50,350	37.3	10.0	22.9	5,035	162.6
Services	67,953	50.3	18.0	41.3	3,775	121.9
Total/Average	135,049	100.0	43.6	100.0	3,097	100.0

GOVERNMENT FINANCE

	<u>Federal Government</u>		
	<u>(Cr\$ Bln.)</u>	<u>% of GDP</u>	
	<u>1979</u>	<u>1979</u>	<u>1972</u>
Current Receipts	544.2	9.9	10.4
Current Expenditure	460.4	8.4	9.9
Current Surplus	83.8	1.5	0.5
Capital Expenditures	43.7	0.8	0.6
Government Fixed Capital Formation	145.7	2.6	3.7

a/ Between 1974 and 1978

b/ The Per Capita GNP estimate calculated by the same conversion technique as the World Bank Atlas.

c/ Including intergovernmental transfers and residual cash adjustment.

d/ Including state and municipal government direct fixed investment, largely financed with Federal Government transfers.

. Not applicable

COUNTRY DATA - BRAZIL

MONEY, CREDIT and PRICES

	1975	1976	1977	1978	1979	1980
	(Billions Cr\$ outstanding end period)					
Money Supply	157.8	220.6	304.3	428.5	746.6	1,340
Bank Credit to Public Sector	22.6	49.8	70.6	117.2	236.4	477.5
Bank Credit to Private Sector	297.3	461.3	695.1	1,029.4	1,730.4	2,913.4
	(Percentages or Index Numbers)					
Money as % of GDP	15.6	14.1	13.1	12.6	13.5	10.7
General Price Index (1965-67=100)	613	866	1,236	1,714	2,639	5,542
Annual percentage changes in:						
General Price Index	27.7	41.3	42.7	38.7	54.0	110
Bank credit to Public Sector	56.9	120.4	41.8	66.0	101.7	101.9
Bank credit to Private Sector	55.2	50.1	50.6	48.1	68.1	95.9

BALANCE OF PAYMENTS

	1977	1978	1979	1980
	(Millions US\$)			
Exports of Goods, NFS	13,344	14,025	16,714	21,892
Imports of Goods, NFS	14,823	16,854	21,748	26,921
Resource Gap (deficit = -)	-1,479	-2,829	-5,034	-5,029
Interest Payments (net)	-2,103	-2,694	-4,104	-6,004
Other Factor Payments (net)	-455	-563	-636	-1,296
Net transfers	-	71	17	150
Balance on Current Account	-4,037	-6,015	-9,757	-12,179
Direct Private Foreign Investment (net)	810	1,071	1,505	1,202
Net MLT Borrowing				
Disbursement	8,765	14,284	11,658	12,451
Amortization	4,135	5,439	6,536	7,000
Net Disbursements	4,630	8,845	5,122	5,451
Other Capital (net) and capital n.e.i.				
Increase in Reserves (+)	-773	361	-88	2,027
	630	4,262	-3,218	-3,499
Gross Reserves (end year) ^{c/}	7,256	11,894	9,688	6,911
Petroleum Imports ^{a/}	4,081	4,483	6,698	10,210
Petroleum Exports ^{a/}	32	46	57	195

RATE OF EXCHANGE

AVERAGE 1979	AVERAGE 1980
US \$ 1.00 = Cr \$26.955	US \$ 1.00 = Cr \$52.605
Cr \$ 1.00 = US \$ 0.037	Cr \$ 1.00 = US \$ 0.190

MERCHANDISE EXPORTS (AVERAGE 1976-1980)

	US \$ Mln	%
Coffee (beans + soluble)	2,481	17.6
Soybean products	1,565	11.1
Sugar	554	4.0
Cacao	378	2.7
Cotton	22	20.2
Iron Ore	1,215	8.7
Manufactured Goods	5,003	35.6
All other commodities	2,838	20.1
Total	14,056	100.0

EXTERNAL DEBT, DECEMBER 31,

	US \$ Mln
Public Debt, incl. guaranteed	40,049
Non-Guaranteed Private Debt	16,358
Total outstanding & Disbursed	56,407

DEBT SERVICE RATIOS for 1979

	%
Net Debt Service Ratio ^{b/}	61.0
Public Debt Service Ratio (gross)	36.6

IBRD/IDA LENDING, (July 1, 1980) (Million US \$):

	IBRD	IDA
Outstanding & Disbursed	2,382	-
Undisbursed	2,579	-
Outstanding incl. Undisbursed	4,961	-

^{a/} Crude and derivatives.

^{b/} Debt Service on both public and private external debt net of interest earned on foreign exchange reserves as a percentage of Exports of Goods and Non-Factor Services.

^{c/} Change in level of reserves differs from reserve change in balance of payments by valuation adjustment.

GLOSSARY OF ACRONYMS

ASTER-RO	Associacao de Assistencia Tecnica e Extensao Rural -- Rondonia (Technical Assistance and Rural Extension Association -- Rondonia)
BB	Banco do Brasil (Bank of Brazil)
BASA	Banco da Amazonia (Bank of the Amazon)
CEPLAC	Comisao Executiva do Plano da Lavoura Cacaueira (Executive Commission for the Cocoa Development Plan)
CETREMI	Centro de Triagem e Encaminhamento do Migrante (Migrant Orientation Center)
CIBRAZEM	Companhia Brasileira de Armazenamento (Brazilian Storage Company)
DERMAT	Departamento de Estradas de Rodagem do Estado de Mato Grosso (Mato Grosso State Roads Department)
DNER	Departamento Nacional de Estradas de Rodagem (National Highways Department)
EMATER-MT	Empresa de Assistencia Tecnica e Extensao Rural -- Mato Grosso (Technical Assistance and Rural Extension Enterprise -- Mato Grosso)
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuaria (Brazilian Agricultural Research Enterprise)
FIBGE	Fundacao Instituto Brasileiro de Geografia e Estatistica (Brazilian Institute of Geography and Statistics)
FSESP	Fundacao Servico Especial de Saude Publica (Special Public Health Service)
FUNAI	Fundacao Nacional do Indio (National Indian Foundation)

IBDF Instituto Brasileiro de Desenvolvimento Florestal
(Brazilian Institute of Forestry Development)

INCRA Instituto Nacional de Colonizacao e Reforma Agraria
(National Institute for Colonization and Agrarian Reform)

POLAMAZONIA Programa de Polos Agropecuarios e Agrominerais da
Amazonia
(Amazon Agricultural and Mineral Poles Program)

POLONOROESTE Programa Integrado de Desenvolvimento do Noroeste do
Brasil
(Northwest Brazil Integrated Development Program)

PROMAT Programa Especial de Desenvolvimento do Estado de
Mato Grosso
(Special Development Program for the State of Mato Grosso)

SEAC Secretaria de Agricultura e Colonizacao do Territorio de
Rondonia
(Rondonia Territorial Agriculture and Colonization
Secretariat)

SEMA Servico Especial do Meio Ambiente
(Special Secretariat for the Environment)

SUCAM Superintendencia de Companhas de Saude Publica
(Superintendency for Public Health Campaigns)

SUDAM Superintendencia do Desenvolvimento da Amazonia
(Superintendency for the Development of Amazonia)

SUDECO Superintendencia do Desenvolvimento da Regiao Centro-Oeste
(Superintendency for the Development of the Center-West
Region)

SUMMARY AND CONCLUSIONS

The Setting

i. The Northwest of Brazil, as officially defined, covers 410,000 square kilometers -- about three-quarters the size of France -- and is comprised of the federal territory of Rondonia and part of the state of Mato Grosso. It forms a part of the legally-defined Amazon region, and is heterogeneous in terms of climate, vegetation, agricultural aptitude, and population density. Until the mid-1960s, the Northwest was practically uninhabited except for scattered Indian tribes and itinerant rubber-tappers and prospectors. However, with the completion of a 1,500 kilometer earth road linking the two major cities of the region, Cuiaba and Porto Velho, a massive wave of migrants started arriving in search of land and employment opportunities. Today, the population of the Northwest totals approximately 1.2 million, after growing at a rate of about 11% per annum during the 1970-80 period.

ii. One of the distinctive characteristics of the Northwest, shared by few other parts of Amazonia, is the existence of climatic conditions and soils suitable for agriculture. While the extent and types of soils present in the Northwest are not fully known, existing farms are situated, by and large, in relatively fertile areas appropriate for the cultivation of tree crops such as coffee, cocoa, and rubber. Annual crops are also grown in these areas, but further research on the agronomics and economics of fertilizer use, and stronger extension services, are needed before sustained annual cropping can be recommended as an appropriate form of land use. Much less is known about the agricultural aptitudes of the presently unoccupied areas of the Northwest, although preliminary surveys have indicated some additional pockets of relatively fertile soils. Detailed land-use capability surveys, now underway, are being employed to determine the suitability of these areas for new settlement projects based on small-scale farms (see para. xiii below).

iii. The possibility of obtaining inexpensive agricultural land has been the main attraction of the Northwest to the hundreds of thousands of migrants who have arrived spontaneously over the past decade. As of end-1979, about 24,000 migrant families had been settled in government-sponsored settlement projects scattered along the Cuiaba-Porto Velho road. Others, probably the majority, have established squatters' rights on the fringes of the official settlement areas, or have found temporary employment on the farms of those already settled or in the rapidly-growing towns of the region.

iv. Official colonization projects, based on 100-hectare lots, are presently confined to Rondonia. They were started in 1970 and now total seven. These projects are under the responsibility of the National Institute for Colonization and Agrarian reform (INCRA), an agency which also has jurisdiction over the disposition of lands within 150 kilometers of an international boundary and those located within 100 kilometers of any federal road or highway in Amazonia. As such, INCRA is a key institution responsible for bringing order to the rapid human occupation of the Northwest. To date, INCRA has been unable to fully accommodate the huge flow of migrants entering Rondonia. Though the situation is improving, the provision of land titles to prospective

settlers (an essential element in the settlement process) has lagged, as has the provision of necessary physical and social infrastructure and services. As a result, a sense of insecurity and isolation pervades much of the territory and crop losses, for lack of physical access to markets, are high.

v. The Mato Grosso part of the Northwest, like Rondonia, is being occupied primarily by migrants from the South and Northeast of Brazil. However, no federally-sponsored settlement schemes have yet been established in the state and the role of INCRA has been confined to regularizing the land tenure situation (a process known as "land discrimination") and setting norms for private colonization projects. The land discrimination process is still far from complete in Mato Grosso and the de facto pattern of land distribution is much more heterogeneous than that of Rondonia. Within Mato Grosso, the area of older settlement north of the city of Caceres has a high potential for agricultural development. Here, the size distribution of farms is fairly equitable and the soils and climate permit an economy based on coffee and rice cultivation. Like the situation in Rondonia, the principal constraint to further development is the presently inadequate infrastructure and services.

vi. As in other parts of Amazonia, the recent and rapid human occupation of the Northwest has raised concerns about the possible impact of economic development on the natural environment and on the indigenous Amerindian population. In regard to the environment, it is increasingly evident that the wet tropical forest ecosystem is among the most complex and fragile on earth and that deforestation can have some very negative effects, including leaching and erosion of the soil and, possibly, changes in the climate. Fortunately, and contrary to the conventional wisdom, relatively little of the Northwest has been deforested to date--certainly less than 5% of the original forested area. However, the potential for environmental degradation exists and ecologists are almost unanimous in their preference for farm systems based on tree crops and/or forestry over those emphasizing annual crops. This view is, by and large, also shared by government authorities, and programs to promote the cultivation of coffee, cocoa, and rubber have already been initiated in various areas of the Northwest.

vii. The size of the Northwest's Amerindian population is not reliably known although estimates run as high as 8,000. It is known, however, that the recent swell of migration to the region has intensified pressures on Indian lands and has increased the transmission of diseases, such as tuberculosis, measles and influenza, to which the indigenous population has little or no immunity. Though the rights of Indians are protected, in principle, through the Brazilian Constitution and implementing legislation, the National Indian Foundation (FUNAI) has, for lack of funds and staff, been unable to prevent invasions of Indian lands or to provide adequate medical care when epidemics have erupted. In the future, it is inevitable that contacts between settlers and Indians will increase, and FUNAI will need to improve its capacity for ameliorating the possible negative effects of such contacts.

Emerging Regional Policy

viii. The further settlement and economic development of the Northwest is currently one of the high priorities of the federal government. To this end, a federal Special Program, called the Northwest Brazil Integrated Development Program (POLONOROESTE), was established for the region in 1981 and budgeted at Cr\$77.3 billion (about US\$1.1 billion equivalent at the end-January 1981 official exchange rate) for the 1981-85 period. In essence, POLONOROESTE is directed to helping bring order to the large, spontaneous migratory flow to the Northwest and, consequently, at increasing the productivity, incomes and social welfare of the region's present and future population. These basic objectives would be reached through the execution of a number of integrated measures. Though the details of specific projects to be financed through POLONOROESTE are still evolving, the major components of the program may be generally described.

ix. In order to help resolve the problem of inadequate physical farm-to-market access (probably the most urgent of the current problems), about 57% of the total POLONOROESTE budget would be used for the reconstruction and paving of the Cuiaba-Porto Velho road and the improvement of the secondary and feeder roads network in the areas of greatest agricultural potential. These related measures, in themselves, should greatly benefit the region by lowering the cost, and increasing the accessibility, of inputs (both agricultural and industrial) and by facilitating the evacuation of regional production.

x. It seems clear that improving the regional transport system is a necessary, though not sufficient, step in the process of promoting the productive settlement of the Northwest. This point is explicitly recognized in the POLONOROESTE program proposal (exposicao de motivos) which, in addition to the construction and improvement of roads, also provides for the consolidation of existing settlement projects and the establishment of new ones, improvements in the region's physical and social infrastructure and services (including land titling), and measures to protect the natural environment and the interests of the indigenous population.

xi. In regard to the consolidation of existing settlement projects, it is the intention of the Rondonia government to establish a number of urban support centers (nucleos urbanos de apoio rural) in the rural areas furthest removed from the Cuiaba-Porto Velho road. These support centers would make available to previously isolated settlers a wide range of infrastructure and services, including technical assistance; credit, storage and marketing facilities; schools and health posts; communications facilities; and recreation areas. In addition to the production benefits these centers would bring to the settlers, they would be instrumental in creating a sense of community -- a crucial factor in the process of fixing settlers to the land. The role of INCRA in the existing settlement areas is expected to gradually diminish over the next few years as preparations are made to transfer existing settlement projects to the jurisdiction of the territory (which is expected to become a state in 1981).

xii. The major responsibilities of INCRA under POLONOROESTE would be to regularize the region's land tenure situation and to establish new settlement projects in presently unoccupied areas. The first responsibility, if carried out successfully, would significantly reduce the insecurity of many settlers who do not now possess definitive titles to their land, while increasing their opportunity to obtain investment credit through the formal banking system. Though the land tenure services of INCRA would be upgraded throughout the Northwest, high priority would be given to providing definitive titles to settlers who have already established squatters' rights on the fringes of the existing settlement projects. This measure would help fix this population to the land and, hence, take some of the pressure off the new settlement areas.

xiii. The new settlement areas would be initially located in Rondonia (to be extended later to Mato Grosso) along a road now under construction between the towns of Ouro Preto and Costa Marques. It is INCRA's intention to settle at least 30,000 families in these areas (22,000 in Rondonia and 8,000 in Mato Grosso) over the 1981-85 period. Originally, the new INCRA projects were to be implanted in the form of square-shaped "modules" measuring nine kilometers on a side, with the capacity to settle 120 families each on 45-hectare lots (supplemented by 3.45-hectare lots for housing and subsistence agriculture). While this "module" concept has been retained for planning purposes, in practice the design of the new settlement projects would be a function of the agricultural aptitudes of the selected sites and the socioeconomic characteristics of the expected settler population. INCRA has commissioned land-use capability and demographic surveys to serve as the bases for subsequent project preparation.

xiv. The specific measures aimed at protecting the natural environment and the interests of the Amerindian population are still being developed. It is expected, however, that POLONOROESTE funds will be mainly used for strengthening the administrative capacities of the agencies entrusted with these tasks (the Brazilian Institute for Forestry Development - IBDF and the Special Secretariat for the Environment - SEMA in the case of environmental protection, and FUNAI in the case of Indian affairs). In regard to the environment, institution-building would be directed to improving IBDF's ability to monitor deforestation and to prevent invasions of forest reserves. Funds would also be made available for the financing of new national parks (IBDF) and ecological research stations (SEMA). Likewise, FUNAI would be strengthened and provided with funds for the demarcation and monitoring of Indian lands, the contacting of as yet uncontacted tribes, and for improving its social and production services.

xv. A forest policy for Amazonia is being developed parallel to POLONOROESTE, and its implementation should also have a beneficial impact on the future development of the Northwest. This policy, elaborated by the Ministries of the Interior and Agriculture, in effect calls for the zoning of Amazonia and the promotion of environmentally-preferred modes (e.g., sustained logging operations) of development. It also provides for the monitoring of forest reserves, Indian lands, national parks and other types of land-use zones, and for severe penalties for unauthorized land use within these zones. The implementing legislation for this policy is currently under review by the National Security Council.

Agricultural Production Forecasts

xvi. In order to better evaluate the agricultural potential of the Northwest and to assess in a preliminary manner the possible impact of proposed regional development policies, an attempt was made to project regional agricultural and timber production to 1984, 1989, and 1994. These projections were made according to two scenarios -- one representing a simple extrapolation of past trends and the other assuming a full array of government assistance, much as proposed under POLONOROESTE. The results of this exercise strongly suggest that the Northwest has considerable potential in agriculture and forestry and that the production response to public investments in infrastructure and services could be both rapid and extensive.

xvii. Under the assumptions of Scenario I (that is, extrapolation of past trends), total agricultural production could be expected to grow at a 8% average annual rate over the next 15 years. Though this is in excess of the historical growth of all Brazilian agriculture of about 5%, the absence of expanded government activity under this scenario could very well jeopardize the long-term development of the region in ways (e.g., through an aggravation of social tensions over issues related to land tenure, and needless environmental degradation) not fully reflected in the production figures. The clear preference, therefore, would be for Scenario II (which assumes a full range of government assistance). Under this scenario, not only would production be expected to grow at a 13% average annual rate (resulting in a level of production which by 1989 would be 2.3 million tons in volume, or US\$827 million in value, higher than would be the case under Scenario I), but indiscriminate land clearing would be checked, and by good initial land selection, improved land titling and technical support, there would be a move toward sustained cropping (emphasizing tree crops) rather than the short-term exploitation of the land.

Conclusions

xviii. The principal conclusion of the present report is that the Northwest has the potential to become an important agricultural and timber-producing region of Brazil, and a place where migrants from other parts of the country may be productively and permanently settled on small-scale farms. Thus, the measures proposed under POLONOROESTE in support of the future settlement and development of the region seem justified on both economic and social grounds. Such measures also seem justified on the grounds that a sizeable population already exists in the region -- a significant proportion of which now finds itself in insecure land tenure situations and without access to basic infrastructure and services.

xix. Though the measures contemplated in POLONOROESTE deal with most of the region's major problem areas, it may also be concluded that the execution of this program will entail a higher-than-normal degree of risks. Most of these risks emanate from the basic characteristics of the Northwest: (i) its huge land area and frontier status; (ii) its rapidly-growing population; (iii) its confused land tenure situation; (iv) its fragile, and imperfectly-known, natural environment; (v) its Amerindian population, now in the early stages of contact with modern society; and (vi) its thin administrative structure.

xx. Perhaps the greatest risk is that the administration of POLONOROEST and those of the executing agencies, may be unable to fully control and monitor the future occupation and development of the Northwest. Thus, the government should be prepared to accept some of the negative effects frequently associated with accelerated development in frontier areas. Included among these negative effects are likely to be: (i) continued conflicts over land-related issues, including some invasions of Indian lands; (ii) some indiscriminate deforestation and unsound farming practices; and (iii) instances of general lawlessness. While such effects are to some extent inevitable, they would certainly be more widespread and serious in the absence of the special measures contemplated under POLONOROESTE.

THE INTEGRATED DEVELOPMENT OF
BRAZIL'S NORTHWEST FRONTIER

I. INTRODUCTION

1.01 The Northwest Region of Brazil is officially defined as the area of influence of the 1,500 kilometer Cuiaba-Porto Velho road. This area encompasses all of the federal territory of Rondonia, plus 14 municipios located in the central and western parts of the state of Mato Grosso. In total, the Northwest covers approximately 410,000 square kilometers, or slightly less than 5% of the national territory. The 1981 regional population, including the município of Cuiaba, is estimated to be in the neighborhood of 1.2 million. While relatively short-lived economic booms (based on gold in Mato Grosso and on wild rubber in Rondonia) have lured migrants to the region in the past, most of the present population has arrived since the mid-1960s -- a period coinciding with the opening of the Cuiaba-Porto Velho road. Despite this recent growth, however, the average population density is still less than three inhabitants per square kilometer, and vast areas of forest remain virtually uninhabited.

1.02 Within Brazil, the Northwest is perceived as a region of rich soils and great economic potential and, as such, has attracted the attention of both the public and private sectors in recent years. To the government, the region is viewed as an important future source of agricultural production for export and for domestic consumption, as well as a location where migrants from other parts of Brazil can be productively and permanently settled on small-scale farms. To private firms and individuals, the region is viewed more in terms of profits arising from current or potential initiatives in agriculture and livestock, forestry, mining, light industry, private land development, and outright land speculation and fraud (grilagem). Though the aims of the public and private sectors complement each other in many ways, the disorderly pattern of the region's past occupation makes it imperative that its future development be closely guided by the government in a manner which promotes both rational land-use patterns and social equity. If such guidance is not forthcoming, there is a substantial risk of replicating in the Northwest the highly skewed distribution of income and wealth, chronic migration, and environmental degradation observed elsewhere in Brazil.

1.03 The desire of the present government to steer the future socio-economic development of the region in the directions recommended above is evident from the Northwest Brazil Integrated Development Program (Programa Integrado de Desenvolvimento do Noroeste do Brasil-POLONOROESTE) first proposed in 1979 and formally established in 1981. At the core of this program is a project to reconstruct and pave the Cuiaba-Porto Velho road budgeted at approximately US\$568 million equivalent at the end-January 1981 official exchange rate, excluding allowances for physical and price contingencies. However, in order to maximize the economic and social benefits of this improvement in the transport system, the program also calls for the implementation of parallel projects to promote land settlement, agricultural development, and feeder roads construction in the main road's area of influence. These parallel projects, budgeted at around US\$520 million, are specifically aimed at improving the socioeconomic conditions of small-scale farmers already residing in the area and establishing colonization schemes to accommodate the expected flow of new immigrants. An additional US\$36 million is allocated for environmental protection and for support of Indian communities.

1.04 In principle, the measures contemplated in the integrated development program could lead to significantly higher levels of output and employment in the region, coupled with a socially-acceptable distribution of income and wealth. However, the existence of certain conditioning factors imply that the successful execution of any overall development program for the Northwest will require a flexible and creative approach and exceptionally strong central management. Among the more important of such factors are: (i) the region's great heterogeneity in terms of present levels of development, natural resource endowments, population densities, structures of land ownership, availabilities of physical and social infrastructure and services, and other socioeconomic variables; (ii) its extremely high rate of population growth based mainly on immigration; (iii) the rudimentary knowledge of its soils, forests, and population; (iv) its precarious transport system, particularly roads; (v) the undefined land tenure situation prevailing in some areas; (vi) its fragile natural environment subject to rapid degradation after clearing; (vii) the existence of an indigenous population subject to threats from new immigrants over land rights; and (viii) the weak managerial capacities of some potentially important executing agencies.

1.05 The basic purpose of the present report is to describe the physical and human environments of the Northwest, with a view to assessing this region's potential and prospects for sustained economic development. Emphasis will be placed on further describing the aforementioned conditioning factors and on analyzing how they influenced in the past, and might influence in the future, the design and implementation of public policies, including POLONOROESTE. As implied in the previous paragraph, the available statistical information on the Northwest is limited, often outdated, and of questionable quality -- a problem which is common to most dynamic frontiers. It was frequently necessary to choose among several conflicting sources of information or to extrapolate from limited field observations. Thus, while the descriptions and analyses contained in the present report are believed to be based on the best information available, the report's findings may be subject to a wider margin of error than would be those of studies of less dynamic regions of older settlement.

II. DEVELOPMENT PLANNING FOR THE NORTHWEST

2.01 The elaboration of plans and the execution of programs for the development of the Northwest involve a host of agencies at different levels of government. The development of the Northwest entails benefits (e.g., improving the national balance of payments and domestic food supply, providing settlement areas for poor migrants from other parts of the country, promoting national integration, etc.) which transcend regional boundaries. At the same time, subnational governments in the region have neither the financial resources nor the administrative capacities to mount a comprehensive development effort. For these reasons, the role of the federal government is currently dominant. The present chapter briefly describes the basic administrative structure of the Northwest and the federal Special Programs operating in the region. Recent development plans elaborated by the state of Mato Grosso and territory of Rondonia will also be described and evaluated. Specific comments and recommendations pertaining to the major federal, state, and territorial executing agencies are scattered throughout subsequent chapters.

A. Administrative Structure

Federal

2.02 At the federal level, it is the Ministry of the Interior that is largely responsible for administering and monitoring regional development programs. The federal Secretariat of Planning (SEPLAN), however, also plays an important role by setting national planning objectives (which the regional plans must follow) as well as broad guidelines for public expenditures. In order to decentralize regional development efforts, a number of regional development agencies, all linked to the Ministry of the Interior, have been established over the years and it is the intention of the present government to further strengthen them. Two of these agencies, the Superintendency for the Development of Amazonia (SUDAM) and the Superintendency for the Development of the Center-West Region (SUDECO), have overlapping jurisdictions in the Northwest.

2.03 SUDAM is the principal planning agency for "Legal Amazonia", which, in addition to Rondonia and Mato Grosso (the Northwest), includes the states of Para, Amazonas and Acre, the federal territories of Amapa and Roraima, and parts of the states of Maranhao and Goias. It is headquartered in Belem and is responsible for elaborating the overall development plans for Amazonia, for administering fiscal incentive funds in collaboration with the Banco da Amazonia (BASA), and for administering and monitoring the federal Special Programs in its jurisdiction. SUDECO, whose main offices are located in Brasilia, is in charge of development planning for the Center-West, defined as the Northwest, plus the states of Mato Grosso do Sul, Goias, and the Federal District, and for administering and monitoring a number of federal Special Programs, not under the responsibility of SUDAM. Unlike SUDAM, SUDECO does not administer fiscal incentive funds.

Territory, State, and Local

2.04 Parallel to the regional development agencies are the governments of the federal territory of Rondonia (with seven municipios) and the state of Mato Grosso (with 14 municipios included in the Northwest region). Rondonia has been a federal territory since 1943 and is considered a "decentralized unit" of the federal government, linked to the Ministry of the Interior. Its governor is nominated by the Minister of the Interior and confirmed by the President of the Republic. Until recently, Rondonia had little financial autonomy and taxes normally in the sphere of the states (principally the value-added tax - ICM) were collected by the federal government and returned to the territory upon the approval (by the Ministry of the Interior) of a spending plan. Starting in 1979, however, Rondonia began collecting its own taxes while gaining a certain degree of autonomy over how the proceeds would be spent. Taxes collected by the territory are supplemented by various revenue-sharing arrangements, the most important being the State and Territorial Participation Fund which, in recent years, has accounted for about one-fourth of Rondonia's total revenues. Municipal government is at an embryonic stage in the territory, but the present administration of Rondonia is seeking to strengthen the local administrative apparatus as part of its preparations for statehood, expected in 1981.

2.05 The present state of Mato Grosso was established on January 1, 1979 when the former state of Mato Grosso was divided into two parts, the southern portion becoming the state of Mato Grosso do Sul. As a result of this division, which left the state with two-thirds of the land area of the former state, but only one-third of its population and economic activity, Mato Grosso has been undergoing severe financial difficulties. In addition, the new state of Mato Grosso includes the former capital, Cuiaba, and it has been obliged by stringent civil service laws to maintain much of the payroll of the old state. In order to ease this financial problem, a federal Special Development Program for the State of Mato Grosso (PROMAT) was established in 1977 to supplement the state's budget (see paras. 2.14-2.16 below for more details).

2.06 The strength of local government varies considerably within Mato Grosso. The most developed municipios tend to be located in the area of older settlement between Cuiaba and Caceres. In the frontier areas of the state (i.e., Vila Bela and Aripuana), municipal governments, like those of Rondonia, are at an early stage of development and frequently require financial and technical assistance from the state.

B. Federal Special Programs

2.07 Three federal Special Programs are currently directed at the Northwest: PROMAT, POLONOROESTE, and POLAMAZONIA (Amazon Agricultural and Mineral Poles Program). As mentioned above, the responsibility for the administration and monitoring of these programs lies with the Ministry of the Interior (through SUDECO and SUDAM), in collaboration with SEPLAN, other federal ministries, and the subnational governments involved in the programs' execution. A discussion of these programs' objectives and accomplishments to date follows.

POLONOROESTE

2.08 POLONOROESTE, formally created in 1981, is Brazil's newest Special Program and the first specifically designed for the Northwest. Its primary objective is to promote the orderly human occupation and development of the region through government support of productive activities, and the implantation of economic and social infrastructure. The reconstruction and paving of the Northwest's main overland artery (the Cuiaba-Porto Velho road), a key element of POLONOROESTE, had been considered by the Ministry of Transport as early as the mid-1970s, but it was not until 1979 that the government officially called for a program in which highway construction was integrated with agricultural development and settlement. In this year, Regulation (Portaria) 126, signed by the Ministers of Interior, Transport, and Agriculture, established an interministerial working group charged with the task of designing a settlement strategy for the region, and of proposing specific settlement and infrastructure projects. The findings of this working group were subsequently issued as a two-volume report. 1/ Although hastily prepared, this document served to highlight the problems and potential of the Northwest. It also stimulated a constructive debate in regard to the approaches that could be taken to bring order to the region's settlement and agricultural development. A broad consensus was finally reached on this point and, while the details of specific projects are still evolving, the main thrust of the interministerial report now forms the basis of POLONOROESTE.

2.09 According to the program proposal (exposicao de motivos), POLONOROESTE's principal undertakings during the 1981-85 period are to be: (i) reconstruction and paving of the Cuiaba-Porto Velho road; (ii) construction and consolidation of the secondary and feeder roads network; (iii) implantation and consolidation of settlement projects; (iv) execution of land tenure regularization services; (v) support of agricultural, forestry and agroindustrial activities and provision of social services and infrastructure to small rural communities 2/; and (vi) environmental protection and support of indigenous communities. The investment budget for POLONOROESTE for the 1981-85 period totals Cr\$77.3 billion, approximately US\$1.1 billion at the end-January 1981 official exchange rate. More than half of this budget would be allocated to the transport sector (see Table 1). Sources of funds for the entire period have not yet been identified, but are expected to emanate from the regular budgets of the executing agencies, allocations from the National Integration Program (PIN), and domestic and foreign loans (including one or more from the World Bank).

1/ Ministries of Interior, Agriculture, and Transport, Programa Integrado do Desenvolvimento do Noroeste do Brasil (Brasilia, 1979).

2/ Integrated rural development projects would be implemented in Ariquemes and Ji-Parana/Cacoal (Rondonia) and Caceres/Mirassol d'Oeste and Tangara da Serra/Barra do Bugres (Mato Grosso).

Table 1

POLONOROESTE BUDGET, 1981-85
(millions of January 1981 cruzeiros)

<u>Component</u>	<u>Cr.\$</u>	<u>% of Total</u>
<u>Transport</u>	<u>44,305.3</u>	<u>57.3</u>
- Cuiaba-Porto Velho Road	38,690.0	50.0
- Feeder Roads	5,615.3	7.3
<u>Settlement of New Areas</u>	<u>17,813.2</u>	<u>23.0</u>
<u>Land Tenure Services</u>	<u>2,179.3</u>	<u>2.8</u>
<u>Rural Development</u>	<u>9,783.0</u>	<u>12.7</u>
- Arquemes (RO)	2,041.8	2.6
- Ji-Parana/Cacoal (RO)	2,463.6	3.2
- Caceres/Mirassol d'Oeste (MT)	3,335.6	4.3
- Tangara da Serra/Barra do Bugres (MT)	1,942.0	2.5
<u>Environmental Protection</u>	<u>791.1</u>	<u>1.0</u>
<u>Amerindian Affairs</u>	<u>1,646.1</u>	<u>2.1</u>
<u>Administration</u>	<u>790.0</u>	<u>1.0</u>
<u>TOTAL</u>	<u>77,308.0</u>	<u>100.0</u>

Source: POLONOROESTE, Exposição de Motivos.

2.10. At present, the preparation of the agricultural development and settlement, feeder roads, environmental, and Indian protection components of POLONOROESTE, though proceeding well, is still incomplete, and the reconstruction and paving of the Cuiaba-Porto Velho road is only just beginning. However, the integrated nature of the program, its concentration in an area with a rapidly growing rural labor force and considerable agricultural potential, and its explicit concern for the natural environment and the indigenous population, represent a vast improvement over previous road-building programs in the Amazon region in which such factors were generally absent.

POLAMAZONIA

2.11. POLAMAZONIA, created through Decree 74,607 of September 25, 1974, operates in 15 areas of "Legal Amazonia" selected for their development potential. Its principal objectives are: (i) the incorporation of regional resources into the national productive process; (ii) the improved distribution of income; (iii) the promotion of productive activities oriented toward both local consumption and export; (iv) the fixing of population through the creation of employment and improvements in the quality of life; and (v) the improvement of urban infrastructure. POLAMAZONIA, jointly administered by SUDAM and SUDECO, effectively began operations in July 1975.

2.12. During the 1975-78 period, Cr\$1.1 billion in 1978 cruzeiros (US\$61 million), or about 14% of POLAMAZONIA's total budget, was allocated to Rondonia. An additional Cr\$478 million (US\$17 million), 16.3% the program's total annual budget, went to the territory in 1979. The funds for 1979 were distributed among 24 projects for physical infrastructure in transport and energy (47% of the total), health and education (21%), support of agriculture and industry (20%), and urban development (13%).

2.13. Many of the specific projects receiving POLAMAZONIA funds in Rondonia in 1979 were also granted resources through this program in previous years. This was the case, for example, with agricultural research and technical assistance; land tenure services; the construction of grain storage facilities in Ariquemes, Ouro Preto, Ji-Parana, and Vilhena; support of agroindustrial projects in Porto Velho and Ji-Parana; and the initial phases of the road planned to link Costa Marques with Ouro Preto. Other projects, completed during the 1975-78 period, include: (i) a road from Ariquemes to Rio Machado (in the cassiterite mining area); (ii) improvement of the airports in Porto Velho, Ji-Parana, and Guajara-Mirim; (iii) the preparation of urban development plans for Porto Velho, Ariquemes, Ji-Parana, Pimenta Bueno, and Vilhena; (iv) urban water and sewer projects in Ouro Preto, Cacoal, Jarú, Ariquemes, Presidente Medici, and Vilhena; (v) a study of industrial opportunities in the territory; the installation of a major health facility in Ji-Parana and of smaller health posts in Espigao d'Oeste, Riozinho, Ariquemes, Pimenta Bueno, Jarú, Ouro Preto, Presidente Medici, Cacoal, and Vilhena; and (vii) studies for the implantation of a hydroelectric project at the Cachoeira Samuel.

PROMAT

2.14. PROMAT was established through Complementary Law 31 of October 11, 1977 at the time of the decision to divide the former state of Mato Grosso. It was to run for ten years, starting in 1979, with an expenditure program to be elaborated by a special federal commission under the coordination of SUDECO. SUDECO, in turn, contracted the basic studies and the preparation of a six-year investment program (1980-85) for Mato Grosso to the Joao Pinheiro Foundation.

2.15. The principal concerns of the federal government in Mato Grosso, to be partially dealt with through PROMAT, are the precarious nature of the state's physical infrastructure, especially energy and transportation, and the current financial crisis described above. The subregions of the state given priority for PROMAT funds by the federal government include the area of influence of the Cuiaba-Porto Velho road and, secondarily, the Pantanal and the areas of influence of the Cuiaba-Santarem road (BR-163), and roads BR-158 (in the area of Barra do Garcas) and AR-1 (in the private colonization area in the município of Aripuana). It was originally felt that PROMAT funds should not be used in parts of Mato Grosso already encompassed in other federal Special Programs, but a decision was subsequently reached to repress Cr\$500 million of the 1980 budget to POLONOROESTE.

2.16. Owing to a national policy of reducing public expenditures, relatively little was accomplished during 1979, PROMAT's first year of operation. The original investment program, which gave emphasis to transportation (26% of the total), urban development (7%) and rural development (3%), could simply not be carried out for lack of funds. The initial budgetary allocation to Mato Grosso of Cr\$1.7 billion was first reduced to Cr\$1.4 billion and then to Cr\$450 million. The funds actually received were used exclusively for covering the state's current expenditures. In order to make up for the shortfall in 1979, a Cr\$1.05 billion supplement to the regular PROMAT budget was to be allocated to Mato Grosso in 1980.

C. State Development Plans

2.17. In addition to the Joao Pinheiro investment plan for PROMAT mentioned above, there are two other multi-sectoral development planning documents with a state/territory scope. The first of these, the I Plano Geral de Governo para o Estado de Mato Grosso (I PAGEMAT), was prepared for the government of Mato Grosso by CAEEB (Companhia Auxiliar de Empresas Eletricas Brasileiras), a government enterprise subordinated to the Ministry of Mines and Energy. The second, the I Plano de Desenvolvimento de Rondonia (hereafter I Plano), was prepared by the Secretariat of Planning of the territory.

I PAGEMAT

2.18. The I PAGEMAT, which covers the period 1980-84, is an attempt to develop a growth strategy for the new state of Mato Grosso. Throughout the document, the Center-West, in general, and Mato Grosso, in particular, are viewed as "natural alternatives" for migration and agricultural expansion.

The economic growth strategy proposed in the I PAGMAT is a variation of the primary export-based model, although a degree of industrial processing is called for in order to maximize value-added locally and, hence, state tax revenues. Emphasis is given to investments in physical infrastructure, particularly energy and transportation, with the objective of attracting private capital to the state. In general, economic growth promoting measures are given explicit precedence over social development programs.

2.19. The expenditure program proposed in the I PAGEMAT totals Cr\$42 billion in June 1979 cruzeiros (US\$1.8 billion) to be disbursed over the 1980-84 period. As implied above, the largest budgetary allocations are to the transport, energy, and agricultural sectors, accounting for 24%, 20%, and 17%, respectively, of the total. With regard to transportation, the principal concern of the plan is with the paving of the primary road system (including the Cuiaba-Porto Velho road) and the implantation of feeder roads (with first priority given to the Caceres/Barra do Bugres area). In the energy sector, the I PAGEMAT gives major emphasis to the construction of major hydroelectric projects near Cuiaba. Finally, in agriculture, the plan recommends that priority be given to the establishment of storage and marketing facilities, and meat packing plants.

2.20. Most investment would be concentrated in the axis formed by the cities of Cuiaba, Caceres and Rondonopolis (the latter falling outside of the POLONOROESTE area). However, the I PAGEMAT is essentially an indicative document, and the availability of resources to finance the proposed investment projects would depend on transfers from the federal government, PROMAT funds and other sources, and, thus, on a process of negotiation between the state and federal administrations.

I Plano

2.21. The principal objective of the I Plano would be to facilitate the transformation of Rondonia into a state. In order to accomplish this, the plan recommends that economic and social development over the 1980-85 period be based on: (i) balanced population growth through the settlement of previously unoccupied areas and the development of agricultural and silvi-cultural activities; (ii) the intensification of mining operations, particularly cassiterite; (iii) the establishment of industries for processing regional raw materials, especially agricultural commodities; and (iv) the development of urban support centers in rural areas.

2.22. According to the I Plano, present and future migrants should be productively settled in the territory through the development of a colonization model which includes the necessary physical and social infrastructure as well as sufficient lots for those seeking land. It goes on to state that proposed improvements in the social services should be primarily directed at existing settlement areas, and that these services should be provided, together with production services, through urban support centers to be established in the more isolated parts of the presently occupied official colonization projects. In short, the basic guideline for settlement would be to provide assistance to small farmers through the provision of physical infrastructure and a variety of services, while taking advantage of, and reinforcing, existing concentrations of population at all levels of Rondonia's emerging urban hierarchy.

2.23. The I Plano proposes a total budget of Cr\$64.4 billion in 1979 cruzeiros (US\$2.4 billion) between 1980 and 1985 -- an amount substantially larger than the POLONOROESTE budget for the same period. Among the 15 sectors included in the expenditure program, the most important are "regional development" (26% of the total), planning and administration (17%), agriculture and food supply (14%), and transportation (11%). The largest individual expenditure items contemplated in the I Plano are: the paving of the Cuiaba-Porto Velho road (budgeted at Cr\$8.3 billion); general administration of the territory (Cr\$6.4 billion); the provision of low-income housing (Cr\$6.1 billion); the construction of secondary and feeder roads (Cr\$5.7 billion); the implantation of a hydroelectric facility at Cachoeira Samuel near Porto Velho (Cr\$4.9 billion); and colonization and land tenure services (Cr\$4.5 billion).

General Observations

2.24. It is evident that the I PAGEMAT and the I Plano were elaborated, for the most part, independently of the interministerial report and POLONOROESTE. Though most of the investments contemplated in POLONOROESTE (e.g., road construction, settlement schemes, and the provision of other physical and social infrastructure and services) are also included in the state/territory plans, some of the additional concerns of the state and territorial governments, particularly in regard to energy, urban development, and administration have not been explicitly considered in the new federal special program for the region. In subsequent discussions between federal and state/territorial officials it was agreed that POLONOROESTE would be primarily directed at resolving problems in the rural areas of the region, and that energy and urban development programs would need to be financed either through local funds or through other programs of the federal government.

III. POPULATION, MIGRATION AND SOCIAL INDICATORS

A. Population Growth and Spatial Distribution

Total Population Estimates

3.01 Brazil's most recent demographic census was conducted in 1980, but only the preliminary findings, confined to data on total population by município and sex, have been published so far. However, it is already evident that the Northwest was the fastest growing region of the country over the past decade. The total 1980 regional population, according to the census, was around one million (versus about 350,000 in 1970). This figure exceeds by a significant margin the official inter-censal estimates made by FIBGE (Brazilian Institute of Geography and Statistics) since the latter did not take adequate account of the extremely high rates of migration to the Northwest between 1970-80 (see Table 2 and paras. 3.09-3.19). This agency, for example, predicted a 1980 total population for Rondonia of 172,000 -- a level probably surpassed by 1975.

3.02 Owing to the proposed reconstruction of the Cuiaba-Porto Velho road and associated investments in economic and social infrastructure and

services, plus the continuing lure of inexpensive farmland, it is unlikely that the migratory flow to the Northwest will abate significantly during the 1980s. In fact, some official projections suggest that the rate of migration will actually increase. In this regard, forecasts prepared by the Interministerial working group for the Northwest (see para. 2.08) predict a total regional population of 2 million by 1985 and 2.8 million by 1988.

Population Densities

3.03 Because the Northwest is a frontier area in the process of settlement, its average population density (2.5 inhabitants per km²) continues to be far lower than the national average (about 14 inhabitants per km²). Moreover, given the heterogeneous nature of the region in terms of such factors as means of access, agricultural potential, and land ownership patterns, it is not surprising that average population densities vary considerably among municipios. In general, average densities tend to be relatively highest in older urbanized areas, such as Varzea Grande (113 inhabitants per km²), and in recently occupied farming areas enjoying relatively easy access. Municipios falling into the latter category include Mirassol d'Oeste (12.7 inhabitants per km²), Cacoal (8.4 inhabitants per km²), and Ji-Parana (5.3 inhabitants per km²). In contrast, population densities considerably below one inhabitant per square kilometer may be observed in Aripuana, Vila Bela, and Guajara-Mirim. Though many factors explain these extremely low population densities, the most important are difficulty of access, concentrated land ownership and, in the case of Guajara-Mirim, limited soils suitable for small-scale farming.

Table 2

NORTHWEST REGION: TOTAL POPULATION, LAND AREA,
AND POPULATION DENSITY, 1980

<u>State/Município</u>	<u>Population</u>	<u>Area (km²)</u>	<u>Density (inhabitants per km²)</u>
<u>MATO GROSSO</u>	<u>567,053</u>	<u>179,904</u>	<u>3.15</u>
Aripuana <u>a/</u>	6,250	27,300	0.23
Barra do Bugres	23,609	9,433	2.50
Caceres <u>b/</u>	104,885	36,143	2.90
Vila Bela <u>c/</u>	23,515	60,633	0.39
Mirassol d'Oeste <u>d/</u>	53,902	4,233	12.73
N.S. do Livramento	10,229	6,315	1.62
Pocone	23,314	16,691	1.40
Tangara da Serra	31,367	5,684	5.52
Varzea Grande	77,053	682	112.98
Cuiaba <u>e/</u>	212,929	12,790	16.65
<u>RONDONIA</u>	<u>492,744</u>	<u>243,044</u>	<u>2.03</u>
Ariquemes	53,489	35,918	1.49
Cacoal	67,243	8,000	8.41
Guajara-Mirim	34,814	73,654	0.47
Ji-Parana	122,124	23,203	5.26
Pimenta Bueno	30,072	17,049	1.76
Porto Velho	134,621	53,846	2.50
Vilhena	50,381	31,374	1.61
<u>NORTHWEST REGION</u>	<u>1,059,797</u>	<u>422,948</u>	<u>2.51</u>

a/ Area west of the Rio Roosevelt only.

b/ Includes municípios of Jauru, Salto do Ceu and Rio Branco created in 12/79.

c/ Includes município of Pontes e Lacerda created in 12/79.

d/ Includes municípios of Quatro Marcos and Araputanga created in 12/79.

e/ Data is for município; officially-defined Northwest includes city only.

Source: FIBGE, Censo Demografico de 1980: Resultados Preliminares, 1980;
and mission estimates.

General Growth Patterns, 1960-80

3.04 The most striking demographic characteristic of the Northwest, and probably the most significant for regional planners, is the extremely high rate of population growth this region has experienced in recent years, particularly since 1970. As indicated in Table 3, the region's total population increased at an average annual rate of 6.5% during the 1960-70 period, and accelerated to a rate of 10.8% during 1970-80. Population growth during both periods was thus much greater than could be explained by natural rates of increase alone. The data also indicate important intraregional variations in the population growth rate. During the 1960s, Mato Grosso's population grew at a rate far above that experienced by Rondonia, owing primarily to the rapid growth of Cuiaba and the municípios of Caceres and Barra do Bugres, the latter two of which received a large contingent of rural migrants during the decade.

3.05 From 1970 to 1980, the situation described above reversed, with Rondonia's population growing at the extraordinarily high annual rate of 15.8%, versus the still very substantial 7.8% rate registered in Mato Grosso. Within Mato Grosso, the areas of most rapid population growth have been the Cuiaba-Varzea Grande urban agglomeration and the rural zones to the north, including the municípios of Aripuana, Barra do Bugres, Caceres, Mirassol d'Oeste, and Tangara da Serra. In Rondonia, recent demographic expansion has occurred almost exclusively within the boundaries of the former município of Porto Velho, that is, in or near the official agricultural settlement areas adjacent to the Cuiaba-Porto Velho road.^{1/}

Table 3

NORTHWEST REGION: AVERAGE ANNUAL RATES OF POPULATION GROWTH,
1960-70, 1970-80, 1960-80
(%)

State/ Territory	Time Period		
	1960-70	1970-80	1960-80
Mato Grosso *	7.2	7.8	7.5
Rondonia	4.8	15.8	10.2
Northwest Region	6.5	10.8	8.6

* Includes município of Cuiaba and excludes município of Aripuana.

Source: FIBGE, Censo Demografico, 1960, 1970 and 1980.

^{1/} The former município of Porto Velho has been recently subdivided into five new municípios: Ariquemes, Ji-Parana, Cacoal, Pimenta Bueno, and Vilhena. The latter also occupies a part of the former município of Guajara-Mirim.

Rural-Urban Growth Patterns

3.06 At the time of the 1970 census, the population of the Northwest was distributed more or less equally between rural and urban areas, with a slight predominance of rural population in Mato Grosso (50.9%) and of urban inhabitants in Rondonia (53.6%). Official estimates for 1978 suggest that this urban-rural demographic balance has remained essentially unchanged, although rural areas have apparently grown somewhat faster than urban centers in northwestern Mato Grosso and in Rondonia. As was the case with rates of population growth, however, significant inter-municipal differences exist with respect to the urban-rural population distribution.

3.07 The rate of urbanization in the Northwest, like the rate of population growth generally, has been very rapid, especially since 1970. This may be observed in the two major urban "poles" of Cuiaba-Varzea Grande and Porto Velho whose populations grew at rates estimated at 6.2% and 12.3% per annum, respectively, during the 1970-78 period. It may be even more readily observed in the smaller cities and towns of Rondonia (e.g., Ariquemes, Ouro Preto, Vilhena, Cacoal) situated adjacent to the Cuiaba-Porto Velho road, where average annual growth rates above 50% are not uncommon. In Mato Grosso, outside of the Cuiaba-Varzea Grande urban agglomeration, the rate of urbanization has been considerably lower.

B. Migration

3.08 As implied by the high growth rates discussed above, migration has been responsible for most of the post-1970 demographic expansion of the Northwest. Even before this period, however, migration to areas of Mato Grosso such as Cuiaba and the municipios of Caceres and Barra do Bugres explained much of their population growth. While most migrants to Cuiaba came from other parts of the state (especially nearby rural areas), those arriving in Caceres and Barra do Bugres generally originated in rural areas of the states of Minas Gerais, Sao Paulo, and Espirito Santo. The migrants to Caceres and Barra do Bugres were apparently motivated by the availability of inexpensive land in state government settlement projects that were being implemented at the time, and often arrived in the region with financial resources derived from the sale of their previous landholdings. Pre-1970 migration to Rondonia occurred on a much smaller scale than in Mato Grosso (roughly 25,000 versus 100,000). The Northeast and Southeast were the regions of origin for approximately 60% and 20%, respectively, of the total flow.

3.09. Prior to 1970, unlike the more recent situation, the principal motive for migration to Rondonia was the opportunity for employment in extractive activities such as rubber-tapping and Brazil-nut gathering, and cassiterite and gold mining. With the improvement of the Cuiaba-Porto Velho road in 1969 and the rapid spread of information (frequently erroneous) about the high quality of soils and wide availability of inexpensive or "free" land in the area cut by the highway, the flow of migrants to the Northwest, and particularly to Rondonia, increased sharply. The implantation of a number of

official agricultural settlement projects in Rondonia also tended to reinforce the attractiveness of the Northwest to potential migrants. In addition to these "pull" factors, it would appear that several factors acted to "push" rural workers from the South and Center-West of Brazil. Among the factors most frequently cited are: (i) agricultural mechanization and a consequent decline of rural employment opportunities; (ii) sales of smallholdings to large commercial farmers seeking to expand the production of export crops, particularly soybeans; (iii) excessive fragmentation of landholdings through inheritance in regions of earlier small farmer settlement, such as northern Parana and southern Mato Grosso; (iv) the substitution of agricultural production by ranching activities; and (v) periodic climatic problems (especially frosts) in southern coffee-growing regions.

Size and Time Pattern

3.10 The total size of the migratory flow to the Northwest during the past decade will not be known precisely until the full results of the 1980 census are published. However, given the estimates of total population presented earlier, and assuming a 3% per annum rate of natural increase for the region, the total flow must have been on the order of 500,000 (335,000 to Rondonia and the balance to Mato Grosso). In regard to the time pattern, one knowledgeable researcher argues that the flow of migrants to Rondonia has tended to accelerate since 1974 -- perhaps by coincidence the year in which the policy of establishing official settlements along the Transamazon highway was essentially abandoned (see para. 6.03). 1/ As illustrated in Table 4, the available data on migrants passing through the Migrant Orientation Center (CETREMI) in Vilhena during the 1976-80 period generally corroborate this assertion, although one may observe considerable annual variations. 2/ Though these variations may only reflect deficiencies in the statistical base, some authorities attribute them to the implementation, and subsequent abandonment, of a government-sponsored program to discourage migration to Rondonia. 3/

1/ See G. Martine, "Recent Colonization Experiences in Brazil: Expectations Versus Reality". Paper presented at the Symposium on Internal Migration and Development, Cuernavaca, Mexico, September 18-21, 1978.

2/ Seasonal variations are also important. In recent years, roughly two-thirds of the migratory flow has entered Rondonia during the drier months (April-September).

3/ The data contained in Table 4 greatly understate the total annual flow of migrants; probably by more than half. This is mainly because CETREMI only counts those persons declaring themselves to be migrants, and because young children are excluded from the totals. Moreover, until very recently, CETREMI only processed migrants entering the territory during the daylight hours when the facility was open.

Table 4

NUMBER OF PERSONS PROCESSED AT RONDONIA
MIGRANT ORIENTATION CENTER (CETREMI), 1976-80*

1976	17,129
1977	6,319
1978	14,755
1979	44,278
1980	57,572

* Excludes children under 5 years of age.

3.11 This program contained elements of both persuasion and coercion. The first element is best exemplified by the propaganda campaign mounted in late 1977. The major feature of this campaign was the distribution in the states of Parana, Mato Grosso, Minas Gerais, and Espirito Santo (areas from which much of the migration was coming) of pamphlets purporting to describe the potential risks and hardships involved in migrating to Rondonia. 1/ In addition to this attempt at persuasion, it is reported that highway police were employed to force the return of trucks carrying migrants. It is suspected, however, that many migrants posing as "tourists" crossed the border in buses or entered the territory during hours when the control post was unmanned. 2/

Origin and Destination

3.12 A rough comparison of the migrants' places of birth and previous residences before arriving in Rondonia can be extracted from the INCRA and CETREMI data. As of early 1977, the INCRA data reveal that about one-third of the settlers (colonos) surveyed were born in Minas Gerais, 10% in Bahia, and roughly 5% each in Parana and Ceara. However, the CETREMI data, which are tabulated on the basis of previous residence, convey quite a different picture. According to this source, of those migrants surveyed between August 1977 and March 1979, about 30% of all family heads had come from Parana, with roughly an equal percentage last residing in Mato Grosso. Much smaller numbers of migrants had come directly to the territory from Minas Gerais, Espirito Santo, Sao Paulo, and the Northeast.

1/ These pamphlets read as follows: "Rondonia has soils of excellent quality for agricultural exploitation. But, for all practical purposes, these lands are already occupied. Therefore, only a limited number of lots are available for sale. Moreover, a large part of these lands (over 2 million hectares) are located either in official colonization projects or in areas which have been ceded by INCRA, in public auction, to farming and cattle-ranching companies." Cited in G. Martine, op. cit.

2/ See C. Mueller, "Recent Frontier Expansion in Brazil: The Case of Rondonia." Paper presented at the conference on the Development of Amazonia in Seven Countries, Cambridge, England, September 23-26, 1979.

3.13 The data cited above suggest either that a significant change occurred after 1977 with respect to the migrants' geographical origin, or that many of the settlers who last resided in Parana and Mato Grosso were born somewhere in the southeast or northeast of Brazil. While both of these hypotheses may be correct to some extent, in all probability the latter accounts for most of the discrepancies between the two sets of data. This contention is supported by the findings of a University of Brasilia study on the Ouro Preto colonization project. Of the settlers surveyed for this study, roughly 55% were born in Minas Gerais and Espirito Santo, as compared with only 10% in Parana and Mato Grosso. On the other hand, among those who had lived in more than one place before arriving in Rondonia, nearly half had resided in Parana and Mato Grosso, this being especially the case for settlers born in Minas Gerais and the Northeast. Overall, 71% of the Ouro Preto colonos had lived in at least two places, and 27% in at least three places, prior to entering the territory.

3.14 Within Rondonia, migrants have gone primarily to official colonization areas. Moreover, during the past few years, the overall flow has become more directed to the central and northern parts of the territory. During the period from August to October 1977, for example, the principal destinations were: Colorado (39%), Cacoal (18%), Vilhena (14%), Ji-Parana (9%), and Ariquemes (8%). During the first three months of 1979, slightly more than half of the migrants interviewed at the CETREMI post intended to head for Ariquemes (27%) and Ji-Parana (25%). With respect to Mato Grosso, the destinations of migrants may be indirectly inferred from the data on the changes in agricultural employment between 1970 and 1975. On this basis, one may hypothesize that the most intense inflows occurred in the municipios of Vila Bela (where the total number of persons employed in agriculture in 1975 was up 300% from the 1970 level, Barra do Bugres (up 265%), Caceres (up 230%), and Cuiaba and Varzea Grande (up 215%).

Age, Sex and Employment Experience of Migrants

3.15 The available data indicate that the migrant population of Rondonia is predominantly young, male and from an agricultural background. The INCRA data on settlers in official colonization projects, for example, shows that about 46% of the population is under 15 years of age, as compared to the national average in this age bracket of about 42%. This age structure implies a high dependency ratio and a great potential demand for social services, particularly health and education. For the overall settler population, the male-female ratio is on the order of 1.1. However, the average rises to 1.3 in the rural areas and falls to 1.0 in urban zones. These ratios suggest that many males migrate alone and that employment opportunities in the territory are strongly differentiated by sex.

3.16 Most migrants to Rondonia have come from rural areas and the principal reported occupation of the family head has been agriculture. Between March and December 1978, approximately 70% of all migrants interviewed at the CETREMI post originated in rural areas, although the share of families coming

from urban areas tended to rise during the period. ^{1/} This latter tendency continued in early 1979. During the first quarter of 1979, for example, 44% of all migrants entering the territory originated in towns and cities. Paralleling the change in the rural versus urban origins of migrants to Rondonia, an increasing percentage of family heads report non-agricultural occupational backgrounds. While in 1977 roughly 90% of all household heads gave their occupation as farmers, this share had fallen to about 50% by the first quarter of 1979. Throughout the 1977-79 period, the most important non-agricultural occupations have been those associated with transportation, construction, domestic activities, and commerce.

3.17 The INCRA data on migrants settled in official colonization projects reveal that the previous agricultural experience of most has included the cultivation of perennial (unspecified) crops. However, it appears that relatively few colonos had made use of rural credit, or had marketed their produce through formal channels (e.g., wholesalers, cooperatives, public agencies) prior to arriving in Rondonia. Table 5 summarizes the available information on these aspects disaggregated by project.

3.18 From Table 5, it may be observed that, on the average, 62% of the settlers in the official projects had worked with perennial crops in their places of origin. However, considerable inter-project variations in this average are evident; ranging from a high of 84.3% in the case of Rolim de Moura to a low of 41.1% in the case of Sidney Girao. In the projects for which data is available, less than one-fourth of the settlers had ever used rural credit. For those who had, the most frequently cited source was the Banco do Brasil. Finally, the majority of settlers, independent of whether they worked with annual or perennial crops, had before coming to the territory marketed their produce exclusively through intermediaries.

3.19 In sum, the available information for Rondonia suggests that many, if not most, of the recent settlers have come from market-oriented, albeit relatively low-income, agricultural backgrounds. These data also suggest the need for a strong extension service to provide advice on agronomic techniques (especially those pertaining to tree crops), the use of rural credit, marketing, and cooperative development. Moreover, the actions of this extension service would need to be flexible enough to take into account the wide differences in agricultural experience among the settlers.

^{1/} On the basis of a sample of farmers interviewed in 1977 as part of the state planning secretariat's study on migration, it would appear that about 80% of the recent migrants to Mato Grosso originated in rural areas.

Table 5

RONDONIA: PREVIOUS AGRICULTURAL EXPERIENCE OF SETTLERS
IN SELECTED OFFICIAL COLONIZATION AREAS
 (% of total household heads)

<u>Project</u>	<u>Perennial Crops *</u>	<u>Use of Credit</u>	<u>Informal Marketing **</u>
Rolim de Moura	84.3	16.0	80.2
Ji-Parana	68.9	18.2	67.3
Ouro Preto	71.1	48.0	68.6
P. de Assis Ribeiro	50.9	19.9	27.5
Sidney Girao	41.1	-	75.9
Adolfo Rohl	85.1	-	44.7
<u>MEAN</u>	<u>62.0</u>	<u>23.5</u>	<u>57.5</u>

* Exclusively, or in association with annual crops.

** Exclusive use of intermediaries.

Source: M. H. da Trindade Henriques, "Diagnostico e Perspectivas para o Territorio Federal de Rondonia: Demografia" (Brasilia, 1979).

C. Education and Health

3.20 Certain factors complicate the education and health problems of the Northwest and make them especially difficult to deal with. First of all, the origins of most of the migrants appear to be extremely humble, and hence they may be expected to bring with them the poor education and health standards prevailing in their places of origin. Second, the age structure of the migratory flow is such that the potential demand for social services, particularly education and health, is unusually high. Third, the process of deforestation and rapid settlement causes changes in the environment which may, in turn, increase the incidence of certain tropical diseases, especially malaria, to which the majority of migrants have no resistance. ^{1/} Fourth, the absence of an adequate secondary and feeder roads network in the region tends to isolate the new settlers and thus impede their physical access to education and health facilities now concentrated in the cities and towns. Fifth, because of the incipient stage of settlement and agricultural development in many parts of the region, the extra demand for public education and health services

^{1/} Moreover, it should be pointed out that the migrants often bring in diseases (e.g., measles, influenza, tuberculosis) to which the indigenous population has no resistance (see Chapter IV).

generated by the new migrants is not, in the short run, accompanied by an equivalent increase in the means to finance these services at the local level. Finally, health planning (and to a certain extent education planning) is impeded by the lack of an adequate statistical base upon which to make decisions. With these factors serving as a general background, the following paragraphs describe the education and health conditions currently prevailing in the region and comment on government programs in these sectors.

Education

3.21 The available evidence shows that recent migrants to Rondonia have been, on the whole, very poorly educated. In this respect, INCRA data reveal that over 50% of the family heads in the official colonization projects are illiterate, with the average illiteracy rate rising to almost 70% in the case of the Adolfo Rohl project. Of those settlers who had received some formal education, no more than 2% in any project had graduated from primary school. The educational status of migrants to rural areas of Mato Grosso is also low but, on the average, considerably better than that of settlers in Rondonia. Of some 1,000 migrants interviewed in 1977, about 36% of the family heads were found to be illiterate. Among those with some formal education, 9% had completed four or more years of schooling.

3.22 The large and continuing inflow of migrants and their school-aged children has put considerable strain on the region's educational system. This is particularly evident in the case of Rondonia where the number of primary and secondary school students increased by 240% (from 41,148 to 140,311) between 1975 and 1979. Though the number of schools in the territory has also increased rapidly in recent years, as of 1978 about 28% (roughly 32,000 persons) of the 7-14 years population cohort was not enrolled in primary school. At the secondary level, almost 90% (about 34,000 persons) of the eligible population (15-18 years) was not enrolled in school. In Mato Grosso, the rates of non-attendance at the primary and secondary levels in 1977 were 25% (29,000 persons) and 58% (20,000 persons), respectively.

3.23 In Rondonia, the most serious deficiencies in the educational system are found in the rural parts of new settlement areas. Here the chief problems are lack of physical access to the formal educational system, which tends to be concentrated in the towns and cities, and the inability to attract qualified teachers. In response to these problems, settlers in Rondonia have constructed a large number of "provisional" schools on the basis of self-help arrangements and have staffed them with members of the local community. Though these grass roots efforts are commendable, they are clearly inadequate. As of 1978, there was a shortage of almost 900 classrooms in the territory. Moreover, in 1979 only 17 of the 1,257 teachers in the rural areas (1.3% versus 61% in urban areas) of the territory were officially qualified (habilitados). However, a teacher training facility is now operating in Ji-Parana and others are expected to be established in the near future. It remains to be seen, though, whether, once trained, these teachers will return to the rural areas where salaries and living conditions are generally the poorest.

3.24 Though the available information is sketchy, it would appear that the problems of rural education in Mato Grosso are similar to those observed in Rondonia -- deficient infrastructure, poorly-trained teachers, and limited physical access. In regard to the first aspect, official statistics for 1977 show a deficit of around 700 classrooms for the entire survey area. Unfortunately, the statistics do not allow a spatial disaggregation of this deficit, but it must be presumed that a major proportion is accounted for by rural areas. Likewise, the statistics do not permit a urban-rural breakdown of teachers' qualifications. However, in municipios characterized by recent occupation, such as Aripuana and Vila Bela, less than half of the primary school teachers have themselves completed a primary education. This may be compared to the situation in the older urbanized areas of Cuiaba and Varzea Grande where 95% of the primary school teachers have a secondary level or higher education.

3.25 In the short-run, it will be extremely difficult to substantially improve the rural education system of Mato Grosso given the current financial problems of the state and the municipios, the latter responsible for rural education. However, some stop-gap measures, such as the state paying teachers' salaries in the poorer municipios, and sub-contracting educational services to private colonization companies located in the far north, are now in effect. In addition, state authorities look with favor on a new rule which obliges cattle ranches receiving fiscal incentive funds to provide primary schooling to the children of their employees.

Health

3.26 The dearth of health statistics for the Northwest makes it virtually impossible to evaluate current conditions precisely. Owing to the isolation of much of the population, deficient infrastructure, and poor diagnostic capabilities, both births and deaths tend to be under-recorded. Thus, traditional measures of health conditions such as life expectancies and infant mortality rates are either not available or of questionable reliability. Still, the available evidence suggests that regional health conditions are generally poor.

3.27 In Rondonia, the part of the region for which health statistics are most complete, the average infant mortality rate in 1978 was on the order of 137 per 1,000 live births; a rate 40-50% higher than the national average. Within the territory, the infant mortality rate ranged from a "low" of 84 in the municipio of Guajara-Mirim to an extraordinarily high 414 in Ji-Parana. According to the Rondonia health secretariat, the most common transmissible diseases in the territory are malaria, leishmaniasis, measles, and whooping cough; the most frequent causes of death (1977-78) are malaria, hepatitis, tuberculosis, and measles. 1/ Work accidents associated with land clearing are also cited as a major health problem.

1/ In 1977 the leading causes of death in Mato Grosso were infectious and parasitic diseases, respiratory ailments, and anemia. No further details are available.

3.31 In Rondonia, general public health services are coordinated by the territorial secretariat of health. ^{1/} However, in the towns along the Cuiaba-Porto Velho road (from Ariquemes south) these services have been sub-contracted to the federal Foundation for Public Health Services (FSESP). As of 1979, FSESP operated nine health facilities of various levels of complexity in the territory, and four others were under construction. This agency has also implanted five urban water supply systems. The state of Mato Grosso has raised the possibility of entering into a similar agreement with FSESP to provide health services in the southern portion of the Cuiaba-Porto Velho road, but this has not yet been finalized. Though the services of FSESP are generally of high quality, the problem of delivering health care to the rural population remains unresolved because this agency's facilities and manpower are concentrated in urban areas. However, it is expected that the current plan of the Rondonia government to establish urban support centers (nucleos urbanos de apoio rural) away from the main road should ameliorate the situation considerably. As currently envisaged, these support centers would contain not only health posts, but schools as well (see Chapter VI, paras. 6.29-6.30 for more details).

IV. AMERINDIANS

4.01 Since the colonial period, Brazil's Amerindian population has fallen from an estimated two to five million to a present-day population of less than 200,000. This dramatic decline (which is similar to that of other lowland South American Indians) has been the result of a combination of factors, including early slave raiding expeditions, exposure to disease, and intermarriage. More recently, the progressive occupation and economic development of Amazonia has placed the Amerindian population in an increasingly precarious position. Diseases transmitted by new settlers have decimated whole tribes and illegal seizures of Indian lands have reduced the area available for traditional hunting, fishing and agricultural activities.

A. Legislation

4.02 The indigenous population of Brazil has its status and rights defined in a body of legislation comprised of Article 198 of the Constitution of 1969, the Indian Statute of 1973 (Law No. 6,001), and a series of laws and decrees enacted between 1967 and 1980 which established and now govern FUNAI. This legislation was designed to assure the survival of the Indian population, regulate the contact and interaction of this population with the larger national community, and to provide adequate time for the acculturation of the Indian society to the modern world.

4.03 The most important parts of the legislation are the guarantees regarding Indian land rights. Prior to the 1969 Constitution, Indians were considered to own the lands they inhabited. Article 198 of the 1969 Constitution modified this precept. It guarantees to Indians the inalienable right to the use of the lands they inhabit, but grants ownership to the Union.

^{1/} The provision of health care services to the indigenous population is the responsibility of FUNAI. The nature of these services is discussed in Chapter IV.

4.04 The Indian Statute protects native lands from illegal trespass and gives FUNAI the right to call on the armed forces and on the federal police for enforcement of this law. It also states that squatters' rights do not apply to Indian lands. According to the Indian Statute, intervention within native lands is permitted through presidential decrees, but only under the following conditions: (i) to put an end to fighting between tribal groups; (ii) to combat serious outbreaks of epidemics that may lead to extermination of the native community or any disease that may endanger the integrity of the forest dwellers or tribal group; (iii) for the sake of national security; (iv) to carry out public works of interest to national development; (v) to repress encroachments upon Indian lands; or (vi) to work valuable subsoil deposits of outstanding interest for national security and development. If, for any of the above reasons, a tribal group must be removed to another area, the native community is to be assigned an area equivalent, in all respects, to the former one.

4.05 The Indian Statute thus clearly provides for the maintenance and protection of native lands and the right to the natural wealth thereon, with the qualifications stated. These qualifications can, and in some cases have, reduced the force of the legal guarantees provided in the Indian legislation. Nevertheless, it is important to note that the main thrust of the legislation is to provide for protection of the rights of the Indian population in ways which duly recognize their cultural distinctness and their need, given their existing economic systems, for large areas of land.

B. The National Indian Foundation (FUNAI)

Historical Background

4.06 The Indian Protection Service (SPI) was created in 1910 by Colonel (later Marshal) Candido Mariano da Silva Rondon, and under his guidance guaranteed protection for the Indians in their own territory, prohibited familial disruption, and assured each Indian equal citizenship rights with other Brazilians. In its later years, the SPI strayed from its founding principles. By 1967, widespread corruption within the SPI was revealed in the proceedings of a special investigation commission (known as the Figueiredo report) and the organization was disbanded. Of a total 700 employees in the SPI, 238 were dismissed and 134 were charged formally with crimes.

4.07 A new agency, FUNAI, was then established to deal with the problems of the Amerindian in Brazil. ^{1/} Since 1970, the growing emphasis on the development of the Brazilian Amazon--evidenced by the creation of PIN with its ambitious sub-programs of highway construction, mineral and other natural resource surveys, and agricultural development; the SUDAM fiscal incentive

^{1/} It should be noted, however, that the legislation creating FUNAI specifically stipulated that personnel previously serving the SPI would automatically be employed by FUNAI, with the exception of those who were dismissed for misconduct.

program; and official and spontaneous settlement--has intensified the pressures on Indian lands. In principle, this has made the role of FUNAI as a mediator between "developmentalists" and "protectionists" increasingly important.

Administrative Structure

4.08 FUNAI is administratively linked to the Ministry of the Interior, like the territorial governments, SUDAM and SUDECO. Its objectives sometimes conflict with those of the other, more economic development oriented, institutions. 1/ For this reason, it often has been suggested that FUNAI be removed from the Ministry of the Interior and placed instead in the office of the President of the Republic. There is no indication, however, that such a step is under serious consideration by the Government.

4.09 FUNAI maintains a large administrative headquarters in Brasilia, which is responsible for coordinating and overseeing the work of 13 regional delegations. The Presidency, Administrative Superintendency, Planning Advisory Unit (ASPLAN), and operational divisions are all located in Brasilia (see Figure 1). Regional delegations and local Indian posts are subordinated to the Department of General Operations, which is also responsible for executing the various programs designed by the Community Planning Department and ASPLAN. The Indian Patrimony Department is responsible for commercial activities involving Indian lands, resources, or production (including handicrafts).

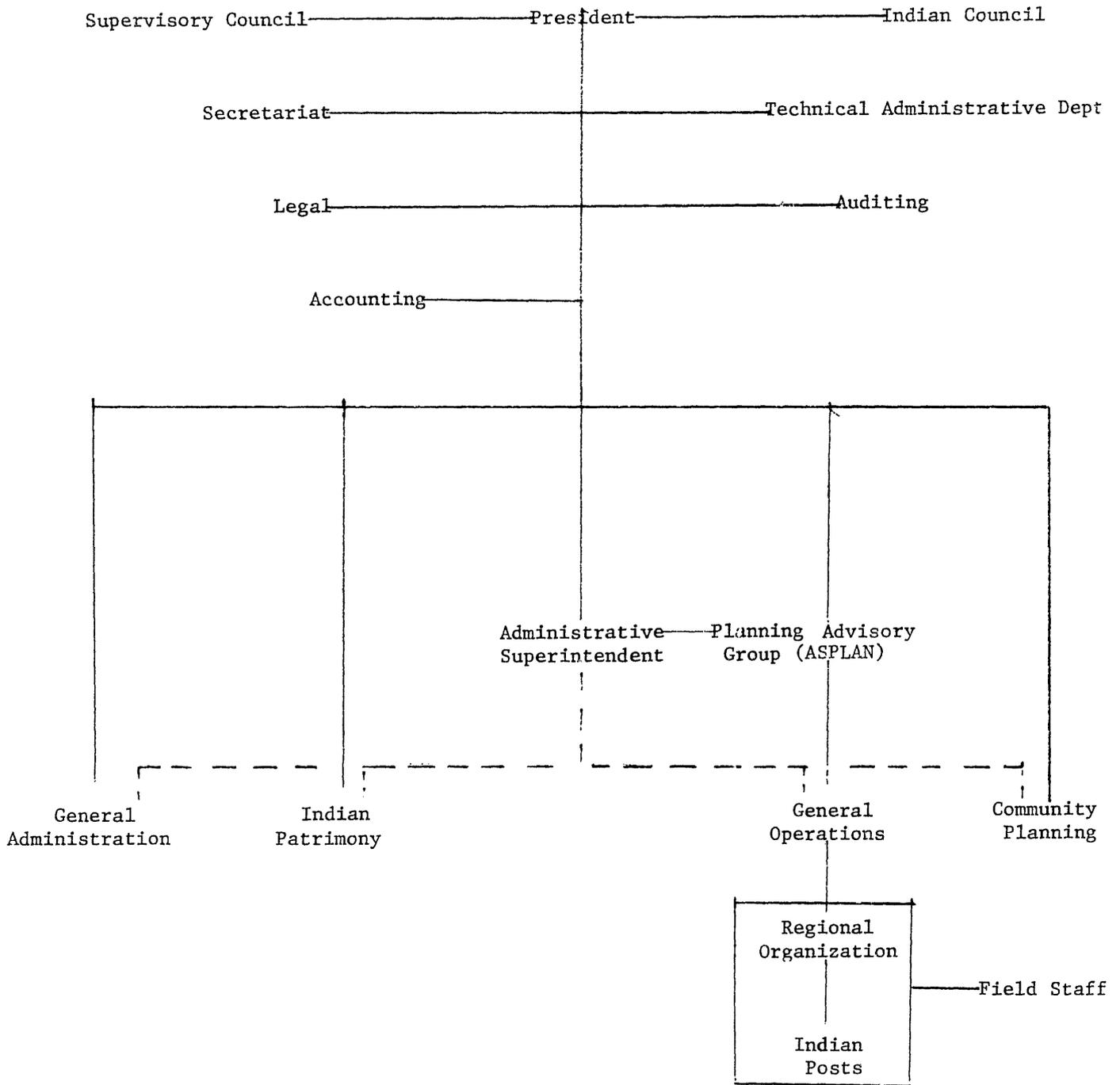
4.10 Direct, daily contact with the indigenous population mainly takes place at the local Indian posts. The area, population, and number of villages attended by these posts varies considerably, sometimes encompassing a large area with a dispersed population. During the early 1970s, Indian post managers were given a training course organized by the education division with lectures on basic anthropology, medical care, accounting, and other relevant subjects. This training was discontinued in the late 1970s for lack of funds.

4.11 In principle, each Indian post is equipped with a medical dispensary. In practice, not all of them are. However, some regional delegations maintain mobile health teams (equipes volantes de saude) staffed by a doctor, dentist, nurse, and laboratory technician. These teams carry out routine inspection missions and emergency missions (e.g., for the control of an epidemic). Mobile health teams generally service operate only in the area of their respective regional delegations, but in emergency cases they may be called upon to assist other delegations. Transport for the medical teams is provided by FUNAI, which employs boats, small aircraft and, in emergencies, an air taxi service.

1/ In order to minimize possible conflicts of this nature, the government has recently decided to place a representative of FUNAI on the Deliberative Councils of SUDAM and SUDECO.

FIGURE 1

FUNAI: Present Organization



Funding

4.12 FUNAI depends on a number of revenue sources for financing its activities. The most important source, however, is the annual allocation from the national budget (see Table 6). This source is followed in importance by allocations from the FAS (Social Assistance Fund) and PIN/PROTERRA. Funds generated by FUNAI itself, largely through the sale of Indian artifacts, are relatively insignificant. In 1979, FUNAI was budgeted at slightly less than US\$17.5 million equivalent, of which over half was used for administration.

Table 6

FUNAI Budget, 1979

<u>Sources</u>	<u>% of Total</u>	<u>Uses</u>	<u>% of Total</u>
National Budget	57	General Administration	56
FAS	23	Community Development	17
PIN/PROTERRA	10	Community Assistance	14
FUNAI	3	Demarcation of Lands	6
Other	7	Other	7

Source: FUNAI

4.13 A serious problem in the history of FUNAI has been the chronic shortage of funds which has forced the postponement or cancellation of important programs, including the demarcation of Indian lands and the training provided to Indian post managers (see para. 4.10). There are indications, however, that this situation is changing. First, the government has recently announced a new program to accelerate the pace of demarcation (see para 4.23). Second, the allocation to FUNAI in the final POLONOROESTE budget is substantially higher, in both absolute and relative terms, than it was in earlier drafts (i.e., Cr.\$1.6 billion out of a Cr.\$77 billion total, versus Cr.\$500 million out of Cr.\$59 billion).

Management Style

4.14 Although FUNAI operates through a three-tier hierarchy (i.e., national, regional and local), planning and decision-making functions tend to be centralized in Brasilia. One result is that programs and projects elaborated at the national level do not always accurately reflect the local situation and the self-perceived needs of the Indians. Another result is that actions to be taken at the local level are often delayed as requests for authorizations of various types work their way up through the bureaucracy.

These related problems suggest the need for more frequent and open communication between the three administrative levels of FUNAI, and the delegation of more decision-making authority to the regional and local levels. FUNAI is aware of the need to streamline its operations and to make its programs more responsive to local needs and is now reviewing possible administrative reforms directed to these ends (see paras 4.16 and 4.17).

4.15 A lack of continuity in management has compounded the problems described above. FUNAI has had three different presidents in the past three years, and top managerial posts have changed with each change in the presidency. As a consequence, many senior administrators (commonly retired military officers) have little knowledge of, and experience with, Indian affairs and are not always able to anticipate problems of concern to FUNAI. This factor has tended to reduce the effectiveness of FUNAI and has increased the chances for friction between decision-makers on the one hand and professional "Indianists" (both government and non-government) on the other. One way in which to improve this situation would be to establish a career service through which Indian specialists could move into senior operational positions.

Proposed Administrative Reforms

4.16 In late 1979 President Figueiredo issued a decree authorizing the restructuring of FUNAI to bring greater order and efficiency to its administration. There are ongoing discussions concerning the kinds of changes to be made, but as yet no specific structure has been decided upon. Some of the proposals which have been made (not mutually exclusive) include: (i) readjusting the boundaries of the regional delegations to conform to political-administrative boundaries; (ii) changing the administrative superintendent into an executive director who would assume responsibility for general operations as well as for community planning; and, (iii) decentralizing FUNAI's operational responsibility, to allow greater autonomy at the regional level.

4.17 The proposed decentralization of FUNAI (item iii above) has met with criticism from private pro-Indian organizations such as CIMI (the Missionary Indian Council) and the Comissoes Pro-Indio. They believe that this would give local and state political and economic interests greater influence in FUNAI activities, and that the developmentalist attitude of these interests will lead to greater infringements of Indian rights. ^{1/} Advocates of decentralization within FUNAI, however, feel that the regional delegate needs to exercise a greater influence on the society in his area. The regional delegate would, in his expanded role, participate in the process of sensitizing local politicians and social groups to the needs and problems faced by the Indians. This greater awareness of the community would, it is believed, make FUNAI's operations easier in the future. In order to prevent the application of local political pressures on the regional delegate, proper and consistent norms would be established as a guide to his activity. This would entail defining some difficult issues, such as what type of action is appropriate for a tribe or tribes at various stages of acculturation.

^{1/} Most disputes with FUNAI concern land, and regional delegates subject to local influence might be encouraged to hasten the "emancipation" of an area in order to shift reserve boundaries.

C. Identification and Protection of Indian Lands

4.18 The demarcation of Indian lands, in a way which is clear and unmistakable, is essential to ensuring the protection of Indian territory. The recent migration into frontier areas such as the Northwest, and the disorganized pattern of settlement, has made demarcation one of the most critical issues for the Indian population. Protection of Indian lands is necessary in order to provide Indian groups with the continued ability to maintain their subsistence while they adjust and adapt to the modern world, and to shield them from the initial shock of contact with the expanding Brazilian economy.

4.19 The existing legislation provides that prior to the establishment of any project in the national territory, the responsible individual or corporation must receive from FUNAI a "negative certificate" (certidao negativa) which essentially states that no Amerindian groups are present in the area of the proposed project. In most cases, presentation of a negative certificate is required by banks prior to making a loan. If it is established that there are no Indians in the area, then no further action by FUNAI is necessary after the negative certificate is issued. If not, however, FUNAI must take measures to demarcate and protect the Indian area.

FUNAI Procedures for Demarcation

4.20 The first step, after the presence of an Indian group has been verified, is to declare an area "interdicted". This is an administrative measure which prohibits the entrance of anyone, with the exception of FUNAI staff, into an area believed to be inhabited by Indians. The boundaries of the interdicted areas are only approximate, however, and little or no monitoring is possible with FUNAI's small field staff. At the same time an area is interdicted, a FUNAI "pacification" mission is sent into the field. The objective of this mission is to make initial contact with the Indian group in order to determine its size, origins, traditional territory and language. Once the group is contacted, a team is left behind to evaluate the needs of the tribe for land, based upon the types of land use and economic activity, as well as factors such as religious or other traditions.

4.21 After an Indian group is contacted -- a process which can require as little as a month, but may last a period of years -- FUNAI can begin to identify the range of the Indian group. The second step taken is to "delimit" the area, based on information gathered in field work with the Indians. Delimitation is done on a map and, once determined, serves as the basis for a presidential decree, or a regulation of the president of FUNAI, granting to the Indians rights over those lands contained within the delineated boundaries.

4.22 The third and final step is the actual "demarcation" of lands at the ground level and registration of the Indians' legal right to the land in the Federal Register. According to FUNAI norms, demarcation requires the clearing and maintenance of a six-meter swath of land around the reservation, the marking of the boundary lines with surveyors' markers, and the placing of

concrete posts every 1,000 meters. Aluminium signs are also to be posted at regular five kilometer intervals. Demarcation is generally contracted out to private firms through the General Operations Department in Brasilia. The cost per kilometer demarcated is estimated at Cr\$42,000 in May 1980 cruzeiros (about US\$830).

4.23 Discussions with Indian post managers and regional delegates indicate that the first and most important step to take with respect to protection of the rights of Indians to their land is to demarcate and monitor borders of reservations. The common wisdom is that this would discourage a good deal of the illegal trespassing taking place in the region which many people believe occurs out of ignorance. Initially, the deadline for the demarcation of all Indian lands was December 1978. Owing to budgetary constraints, this deadline was not met. Recently, in the wake of two well-publicized violent clashes between Indians and settlers, the Government has announced that the pace of demarcation would be accelerated. Priority would be given to demarcating areas where Indian-settler relationships are most tense. 1/

Posseiros vs. Indians

4.24 As implied above, a recurring, and difficult, problem for FUNAI has been the presence of squatters (posseiros) and other intruders (e.g., prospectors, hunters, rubber-tappers) within the boundaries of Indian reserves. 2/ Squatters are subject to arrest and have no claim to compensation for improvements made on Indian lands if they arrived after the land was declared a reserve. FUNAI feels that if such compensation were offered, it would encourage land invasion by squatters whose major objective would be the compensation. However, if it is determined that a squatter was present before the establishment of a reserve, he is entitled to some compensation. This is done on the assumption that, prior to the detection of Indians, there were no restrictions on ownership of the land. In the case of those who have received title to lands which are later declared a reserve, compensation is mandatory.

4.25 One continuing problem for FUNAI has been the removal of squatters from Indian lands. FUNAI, with the aid of the police, has the power to remove the settlers, but cannot resettle them elsewhere, as this is the responsibility of INCRA. There are often considerable delays because of the failure of the two agencies to coordinate their activities, and much may depend upon the personal relationship of the administrators involved. However, draft legislation is now being considered which would, if enacted, establish norms and assign responsibility to the relevant agencies for the removal and subsequent resettlement of squatters.

1/ In such troubled areas, the government has recently decided to entrust the engineering aspects of demarcation to the Army Construction Battalions.

2/ FUNAI uses a variety of (as many as eight) classifications for Indian lands. However, the distinctions are not clearly defined. The basic categories are a "reserve" (an area set aside for one tribe) and a "park" (an area for several tribes).

D. The Situation of the Indians in the Northwest

4.26 It is, at present, difficult to describe accurately the situation of the Indians in the Northwest for two reasons. First, information sources (FUNAI, anthropologists, publications, etc.) disagree in their presentation of the facts, and there is no complete central source of information. Second, because settlement of the area has been relatively recent, contacts with hitherto uncontacted Indian tribes are still being made. The data on the number and location of the Northwest's Indian population presented below should be considered in this light.

4.27 The indigenous population of the Northwest located in official Indian areas (i.e., demarcated, delimited or interdicted tracts) is estimated to be in the neighborhood of 4,600 (see Table 7) ^{1/}. These Indians occupy an area totalling about 5.3 million hectares, of which 1.6 million hectares (30% of the total) have been demarcated. There are more than 20 different tribal groups though some may be related as evidenced by certain language affinities. These tribal groups are attended, in principle, by a FUNAI network of 24 Indian posts. However, according to FUNAI only 12 of the posts are presently manned by Indian agents (chefes de posto). The ability of the FUNAI agent to assist the population under his jurisdiction varies according to local access conditions. In many cases, the agent can assist only those Indians who seek him out.

4.28 The smallest tribal group in the Northwest, the Jaboti of northeastern Rondonia, has only ten members, while the largest, the Cinta Larga (also in northeastern Rondonia) has 1,750. The population of the Uru-Eu-Wau-Wau group is unknown in as much as initial contact has been only recently established. Some of the tribes, regardless of their total size, are subdivided into smaller groups, and are present in a number of reservations. For example, Indian bands known as the Nambikwara are found in seven reservations, and the Pareci in five. Thus, an Indian agent in a particular post may sometimes assist a number of groups each with a different culture and social organization.

Northeastern Rondonia

4.29 The Indian groups in northeastern Rondonia were contacted only recently (about ten years ago), or are completely isolated. Much of the contact was due to the expansion of the agricultural and mining frontier, as a result of the rapid and intense migration of small-scale farmers and prospectors from the South.

4.30 Two areas have been interdicted in northeastern Rondonia. To the southeast of Ariquemes, 878,000 hectares were interdicted in late 1979 for the Uru-Eu-Wau-Wau. Their presence was discovered when a small group of these Indians clashed with a family of colonists on the outskirts of an INCRA

^{1/} The total indigenous population of the Northwest may reach 8,000 if one includes uncontacted groups and contacted groups for whom an official area has not yet been designated.

Table 7

NORTHWEST REGION: POPULATION, SIZE, AND STATUS OF OFFICIAL INDIAN AREAS

	<u>Population</u>	<u>Size (ha. 10³)</u>	<u>Status</u>
<u>RONDONIA</u>	<u>2,540</u>	<u>2,841.1</u>	<u>-</u>
Roosevelt	191	233.1	Demarcated
Ribeirao	79	47.9	Demarcated
Lage	175	107.3	Demarcated
Lourdes	446	185.5	Demarcated
Rio Guapore	131	69.8	Demarcated
Rio Negro Ocaia	193	104.1	Demarcated
Pacaas Novas	463	279.9	Demarcated
Sete de Setembro	165	247.9	Demarcated
Karitiana	80	89.7	Demarcated
Rio Branco	206	n.a.	Demarcated
Panorama	n.a.	205.0	Delimited
Linha 14	71	n.a.	Demarcated
Tubaroes-Massaca	106	200.0	Interdicted
Kaxarari	109	83.0	Delimited
Uru-eu-wau-wau	n.a.	878.0	Interdicted
Serra Morena	125	110.0	Demarcated
<u>MATO GROSSO</u>	<u>2,260</u>	<u>2,484.0</u>	<u>-</u>
Negarote	31	12.3	Demarcated
Santana	184	6.3	Demarcated
Bakairi	262	50.0	Demarcated
Umutina	117	24.6	Demarcated
Sarare	35	69.3	Delimited
Nambikwara	165	912.0	Delimited
Wasusu	39	14.3	Demarcated
Alantesu	30	10.8	Demarcated
Hahaintesu	56	28.3	Demarcated
Mamainde	58	63.4	Delimited
Saluma	123	640.0	Interdicted
Irantxe	122	58.0	Delimited
Pareci	806	556.0	Delimited
Brito	10	1.9	Delimited
Figueira	14	16.2	Delimited
Formoso	30	20.5	Delimited
<u>TOTAL</u>	<u>4,622</u>	<u>5,325.1</u>	<u>-</u>

Source: FUNAI, Projeto de Apoio as Comunidades Indigenas da Area de Influencia da Rodovia Cuiaba/Porto Velho, 1980-85 (Brasilia, September 1980); mission estimates.

settlement project. A "pacification" team has been in the field since January 1980 and face-to-face contact has been recently established. Since INCRA is planning to implant a number of new settlement projects in areas near to where the Uru-eu-Wau-Wau are located, it is particularly urgent that traditional Indian lands be delimited and preventive medical care provided. Another 200,000 hectares have been interdicted for the Tubaroes-Massaca Indians and it is expected that this area will be demarcated by the end of 1981.

4.31 Because the interdicted areas are so large, it has been very difficult to monitor their borders. However, because the Indian groups are thought to be aggressive, squatters have avoided entering the interdicted lands. Of the remaining groups, six in the Rio Branco post have no area reserved. The Arara, Gaviao, Digint, Surui, Pareci and Cinta Larga all have lands demarcated by FUNAI, which includes the Aripuana park. The Aripuana park itself straddles the border of Rondonia and Mato Grosso, and its size is on the order of 1.5 million hectares.

4.32 Despite the demarcation of most of the Indian lands in northeastern Rondonia squatters remain within Indian reserves. The most visible case is the Sete de Setembro reserve, where approximately 90 squatter families (who arrived after the reserve was demarcated) have been identified. The Government has recently begun to move some of these families elsewhere, and it is now thought that there are 50-60 families remaining.

Northwestern Rondonia

4.33 The administrative unit of FUNAI responsible for Indians in northwestern Rondonia is the Ajudancia de Guajara Mirim. Some of the groups in this area have been in contact with the national society for almost 20 years, as is the case with the largest, the Pacaas-Novos. In some cases, Indians have adopted the way of life of rubber-tappers, with correspondingly poor socioeconomic situations. However, a community development project, based on rubber-gathering, has eliminated the middleman and now allows the Indians to trade on their own. The Indians of northwestern Rondonia are generally considered to be in a period of "demographic recovery". That is, their populations are recovering from the shocks of disease and armed conflict with rubber-tappers and settlers during the early period of contact. Most groups remain near the various Indian posts in the area.

4.34 The land situation is relatively tranquil in northwestern Rondonia. Almost all of the areas have been demarcated. However, official FUNAI sources disagree on the status of the Rio Guapore post. One source claims it is demarcated but another claims demarcation was halted when the firm which had been contracted went bankrupt. This has affected the Makurap, Jaboti, Kanoe, and Tupari, some of which are beyond the access of the post agent. The Kaxarari and Panorama reserves must also be demarcated.

Mato Grosso

4.35 Most of the Indians in the portion of Mato Grosso in the area of influence of the Cuiaba-Porto Velho road are at relatively advanced stages of acculturation. In fact, some groups engage in mechanized agriculture and maintain commercial relationships with the national society. The Saluma and Menku are exceptions to this as they were contacted as late as 1974.

4.36 As elsewhere in the Northwest, the most important issues in Mato Grosso are related to land rights. Perhaps the most well-known case in point involves the Nambikwara bands of the Guapore Valley. These bands, who once controlled almost one million hectares, are today in possession of six small reserves totalling less than 200,000 hectares (of which less than 60,000 hectares have been demarcated). 1/ Since a new 203 kilometer stretch of the Cuiaba-Porto Velho road is expected to cut through the Guapore Valley in the near future, it is most urgent that demarcation of Nambikwara areas be completed in order that further encroachments on Indian lands may be avoided. Other major priorities for Mato Grosso include completing the redefinition and demarcation of the Pareci area and the demarcation of the Irantxe, Saluma, Brito, Figueira and Formoso areas.

F. The FUNAI Program for the Northwest

4.37 FUNAI has prepared a program aimed at minimizing the negative effects of POLONOROESTE on the Northwest's indigenous population. 2/ This program has a duration of six years (1980-85) and is budgeted at Cr\$1.07 billion, or around US\$21 million equivalent. Expected sources of funds include allocations from POLAMAZONIA and POLONOROESTE, in addition to the regular FUNAI budget.

Sectoral Objectives

4.38 The FUNAI program is organized according to sub-projects for health, education, agriculture and demarcation. 3/ Each of these sub-projects is, in turn, disaggregated to the level of individual Indian areas. Little provision, however, is made for assisting Indians located outside of official Indian areas, that is, uncontacted groups and contacted groups for whom an area has not yet been designated.

1/ A Nambikwara band located to the north of the Valley has had a 912,000 hectare reserve demarcated for it. However, it is reported that this area has little game and is largely unsuitable for the cultivation of crops.

2/ Fundacao Nacional do Indio (FUNAI), Projeto de Apoio as Comunidades Indigenas da Area de Influencia da Rodovia Cuiaba/Porto Velho, Período 1980-85 (Brasilia, 1980).

3/ "Administration" is also dealt with through a separate sub-project. This aspect is described in paras. 4.42-4.43 below.

4.39 Demarcation. Of the sub-projects, priority is given to accelerating the demarcation of Indian lands. In more specific terms, this sub-project provides for the demarcation of almost 4,000 kilometers of reserve perimeters (approximately 2.6 million hectares) by the end of 1982. This objective, if met, would leave around one million hectares left to demarcate. Most of this remaining area is inhabited by newly contacted Indians, such as the Uru-Eu-Wau-Wau (Rondonia), whose needs for land have not yet been determined.

4.40 Health. The sub-project for the health sector would be directed at upgrading preventive and curative services and at implanting basic sanitation systems. With respect to preventive health care, the primary objective would be to immunize the region's indigenous population against "imported" diseases such as tuberculosis, measles, influenza and polio. Mobile health teams attached to FUNAI regional delegations would be primarily responsible for administering the necessary inoculations. Curative care for common health problems like dysentery, malaria and injuries would be treated, except for severe cases, in existing facilities in the Indian areas and in 28 new infirmaries to be constructed, equipped and staffed during the 1980-85 period.

4.41 Education. The education sub-project emphasizes the need to adapt all instruction to the culture of each Indian community. Although it is implied that some communities (i.e., those with a relatively long history of contact with the national society) may already be prepared to receive training in Portuguese, most would first require literacy courses taught in their own languages. In order to improve educational opportunities in the Indian areas, 15 new schools would be constructed and two others upgraded. In addition, six new teachers and five bilingual "monitors" would be hired.

4.42 Agriculture. In agriculture, the primary objective would be to promote increased production in selected Indian areas. According to the FUNAI program document, increased production of such crops as corn, manioc, rice and beans would help compensate for the declines in traditional food sources (i.e., fish, game and forest products) which usually accompany the intrusions of the national society. The document also suggests that proceeds from the sales of agricultural surpluses could be used by the Indians for purchasing consumer goods. Increases in agricultural production would be brought about through the provision of infrastructure, farm implements and machinery and technical assistance. In addition, FUNAI would establish a number of trading posts (called cantinas reembolsaveis) in the Indian areas where Indians could buy consumer goods on credit; their accumulated debts presumably to be paid off with money earned by selling excess agricultural production.

Administration

4.43 The execution of each sub-project would be the responsibility of the local Indian agents who would be required to submit quarterly progress reports to their respective regional delegations. The regional delegations, in turn, would verify these reports in the field and transmit their findings to FUNAI's Department of General Operations in Brasilia. The latter would be responsible for the administration and monitoring of the overall program. Additional supervision of the health and education sub-projects would be provided by the Community Planning Department and by the Indian Patrimony Department in the case of demarcation.

4.44 In order to strengthen FUNAI's administrative capacity at the regional and local levels, the program provides for the construction of new infrastructure (administrative centers, employee housing, landing strips, etc.), the acquisition of transportation and communications equipment, and the hiring of incremental staff. Of the 42 new staff members envisaged, however, only four -- two Indian agents and two agricultural extensionists -- would work directly with the Indians. Practically all of the rest, including 13 tractor drivers and eight radio operators, would perform ancillary services.

F. Issues and Recommendations

4.45 Protecting the Northwest's indigenous population from the negative effects of settlement and economic development will be a formidable task, demanding the effective implementation of special mitigatory measures and the rigorous enforcement of existing Indian legislation. It is the purpose of this section to review some of the major issues associated with this task and to make recommendations on ways and means through which these issues might be resolved. The institutional aspects of dealing with the Indian question are considered first. This is followed by a general assessment of the FUNAI program for the Northwest.

Institutional Issues

4.46 Despite the dynamism, sense of dedication and relative efficiency observed at many of FUNAI's local and regional offices, experience to date with the central organization in Brasilia indicates that the institution needs to improve considerably its approaches, image, staffing and operating procedures in order to deal effectively with the increased threats to the Indian population posed by the development measures contemplated under POLONOROESTE. While the administrative shortcomings of FUNAI are largely recognized, their resolution will almost certainly require the enactment of some wide-ranging reforms, including inter alia a decentralization of FUNAI's staffing and decision-making powers coupled with measures to assure greater continuity in its top management. Because of the broader political conflicts involved in the Indian issue in Brazil, reforms of this nature would most likely need to be implemented gradually over the long-term. However, the following steps could be taken immediately to begin the institution-building process:

- (i) timely and consistent financing to permit the establishment of additional Indian posts, to improve the equipment and supplies of these posts, and to develop a field staff of sufficient number and quality;
- (ii) more frequent and direct communication between local and Brasilia staff to help remove the isolation and some of the frustration of the former; and
- (iii) formulation of a plan to establish a career service that would facilitate the movement of Indian specialists into high decision-making positions.

Program Issues

4.47 While the FUNAI program for the Northwest is directed quite correctly at the crucial problems regarding land, health, education, agriculture and administration, it would appear that many of the measures proposed in these areas are exceedingly complex, costly and, in some cases, inappropriate. Most of the issues of this type are the result of an inadequate knowledge of conditions in the field -- including the self-perceived wants and needs of the Indians -- on the part of the program's authors. In principle, this could have been avoided if, before or during the elaboration of the program, its authors had visited each of the Indian reserves in the program area to receive substantive inputs from the regional delegates, local Indian agents and the Indians themselves.

4.48 As a result of this initial error, and in order for the program to respond more closely to the problems perceived in the field, a thorough re-programming exercise should be undertaken. The specific mechanism through which this exercise is executed could take various forms. However, the key element would involve the establishment of means to increase the depth and frequency of interchange between the program management in Brasilia on the one hand and FUNAI's regional and local staff and the Indians on the other. This process could begin with extended visits to the Indian areas by Brasilia staff, followed by discussions in the regional offices of FUNAI and in Brasilia with a view to reaching a consensus on the changes to be introduced in the overall program.

4.49 Another issue of a general nature is that the FUNAI program does not clearly establish spatial priorities for the measures it proposes. One way in which FUNAI could facilitate the establishment of these priorities would be through close and continuing contacts with the various other agencies and governments (e.g., SUDECO, INCRA, Territory of Rondonia, State of Mato Grosso, etc.) involved in the planning and execution of POLONOROESTE. If, through such contacts, the FUNAI program becomes an integral part of the overall regional development program it could be significantly improved. Furthermore, the implementation of the FUNAI program ought to be synchronized, to the extent possible, with that of POLONOROESTE so that Indians in presently uninvaded areas will be spared the serious consequences of unregulated new contact with non-Indians.

4.50 Finally, special precautions to be taken during road construction, though not forming part of the FUNAI program per se, have already been published in the bidding documents prepared by the Ministry of Transport.

These documents provide that all contact between construction crews and Indians be reported to FUNAI and that no health care be given to Indians without first notifying the local FUNAI representative. It is expected that the construction firms will maintain separate health facilities for the indigenous population, but further clarification as to who is responsible for administering health care to the Indians is necessary.

4.51 Of course, even the most imaginative program for protecting Indian interests in the Northwest will be doomed to failure if it is not given strong support at the highest levels of government. Such support could be manifested in many important ways including the promotion of administrative reforms for FUNAI and the provision of adequate and timely program funding. Most of all, however, strong political support would mean a firm commitment to enforcing the provisions of the Indian Statute, even in the face of economic pressures to the contrary. Recent pro-Indian statements by high-ranking government officials are encouraging in this respect.

V. ENVIRONMENTAL ISSUES AND POLICY

5.01 The Amazon region holds the world's largest tropical evergreen rainforest and most diverse biological stock. The forest forms a delicately balanced ecosystem, still only partially understood, in which most of the nutrient capital is held in the biomass rather than in the soil. Nutrients recycle very quickly into the shallow root structures of the trees owing to the rapid degradation of falling detritus in the high humidity. When the forest is removed and is not replaced by other protective vegetation, most of these nutrients are lost through leaching and erosion.

5.02 A further reason for conservation of the Amazon forest is the enormous variety of flora and fauna it contains. Many species of its plant and animal life are as yet unidentified, with unknown possible value to human beings. This fact highlights the importance of basic biological research and argues for the maintenance of large biological reserves in representative ecosystems, since the stock of flora and fauna varies greatly from one sub-region of Amazonia to another.

A. The Natural Environment of the Northwest

Climate

5.03 The climate of the Northwest favors plant growth. Monthly mean temperatures within the region are between 21 and 27 C^o, and sunshine hours average from 30% of the potential maximum in the wetter months to 80% in the dry season. Mean annual rainfall ranges from 1,200 mm in the southernmost parts of the area (Cuiaba and Caceres), to 1,800-2,000 mm at Vilhena and in the agricultural areas to the north of Cuiaba and Caceres, and to 2,200 mm in the center and west of Rondonia. In all areas there is a single summer rainy season increasing from five months duration (November-March) in parts of

Mato Grosso to seven (October-April) in Rondonia. The rains open and close with a month of intermediate rainfall, leaving a dry season of five months (March-September) in southern Mato Grosso and three months (June-August) in Rondonia.

Topography

5.04 The topography of the region is highly variable. The northern and eastern sections consist of the geologically ancient sandstone plateau, mostly gently undulating at around 500 meters altitude, which forms the southern limit of the Amazon basin. The southern and western sections of the region consist of undulating country at around 200 meters which merges into riverine swamp and drains into the Amazon and Paraguay rivers. The eroded edge of the plateau forms the watershed between the Amazon and Paraguay basins and varies from a distinct escarpment to a band of broken terrain which can be over 200 kilometers wide. In Mato Grosso, the Cuiaba-Porto Velho road runs from 20 to 200 kilometers south of the plateau edge until it approaches Vilhena, which lies on the plateau. In central Rondonia, the plateau edge is indistinct, and the highway traverses undulating terrain, then descending into more level country some 200 kilometers before Porto Velho.

Main Vegetation Types

5.05 The Northwest region comprises six principal types of vegetation -- three forest and three grassland types. As Table 8 indicates, these six types differ greatly in extent and grade into each other. The three types of Amazon forest are evergreen wet forest, semideciduous forest and wet varzea forest. The latter is lowland, occasionally flooded forest; the two former types are upland forest. Major tree species, such as cerejeira, mahogany, and Brazil nut, occur throughout the region although with different abundancies. All the tree species, prime grade as well as lowest quality, are dispersed throughout the forest and rarely occur in homogeneous stands, making extraction time-consuming and costly. The evergreen canopy is about 20 to 30 meters in height with emergents to 50 meters, whereas the semideciduous canopy is lower by five to 15 meters. The semideciduous forest contains more Brazil nut and babacu, whereas the varzea forest contains more rubber.

5.06 The three types of non-forest vegetation are cerrado or savanna, grassland or campos, and sedge meadow. Sedge meadows or inundated varzea grasslands are very appropriate for water buffalo and rice. Grasslands or campo limpo usually occur on uplands and provide inferior grazing. Cerrado, a variably treed form of savanna, also is an upland formation, often on plateaux with poor grazing and almost negligible wood value. The southwest portion of the region is occupied partially by the Pantanal, a 173,015 square kilometer mosaic of vegetation nearly all of which is flooded seasonally. The Pantanal teems with wildlife and supports a cattle industry. Most of the southern portion of the region (in Mato Grosso) is covered by this mixture of swamp, sedge meadow, grassland, and cerrado with patches of woodland and forest.

Table 8

NORTHWEST REGION: MAJOR VEGETATION TYPES

Vegetation Type	Region*		Rondonia		Mato Grosso	
	Km ²	%	Km ²	%	Km ²	%
Upland wet forest	696,181	47.2	191,514	78.8	504,667	41.0
Wet <u>varzea</u> forest	16,472	1.1	16,472	6.8	-	-
Semideciduous forest	39,160	2.7	-	-	39,160	3.2
<u>Cerrado</u>	493,738	33.5	20,701	8.5	473,037	38.4
<u>Campo</u> Grassland	54,808	3.7	14,357	5.9	40,451	3.3
Pantanal	173,015	11.7	-	-	173,015	14.0
Rocky scarp	1,219	0.0	-	-	1,219	0.1
<u>TOTAL</u>	<u>1,474,593</u>	<u>100.0</u>	<u>243,044</u>	<u>100.0</u>	<u>1,231,549</u>	<u>100.0</u>

* Does not conform to concept of "Northwest Region" used elsewhere because data for Mato Grosso refer to total land area of old state.

Source: FIBGE, Anuario Estatístico do Brasil - 1978

Soils

5.07 Although the state of pedological knowledge of the Northwest is still far from ideal, it is possible to broadly identify the types and locations of the major soils. The dominant soils of the region are red-yellow podzols formed by prolonged weathering of poor parent materials. In Rondonia, areas of relatively good red-yellow eutrophic podzolic soils are found on both sides of the Cuiaba-Porto Velho road between Ariquemes and Pimenta Bueno. Similar soils also occur in the Colorado area interspersed with fertile terra roxa soils. The northern part of the territory (between Ariquemes and Porto Velho) is dominated by a belt of low fertility/high aluminum content red-yellow and yellow latosols, the latter following the Mamore-Guapore Valley in a wide swath southwest from Guajara-Mirim. Areas of highly erodible quartz sands of low intrinsic fertility occur to the east of Pimenta Bueno under both forest and cerrado. In Mato Grosso, the areas of better soils derived from more favorable parent materials are concentrated to the north of Caceres and in the Guapore Valley between Vila Bela and Vilhena.

B. Land Use and the Environment

Forests and Forestry

5.08 The most abundant and valuable natural resource of the Northwest is undoubtedly the forest itself. Although a complete inventory of the region's forest resources has yet to be taken, the published findings of the RADAM Project of the Ministry of Mines and Energy are illustrative in this respect. Volume 16 of the RADAM findings, which covers a 262,110 square kilometer area including most of Rondonia and small portions of Amazonas and Mato Grosso, shows a total potential of 2.4 billion cubic meters of timber. Half of this volume is accounted for by species presently traded on international and domestic markets. The total value of this timber in 1978 was conservatively estimated by RADAM to be around US\$21 billion (CIF, port or sawmill).

5.09 Contrary to popular thought, the extent of deforestation in the region so far is estimated through Landsat imagery to be less than 5% of the total land area. However, the pace of deforestation has accelerated in recent years. The deforested area of Rondonia, for example, rose from 121,000 to 297,000 hectares between 1975 and 1978. Some of this deforestation has been an inevitable consequence of new settlement and agricultural development. But field observations made in various parts of the Northwest indicate that land has been cleared in areas with little or no agricultural potential and that some clearing has been undertaken for the sole purpose of establishing a legal claim to the land and/or for speculation. It is imperative that such wasteful uses of the forest be halted. Given the large volume of migration to the Northwest expected in the coming years, this will not be an easy task. It will require the development of comprehensive land-use zoning and the rigorous enforcement of environmental legislation.

5.10 The necessity of developing and enforcing effective protective measures does not imply that all of the Northwest's forested areas should be preserved in their natural states. On the contrary, forestry should become an important sustainable source of income and employment for the regional population. Many options for the development of the region's forests might be considered, including inter alia mixed agro-forestry systems, plantation forestry and sustained yield management. However, more local research on the silvics and economics of these models is required before they can become operational in the Northwest. In the meantime, new settlers should be encouraged to clear no more land than is absolutely necessary for subsistence agriculture and to make fuller use (e.g., for conversion to alternative energy sources) of the lower grade woods that are commonly burned during the land clearing process (see paras. 5.13-5.14).

Choice of Crops

5.11 Owing to the inherent fragility of the Northwest's environment, the choice of crops is crucial. Tree crops are strongly preferred over annuals on environmental grounds because they protect the fragile soils, reduce soil deterioration, and produce on a sustainable basis. Those tree crops grown with the most protective cover will conserve the soils longer than those with more open canopies. Similarly, those tree crops harvested without killing the tree (e.g., oil palm) are more protective of the soils than those which kill the tree (e.g., heart of palm).

5.12 The appropriate mix of crops should be determined as an integral part of the development program for the Northwest. At this stage it is clear that a sustainable, rational land use plan would include, in addition to forestry, perennial crops such as coffee, cocoa and rubber. However, one of the major problems in developing both forestry and tree crops will be the high rate of inflow of migrants who initially exploit the land primarily with annual crops. Nevertheless, forestry and tree crop-based development ought to be the dominant objectives of regional policy.

Energy Relations

5.13 The Northwest is currently dependent on petroleum for the bulk of its energy requirements. All the official settlement projects are based on diesel-fueled electricity and most of the region's imports and exports are carried by trucks. While there are plans to tap the hydroelectric potential of the region (see para. 8.08), little has been done to develop forest-based energy sources. This is paradoxical given Brazil's heavy reliance on foreign oil, and the huge amount of biomass present in the Northwest.

5.14 The forest may be converted into a number of alternative energy sources, including firewood, sawdust, charcoal, methyl alcohol, and biogas. Wood or sawdust-fueled steam engines are now used in the Northwest for

powering sawmills and mining operations, but these are the exceptions. Charcoal, which is easily produced, could be used for all domestic cooking and for supplying energy to towns and some types of industry. The production of methyl alcohol and biogas (largely methane) would involve somewhat higher levels of technology than charcoal, but these energy sources could serve various additional purposes including fuel for tractors and trucks. Eventual reliance on the above energy sources should be stressed by the government in the context of planning for the Northwest.

C. Government Institutions and Policies

5.15 Brazilian government policies regarding conservation and preservation of the environment have undergone many revisions since 1970. In 1972, in a paper submitted to the UN Conference on the Environment, the government emphasized the commitment to rapid economic growth and stated its belief that "... development should not be negatively affected by sometimes exaggerated concern for preservation of the environment." Since then, the government has shown a marked and increasing concern about the environmental impact of projects in general, but especially about the effects of resource use in Amazonia. In February 1980, in a statement to a UN meeting on Tropical Forests, the government emphasized its strong interest in forest management, particularly in its potential as a substitute for energy inputs. It has indicated its intention to make a strong effort to prove the technical, ecological, and economic possibilities of sustained forest management, in order to prevent the spread of other, less desirable, forms of land use.

5.16 In May 1979, an Interministerial Commission was created by the President of Brazil, with the objective of preparing recommendations for an integrated forest policy for Amazonia. The final report of this Commission calls for the establishment of a "conservation unit system", a system providing for the development of a basic strategy for the conservation of Amazonia's renewable natural resources, and for the rational utilization of financial and human resources for the system's management and control. The general lines of action for this system, as stated in the Commission's report, would be to:

- (i) establish a system of ecological and economic zoning for Amazonia; 1/
- (ii) establish new, and enlarge existing, protected or conservation areas;
- (iii) demarcate and regularize Amerindian lands;
- (iv) bring order to the land tenure situation;

1/ The government of Rondonia has already proposed a land-use zoning plan that would reserve 50% of the territory's land area for the indigenous population and for non-agricultural uses (e.g., forest reserves, national parks, etc). An additional 20% of the area would be used for tree crops, and 30% for other uses (urban areas, industry and annual crops).

- (v) establish national forest areas for multiple-purpose use with an emphasis on sustained-yield logging with natural regeneration;
- (vi) strengthen the forest administration system;
- (vii) intensify research efforts, and aid the development of qualified researchers;
- (viii) recuperate degraded lands;
- (ix) intensify river fishing, taking care to guard against over-fishing;
- (x) promote conservation in education; and
- (xi) re-examine and reformulate forestry legislation.

The legislation to implement the above measures is currently under review by the National Security Council.

5.17 The major institution responsible for carrying out national forestry policies is the National Institute for Forestry Development (IBDF). IBDF was created in 1967 as a semi-autonomous organization linked to the Ministry of Agriculture. To date, its main activity has been the administration of fiscal incentives for reforestation, most of which has taken place in southern and central Brazil. However, IBDF also bears the primary responsibility in the federal government for conservation, national parks, forest reserves and general forestry development. The main tracts in the Northwest are listed below:

- (i) the Pacaas Novos National Park (Rondonia) was created in October 1979. An interdicted Indian area and a forest reserve lie within this 764,800 hectare park;
- (ii) the Pedras Negras Forest Reserve (Rondonia) was created in 1961 with 176,000 hectares, but recently rescinded;
- (iii) the 679,000 hectare Jaru Biological Reserve (Rondonia) created in 1961, since largely lost to CEPLAC's Burareiro cocoa project; and
- (iv) the Cara Cara Biological Reserve (Mato Grosso), created in 1971, eventually to cover 80,000 hectares in the município of Cáceres on the frontier with Bolivia. A Pantanal National Park of about 300,000 hectares has been proposed, which would include this reserve.

5.18 In addition to the establishment of government conservation tracts, IBDF does not permit any private landowner to clear more than half of his property, a measure known as the "50% rule." However, if land is sold or transferred, the new landowner is free to clear 50% of his parcel, thus leading to additional deforestation. In order to close this loophole in the

legislation, the Interministerial Commission has recommended the creation of central forest reserves and that new development projects (including land settlement) include forest reserves equivalent to 50% of the land available. Such reserves would be continuous and not depend on individual landowners for maintenance. This will greatly improve chances of enforcement. INCRA, in consultation with IBDF, is now planning its new settlement schemes in accordance with the Commission's recommendation (see Chapter VI).

5.19 IBDF is presently considered to be a weak institution, lacking in funds and human resources to carry out its broad responsibilities in the forest use area. The Interministerial Commission's report makes recommendations for basic measures to strengthen IBDF, including the creation of a department of Amazonian natural forest resources, which would be responsible for implementing the forest policy being developed, and would receive adequate equipment and stations for the purposes of:

- (i) surveying the land tenure situation in areas of national forest and resource reserves;
- (ii) selecting areas for national forests and conservation units;
- (iii) enforcing the boundaries of national parks, forests and other conservation units;
- (iv) carrying out forest inventories, to identify commercially desirable species;
- (v) preparing programs for logging and milling operations; and
- (vi) most importantly, developing long-term forest use systems, based on the development of methods of log extraction and reforestation.

Further, the Commission's report calls for the strengthening of IBDF's supervisory capacity, including the use of state and territorial agencies for such supervision. This would expand IBDF's ability to monitor and enforce conservationist practices, as well as to implement a forest policy taking into account the dual objective of economic development and conservation.

5.20 A second agency involved with environmental matters is the Special Secretariat for the Environment (SEMA) in the Ministry of the Interior. SEMA was established in 1973 for the purposes of monitoring the utilization of the country's natural resources and environment, establishing pollution control norms and standards, coordinating federal pollution control activities, and assisting state pollution control agencies. This agency has established a 266,000 hectare ecological station in the Northwest (in the município of Aripuana, Mato Grosso) to serve as a base for the scientific study of the region's natural environment. Basic research on possible uses of the tremendously varied flora and fauna of Amazonia is still extremely scarce. Thus, the program of ecological research stations ought to be expanded. By placing them strategically in the region, it would be possible to reserve areas for study which cumulatively preserve the forest variety. SEMA and the government of Rondonia are now considering the establishment of a new ecological station in the territory.

5.21 The measures discussed above are promising, and reflect the commitment of the Brazilian government to improve their management of environmental issues in the nation and in Amazonia in particular. The proposed plans and programs will, however, require some time for implementation. In view of the rapid migration into the area, it is clear that there are some environmental risks, and that some damage will undoubtedly occur. However, by establishing usable criteria for program planning, and by promoting the process of institution-building, this damage can be kept to a minimum.

VI. LAND SETTLEMENT

A. General Background

Historical Precedents

6.01 Amazonia has long been regarded as a potential home for marginalized people from overpopulated parts of Brazil, especially the Northeast. During the rubber boom of the late nineteenth and early twentieth centuries, as well as during World War II, there was a significant flow of workers from the Northeast to gather wild rubber in Para, Amazonas, Rondonia and Acre. However, these earlier settlements, based on extractive agriculture, generally declined with the recovery of the world economy after the war.

6.02 During the postwar years, the Brazilian government has made several attempts to establish small-scale land settlement projects. In the 1960s, the Superintendency for the Development of the Northeast (SUDENE) initiated the Alto Turi Project, which was expected to settle 26,000 families on three million hectares of land. SUDENE was unable to administer the project effectively and the use of just annual crops proved to be unsuitable for the relatively weak soils of the area. Therefore, in 1972 the scale of the project was reduced to a program for 5,200 families on 939,000 hectares of land and a public company, the Companhia do Colonizacao do Nordeste (COLONE), was formed to administer the project. In its reduced form, the Alto Turi project has been moderately successful.

6.03 In 1970, President Medici announced the beginning of the construction of the Transamazon highway, which was expected to provide the means for northeasterners to find new employment opportunities in the Amazon Basin. It was then confidently predicted that as many as 100,000 families (about 500,000 persons) would be settled along the highway in ten years. To this end, major small-scale settlement projects were established near Maraba, Altamira, and Itaituba, all in the state of Para. By mid-1978, however, only 7,900 families had been settled. Administration of these projects, by the National Institute for Colonization and Agrarian Reform (INCRA), was weak and failed to provide titles which were required for credit applications. Support services, including storage, and technical assistance, also failed to reach the settlers. These failures, combined with inadequate feeder roads construction, seriously stalled the development of the projects. Partly because of these initial setbacks, the Geisel Administration, which came to office in 1974, deemphasized colonization and small-scale land settlement, choosing instead to concentrate on promoting larger agricultural and ranching enterprises associated with POLAMAZONIA.

6.04 During the period when national policies for Amazonia were shifting, migrants began pouring into Mato Grosso and Rondonia via the newly-opened Cuiaba-Porto Velho road. When this rush occurred, the government was not prepared to allocate land, assign titles, build feeder roads, or to provide agricultural extension services and credit. Serious land conflicts and the hardships experienced by the landless migrants made clear the need for greater governmental action and control in the area if its occupation was to be orderly and consistent with the existing ecological and economic constraints. In the Northwest of Brazil, specifically in the area of influence of the Cuiaba-Porto Velho road, the development of a strategy to provide for such an orderly occupation, as well as the strengthening of the institution involved, is still going on. But the development of settlement schemes based on small farms will require greater efficiency from the institutions involved as well as correction of the major errors made in the previous settlement models.

National Institute for Colonization and Agrarian Reform (INCRA)

6.05 INCRA, the major agency concerned with land settlement, was established in 1970 as a result of the merger of two other public agencies (i.e., IBRA and INDA) which had been, since 1964, responsible for the distribution and administration of federal lands. It was at first expected to concentrate its energies on the execution of an extensive land reform in the Northeast but, as there was little political commitment to that reform, it made little progress. INCRA soon concentrated on settlement along the Transamazon highway, and subsequently on bringing order to the situation in Rondonia. INCRA has jurisdiction over the disposition of all federal lands, including land within 150 kilometers of international boundaries and 100 kilometers each side of federal roads and highways in the Amazon region, and it must approve land division projects carried on by any entity in Brazil -- federal, state or private. Moreover, it is responsible for assessing and collecting the graduated rural land tax.

B. Mato Grosso

6.06 Land settlement projects in Mato Grosso have been managed primarily by private development companies which have submitted projects to INCRA and received approval. These projects are primarily located in the central part of the state, along the Cuiaba-Santarem road, and in the município of Aripuana. While it is not the purpose here to analyze the private settlements in detail, it is useful for comparative purposes to make some comments about them.

6.07 In general, settlers who enter private settlement projects in Mato Grosso are, or were, owners of land in the south of Brazil. Agricultural land in the south is expensive, and smallholders cannot compete with larger landholders to buy additional lands. Smallholders may choose, therefore, to sell their lands in the south in order to purchase larger parcels of land in the north. This initial capital, combined with the returns from timber extraction, allow the settler to support himself and accompanying family until the land is productive. Private settlement projects, because of the cost of the land, do not generally absorb settlers from the region itself. However, local persons are frequently employed as wage laborers in the projects to help with clearing the original forest. Though other opportunities for more steady employment sometimes arise, local persons are seldom able to afford a lot within the project.

6.08 The Juina project, located in the Aripuana Valley in northwest Mato Grosso, is the only public colonization scheme now underway in the state. It was initiated in 1977 by the Mato Grosso Development Company (CODEMAT), and the first settlers entered the area in late 1978. Project administration and settler selection are based on the system used in private settlement projects (but with a modified payment schedule) so that Juina is presently the least expensive project for the prospective settler to enter. The motivations for establishing Juina were to allow the state to capture the benefits of the land sale, and to populate an area of the state with relatively good soils.

6.09 The Juina project occupies a total area of 411,000 hectares. The project design includes an urban nucleus which has a commercial and industrial (primarily sawmills) center. Around this urban center is a belt of smaller lots (12 ha.) for private residences and the growing of fruits and vegetables. Rural lots, for agricultural production, surround the entire nucleus. They are presently divided into lots of 110, 164, and 220 hectares, though larger areas (up to 3,000 ha.) may be made available. The following data show the distribution of lots as of 1979:

	<u>Urban</u>	<u>Rural</u>
Total available:	265	1,500
Total sold:	200	500
Total occupied:	154	190

Source: CODEMAT, 1979

6.10 Initial plans for the project base land use on a combination of coffee and cocoa, supported by adequate technical extension for settlers. In fact, there is no technical assistance program at the present time. In general, settlers bring to the area whatever previous agricultural or technical know-how they acquired. It is not clear why no technical assistance has been extended to the settlers. However, the necessity for technical assistance in many phases of land clearing and crop management is evident. For example, steep slopes have been clear cut and burned which, in the first season of rains, tend to erode away.

6.11 The recent history and pattern of land settlement in Mato Grosso suggests that the state will have to modify its policies if small scale land settlement projects are to achieve a higher level of government priority. Given the increasing intensity of occupation of the region and the corresponding rise in land values, such an approach would require an expensive program of compensation to the landowners. The structure of land tenure in Mato Grosso thus remains an important obstacle to the development of small-scale land-settlement project.

C. Rondonia

6.12 INCRA has been the major agency responsible for controlling and organizing the massive migratory flow into Rondonia. In fact, until the new territorial government took office in March 1979, the planning and execution of programs for land use were carried out by INCRA with little input from territorial officials. The rapid increase in the demands for services from public agencies resulting from the in-migration was the major motive for the founding of seven INCRA land-settlement projects between 1970 and 1975 (see Table 9). However, despite the rapid migration into the region and the consequent rise in social tension, it was not until 1978 that INCRA established a separate administrative office in Porto Velho to deal with the emerging problems. This office, the Coordenadoria Especial do Territorio de Rondonia, was to deal exclusively with all phases of land tenure, settlement, and organization in the area. By 1978 the need for such a unit was very serious: a five-fold increase in population had taken place with no sign of slowing and a proliferation of projects, smaller administrative units, and special issues required overall integration into a concerted plan of action.

Table 9

SIZE AND CAPACITY OF INCRA SETTLEMENT PROJECTS IN RONDONIA

<u>Project</u>	<u>Year Founded</u>	<u>Size (Ha.)</u>	<u>Family Capacity *</u>
Ouro Preto	1970	512,585	5,133
Sidney Girao	1971	76,300	500
Ji-Parana	1972	479,737	4,756
Paulo de Assis Ribeiro	1973	293,560	2,974
Padre Adolpho Rohl	1975	456,366	4,341
Burareiro	1975	304,925	1,215
Marechal Dutra	1975	494,661	4,520
		<u>2,618,134</u>	<u>23,439</u>

* As of end-1979, almost 24,000 families had been effectively settled.

Source: INCRA

6.13 The increase in the number of settlement projects, as well as the growth in demand for public services (until 1975 provided almost exclusively by INCRA in the settlement projects), made it difficult for INCRA to proportion its budget adequately between the needs for investment in infrastructure on the one hand, and current expenses on the other. In both 1977 and 1978, for instance, only 10% of the total annual budget for the projects went for investment. Furthermore, there was a shortage of trained personnel to manage the projects in Rondonia. The INCRA salary scale is not sufficient to attract skilled people from other regions of Brazil, and the staff working in Rondonia is generally young with little experience. The resulting high rate of staff turnover in INCRA projects has made continuity in planning and management a serious problem for the agency.

6.14 The lack of long-range planning in the establishment and implementation of the INCRA projects in Rondonia had an overall negative impact on the situation in the territory. The promise of land with good soils already had a strong attractive power for southern and northeastern rural workers. The additional prospect of entering an INCRA settlement project, often nurtured by stories from friends and relatives who had moved into the territory, reinforced the tendency to migrate. However, as described in the next section, INCRA has yet to meet the minimum requirements for establishing an effective settlement system in the territory.

6.15 INCRA project design. Over the past decade, the Integrated Colonization Project (PIC) has been the model used by INCRA for land settlement schemes. It consists of three phases of operation:

- (i) selection of the settlement site, mapping of 100-hectare lots, and selection of settlers;
- (ii) establishment of the urban nucleus consisting of the project headquarters, offices of other public agencies working in the project, and residences for public employees; and
- (iii) construction of infrastructure and completion of titling according to project specifications.

With the completion of the third phase -- which means that all settlers have definitive title to land, road access to markets and urban centers, and health and school facilities -- the projects are to be transferred to state authorities. Of the seven existing projects in Rondonia, only Sidney Girao is considered ready for transfer to territorial administration, a process known as emancipacao. Present plans call for transfer of the other six projects over the next few years.

6.16 The physical layout of each of the settlement projects is essentially the same. The total area of the project is mapped, and then a grid-like pattern of roads conforming to rectangular 100-hectare lots is superimposed upon it. In theory, feeder roads are to be built prior to the arrival of the settlers. In practice, however, INCRA has fallen far behind the needs of the settlers for roads as well as titling. Because titling and road construction are the basis for the settlers' access to credit and markets it is worthwhile to review INCRA's historical performance in these two areas.

6.17 Titling. Until 1979, INCRA used a two-stage titling system, the purpose of which was to title only those settlers who had demonstrated a commitment to remain in the project. After registering with INCRA (generally when the INCRA agent visited the farmer) colonists received the Autorizacao de Ocupacao (AO), a provisional title recognizing their right to settle and work the land but not conferring ownership. Seasonal crop credit was made available for those with the AO. After a two-year interval and a visit by INCRA agents to evaluate the progress of the settler, the Titulo Definitivo (TD) was issued, a formal title of ownership with the restriction that no sale or transfer could be made without INCRA approval for a period of five years. With the TD, both production and investment credits were made available to the settler.

6.18 The system described above had two major disadvantages. First, the system severely limited the farmer's access to credit for at least a two-year period (not counting the period prior to receipt of the AO) and hence made settlement much more difficult. Second, the requirement of a number of documents of personal identification often delayed the processing and issuance of titles. In an effort to resolve this latter problem, the Army undertook a campaign to issue full and adequate documentation to settlers in the projects. However, inadequate documentation on the part of applicants continues to delay the processing of titles.

6.19 Before 1979, INCRA's performance in titling was slow and uneven. The maximum number of titles issued during any one year (1978) was 2,586. In 1974, no titles were issued, despite the fact that four of the seven projects had already been initiated. As Table 10 shows, however, the pace of titling accelerated substantially during 1979 and the first half of 1980 when more titles were issued than in the previous six years combined. Still, the actual numbers of titles issued remain well below the targets set for several projects.

6.20 A large part of the problem in titling has been due to a shortage of staff in the field and the difficulty of access to farm sites. In the Ouro Preto project, for example, only three technicians responsible for processing documents were assigned to the settlement division in mid-1979. One result of the uneven distribution of titles has been the development of a land tenure situation which varies according to the distance of the settlers' lot from the Cuiaba-Porto Velho road. In general, the area of definitive titles extends in a band extending to 20 kilometers on either side of the road. The area between 20 and 40 kilometers on either side of the road consists primarily of lots with provisional titles. Beyond that range any documentation of landholding is scarce, and it is in this area that land tenure is most unstable.

Table 10

TITLES ISSUED BY INCRA IN RONDONIA SETTLEMENT PROJECTS, 1973-80

	<u>Target</u>	<u>1973/78</u>	<u>1979</u>	<u>1980 *</u>	<u>Total</u>	<u>% of Target</u>
Ouro Preto	5,133	2,854	487	719	4,060	79
Sidney Girao	500	383	123	63	569	114
Ji-Parana	4,725	1,294	908	1,242	3,444	73
Paulo de Assis Ribeiro	2,974	712	718	870	2,300	77
Padre Adolpho Rohl	4,341	1,131	216	636	1,983	46
Burareiro	1,594	158	242	216	616	39
Marechal Dutra	4,649	397	120	904	1,421	31
Total	23,916	6,929	2,814	4,650	14,393	60

* Through July.

Source: INCRA.

6.21 As implied by the data in Table 10, the new national INCRA administration has given increased emphasis to titling, and staff from other divisions have been assigned to this task. The system also has been streamlined in accordance with the aim of speeding transfer of the projects to territorial jurisdiction. The required personal identification documents have been reduced from eight to only three, and titles can be approved directly in Porto Velho instead of Brasilia as was previously the case. Most importantly, INCRA has apparently decided to rescind the two-tier system and to issue definitive titles to qualified settlers with no waiting period.

6.22 Roads. Roads are a major element in the success or failure of any settlement project, as they guarantee access to markets, to medical care and schools, and to technical assistance agents working in the field. As with titling, INCRA performance in road building has been erratic. In 1973 only 150 kilometers were built, while in 1976, 1,258 kilometers were built (see Table 11). Moreover, the ratio of kilometers of road per settler, given the grid-like configuration used by INCRA, is a relatively high 0.33. In contrast, the Alto Turi project in Maranhao, which uses a different settlement pattern to serve a number of settlers equal to the Ouro Preto project, has a ratio of 0.07 kilometers per settler. Project design thus demands a fairly heavy road construction component. However, INCRA has neither been able to meet the demand for roads nor used an effective project design to minimize this requirement.

Table 11

INCRA ROAD BUILDING IN RONDONIA SETTLEMENT PROJECTS, 1971-78
(Kilometers)

	Target	1971/74	Realized		1977	1978	Total	% of Target
			1975	1976				
Ouro Preto	1,770	567	94	428	31	0	1,120	63
Sidney Cirao	224	142	0	26	0	0	168	75
Ji-Parana	1,427	172	40	237	142	32	623	44
Paulo de Assis Ribeiro	1,003	56	105	245	150	0	556	55
Padre Adolpho Rohl	1,300	n.a.	406	0	0	0	406	31
Burareiro	896	n.a.	23	106	36	96	261	29
Marechal Dutra	1,123	n.a.	10	217	85	63	375	33
Total	7,743	937	678	1,259	444	191	3,509	45

n.a. = not available.

Source: INCRA, Porto Velho.

6.23 It should be pointed out that the figures for road construction are deceptive, as most "roads" are narrow and only seasonally useful. In the Ouro Preto project, for instance, it is estimated that during the dry season roads give access to 70% of the project area while during the rains access drops

to only 10%. As rice and corn are harvested during the rainy season, much of this production is lost owing to lack of access to proper storage facilities or to markets.

6.24 Two efforts involving greater colonist participation have been made to ease the road situation. In 1978, road construction and maintenance was carried out through a program of limited cooperation between INCRA and settlers in which settlers paid for fuel and INCRA provided machinery for the work. In 1979, this effort was expanded, and coordination was passed by INCRA to the Secretariat of Agriculture and Colonization (SEAC) of the territory of Rondonia. This effort involves the participation of all agencies working in the projects, as well as municipal governments and settlers. It is centrally coordinated by the SEAC and involves specific commitments of manpower, funds, and material resources by all participants. 1/

6.25 To serve the areas of most critical need, it was estimated that 1,500 kilometers of roads would be required by the end of 1979 and, according to the SEAC, this target was reached. However, owing to unforeseen detours it is now estimated that an additional 400 kilometers will be necessary. The results of this self-help effort have been quite positive, both in the sense of pooling resources to meet the critical need for roads and in providing a basis for coordinating agencies such that further similar community development efforts may be possible. However, despite the positive effects this type of community effort may have, such a program makes a significant demand on settlers whose first priority is to care for their farms.

6.26 Support Services. 2/ In 1974, INCRA began to reduce its responsibilities in the settlement projects by passing the responsibility for providing specific services to other state and federal agencies. These other agencies were to provide the necessary support services--adequate credit facilities, storage areas, technical assistance, and medical and educational services--that would help fix the settler to the land. While there are some project-to-project differences, the interagency division of responsibilities is usually as follows: Technical Assistance and Rural Extension Association-Rondonia (ASTER-RO): technical assistance for rubber, cattle, and subsistence crops; Executive Commission for the Cocoa Development Plan (CEPLAC): cocoa development, including, technical assistance research, and marketing; Brazilian Agricultural Research Enterprise (EMBRAPA): farm system and crop specific research; and Special Public Health Service (FSESP): medical assistance.

6.27 In general, though performance varies from agency to agency, the administrative set-up outlined above has been ineffective in implementing services on a scale large enough to adequately serve the settler population. To a great extent, the performance of a given agency has depended on the availability and consistency of funding, the ability to pay salaries that

1/ Settlers are responsible for clearing a 30 meter wide swath of forest along the road path; government agencies provide technical direction, machinery, and funds.

2/ A more detailed evaluation of the existing agricultural support services in the Northwest is contained in Chapter VII.

attract qualified personnel, and local managerial capability. The lack of cooperation among agencies operating in the projects has also been a problem. Examples include lack of coordination in the use of vehicles (at present each agency maintains its own fleet of vehicles) and overlap in the provision of some services leading to conflicting instructions to the farmers. This coordination problem is primarily a reflection of the piecemeal approach to land settlement so far taken by INCRA.

D. Proposed Settlement Programs

6.28 The population forecasts for the 1980s, which assume migratory inflows even larger than those of the previous decade, clearly suggest that settlement programs for the Northwest will need to be expanded considerably. In addition, steps will need to be taken to consolidate existing settlements in order to rectify the errors in planning and execution discussed above. Although the past performances of INCRA and other agencies involved in land settlement have often been less than ideal, much useful experience has been accumulated -- experience that should be utilized to guide the design of new programs.

Consolidation of Older Settlement Areas

6.29 In order to consolidate areas of older settlement, the Rondonia government, under the direction of the SEAC, has developed a plan to extend the present network of support services to locations situated from 20 to 80 kilometers on either side of the Cuiaba-Porto Velho road. Central to this plan would be the establishment of a number of urban support centers (nucleos urbanos de apoio rural - NARs) at strategic locations in the rural zone. ^{1/} These proposed support centers would be of various sizes, depending upon the population to be served. Smaller ("primary") centers would be linked to larger ("district"), market-oriented centers, and a system of storage, which would permit settlers to hold crops until prices were better or to move them to where transport was easier, would help deal with the current problem of crop losses. NARs would also contain a technical assistance agent, schools, health posts, a commercial district, recreation facilities, and police, telephone, and postal agencies. The new Rondonia agricultural development company (CODARON) would be responsible for managing the network's production and marketing system, perhaps also acting as a buying agent for the Bank of Brazil.

^{1/} Thirty-nine such centers would be financed under POLONOROESTE during the 1980-85 period. These centers would be located in the municipios of Ariquemes, Ji-Parana, and Cacoal.

6.30 The major advantage of the proposed network of NARs is that it would provide previously-isolated settlers with access to economic and social services which until now have been available almost exclusively to settlers located in or near the urban centers along the main road. In economic terms, this implies that the incomes of many producers would increase over current levels as a result of greater access to technical assistance on the one hand, and a decline in their dependence on intermediaries for credit and marketing services on the other. The social well-being of these producers and their families would also be greatly enhanced through the greater availability of schools, health posts, communications facilities, and recreation areas. Moreover, a significant secondary benefit of the NAR network would be the creation of a sense of community among the settlers -- a crucial ingredient in the process of fixing them to the land.

Settlement of New Areas

6.31 Owing to the limited possibilities for increasing the absorptive capacities of existing settlement projects, INCRA is planning to establish a number of new projects in presently unoccupied areas of the Northwest. These projects would be initially sited in Rondonia along the partially-constructed Ouro Preto to Costa Marques road and later extended to the Guapore Valley of Mato Grosso. The objective of INCRA would be to settle at least 30,000 families (22,000 in Rondonia and 8,000 in Mato Grosso) over the 1981-85 period. About Cr\$17.8 billion (US\$261 million), or US\$8,700 per family settled, is allocated to this end in the POLONOROESTE budget.

6.32 The design of the new INCRA settlement projects is still evolving. Originally, they were to be implanted in the form of square-shaped "modules" measuring nine kilometers on a side with the capacity to settle 120 families each on 45-hectare lots (supplemented by 3.45-hectare lots for housing and subsistence agriculture). While this "module" concept has been retained for planning purposes, in practice the design of the new settlement projects would be a function of the agricultural aptitudes of the selected sites and the socioeconomic characteristics of the expected settler population. INCRA has commissioned land-use capability and demographic surveys to serve as the bases for subsequent project preparation.

6.33 Although the new settlement projects are still under preparation, it would appear that in several respects the set of general preparation guidelines now being followed by INCRA represents a distinct improvement over past practices. First, INCRA planners have indicated their willingness to diverge from the standard 100-hectare lot size established for existing projects in Rondonia and elsewhere in Amazonia. According to INCRA, lot sizes in the new projects would not be standardized, but would be determined instead by factors such as soil fertility, topography and the availability of farm labor. This decision is, in itself, a big step forward since preliminary field observations suggest that, in the areas of better soils, 10-hectare plots of coffee or cocoa may be all that can be handled effectively by family labor.

6.34 Second, INCRA has expressed its preference for maintaining the settlement projects' legally-required forest reserves (equal to 50% of the area of the lots) in block form rather than on the individual lots as has been the case in the past. This proposed modification in project design would have certain ecological advantages and would also simplify the task of monitoring and controlling, on the part of IBDF, unauthorized deforestation (see para. 5.18).

6.35 Finally, INCRA has demonstrated a greater interest than formerly in assuring that timber felled during the land clearing process is fully utilized by the settler. To this end, it is proposed that technical assistance in the area of forest management (including instruction on rational clearing practices and marketing) be provided to each settler. Alternatively, INCRA is studying the possibility of providing settlers with lots that have been already partially or fully cleared. In this case, the settler would be given the net proceeds from the sales of timber extracted from his land to help satisfy subsistence and working capital requirements during the first one or two crop years.

6.36 The innovations described above suggest that INCRA has benefitted from its long years of experience with official settlement in Amazonia and that some past errors will be avoided in the new project areas. However, other crucial factors such as settler selection criteria are still of concern. Research on settlement projects along the Trans-Amazon highway, for example, indicates that INCRA was erroneous in assuming that the area of origin, educational level and years of previous agricultural experience of prospective settlers would determine the success or failure of colonization programs. In fact, it was whether settlers had been farm owners or managers before coming to the frontier area and whether they had stable residence in the past which accounted for differential performances. 1/ In this respect, one might question INCRA's plan to recruit up to one-third of the settlers for its new settlement projects from cooperatives established in other parts of Brazil. While it is possible that such individuals could create a salutary "demonstration effect" for the other (spontaneous) contingent, this anticipated (but by no means certain) benefit must be carefully weighed against the disadvantages associated with further increasing the size of the already massive migratory flow to the Northwest.

1/ Emilio F. Moran, "Criteria for Choosing Successful Homesteaders in Brazil", Research in Economic Anthropology, Vol. 2 (1979), 339-59.

VII. AGRICULTURE

A. Introduction

7.01 The agricultural development of the Northwest is still at an early stage, especially in the more isolated areas away from the main road. ^{1/} However, the potential for increasing production is considerable. In contrast to most other parts of Amazonia where agroclimatic conditions are generally unfavorable, the Northwest has areas of soils suitable for some crops and a pronounced dry season which inhibits the propagation of plant diseases. The region also has a rapidly growing rural labor force resulting from the large migratory inflows and, in Rondonia and the older developed area of Mato Grosso, a fairly equitable division of farm areas.

7.02 It is increasingly evident that, despite the favorable factors mentioned above, inadequate infrastructure and support services, a confused land tenure situation, the weak administrative capabilities of key institutions, and a number of other factors are impeding the full realization of the Northwest's agricultural potential. A discussion of these constraints and the formulation of recommendations as to how they may be overcome is a major objective of the present chapter. First, however, it is useful to review briefly the regional resource base and present agricultural development patterns.

B. Resource Base

Land Capability

7.03 At present, the nature and extent of the various soils occurring in the Northwest is not precisely known. There are only two sources of data concerning land capability: the Brazilian Agricultural Research Enterprise (EMBRAPA) survey (1975) with maps at a scale of 1:5 million and the RADAMBRASIL survey (1978) at 1:1 million. The findings of these surveys, summarized in Table 12 in terms of land-use capability, indicate that more than half of the region's land area is suitable ("good" or "moderate") for annual or permanent crops. However, the areas which prove on more detailed survey to be suitable for agriculture may differ from the figures shown.

Labor Force

7.04 Data on the regional agricultural labor force are contained in the 1975 Agricultural Census. At the time of the census, approximately 202,000 persons were employed in agriculture in the Northwest, of which 136,000 were 14 years of age or over. The total labor force was divided about equally between Rondonia (51%) and Mato Grosso (49%). Within Rondonia, over 90% of

^{1/} As of 1975, for example, agriculture accounted for only 18% of Rondonia's net product. No recent social accounts are available for Mato Grosso, but in 1970 the agricultural sector's relative participation in the old state's net product was just over 30%.

Table 12

NORTHWEST REGION: LAND CAPABILITY CLASSIFICATION

Class	Rondonia		Mato Grosso		Region	
	Km ²	%	Km ²	%	Km ²	%
Good	24,120	9.9	5,187	3.1	29,307	7.1
Moderate	145,823	60.0	36,062	21.6	181,885	44.4
Marginal	17,982	7.4	68,834	38.2	81,816	20.0
Unsuitable	55,125	22.7	61,867	37.1	116,996	28.5
T O T A L S	243,050	100.0	166,950	100.0	410,000	100.0

Note: "Good" = Soils dominantly terra roxa or eutrophic podsols, frequently with eutrophic lithosols in patches. Suitable for annual or perennial crops on a sustained basis.

"Moderate" = Soils dystrophic, deep latosols with clayey or loamey textures. Normally require liming and fertilizers for sustained agricultural production.

"Marginal" = Soils dystrophic, sandy or concretionary, always requiring liming and fertilizers in agriculture, texturally unsatisfactory for fertilizers.

"Unsuitable" = Unsuitable for known land uses.

Sources: RADAMBRASIL; FAO - UNESCO Soil Map; mission estimates.

the agricultural labor force was concentrated in the former município of Porto Velho, that is, in the areas closest to the Cuiaba-Porto Velho road. In Mato Grosso, almost three-fourths of the labor force was located in the older developed area of Caceres, Mirassol d'Oeste, Tangara da Serra, and Barra do Bugres. As of 1975, the município of Aripuana (west of the Roosevelt River) was practically empty with only 49 persons identified as working in agriculture.

7.05 During the 1970-75 period, the regional agricultural labor force increased very rapidly, reflecting the intense migratory flow and the establishment of the INCRA settlement projects. The average annual growth rate for the entire Northwest was 25%, with the labor force of Mato Grosso growing at about 13% and that of Rondonia increasing at a phenomenal 38%. Despite these high growth rates, farm labor is reported to be in short supply in the region, particularly during the land clearing and harvest seasons. As a result, wages tend to be relatively high (averaging Cr\$250 per day in some of the colonization projects versus Cr\$100-150 in the Northeast), and sharecropping arrangements are very favorable to the sharecropper. Under a typical coffee development scheme, for example, the sharecropper receives a parcel of cleared land and the coffee seedlings. He plants the coffee, intercropped with rice and corn, and keeps 100% of the production during the first three years. After this initial period, the sharecropper has the option of planting new coffee under the same scheme, or maintaining and harvesting the older coffee stands, for which he receives 50% of the crop.

C. Current Development Patterns

7.06 Agricultural development began in the southern portions of the region in the 1940s, while in Rondonia little land was cleared until the 1970s. The extent of land utilization therefore varies, being greatest on the better soils, and particularly in the older developed areas of Mato Grosso (the municípios of Mirassol d'Oeste, Tangara da Serra, Barra do Bugres, and the northern part of Caceres). The data in Table 13 summarize the estimated areas under seeded and natural pasture, crops, and extractive activities and forestry as of 1978. It should be noted that about 80% of the region's land area (60% of Mato Grosso and 92% of Rondonia) was not utilized for any of the activities listed above. Presumably, much of this unused land is still in the public domain.

Production Practices

7.07 At present, the dominant system of agricultural development in the Northwest is highly traditional. That is, the forest or cerrado is cleared; the timber of a few valuable species is extracted; and the remaining debris is burned. This sequence is usually followed by a single upland rice crop, although several annual crops may be planted if soil fertility is adequate. Fertilizers and lime are seldom used and seeded pasture may eventually degenerate or be invaded by scrub to the point where it produces very little, depending on the quality of the soil and level of management applied. Meanwhile, clearance of new land continues.

Table 13

NORTHWEST REGION: AGRICULTURAL LAND USE, 1978

<u>State/Territory</u>	<u>Total</u>	<u>Unused</u>	<u>Extractive and Forestry</u>	<u>Seeded Pasture</u>	<u>Natural Pasture</u>	<u>Annual and Tree Crops*</u>
Rondonia						
'000 ha	24,304.4	22,255.4	802.2	907.0	121.0	219.0
%	100.0	91.6	3.3	3.7	0.5	0.9
Mato Grosso**						
'000 ha	13,981.4	8,447.0	853.0	1,664.0	2,772.0	245.4
%	100.0	60.4	6.1	11.9	19.8	1.8
Region						
'000	38,285.4	30,702.0	1,655.0	2,571.0	2,893.0	464.4
%	100.0	80.2	4.3	6.7	7.6	1.2

* Probably overestimates actual area. Some double-counting present owing to intercropping.

** Excludes Aripuana.

Source: INCRA Cadastre, 1978

7.08 On better soils, particularly in recent years, there has been a move to more intensive land use. In such areas, tree crops have been planted on a substantial scale, and repeated annual crops are cultivated either in pure stand or as intercrops. Here there is some use of fertilizers and lime, but it is too early yet to know whether soil correctives can permit annual crops to be grown indefinitely on an economically viable basis. It should be pointed out, however, that experiments with annual crops carried in various parts of Amazonia suggest that the use of fertilizers can be profitable to farmers in the region. ^{1/} The sequences described above are shown diagrammatically in Figure 2.

7.09 Coffee is the most widely planted perennial crop in the Northwest. Since many settlers in the region originate from traditional coffee growing areas, production practices are similar to those in the South. Intercropping is widespread and pesticides are often used. However, present spray programs are reportedly unable to completely eradicate the coffee leaf rust present in the area. Cocoa is well suited to the better soils of Rondonia, and its cultivation is supported by the CEPLAC technical assistance and credit programs (see paras. 7.34 and 7.39). Sweet bananas are often interplanted to give shade for the first three to four years and to provide income before the cocoa comes into bearing (usually in the third year). Witch's broom disease (vassoura de bruxa) is the most important production problem, but is usually controlled by a combination of sprays and pruning. Rubber, although native to Brazil, has never been grown on the scale of Asian countries due to the ravages of South American leaf blight (Microcyclus ulei). However, the climate of Rondonia does not favor leaf blight and this, combined with the availability of tolerant varieties and modern fungicides, has led to a government program (PROBOR) to promote the cultivation of rubber in the territory. This program stipulates that only annual intercrops may be grown but, owing to their desire for a higher cash income during the rubber's six to seven year maturing period, many farmers have interplanted with coffee or cocoa.

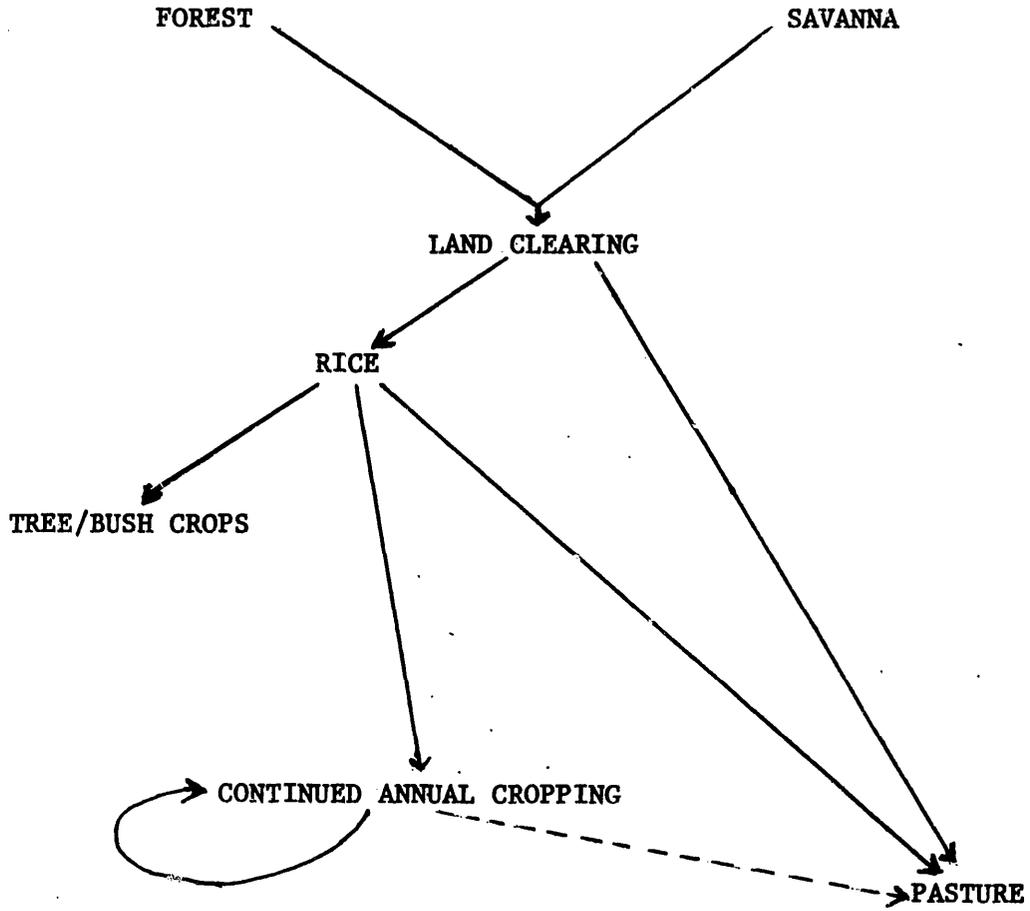
Production and Yields

7.10 Throughout the region, agricultural development is rapid and is often going on in inaccessible places. Government crop statistics are based on rough estimates by a few technical staff who also have other duties, there being neither systematic recording of planted areas nor output to estimate yields. For annual crops there is no indication whether the area recorded is intercropped or in pure stand, and it is possible that the same hectare of intercropped land is recorded more than once. The figures cited below should therefore be regarded as very tentative.

^{1/} See T.T. Cochrane and P.A. Sanchez, "Land Resources, Soil Properties and their Management in the Amazon Region: A State of Knowledge Report", paper presented at the International Conference on Amazon Land Use, Cali, Colombia, April 16-18, 1980.

Figure 2

SEQUENCE OF LAND USE UNDER PRESENT SYSTEM OF AGRICULTURE



7.11 Crops. Table 14 shows basic production data for various key crops as of the late 1970s. The figures for the most recent year available (1978) indicate that the land area devoted to the main annual crops is increasing at 20 to 30% annually in Mato Grosso. In Rondonia, the emphasis is on tree crops with the cultivated area increasing at up to 40% per year. Crop yields show few variations over recent years, but marked differences from 1970 levels. In Mato Grosso, for example, rice has fallen from 2.0 to 1.5 metric tons per hectare, corn from 1.9 to 1.5, and beans from 1.3 to 0.5. In Rondonia, rice and corn both increased from 0.9 to 1.7 metric tons per hectare. Average tree crop yields say little owing to the high proportion of plantings which are still immature. The changes in yields cited for Mato Grosso might be partially explained by the fact that the quality of land being cleared has progressively declined as better areas were occupied. So far, such yield declines have been avoided in Rondonia because of the continued availability of land with better soils.

7.12 Though the production figures for each crop are small in comparison to national totals, ^{1/} average annual growth rates (with the exception of manioc, bananas, and sugar cane in Mato Grosso) have been extremely high (generally in the 20-30% range) over the past decade. However, these high growth rates are mainly due to the rapid increase in the land area under cultivation and the small bases upon which they were calculated. The gross value of the crops listed in Table 14 is about Cr\$2.9 billion at 1979 prices, or approximately US\$95 million at the official exchange rate.

7.13 Livestock. Official statistics show about 1.2 million head of cattle in Mato Grosso, but only 130,000 head in Rondonia. However, the Rondonia herd is reported to be increasing at over 30% per year, while for Mato Grosso it is static. The total annual offtake of cattle in the Northwest is about 150,000 head. Assuming an average carcass weight at slaughter of 220 kg, total regional beef production would amount to some 33,000 metric tons per year, with a value of Cr\$2 billion at 1979 prices (US\$65 million). Dairying is of local importance around towns in Mato Grosso and Rondonia. The only data received for Mato Grosso refer to 1976 and 1977 and show an increase from 12 to 20 million liters of milk. The current annual production level in Rondonia is on the order of 10 million liters.

7.14 Timber. Much of the land suitable for agriculture, especially in Rondonia, is under forest which contains a range of commercial varieties. The volume of standing timber has been estimated at 85 m³ per hectare in the Vila Bela area of Mato Grosso and between 100 and 170 m³ per hectare in Rondonia. However, loggers often extract only the most valuable species, and the remaining timber is burned or allowed to rot. Thus, the effective yield per hectare is seldom more than 5 m³ of timber, and sometimes as little as 1 m³.

^{1/} The national production of rice in recent years has been in the 8-10 million ton range; that of coffee has been in the range of 6-7 million tons.

Table 14

MATO GROSSO AND RONDONIA: AREA, OUTPUT, AND YIELD DATA
FOR KEY CROPS, 1978-79

Crop	Mato Grosso (1978)			Rondonia (1979)		
	Area (['] 000 ha)	Output (['] 000 mt)	Yield (mt/ha)	Area (['] 000 ha)	Output (['] 000 mt)	Yield (mt/ha)
Rice	131.0	187.7	1.4	76.2	128.0	1.7
Corn	38.4	55.6	1.5	40.9	67.9	1.7
Beans	37.8	17.1	0.5	15.9	10.7	0.7
Manioc	8.0	120.4	15.0	10.7	144.5	13.5
Banana	2.3	18.1	9.9	23.9	92.0	7.1
Coffee	23.7	n.a.	n.a.	25.8*	27.0	2.0
Cocoa	n.a.	n.a.	n.a.	24.9**	0.5	0.2
Rubber	n.a.	n.a.	n.a.	1.0	n.a.	n.a.

n.a. = not available.

* Area actually producing = 13,700 hectares.

** Area actually producing = 2,400 hectares.

Sources CEPA-MT; CEPA-RO.

7.15 According to IBDF, legal timber exports from Rondonia increased from 22,500 m³ in 1974 to almost 90,000 m³ in 1978. In addition, much timber is consumed within the territory where most houses are constructed of wood. Fuel and fence posts are the next largest local consumption items. Unfortunately, no estimates are available for local consumption, or for production illegally exported to avoid paying sales taxes and the compulsory reforestation fee of Cr\$33.60 per m³ extracted. It is estimated that 75% of all timber exported is cerejeira, with the balance accounted for by mahogany and other woods of lower quality. The value of timber legally exported from Rondonia in 1978 was Cr\$246.7 million, or about US\$13.5 million at the official exchange rate.

D. Land Tenure 1/

General Considerations

7.16 As is the case in many frontier areas, the land tenure situation in the Northwest is exceedingly complex, fraught with problems, and subject to rapid change. In fact, the existing uncertainties over boundary lines and rights of possession must be considered one of the major constraints on the region's agricultural development. To a certain extent, the land tenure problems of today are rooted in the region's historical dependence on extractive activities. At the turn of the century, large imperfectly surveyed tracts of land, principally in the Guapore Valley of Rondonia, were occupied by persons exploiting the region's stands of wild rubber. Apparently little of this occupation was legally sanctioned, but a number of dubious titles issued during this period are still used to claim private ownership over vast landholdings.

7.17 Improvements in overland access to the region in the mid-1960s further complicated the regional land tenure situation. The construction of the Guaiaba-Porto Velho road had the dual effect of facilitating migration to the region and increasing land values in the highway's area of influence. The combined impact was to create a land rush of large proportions in which corporate cattle interests, private settlement companies, land speculators, migrants and others competed for the choicest real estate. Since the pre-existing land structure was so poorly defined, this land rush was (and continues to be) the source of innumerable legal irregularities and much social tension; most attributable to the sale of fraudulent titles to prospective settlers by groups known as grileiros, and to the invasion of public, private, and Indian lands by squatters (posseiros).

1/ This section mainly refers to the situation in areas outside of official settlement projects. The situation in the latter is more fully discussed in Chapter VI. The issue of Indian land rights is discussed in Chapter IV.

Land Distribution Policies and Procedures

7.18 INCRA has jurisdiction over most of the land in the area of influence of the Cuiaba-Porto Velho road. In such newly opened frontier regions, one of the first tasks of INCRA is to assess the validity of pre-existing private claims to land so that the remaining lands (terras devolutas) can be assigned a use. In order to accomplish this, the agency initiates a process known as "land discrimination" through which contested land claims are examined and resolved either through administrative or legal procedures. Under the administrative procedure, the legitimacy of land claims is decided by a three-member commission composed of the president (who should be a lawyer), an agronomist, and a secretary. The judicial procedure, which employs normal legal channels, is used for appeals to administrative decisions and in cases where the administrative procedure breaks down.

7.19 Squatters' rights. The claims of squatters are taken into account in the discrimination process. Posseiros occupying less than 100 hectares of public land, for example, have a legitimate claim if they have been present for at least 12 months, have cultivated the land using family labor, and have no other land in their name in Brazil. Upon fulfillment of these conditions, such persons may be provided with a provisional document (licenca de ocupacao) which they must hold for at least four years before receiving a definitive land title. 1/ During this waiting period, the farmer is only eligible for production credit.

7.20 Posseiros claiming over 100 hectares, and who have the resources for cultivating larger tracts of land, are permitted to make preferential bids when the land is offered for sale at public auction. Under this scheme, the posseiro has the right to match any bidder and to have the value of the improvements he has made count toward the price of the land. Deforestation is considered to be a land improvement, thus providing an incentive for the cutting of trees. Tracts of up to 3,000 hectares may be sold under this procedure; sales of larger tracts must be approved by the federal senate.

7.21 Land tenure projects. In order to facilitate the land discrimination process, INCRA has established a number of land tenure projects (projetos fundiarios). At present there are four such projects in Rondonia (Alto Madeira, Corumbiara, Guajara-Mirim, and Jaru-Ouro Preto) and a like number in Mato Grosso (Caceres, Diamantino, Cuiaba, and Vale do Araguaia). 2/ Work on these projects began in the mid-1970s.

1/ It should be pointed out that under existing legislation a posseiro may be legally evicted from his claim if he has occupied privately-owned lands without permission. In such cases, the owner is obliged to indemnify the posseiro for any improvements he has made on the land. If during a 20-year period the legal landowner has made no attempt to evict the posseiro, the latter may apply for legal title to his claim.

2/ The Vale do Araguaia and Diamantino land tenure projects fall outside of the Northwest region; the others in Mato Grosso are at least partially included.

7.22 Within Rondonia, all the land bordering the Cuiaba-Porto Velho highway has been discriminated and assigned a use. The land with better soils has been assigned to INCRA settlement projects, with the exception of one private colonization scheme (CALAMA S.A.) along the highway. The remaining area has been sold at auction or is claimed by posseiros whose definitive titles have yet to be processed. The present status of the discrimination process in Rondonia, by land tenure project, is as follows:

<u>Project</u>	<u>Total Area</u> (⁰ 000 ha.)	<u>Area Discriminated</u> (%)
Alto Madeira	5,570	42
Corumbiara	5,990	98
Guajara-Mirim	7,045	79
Jaru-Ouro Preto	<u>5,699</u>	<u>65</u>
TOTAL	24,304	72

The land use designations resulting from the discrimination efforts (as shares of the total land area) are: colonization, 11%; Indian reserves, 11%; forest reserves, 8%; public auction, 10%; "claims still being regularized", 11%; "under study", 21%; and "to be discriminated", 28%.

7.23 As of end-1978, some 4,562 licencas de ocupacao, and 658 definitive titles, had been issued to persons claiming land in Rondonia outside the official colonization projects. An additional 658 licencas and 442 definitive titles were scheduled for delivery during 1979. These numbers are very low considering the size of the farm population outside official projects and uncertainties concerning land tenure continue to be evident (see paras. 7.25-7.33 below).

7.24 The available information on the activities of INCRA in Mato Grosso is very sketchy, but it would appear that less has been accomplished than in Rondonia. According to the report of the Mato Grosso Land Tenure Commission, 1/ INCRA has discriminated 1.5 million hectares of the 2.3 million hectares in its four land tenure projects. But after five years of work, including the examination of over 10,000 land claims, less than 500 definitive titles have been issued. Concerning this situation, the Commission's report further states that if the titling process is not speeded up, a new discrimination process may need to be initiated to take into account the claims of new migrants to the state. The state itself issued some 1,500 titles to farmers occupying land to the west of Caceres (Rio Branco) during the 1960s and early 1970s, but since this area was within 100 kilometers of a federal road (Cuiaba-Porto Velho) and thus under INCRA jurisdiction, these titles were subsequently invalidated. However, it is reported that INCRA plans to revalidate these titles in the near future.

1/ This Commission was established in 1979 for the purpose of identifying areas of social tension in the state caused by irregularities in the land tenure situation. The state's Vice-Governor served as the Commission's President.

Types of Land Tenure

7.25 Owing to the confused land tenure situation prevailing in most of the Northwest, little is known about the distribution of land tenure arrangements by type. Data available from the 1975 Agricultural Census are summarized in Table 15. It appears that most farm units in the region are run by "owner-operators" and "squatters." These two groups account for about 85% of the establishments and almost all of the area under farms. Farms operated under tenancy and sharecropping arrangements account for about 14% of the establishments and have average sizes of 11 and 20 hectares, respectively.

7.26 The data suggest that the tenure situation of many producers is insecure, and indeed it is probable that the number of non-owners was underestimated by the census. First of all, the census coverage corresponds to only 2% of the region's land area. Secondly, the census does not reflect the intense migration to the region which has taken place since 1975. Finally, the census does not provide information on the apparently frequent practice according to the Mato Grosso Land Tenure Commission, of issuing several titles to a given parcel of land.

7.27 Given the slow pace of titling observed over the past few years, it is reasonable to assume that the majority of the new settlers in the region have entered into tenancy or sharecropping arrangements with already established farmers, or have invaded public or private lands in newly opened areas. In Pondonia, for example, recently arrived families often take up residence on lots of others, usually relatives, and work for the owner until INCRA provides them with their own lots. Another common practice is for the new settler to stake a squatters' claim on the fringe of an official colonization project, while at the same time working as a laborer on one of the farms within the project.

7.28 The incidence of farmers without titles is also high in the Mato Grosso portion of the survey area. At present, there are estimated to be some 30,000 posseiro families residing in the state, of which almost one-fourth (6,400) are in the municipios of Caceres, Barra do Bugres and Vila Bela. Though no information is available on the proportion of these families illegally occupying privately-owned land, the Mato Grosso Land Tenure Commission has identified 34 areas in the zone of influence of the Cuiaba-Porto Velho road where conflicts over land tenure issues have arisen. The largest number (eight) of these areas are found in Vila Bela, followed by Caceres (seven), Barra do Bugres (six), Tangara da Serra (six), Mirassol d'Oeste (three), Pocone (two) and Livramento and Varzea Grande (one each). For these areas, the Commission has recommended that a special program be set up to accelerate the regularization of land claims and to establish at least a minimum level of infrastructure.

Table 15

NORTHWEST REGION: DISTRIBUTION OF FARMS BY MAJOR TENURE GROUPS, 1975

Tenure Groups	Region		Rondonia		Mato Grosso	
	% farms	% area	% farms	% area	% farms	% area
Owner-Operators	55.4	87.5	66.1	78.4	42.7	92.2
Tenants	10.4	0.6	1.7	0.2	20.6	0.9
Sharecroppers	3.5	0.4	3.4	0.8	3.6	0.2
Squatters	30.8	11.5	28.9	20.8	33.1	6.7
TOTAL	47,088	9,001 km ²	25,483	3,082 km ²	21,605	5,918 km ²

Note: The total land areas (as opposed to farm areas) of the region, Rondonia, and Mato Grosso are: 410,158 km², 243,044 km², and 167,144 km², respectively.

Source: FIBGE, Censo Agropecuario, 1975

Farm Size

7.29 Data on the size distribution of farms, drawn from the 1975 Agricultural Census (Table 16), indicate that a major proportion of the region's area under farms is in the hands of large landholders. More specifically, while farms of over 1,000 hectares comprised only 2.3% of the total establishments, they accounted for over two-thirds of the land area under farms. In contrast, smaller farms (up to 100 hectares) constituted about two-thirds of the establishments, but only 7% of the land area.

7.30 The data summarized above, though clearly indicating a concentration of farm ownership in the region, do not adequately reflect the significant intraregional variations in the size distribution of farms. Such variations are an important characteristic of the land tenure situation in the Northwest and are attributable to a number of factors including differences in land-use capability, the rate and extent of settlement, historical precedents, and government policy. Large differences in the size distribution of farms are evident even at the state/territory level of disaggregation. From this perspective, farm areas appear to be far more evenly distributed in Rondonia than in Mato Grosso. Small (up to 100 hectares) and medium (100-1,000 hectares) sized farms account for about two-thirds of the farm area in the former but less than 15% of the area in the latter. The relatively more equal distribution of farms in Rondonia is largely attributable to the implantation of the INCRA colonization projects which, as discussed earlier, are based on 100-hectare lots. ^{1/} As yet, no INCRA colonization projects have been established in Mato Grosso, and settlement has generally proceeded on an ad hoc basis. Consequently, there is a wider array of farm sizes in the state, including a number of very large corporate cattle ranches.

7.31 Within Mato Grosso, the greatest concentrations of small and medium-sized establishments occur in the municipios of Varzea Grande, Caceres, Mirassol d'Oeste, Tangara da Serra, Barra do Bugres and, to a lesser extent, in Nossa Senhora do Livramento. In these areas, average farm sizes range from 49 to 195 hectares, versus the 273 hectare average for the entire Mato Grosso portion of the survey area. By and large, these are areas of older settlement where agricultural development, based on annual and tree crops, is already at a fairly advanced stage, but where intense in-migration may still be observed.

7.32 The largest farms in Mato Grosso tend to be located in the municipios of Aripuana, Pocone and Vila Bela. In all three areas, establishments larger than 1,000 hectares account for well over 90% of the total area under farms. With regard to Aripuana, the highly skewed pattern of farm size distribution is largely due to the physical isolation of the area which, until recently, has impeded its occupation by migrants. In the two other municipios, the high incidence of large farms is associated with the predominance of extensive cattle raising. Particularly in Vila Bela, livestock development has been encouraged by the federal government through the provision of generous fiscal and credit incentives to corporations desiring to implant projects in the area.

^{1/} The impact of the INCRA projects on the distribution of farm sizes is reflected in the census data which show the average farm size in Rondonia falling from 230 hectares in 1970 to 121 hectares

Table 16

NORTHWEST REGION: SIZE DISTRIBUTION OF FARMS, 1975

Area Interval (in hectares)	Region		Rondonia		Mato Grosso	
	% farms	% area	% farms	% area	% farms	% area
< 10	35.0	0.8	19.1	0.5	53.8	0.9
10 - 100	30.2	6.1	28.0	10.0	32.8	4.0
100 - 1,000	32.4	25.8	51.8	56.3	9.7	10.7
1,000 - 10,000	2.0	28.8	1.0	16.8	3.2	35.0
> 10,000	0.3	38.6	0.0	16.4	0.5	50.2
TOTAL	47,149	9,001 km ²	25,483	3,082 km ²	21,666	5,919 km ²

Note: The total land areas (as opposed to farm areas) of the region, Rondonia, and Mato Grosso are: 410,158 km², 243,044 km², and 167,144 km², respectively.

Source: FIBGE, Censo Agropecuario, 1975

7.33 Registered corporations may reduce their income tax liabilities by up to 50% if the resulting savings are invested in approved projects located within the legally defined Amazon region. Such funds may be used to finance up to 75% of the project. Land purchases are not financed through fiscal incentives, though the value of the land may be counted toward the minimum 25% share of "fresh money" to be contributed by the project owners. Between 1967 and 1972, 16 such projects, ranging in size from 13,000 to 152,000 hectares, located in the município of Vila Bela and were approved for fiscal incentives administered by SUDAM. However, in recent years this form of development has been discouraged by the government and proposals for livestock projects in densely forested areas of Amazonia are no longer approved by SUDAM.

F. Government Support Services

Agricultural Research

7.34 Agricultural research in Rondonia is mainly the responsibility of the Brazilian Agricultural Research Enterprise (EMBRAPA), although specific studies on cocoa are undertaken by the federal cocoa development agency (CFPLAC) in Ouro Preto, and simple fertilizer trials by the territorial extension agency (ASTER-RO) under an agreement with the FAO. An EMBRAPA research station is located just outside of Porto Velho and is staffed by 14 agronomists. During 1979, investigations were programmed in the following areas: rubber, cattle, coffee, corn, beans, rice, soils, and water buffalo. Research work is carried out at the Porto Velho station, in the Ouro Preto colonization project, in Pimenta Bueno, and in six private holdings in Vilhena, Cacoal, and Ji-Parana.

7.35 To date, the main priority of EMBRAPA has been pasture research, but this is changing to give more emphasis to rubber and coffee cultivated with intercrops. In 1980, work was extended to soybeans and wheat, and to fruit crops in general. In pastures, evaluation of new grass and legume species is under way, and promising results are evident on the red-yellow latosols characteristic of the region. A project to further investigate water buffalo production started in 1980; as yet no work is planned with pigs or other small animals. Work on subsistence crops is mainly directed at variety evaluation and fertilizer experiments.

7.36 Following the division of the original state, Mato Grosso is without any agricultural research facilities. The establishment of such facilities, to be partially financed by a World Bank loan (No. BR-1249) to EMBRAPA under the first agricultural research project, is planned for 1981. In the meantime, a few variety tests and other simple agronomic trials are done by the state extension service (FMATER -MT) in order to fill the gap.

Agricultural Extension

7.37 Institutions providing agricultural extension services in Rondonia are specialized by crop: all annual crops, tree crops (except for cocoa and coffee), and livestock are under the responsibility of ASTER-RO; cocoa is the

responsibility of CEPLAC; and coffee will be the responsibility of the Brazilian Coffee Institute (IBC), which has recently received authorization to start work in the territory. ASTER-RO, established in 1971, is the principal institution providing technical assistance to low-income farmers; about 65% of its budget is devoted to this end. Within this program, farmers are provided with assistance in improving the production practices and marketing of rice, corn, beans, coffee, manioc and livestock. Instruction is also provided in the areas of health, nutrition, and education. The central office of ASTER-RO is located in Porto Velho, and there are two regional offices, in Ji-Parana and Pimenta Bueno, and nine local offices covering the various INCRA colonization projects. The number of local level extension agents was 46 in 1978 and 45 in 1979.

7.38 During 1978, some 5,800 farmers were assisted by ASTER-RO, implying a farmer-to-extension agent ratio of 125:1. However, the number of farmers assisted fell by more than half in 1979 as a result of insufficient funds for vehicle purchase, maintenance and operation, which seriously limited the mobility of the extension agents. The shortfall in funds was primarily caused by INCRA's decision to revoke its financial support for ASTER-RO, support which had previously accounted for between 35-40% of the latter's budget. Subsequently, the Rondonia agriculture secretariat has agreed to assume responsibility for INCRA's portion of the budget.

7.39 CEPLAC has an extension service to provide cocoa growers with assistance in technical matters and in obtaining credit from the PROCACAO line. ^{1/} The agency maintains a regional office, a local office and a research station in Ouro Preto staffed by six agronomists, three tree crop specialists, and 11 middle-level technicians working as extension agents. CEPLAC is also represented in Porto Velho (one upper-level professional), Cacoal (two agronomists and four extension agents), Ariquemes (three agronomists and four extension agents), and Jaru (two agronomists and seven extension agents).

7.40 The principal responsibility for extension work in Mato Grosso rests with the state office of the federal Technical Assistance and Rural Extension Enterprise (EMATER-MT). This agency has 35 field extension staff based in the area of influence of the Cuiaba-Porto Velho road. They are supported by 21 headquarters staff in Cuiaba. Six of the Cuiaba staff operate the state seed testing laboratory and seven are engaged full time in support programs for cooperatives. Thirty-five extension staff are graduates (20 agronomists, 14 veterinarians and a forester), and they are supported by 15 technicians (14 agricultural, one zoological). The department has one vehicle for every two field staff and adequate facilities for preparing written and audio-visual extension material. Salaries are reasonably competitive with alternative private-sector employment. The service aims to work with groups of 15 to 20 farmers, each field man supporting about five groups. This gives a theoretical coverage of about 3,000 farmers.

^{1/} The PROCACAO program, established in 1977, calls for an increase in Brazilian cocoa output to 700,000 tons by 1992, and includes the planting of an additional 100,000 hectares (out of a national total of 330,000) in Rondonia.

7.41 The effectiveness of EMATER-MT is hampered by the large distances which have to be traveled, and no coverage is possible between Vila Bela and Vilhena. Access is difficult except to farms located on main roads, and even here it is often restricted during the rainy season when advice is most needed. As a result, extension staff often have to wait for farmers to come to them, rather than vice versa. Further limitations arise from the lack of valid extension messages due to the absence of supporting adaptive research, and to the other duties which extension staff also have to undertake which, in addition to the gathering of crop statistics, include technical appraisals of credit applications on behalf of the Banco do Brasil, and family health programs.

Storage

7.42 In Rondonia, the Brazilian Storage Company (CIBRAZEM) operates 14 warehouses - six equipped for grain drying and cleaning - with capacities from 2,400 to 9,000 mt and a total capacity of 48,000 mt; 73 people are employed and the annual budget in 1979 was CR\$31 million. A further small amount of storage is operated by cooperatives and the private sector. In Mato Grosso, storage is divided between CIBRAZEM (2,400 mt), the state storage enterprise--CASEMAT (36,000 mt) and the private sector (72,000 mt). Rice is the main product stored, although corn, beans, coffee, Brazil nuts and pasture seeds are also handled in smaller amounts. Both administrations have plans to build more warehouses which, in the case of Rondonia, would be sited off the main road and within colonization schemes.

7.43 Utilization of existing public sector storage is highly variable between seasons and usually well below theoretical capacity. The main reason is the difficulty which the farmer experiences in transporting his rice, harvested during the rains, from his farm to the main centers in which most existing warehouses are located. Lack of marketing credit may also force farmers to sell immediately after harvest without storing, even though they would get a better price by delaying. Thus, even though there may be a need for increased storage and especially for greater drying capacity, it seems unlikely that it will all be used effectively unless the constraints imposed by lack of access and credit can first be removed.

Credit

7.44 Credit is available to producers from a range of government programs including POLAMAZONIA, PROTERRA, PROPEC, PROCACAO and PROBOR. Funds are allocated for medium and long-term capital investment, seasonal or production credit, and marketing. Until December 1979, interest rates ranged from 10 to 18% with no monetary correction. Presently, both principal and interest are adjusted by a factor equal to 40% or 70% (depending on the size of the loan) of the national monetary correction index (ORTN).

7.45 The principal credit channel is the Banco do Brasil (BB) which has five branches in Mato Grosso and five in Rondonia. In Rondonia in October 1979, BB had a portfolio of Cr\$900 million (US\$36 million) covering about 8,000 contracts. In Mato Grosso, 1977 BB disbursements were estimated to total almost Cr\$1.7 billion, of which 56% was for investment, 32% for production and 12% for marketing. The next most important official credit channel is the Banco da Amazonia (BASA). Significant amounts of credit also reach agriculture from the private sector, mainly from the Brazilian Discount Bank (BRADESCO), with six branches in Rondonia. In total, there are 25 bank branches in Rondonia and 12 in Mato Grosso.

7.46 Despite the apparent availability of adequate funds and the existence of bank outlets in major population centers, the credit needs of many producers are not satisfied. Most farmers have no land title and are therefore at a disadvantage when seeking rural credit. Those with title often have difficulty in reaching the urban areas where applications must be made. Finally, the bureaucratic procedures of the banks, which often require loan decisions to be referred from branches to central offices, can result in serious delays.

Cooperatives

7.47 The cooperative sector is poorly developed despite government support programs through INCRA and the agricultural extension services. There are only six operational cooperative societies in Mato Grosso and six in Rondonia, four in each area being concerned with agricultural production. Other cooperatives have failed from lack of management ability or enthusiasm among members and several of the survivors have severe financial problems. Total membership is less than 2,000 and even in Rondonia, with its preponderance of small farmers, includes less than 5% of the farming population.

F. Constraints and Recommendations

7.48 Agricultural production is constrained by numerous factors, many of which interact with each other. Among those discussed below, the limitations imposed by poor physical access, lack of land title, and inadequate support services are of the most immediate concern.

Physical Access

7.49 Main roads are often impassable in the rainy season and the network of feeder and farm access roads is poorly developed. It is therefore difficult, and sometimes impossible, for the farmer to market his output when he wishes. If he can do so, transport is costly. If he cannot move the crop himself, he may sell to an intermediary at far below the urban market price. Alternatively, the crop may spoil while held on the farm -- on-farm losses have been estimated at up to 50%. In each case farm gate returns are lowered, leaving little incentive to produce. Poor roads, by restricting the inward transport of bulky inputs, such as lime or fertilizers, and limiting the farmer's access to government extension services and to neighbors, also constrain intensive land-use and innovation. The farmer is instead pressed toward the exploitive use of land under extensive grazing; the cattle can at least be walked to market at the end of the rains. In order to rectify the problems caused by poor access, the regional secondary and feeder roads network must be upgraded and expanded in the areas of greatest agricultural potential. (More detailed recommendations pertaining to regional roads are presented in Chapter IX, paras. 9.26-9.32).

Land Title

7.50 The fact that many farmers do not have title to their land is the second major constraint to production. With no guarantee of occupancy, there is little incentive to abandon the present low input/low output systems of

production or invest in long-term farm improvements. Furthermore, much labor may be wasted in excessive land clearance undertaken as a means of establishing occupancy for titling purposes. The land discrimination process should be concluded as expeditiously as possible and titles issued with a minimum of bureaucratic delay to qualified farmers occupying land in areas already discriminated.

Support Services

7.51 Agricultural research, which is at present confined to Rondonia, needs to be focused more directly on the production problems currently faced by farmers. Research should therefore initially concentrate on topics such as: (i) selection and evaluation of crop varieties with better local climatic adaptation and disease resistance; (ii) crop timing and production techniques aimed at intensifying production per hectare of land cleared, and increasing net financial returns per man day of available family labor; (iii) development of improved methods to reduce losses during crop growth and post-harvest; and (iv) development of species mixtures and management systems to increase the stability and carrying-capacity of seeded pastures. The delivery of research results to farmers, via demonstration plots and other techniques formulated by a production-oriented extension service, also needs to be given more support. In addition, access to production and investment credit should be improved through the establishment of additional bank agencies (postos avancados) in the various settlement areas. This measure would, in turn, need to be coupled with improvements in the efficiency of the extension services--the principal link between the farmer and the bank. To be effective, the above measures would depend on prior improvement of farm access, so that there are adequate incentives for farmers to respond to advice, and adequate access to the inputs needed to do so.

Crop Drying and Storage

7.52 The use of existing crop drying and storage facilities is often denied to farmers because facilities are in main centers which they cannot reach. Improved access would have to be accompanied by expanded facilities to handle present levels of production. Some post-harvest loss could also be avoided by the establishment of simple on-farm storage facilities, and by greater attention to preliminary sun-drying when weather permits.

Climate, Soils and Zonation

7.53 The high rainfall favors crop growth, but compounds the access problem because it accelerates the deterioration of roads. It thus accelerates post-harvest losses of crops which cannot be rapidly dried and stored. Combined with high humidity, rains also promote the development of weeds, pests and diseases (see para. 7.55 below). Partly due, again, to the access problem, farmers lack the technical skills and materials to make the best returns from the potentially usable soils, while many, through lack of knowledge, or a desire for short-term gain, have cleared and subsequently abandoned unsuitable soils, causing avoidable ecological damage.

7.54 In order to limit ecological damage in the future, land suitability surveys should be made at a scale of 1:250,000 to cover all unoccupied areas considered likely to contain soils which have potential for agriculture and which are not already allocated to another purpose (forest and biological reserves, ecological stations, national parks, etc.). Agricultural zones should be delimited for those areas where potential is confirmed, and the remaining land should be allocated to non-agricultural uses. Within the agricultural zones, land suitability surveys should be done at scales ranging from 1:25,000 to 1:100,000, depending on the potential intensity of land use, to form a basis for infrastructure and settlement planning. The feeder road network should then be concentrated within the identified agricultural zones. Given the high rates of migration to the region, it is clear that current settlement plans cannot be completely halted pending the outcome of the land capability surveys and zoning exercise recommended above. However, such measures should be given high priority and completed as soon as possible.

Weeds, Pests and Diseases

7.55 Weeds are few in newly cleared forest land, but the humid climate fosters rapid establishment if they are left uncontrolled. Forest regrowth almost invariably leads to the eventual abandonment of seeded pasture. Many pests and diseases also develop rapidly. Rice blast and insect pests of maize are particularly common, and diseases of beans are severe unless planting is so late in the rains that there is an alternative risk of loss due to drought. Witch's broom disease in cocoa, South American leaf blight on rubber, and coffee leaf rust have already been mentioned. Although so far none of these constraints are overwhelming, they may raise production costs and/or reduce yields, and impose a need for resistant varieties which cannot always be met by the existing sources.

Labor Availability

7.56 In the future, labor shortages are likely to continue (see para. 7.05). Much of the area recently put under tree crops is in larger holdings than can be managed by the labor of a single family. Most immigrants arriving in the area with the aim of making a living in agriculture are seeking land, and will develop a plot of their own, legally or illegally, rather than seek paid employment. As plantings of coffee and cocoa mature, the availability of hired labor for harvest is therefore likely to become an increasing constraint, unless new arrivals are systematically given more opportunities to participate in tree crop farming -- for instance as sharecroppers.

G. Production Forecasts

7.57 The agricultural production of the Northwest is expected to increase rapidly over the next decades as immigration and the incorporation of new land continues. In order to show the order of magnitude of this expected growth, projections of production were attempted for the years 1984, 1989, and 1994.

These projections were disaggregated spatially and were further broken down into total, marketable, and exportable production. Moreover, recognizing the paramount importance of public sector activity in the region, the projections were made according to two separate scenarios. 1/ The basic assumptions of these scenarios are as follows:

Scenario I

7.58 The first scenario envisages the future essentially as a continuation of past trends. That is, it is based on the assumptions that there will be no special investments to improve the Cuiaba-Porto Velho road or the feeder roads network; no strengthening of institutions responsible for land-use zoning, Indian affairs, and environmental protection; and no improved land titling or additional technical support for agriculture. Inappropriate land is developed by inappropriate means, leading to a continuation of the present, largely exploitative, methods of agriculture. Yields decline in the medium and long terms. Market access becomes increasingly difficult as the agricultural perimeter expands, preventing access to inputs and leading to larger on-farm losses because farmers cannot evacuate their production.

Scenario II

7.59 The second scenario represents the future with a full range of government assistance along the lines proposed in the previous section and in the legislation establishing POLONOROFSTE. More specifically, the upgrading of the Cuiaba-Porto Velho road and improvement of the feeder roads network is linked to a comprehensive program of agricultural development. The latter would include measures to ensure that land is zoned according to agricultural potential and that feeder roads, physical and social infrastructure, and services (including land titling) are implanted only in agricultural zones. Institutions responsible for non-agricultural reserves would be strengthened to prevent, as much as possible, land clearing in these areas. Indiscriminate land clearing would be checked and, by good initial land selection, improved land titling and technical support, there would be a move toward sustained cropping, emphasizing tree crops, rather than the short-term exploitation of land. Better land plus research and technical support would lead to an upward trend in yields in the medium to long terms, and the integration of feeder roads with agricultural support would reduce on-farm losses.

Results

7.60 The results of the forecasting exercise described above are summarized in Tables 17 and 18. In the first of these tables, the expected total production of various commodities are shown for the years 1984, 1989, and 1994. From this table it may be readily observed that the agricultural and timber potential of the Northwest is considerable, especially if government

1/ More detailed information on the methodology and underlying assumptions of these projections are presented in the Annex.

activity in the region expands along the lines and to the extent envisaged under Scenario II. The average annual growth of agricultural production between 1979 and 1994 could be in excess of 13%, as compared to the real historical growth rate for all Brazilian agriculture of about 5% per annum. Potential rates of growth are particularly high for tree crops and, under the conditions of Scenario II, the regional production of cocoa in 1994 would be close to the national total reached in the late 1970s.

7.61 Even if government activity remains at current levels, the growth in agriculture over the next 15 years could be on the order of 8% annually. However, this finding does not imply that the proposed improvements in the region's physical and social infrastructure and services should not be carried out. On the contrary, by not making such improvements the region would be foregoing almost 2.9 million tons of agricultural production per year by 1994. In addition, failure to institute measures dealing with the regularization of land ownership, environmental protection, Indian rights, and land-use planning could very well jeopardize the future development of the region in ways (e.g., through an aggravation of social tensions and needless environmental degradation) not fully reflected in the production figures.

7.62 Future market conditions for the major traded agricultural commodities of the Northwest are mixed. For coffee, real prices are expected to decline gradually until the mid-1980s and then rise moderately for the rest of the decade. The real unit price in 1989 (US\$3,024 per mt at 1980 constant prices), however, is expected to be only 80% of that reached in 1979 (US\$3,789 per mt). Under the assumptions of Scenario II, the annual coffee production of the Northwest could, by 1989, be accounting for about 15% of the national total, equivalent to approximately 5% of world imports. The market for cocoa is expected to weaken considerably over the present decade, owing primarily to high levels of world production assumed for the late 1980s, and the increasing success in the use of cocoa substitutes in chocolate and confectionery. As a consequence of these factors, the unit price of cocoa at 1980 constant prices is expected to decline by about 40% over the decade, from US\$3,489 per metric ton in 1979 to US\$2,073 in 1989. Under Scenario II, the Northwest's output of cocoa could account for 20% of Brazil's total, and equal 7% of world imports by 1989. In contrast to coffee and cocoa, the market prospects for rubber, rice and timber are good and their real unit prices are projected to increase at annual rates averaging 0.6%, 0.4%, and 4.0%, respectively, over the 1979-89 period.

7.63 Despite the fact that prices for coffee and cocoa in both 1984 and 1989 are expected to be lower than those prevailing in 1979, the real value (at border prices) of the combined production of coffee, cocoa, rubber, rice and timber should increase substantially. Under the assumptions of Scenario II, coffee becomes the region's most important cash commodity by the mid-1980s, followed by rice, timber, cocoa and rubber (see Table 18). The total value (in constant 1980 US dollars) of the five commodities in question is expected to reach around US\$772 million by 1984 and US\$1.6 billion by 1989, the latter figure being over six times the 1979 baseline. The large differences between these totals and those attained under Scenario I are particularly

TABLE 17

NORTHWEST REGION: FORECAST OF TOTAL AGRICULTURAL AND TIMBER OUTPUT, 1984, 1989 AND 1994 *

('000 metric tons)

	<u>BASE</u>	<u>SCENARIO I</u>			<u>SCENARIO II</u>		
	<u>1979</u>	<u>1984</u>	<u>1989</u>	<u>1994</u>	<u>1984</u>	<u>1989</u>	<u>1994</u>
<u>Tree Crops</u>							
Coffee (processed)	28	52	68	80	98	224	272
Cocoa	5	8	53	100	34	129	191
Rubber	-	-	4	26	1	17	120
<u>Annual Crops</u>							
Rice (milled)	128	293	428	532	429	697	861
Corn	114	203	305	392	355	586	694
Beans **	14	38	57	68	57	98	115
Other	244	400	600	640	1,080	1,845	2,232
<u>M e a t</u>	43	51	65	83	74	139	216
Sub-Total	577	1,045	1,580	1,921	2,128	3,735	4,701
<u>Timber</u>	221	375	550	628	513	650	734
<u>TOTAL</u>	<u>798</u>	<u>1,420</u>	<u>2,130</u>	<u>2,549</u>	<u>2,641</u>	<u>4,385</u>	<u>5,435</u>

* Less on-farm losses, use as seed, etc.

** Manioc taken as proxy to represent all other crops (peanuts, cotton, vegetables, etc.)

Source: IBRD, Northwest Economic Survey mission. Subsequently revised.

striking (US\$319 million in 1984 and US\$827 million in 1989) and suggest that the POLONOROESTE program aimed at upgrading the regional road network, coupled with measures to improve land use planning and agricultural practices, could have a very rapid and high return.

TABLE 18

NORTHWEST REGION: ESTIMATED VALUE OF KEY TRADED COMMODITIES, 1984 AND 1989 *
(millions of constant 1980 US\$)

	<u>BASE</u>	<u>SCENARIO I</u>		<u>SCENARIO II</u>	
	<u>1979</u>	<u>1984</u>	<u>1989</u>	<u>1984</u>	<u>1989</u>
Coffee	106.1	140.4	205.6	264.6	677.4
Cocoa	17.4	22.7	109.9	96.5	267.4
Rubber	-	-	6.5	1.5	27.5
Rice	62.0	141.8	216.6	207.2	352.7
Timber	61.0	148.1	224.4	202.6	265.2
TOTAL	<u>246.5</u>	<u>453.1</u>	<u>763.0</u>	<u>772.4</u>	<u>1,590.2</u>

* Based on forecasts of total output as shown in Table 17.

Source: IBRD, Northwest Economic Survey mission. Subsequently revised.

VIII. INDUSTRY

8.01 Industrial activity is still of relatively little significance in the Northwest. The industrial sector of Mato Grosso accounted for only 9% of the state's product in 1970 and, as late as 1978, was the source of just 5% of its value-added tax (ICM) revenues. Industry is of far greater relative importance to the economy of Rondonia, accounting for about 20% of the territory's product in 1975, but almost all industrial production is attributable to a few large-scale cassiterite mining operations. 1/

8.02 At the time of the 1970 Industrial Census, the Northwest contained a total of 584 industrial establishments, employing about 3,500 persons. In Mato Grosso, industry was (and still is) concentrated in the Cuiaba-Varzea Grande urban agglomeration (accounting for 73% of the firms, 84% of the employment, and 65% of the value-added), although Caceres is emerging as an important second-level center. In 1970, about three-fourths of Rondonia's industrial establishments were located in Porto Velho, with most of the balance being accounted for by firms in Ji-Parana and Guajara-Mirim.

A. Industrial Structure

8.03 As is typical of natural resource and agricultural frontier areas in rapid expansion, industrial activities in the Northwest are of two basic types: extractive or primary product/raw material processing activities or local service industries, especially those involving food processing, furniture making, and construction. Firms are generally small and characterized by relatively primitive technologies and low levels of fixed capital investment, the large mining companies being the major exception. This industrial structure is typical of both Mato Grosso and Rondonia. In the former, for example, among the 652 industries registered by the state Secretariat of Finance in April 1977, 22% were food processing establishments (primarily grain drying and cleaning operations, and small bakeries), 18% were construction firms, 12% were sawmills, and 11% were vehicle repair shops. In Rondonia, 36% of all industrial establishments registered by the territorial Secretariat of Planning in 1978 were sawmills, 29% were food processing activities, 11% were furniture making operations, and 9% were brick and tile making enterprises.

8.04 The available data permit us a more accurate view of industrial structure and growth in Rondonia than in Mato Grosso. Since 1970, the number of establishments in Rondonia has doubled, and industrial employment has grown at about the same rate. Lumber, food processing, and non-metallic mineral establishments predominate. The recent growth of lumbering concerns is a consequence of the process of land clearance and settlement in the territory. From the standpoint of employment, mining, lumber, food products, and non-metallic minerals (brick and tile making), are the most important

1/ Rondonia, northwest Mato Grosso, and southern Amazonas are estimated to contain 82,000 metric tons of cassiterite, or 95% of Brazil's proven reserves of this mineral.

industrial subsectors. In terms of the total value of industrial production, 1975 data reveal that cassiterite mining activities accounted for 53%; sawmills, 15%; rubber processing plants 11%; rice processing firms, 5%; and furniture makers, bakeries, frozen fish plants, and brick and tile makers, 2% each. Three subsectors were thus responsible for more than three-fourths of the total value of industrial production in the territory.

8.05 Most industrial establishments in Rondonia are relatively small, the major exception being the cassiterite operations which average more than 400 employees per firm. All other activities, except rubber processing (with 35 employees per firm) had an average of ten employees. In nearly all cases, part of the output of these firms is exported either to the south (Sao Paulo, Rio de Janeiro, Minas Gerais, and Rio Grande do Sul), or to the north (Acre and Manaus). However, processed Brazil nuts and some of the lumber production are also sold on international markets.

8.06 Small firms are also the rule in Mato Grosso. According to 1977 data, there were only 31 firms having more than 50 employees in this part of the Northwest. Two firms having more than 1,000 employees were both located in Cuiaba, one being a large construction company (with a total of 2,149 workers), and the other the state electrical energy company (with a total of 1,588 employees). Outside the Cuiaba-Varzea Grande area, and with the exception of a single wood-processing operation and two medium-sized food processing and non-metallic minerals firms in Caceres, industrial establishments were all relatively small. The largest employers in Barra do Bugres, Mirassol d'Oeste, Pocone, Tangara da Serra, and Vila Bela, for example, are sawmills which employ up to 20 workers each. In 1977, the total industrial employment in these municipios amounted to only 58 jobs, as compared with 292 positions in Caceres, 1,416 in Varzea Grande, and 7,952 in Cuiaba (of which 6,606 were in construction and electrical energy production).

B. Constraints and Prospects

8.07 The relative insignificance of industrial activity in the Northwest is primarily the result of serious deficiencies in physical infrastructure and a reduced, albeit rapidly growing, regional market. The principal obstacles to regional industrial development as seen by local government officials and entrepreneurs alike, are an inadequate supply of electrical energy and poor roads. The former represents an obvious constraint on industrial activities which demand large quantities of electrical energy, while the latter results in high freight costs sharply reducing the competitiveness of local manufactured products in extra-regional markets and increasing the cost of necessary inputs and raw materials originating both within and outside the region.

8.08 Both Mato Grosso and Rondonia are currently attempting to increase their electrical energy generating capacity and to improve their primary and feeder road systems. Construction of the 217 MW Samuel hydroelectric facility and associated transmission lines would significantly increase the supply of energy in the northern part of Rondonia, between Porto Velho and Ji-Parana. Plans in Mato Grosso to increase hydroelectricity capacity are concentrated in the area near the capital, extending as far east as Rondonopolis and as far

west as Caceres. The paving of the Cuiaba-Porto Velho road will have a significant effect in reducing freight costs, especially in Rondonia, both of imported and local inputs and final products, thereby directly stimulating industrial production in the territory.

8.09 The current rates of migration and population growth in the region, moreover, guarantee the growth of local markets for a broad range of final consumption and intermediate commodities, many of which are now imported from the South. Prospects over the medium run also continue to be very good for the major extractive industries in the region, especially those based on cassiterite, lumber and extractive agricultural products. Agroindustrial production, in turn, should expand significantly, especially as the production of coffee and cocoa in colonization areas in Rondonia increases, as well as the continued production of cattle in Mato Grosso and rice and other food products in both Mato Grosso and Rondonia.

C. Industrial Policy

8.10 The principal instrument of local industrial policy in the Northwest is the creation of industrial districts, consisting of lots for the installation of manufacturing activities sold to private entrepreneurs at nominal prices and with physical infrastructure provided by the state government. An industrial district has begun in Cuiaba, and three firms, employing 180 people, have already located there. Five additional firms are scheduled to initiate operations in the near future. Nearly 300 firms have expressed interest in the industrial district of Cuiaba, most of which are in the lumber, food processing, or construction materials industries. The government of Mato Grosso also intends to install a smaller industrial district in Caceres. The government of Rondonia plans to establish industrial districts in Porto Velho, Ji-Parana and Vilhena.

8.11 In addition to the installation of industrial districts and the improvement of energy and transport infrastructure, both the state of Mato Grosso, through its Secretariat of Industry and Commerce, and the territory of Rondonia, through the Secretariat of Planning, are studying industrial development opportunities to stimulate the private sector (both local and non-local capital) to initiate activities in sub-sectors where there is a local comparative advantage. More specifically, Mato Grosso is preparing industrial profiles for the following products: lumber, grains, vegetable oils, rubber and rubber products, babacu, vegetable charcoal, meat processing, leather and leather goods, dairy products, sugar refining, alcohol, and cement products. Rondonia is analysing investment opportunities in: fruit processing, tile and brick making, soaps, wooden furniture, and animal feeds. Both Mato Grosso and Rondonia also plan to provide technical assistance to small and medium industries. In Rondonia, finally, plans also exist to use POLAMAZONIA funds to implant meat processing and dairy operations in Porto Velho, as well as a cocoa processing establishment in Ouro Preto. A second dairy products operation is scheduled for implementation in Ji-Parana in 1981.

8.12 In Mato Grosso, a state Secretariat of Industry, Commerce, and Tourism and an Industrial and Commercial Development Council have recently been installed, and the government also plans to create a general development credit program (carteira) in the state commercial bank destined, in part, to promote industrial investments. The use of ICM reductions as a fiscal incentive to industrial activities on the local level is also being considered in both Mato Grosso and Rondonia, although no specific measures have yet been taken. While Mato Grosso and Rondonia are both in Legal Amazonia, to date neither has been a significant recipient of SUDAM fiscal incentives for industrial projects. But both the state and territorial governments wish to increase local participation in this program. Rondonia, moreover, is currently seeking to have the full benefits of the Manaus Free Trade Zone extended to Porto Velho in order to stimulate industrial development. 1/

1/ At present, only imports of "first necessity" items are permitted to enter Rondonia duty free. For more details on the Manaus Free Trade Zone, see D.J. Mahar, "Fiscal Incentives and the Economic Development of Western Amazonia", Brazilian Economic Studies, 2(1976), pp. 147-74.

IX. TRANSPORTATION

A. Overview

9.01 The construction of the Cuiaba-Porto Velho road has had, and continues to have, a profound effect on the rate and pattern of the Northwest's occupation and development. In fact, before the 1960s much of the region was inaccessible (except with great difficulty) by overland means and both population and economic activity were largely confined to riverine areas. Today, rapidly growing towns and cities exist at numerous points along the road and a significant increase of agricultural production may be observed in the hinterlands. However, the present condition of the main road is now a major constraint on the future development of the Northwest. So too is the region's inadequate system of secondary and feeder roads, which hampers farm-to-market access, as well as the population's use of social infrastructure and services. In light of the government's intention to improve the transport system as part of its overall development program for the Northwest, it is useful to describe the present situation in more detail, calling special attention to some of the more important problems and issues.

B. The Present System

9.02 The Northwest is served by air, river and road transport. Of the three, overland transport is the most important in terms of moving goods and people within the region, and between it and the rest of Brazil. In 1978, the region was estimated to have produced about 1.1 million tons of goods, mostly agricultural products (about 900,000 tons), wood either in logs or semi-processed (about 130,000 tons), cattle (about 30,000 tons), and minerals (mainly cassiterite in Rondonia). About 513,000 tons are estimated to have been exported from the area; 98% by truck and the rest by air and river transport. An estimated 840,000 tons of goods were brought into the region, consisting mainly of manufactured products and construction materials originating in the Sao Paulo area, fuel and oil mostly barged in from Manaus, and household goods accompanying the strong migratory flows.

Airports and Landing Strips

9.03 There are 28 airports in the Northwest. Two of them (Cuiaba and Porto Velho) are main line, trunk airports capable of handling jet aircraft, and three are secondary paved airports (Ji-Parana, Guajara-Mirim and Vilhena). The 23 remaining facilities, with gravel and earth runways, are scattered throughout the area. In addition to these airports, there are countless landing strips at smaller localities and farms. Air navigation facilities in the region are reported to be poor and widely scattered, making flying in the area hazardous, particularly during the rainy season when demand for this mode of transportation is high.

9.04 In Rondonia, and to a certain extent in Mato Grosso, it has been mainly the federal government that has taken the initiative of providing public airports and landing strips. Local authorities in the region are still financially and structurally too weak to undertake these activities alone. However, the government of Rondonia and INCRA have set up a joint program to build landing strips at remote localities and this effort is having a favorable impact on the economies of some of the official colonization projects.

Navigable Rivers and Ports

9.05 Some of the rivers of the Northwest flow north toward the Amazon (practically all rivers in Rondonia) and some flow south toward the Parana and the Plate (practically all rivers in the Mato Grosso part of the region). There are two important navigable river systems in Rondonia -- the Madeira and the Mamore-Guapore. The latter is an affluent of the first, but not connected to it by navigation owing to a series of rapids located between Porto Velho and Guajara-Mirim. The Madeira is formed by the Beni and the Mamore rivers, both of which mark the border between Brazil and Bolivia. It runs for 3,240 kilometers before joining the Amazon only a short distance from Manaus. Like most amazonic rivers, it is wide (over 800 meters at places) and deep (about ten meters on average). However, its curves are often narrow, and the navigable channel is constantly shifting. Moreover, the many floating logs in the river (giving the river its name) are hazardous to navigation. Nonetheless, the Madeira is navigable year-round for ships and barges of up to 600 ton capacity, from its mouth to Porto Velho.

9.06 Porto Velho is the region's only port on the Madeira. However, it is a precarious facility built on a river bank in one of the few areas close to Porto Velho without a silting problem. The port's limited infrastructure consists of two small cranes (1.5 tons at 30 meters and 4.5 tons at 20 meters), a paved yard, and a storage shed. As such, it is inadequate for handling large volumes of freight. The port of Porto Velho is administered by the federal port authority (PORTOBRAS). In addition to the PORTOBRAS facility, there are a number of private wharfs and landings used by small, local shipping enterprises which operate mostly mixed passenger and freight services to riverine communities to the north.

9.07 The Mamore-Guapore system borders Rondonia on the south where it delimits the Brazil-Bolivia border. It is navigable, with restrictions in the summer, from Guajara-Mirim in Rondonia to Vila Bela in Mato Grosso -- a distance of about 1,100 kilometers. There are no port facilities along the banks. In general, the area through which this system flows is swampy and periodically inundated. Hence, most economic activities, except for the exploitation of rubber, tend to be seasonal.

9.08 Both the Madeira and the Mamore-Guapore river systems were the major avenues of access to Rondonia in the past, when the regional economy was mostly based on the extraction of natural rubber. Since the Mamore and Madeira could not be joined by navigation, a railway was built between Porto Velho and Guajara-Mirim to move the rubber produced in the area. However, with the decline in the demand for rubber, the railway lost most of its traffic and has since been abandoned and replaced by a road.

9.09 There are two important navigable rivers in the Mato Grosso part of the survey area: the Paraguay, which eventually runs into the Parana and, in turn, into the Plate; and the Cuiaba, one of the Paraguay's affluents. The Paraguay river rises north of Caceres at the foot of the Parecis plateau and runs south through Caceres where it becomes navigable for its next 1,300 kilometers. It is joined by the Cuiaba about 950 kilometers south of Caceres, continues parallel to the Brazil-Bolivia border and at Coimbra, becomes the Brazil-Paraguay border. Of relevance to the survey area is the 720 kilometer section from Caceres to Corumba in Mato Grosso do Sul, where the river is navigable for ships and barges of up to 500 tons. At Caceres there are limited port facilities which include a transit shed and a conveyor loading belt. The situation is similar at Ladario (located next to Corumba) where a rail terminal of the Estrada de Ferro Noroeste do Brasil exists. Despite its limited facilities, the waterway is reported to have been used successfully in recent years by grain shippers from the Caceres-Mirassol d'Oeste area.

9.10 The Cuiaba river is an important affluent of the Paraguay. It runs 625 kilometers before joining the latter (of which 367 kilometers are navigable) between Porto Cercado and the junction. Porto Cercado is 145 kilometers by road from Cuiaba and has had a growing cement traffic in the last few years. At present, the only port facility available at Porto Cercado is owned by the Itau Cement Company, but the Mato Grosso state government has plans to build a wharf there. This wharf would facilitate navigation destined for riverine communities in the state and for those located in Mato Grosso do Sul (including the rail terminal at Corumba).

Roads

9.11 Roads are the core of the Northwest's transport system. In Mato Grosso part, there are two overland axes which concentrate all area flows: BR-163/364, the northern route from Cuiaba to the Rondonia border; and BR-070/174/364, the southern route, which passes through the cities of Caceres, Porto Espiridiao, and Pontes e Lacerda before joining the northern route close to the Rondonia border. ^{1/} There is just one spinal axis in Rondonia, that is, BR-364. These routes are all federal roads and represent the heart of the regional network. In total, there are 1,303 kilometers of federal roads in the Mato Grosso part of the region, and 1,450 kilometers in Rondonia. Except for 45 kilometers in Mato Grosso and 75 kilometers in Rondonia, all roads are unpaved. About half are gravelled and the rest are earth and natural terrain roads. Quite a few of them, particularly in Rondonia, are essentially tracks opened for seasonal use.

9.12 The federal road network is generally in fair condition. However, some sections, particularly the more travelled ones of the primary axis, have deteriorated to a very bad condition. In fact, during the rainy season, these poor sections may be cut off altogether, isolating much of the Northwest from the rest of Brazil for weeks at a time. During the last few rainy seasons, for example, BR-364 has been closed to all vehicles with more than two axles.

^{1/} The southern route in Mato Grosso, plus BR-364 in Rondonia, is commonly referred to as the Cuiaba-Porto Velho road.

9.13 Responsibility for the federal network rests with the National Highways Department (DNER). While DNER maintains a well staffed regional office in Mato Grosso, it has no representation in Rondonia. Federal responsibilities are shared between DNER's regional offices in Cuiaba and in Manaus. Owing to the remoteness of the region and its border-area status, DNER, in turn, has delegated its responsibility for maintaining the most important sections of the federal network to the Army. However, maintenance has been difficult, and parts of the Cuiaba-Porto Velho road have deteriorated to a point where normal maintenance is no longer feasible and where only a reconstruction of the road would ensure year-round traffic.

9.14 In addition to the federal network, there are 1,828 kilometers of state roads -- 1,082 kilometers in Mato Grosso and 746 kilometers in Rondonia. Except for 76 kilometers which are double surface treated, and some 650 kilometers which are gravelled, all state roads in the survey area are earth roads. Their condition is generally poor, and many are only seasonal roads. In Mato Grosso, responsibility for state roads rests with the Highway Department (DERMAT). In Rondonia, this function is exercised by the Secretariat of Works. This latter agency is, however, understaffed. DERMAT, in contrast, is well-staffed and reasonably well-equipped. Moreover, recent investments in equipment by the state government have significantly improved its maintenance capability.

9.15 Finally, the Northwest has about 6,500 kilometers of municipal roads, distributed about equally between Mato Grosso and Rondonia. These are local roads generally of a very low standard. A few are collector roads built in accordance with some engineering criteria, but most are access roads built without engineering designs on the basis of self-help arrangements (*mutirao*). Responsibility for these local roads would normally rest with the municipal government of the area in which they were located. However, few municipalities are capable of carrying out this function. As a consequence, the state and territorial governments have been assisting some municipalities with equipment and engineering know-how. Because the construction standards of state and municipal roads are similarly low, it is difficult to identify clearly (particularly in Rondonia) the scope and area of action of the different levels of government in road building and maintenance.

9.16 In addition to the overall lack of local roads in the Northwest (there is 1 kilometer of local roads for every 50 km² of area in Mato Grosso and 1 kilometer for every 75 km² in Rondonia), there is a serious problem with the maintenance of the few roads that do exist. Since local roads are generally those which provide direct access to the farming areas where most economic activities are presently taking place they should be able to support year-round traffic. Yet these roads were built, for the most part, to standards that do not allow them to stay open year-round.

9.17 In sum, the Northwest's road system is weak. The federal spinal network requires reconstruction and, as will be suggested below, paving as well. The state network is of an extremely low standard and hardly ever maintained. Thus, to ensure year-round access, it would need both upgrading and systematic maintenance. Finally, the local network is limited and in poor condition and also needs to be upgraded and maintained adequately. While these numerous tasks might be carried out efficiently by the federal, state and municipal agencies presently operating in Mato Grosso, the organization in Rondonia is, at present, less capable of doing so.

C. Current Traffic Flows

Air Transport

9.18 Two main trunk carriers serve the Northwest--VASP (Viaçao Aerea de Sao Paulo) and Cruzeiro, a Varig subsidiary. Both airlines provide regular daily service to Cuiaba and Porto Velho from other parts of Brazil with modern jet aircraft. One regional carrier, TABA (Transportes Aereos da Bacia Amazonica), operates in the region with smaller aircraft and regularly serves towns like Guajara-Mirim, Ji-Parana, and Vilhena. There are also a number of air taxi services operating mostly out of the capital cities. Considering only the main trunk carriers, the airports of Cuiaba and Porto Velho had a combined through-put of 155,000 passengers in 1977, the most recent year for which such data are available. In the same year, these two airports handled a rather insignificant 2,000 tons of air freight. However, despite this low level of activity, air transport is, when road conditions are poor, about the only means of connecting the region with the south.

Inland Navigation

9.19 Porto Velho is the most important inland port of the region. It is served by a number of small shipping companies and occasionally by ships of the government-owned Amazon Shipping Company (ENASA). There are, however, no regular services. Traffic is quite imbalanced at Porto Velho and inbound flows are over four times greater than outbound flows at the PORTOBRAS-operated facility (34,000 and 8,000 tons, respectively, in 1978). Although overall traffic is reported to be higher on the private wharves and landings near Porto Velho (about 160,000 tons in 1978), the imbalance of inbound to outbound traffic is estimated to be on the order of eight to one.

9.20 A number of small companies provide intraregional transport services on the Mamore-Guapore river system. It is estimated that the largest of these companies, the Guapore Navigation Service, carries only about 2,700 passengers, and 1,500 tons of freight, per year. The Paraguay system in Mato Grosso is also serviced by comparatively small shippers, the largest being the government-supported Plate Basin Navigation Service (SNBP). Unfortunately, no official data are available on the overall traffic on this river system or on the freight handled by the two major ports in the survey area, Caceres and Porto Cercado. According to one unofficial report, about three million sacks (roughly 150,000 tons) of rice were shipped from Caceres to the rail terminal

in Corumba (Ladario) in 1978. Though this report probably exaggerates the tonnage actually hauled, it does point out the possibility of further utilizing river-road or river-rail connections. This, and the more intensive use of the Madeira river, would appear to be the only reasonable inland navigation prospects for the future.

Road Transport

9.21 Road transport accounts for the vast majority of regional traffic flows. In 1978, an estimated 1.3 million tons of freight, and well over five million passengers, were carried by this means. Though complete information on the composition of freight carried overland is not available, it would appear that the major items are those typical of a frontier area at an early stage of development. Regional exports consist mainly of primary goods such as minerals, lumber, and agricultural products; and imports are mainly manufactured goods such as machinery, parts, chemicals, and pharmaceuticals.

9.22 Although the flow of vehicles along the main trunk highway (Cuiaba-Porto Velho) varies seasonally, the average daily flow may be inferred from scattered traffic counts. Traffic for each of seven sections was estimated on the basis of counts carried out in Rondonia (June, July, August and October 1980) by the Brazilian Transport Planning Enterprise (GEIPOT) and in Mato Grosso (1979 and first, second and third quarters of 1980) by DERMAT. The results of these counts are summarized below:

<u>Section</u>	<u>Average Daily Traffic</u> (No. of vehicles)
Porto Velho to Ariquemes	407
Ariquemes to Ji-Parana	506
Ji-Parana to Rio Rondon	603
Rio Rondon to Barracao Queimado	365
Barracao Queimado to Porto Espiridiao	230
Porto Espiridiao to Caceres	684
Caceres to Cuiaba	486

9.23 Virtually no information is available on traffic flows on state and local roads. Yet, a sizeable proportion of the passengers and freight moved on the main trunk roads originated in areas removed from these roads and, therefore, must have initially used the secondary and local network. However, only case-by-case reviews of activities in relevant sub-areas would provide the necessary information.

D. Estimated Future Traffic Flows

9.24 Because road transport accounts for such a large proportion of regional traffic flows, it is important to estimate the future development of such traffic to assess its implications for future project design. Based on the agricultural, forestry and livestock production estimates, presented in Chapter VII, estimates were made of likely traffic on BR-364 for 1984, 1989 and 1994. In order to arrive at the traffic estimates of future traffic volumes, two categories of traffic were distinguished and handled separately, viz., agricultural export traffic and other traffic. For the agricultural export traffic the forecasts of exportable agricultural surpluses (Annex Table 3) were allocated to specific geographically defined administrative units and, thence to road construction lots, thus establishing a direct link between agricultural export production and traffic. Next, these relationships were translated into the number of originating trucks. It was assumed that exports originating in Mato Grosso would all go towards the Southeast whereas exports from Rondonia would be evenly split between the Southeast and Manaus.

9.25 The balance of the traffic, i.e., non-agricultural export traffic, has been assumed to develop at the same rate as the agricultural production which is taken as a proxy for general economic development. The results of the traffic forecasting exercise are summarized below:

<u>Section</u>	<u>Average Daily Traffic (no. of vehicles)</u>		
	<u>1984</u>	<u>1989</u>	<u>1994</u>
Port Velho to Ariquemes	1,116	2,104	2,691
Ariquemes to Ji-Parana	1,007	2,062	2,112
Ji-Parana to Rio Rondon	1,289	2,245	2,785
Rio Rondon to Barracao Queimado	874	1,594	2,265
Barracao Queimado to P. Espiridiao	676	1,139	1,446
Porto Espiridiao to Caceres	1,896	2,924	3,324
Caceres to Cuiaba	704	946	1,076

E. Issues and Recommendations

General

9.26 Based on the review of the existing transport system, current traffic flows, and anticipated future flows, the future development of the sector should center around improving the safety of air transport, increasing the efficiency of river transport, and expanding and upgrading the road network. Major new investments in infrastructure, however, are indicated only for the latter. There seems to be some capacity available in river and air transport, and the nature of the Northwest's development, with its emphasis on expanding the agricultural frontier and consolidating existing agricultural undertakings, would indicate that providing access to farms should receive precedence.

9.27 Though the future demand for, and supply of, transportation services will most likely be concentrated on the main road network and year-round state and local roads, the reported lack of adequate air navigation facilities is a matter of serious concern, particularly because passengers, rather than freight, are primarily involved. A thorough study of this problem therefore seems warranted. With regard to inland navigation, a more efficient interface between trucks and ships needs to be achieved on both the Madeira and Paraguay rivers. While this would generally entail improvements in administration, labor productivity, and equipment on the land and river sides of the interface, a detailed study is needed.

9.28 Roads will require the largest infrastructure investments. First of all, given the level of traffic flows and the generally poor condition of the Cuiaba-Porto Velho road, it will need to be reconstructed and paved. Secondly, the region's inadequate state and local roads network will require expansion and upgrading in close coordination with existing and proposed agricultural development and settlement programs. Federal and state agencies operating in the region have already proposed, and are currently preparing the necessary studies to implement, both undertakings (see paras. 9.30-9.32 below). However, it will be necessary to strengthen the agencies directly involved, especially in Rondonia. Furthermore, provision would have to be made for the future maintenance and continued construction, as needed, of additional highways and roads.

9.29 Before undertaking the ambitious program described above, inter-governmental responsibilities and financial obligations need to be clearly defined. Given the embryonic stage of municipal government in much of the region (particularly in Rondonia), the responsibility for part of the local roads may need to be assumed by the state and territorial governments. A coordinated program and budgeting system also needs to be established. Under this system, programs would be carried out by the responsible administrative entity according to an overall action plan tailored to take into account each entity's financial capacity. Finally, the executing agencies need to be strengthened through improvements in both staff and equipment. In sum, taking care of the road transport needs of the Northwest should not be just an exercise in building infrastructure, but also one of building the institutions that would be responsible for this subsector's future development.

Reconstruction and Paving of the Cuiaba-Porto Velho Highway

9.30 Plans to improve the Cuiaba-Porto Velho road were first considered in 1974. At that time, DNER commissioned detailed engineering designs for the highway's reconstruction and paving. Since the completion of these studies, about 150 kilometers (50 km. at the Cuiaba end and 100 km at the Porto Velho end), of the road's 1,444 kilometer total length, have actually been reconstructed and paved. Of the roughly 1,294 kilometers remaining, the government has decided that the reconstruction and paving of 252 kilometers would be the responsibility of the Army. The rest (Caceres to Ariquemes) would be carried out by private contractors.

9.31 The budget allocation for reconstructing and paving the 1,294 kilometers is about \$568 million at January 1981 prices, excluding allowances for physical and price contingencies. Initial expectations are that these costs will be financed under POLONOROESTE using funds from the National Integration Program (PIN) 1/, DNER's budget, and a loan requested from the World Bank. The government expects that the works will be completed during the three-year period from 1981 to 1983 2/. Execution of the road project should present no unusual engineering problems. However, special care will have to be taken in the design and construction of the section from Rio Rondon and Barracao Queimado to prevent further erosion of embankments and cuts. Measures to protect Amerindians in the area will also be necessary, particularly when constructing the proposed new stretch of the road between Barracao Queimado and Pontes e Lacerda near the Rondonia-Mato Grosso border (see Chapter IV).

Local Roads Program

9.32 As noted, the region's local collector and feeder roads system is seriously deficient. Present plans call for the construction of about 3,000 kilometers of collector roads between 1981 and 1985; 1,500 kilometers in Mato Grosso and 1,500 kilometers in Rondonia. The road construction program in Mato Grosso would be concentrated in already settled areas, while in Rondonia roads would be built both for the purpose of incorporating new areas and to serve existing colonization and settlement projects. The cost of constructing collector roads is estimated at US\$25,000 per kilometer.

1/ PIN was created by the federal government in 1970 for the purpose of financing infrastructure development in Amazonia and the Northeast.

2/ This scheduling may be somewhat optimistic because there is a six month rainy season during which relatively little can be done.

ANNEX : Agricultural Production Forecasts

THE INTEGRATED DEVELOPMENT OF BRAZIL'S NORTHWEST FRONTIER

Methodology for Agricultural Production Forecasts

1. The production forecasts are based for the most part on assumed population growth, on the premise that the existing relationship between the extent of agricultural activity and the number of people involved will remain about the same. Thus, the area of land cleared annually and the total area under annual crops follow population growth initially. In the longer term, both land clearance and the area devoted to annual crops are assumed to lag somewhat behind population growth, reflecting the increasing urbanization of the population. In the case of tree crops (coffee, rubber, and cocoa) logistical limits are assumed at the outset, owing principally to constraints on the supply of planting material. The underlying assumptions for population growth are shown in Annex Table 1.
2. For each crop, production and consumption tables were prepared. These tables incorporate changes in total area, yields, on-farm losses (including production retained for seeds), on-farm human consumption, and other on-farm utilization (e.g., livestock feed), to calculate total quantities transported off the farm. A similar method was used to derive transported tonnages of timber and livestock. Urban consumption within the area was then deducted to calculate quantities available for export from the region. Consumption tables and estimates of exportable production are shown in Annex Tables 1 and 3, respectively.
3. Finally, an attempt was made to value the projected production of the key traded commodities (coffee, cocoa, rubber, rice, and timber) for the years 1984 and 1989. The price assumptions were based on projections of the World Bank Economic Analysis and Projections Department, converted to Brazilian border prices and adjusted to take into account quality differences between the Brazilian commodities and those considered by the Bank. The adjustment factors were calculated by dividing a three-year average (1977-79) of Brazilian FOB export prices (CIF import price in the case of rubber) for the five commodities in question by a three-year average of world prices for the same (though not necessarily the identical quality) commodities. The Bank commodity prices projected for 1984 and 1989 were then multiplied by the adjustment factors derived as above to attain projected Brazilian border prices. The final step was to multiply the production forecasts for each selected commodity under each of the scenarios by the respective projected border prices. The underlying price assumptions for the selected commodities are presented in Annex Table 2.

POPULATION AND CONSUMPTION ASSUMPTIONS

Population Growth

		% Annual Increase		
		- - - years - - -		
		1-5	6-10	11-15
Scenario I	- Rural	11	10	8
	- Urban	11	11	11
Scenario II	- Rural	12	12	10
	- Urban	12	12	8

Per capita annual consumption (Kg.)

	<u>Rural</u>	<u>Urban</u>
Rice (milled)	80	50
Beans	30	20
Corn (grain equivalent)	10	10
Meat	25	25
Coffee (processed)	6	6
Manioc (wet root equivalent)	100	50

UNDERLYING PRICE ASSUMPTIONS FOR SELECTED COMMODITIES, 1979, 1984 and 1989
(constant 1980 US\$ per metric ton)

	<u>1979</u> (Actual)	1984	1989
Coffee (FOB)	3,789	2,700	3,024
Cocoa (FOB)	3,489	2,837	2,073
Rubber (CIF)	1,517	1,495	1,615
Rice (FOB)	484	483	506
Timber (FOB)	276	395	408

Source: IBRD, Economic Analysis and Projections Department;
updated mission estimates.

NORTHWEST REGION : FORECAST OF EXPORTABLE AGRICULTURAL AND TIMBER OUTPUT, 1984, 1989 AND 1994 *

('000 metric tons)

	BASE	SCENARIO I			SCENARIO II		
	1979	1984	1989	1994	1984	1989	1994
<u>Tree Crops</u>							
Coffee (processed)	21.5	40.5	48.5	49.7	87.0	203.4	239.7
Cocoa	4.7	8.0	52.5	100.0	34.4	129.2	190.6
Rubber	-	-	4.2	25.8	0.5	17.0	119.6
<u>Annual Crops</u>							
Rice (milled)	52.3	164.1	216.8	203.9	294.9	461.4	493.9
Corn	57.8	139.7	197.2	241.2	235.1	354.1	335.2
Beans **	10.1	11.4	24.2	58.4	21.2	54.3	57.6
Other	32.8	49.2	75.4	123.1	44.0	88.0	129.0
<u>M e a t</u>	<u>21.1</u>	<u>22.6</u>	<u>43.6</u>	<u>71.8</u>	<u>29.4</u>	<u>54.2</u>	<u>95.0</u>
<u>SUB-TOTAL</u>	<u>200.3</u>	<u>435.5</u>	<u>662.4</u>	<u>873.9</u>	<u>746.5</u>	<u>1362.5</u>	<u>1660.6</u>
<u>Timber</u>	<u>111.0</u>	<u>189.0</u>	<u>275.0</u>	<u>316.0</u>	<u>256.5</u>	<u>330.4</u>	<u>367.0</u>
<u>T O T A L</u>	<u>311.3</u>	<u>624.5</u>	<u>937.4</u>	<u>1189.9</u>	<u>1003.0</u>	<u>1692.9</u>	<u>2027.6</u>

* Total output less local urban and rural consumption.

** Manioc taken as proxy to represent all other crops (peanuts, cotton, vegetables, etc.)

Source : IBRD, Northwest Economic Survey mission. Subsequently revised.