CHAPTER 5 AGRICULTURAL DEVELOPMENT PLAN NORTHERN REGION

5.1 Summary

The present plan comprehends 2 enterprises, one related to the agricultural sector and the other related to the environmental sector, and 2 programs related to the government. These 2 governmental programs shall be promoted through projects, which in turn shall receive the necessary financial resources through the creation of a development fund. The enterprises shall be carried out directly by the producers while the programs shall be carried out by the government. The producers will receive technical and financial assistance from the government in order to carry out the enterprises. The government shall supply the necessary resources through the development fund.

Enterprises: Carried out by the producers with government assistance.

Agricultural (Introduction of Grains, Diversification /Strengthening of the Livestock Husbandry, Production Nucleus, and Processing of Agricultural Products);

Conservation (Commercial Reforestation, Environmental Reforestation, Control of Fires, and Natural Resources Exploitation Industry).

Programs: Assisted by the government.

Directly related to the Government (Improvement of Production Infrastructure, Improvement of Commercialization Infrastructure: Programs to be borne by the government);

Governmental Assistance (Assistance to the Production Inputs, Financial Assistance, Organizational Assistance, and Program of Seedlings Production and Cultivation of Trees: Programs to be assisted by the government in order to assure the necessary resources to the producers).

Projects: Carried out through the governmental assistance program.

Project of Utilization of the Development Fund (Investment in programs related to the agricultural sector);

Project of Environmental Conservation (Investment to programs related to the environmental conservation).

Development Fund: Transference and supply of necessary resources to the execution of enterprises and programs.

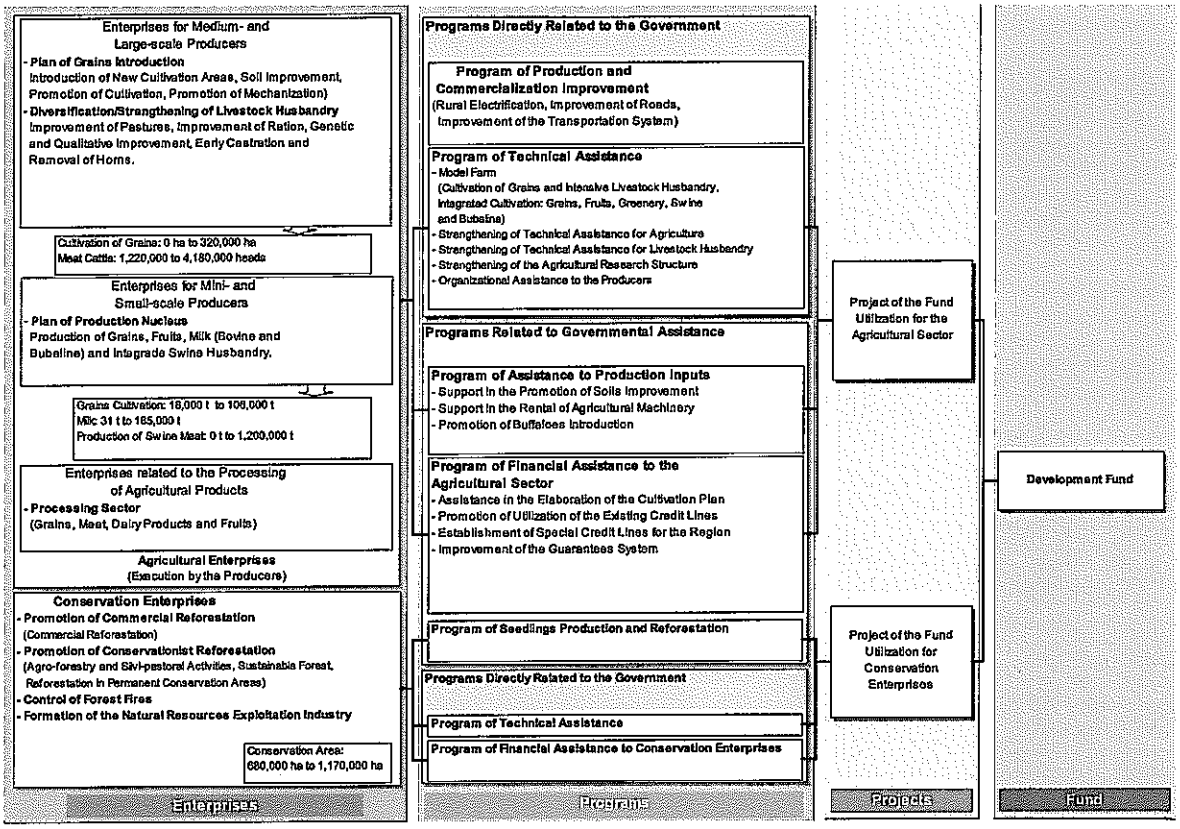
As for the land use, until 2015 the utilized area of 1,980,000 ha shall be reduced to 1,790,000 ha, increasing the green area from 690,000 ha to 1,170,000 ha. The producers' life standards shall also be improved, besides being possible to attain the environmental standards required by the law, and also substituting the currently carried out extensive agriculture by an intensive agriculture. In order to promote the intensification of the agricultural sector, financial and technical investment shall be necessary. Concerning to conservation, the environmental standards demanded by law shall be attained through the conservation areas recuperation plan (29.000 ha per year) until 2015, target year of this plan, attaining 37% (3,230,000 ha) of the conservation area in deficit. The necessary financial resources are presented in the following table.

Necessary Resources for the Execution of the
Northern Region Development Plan (Unit: Thousand Reais)

	Short	Medium	Long	Total
Related to the Agricultural Sector	223,588	843,514	1,670,925	2,738,026
Environmental Conservation Enterprises	30,383	330,625	376,333	723,657
Total	253,970	1,174,139	2,047,258	3,461,684

Remark: Exchange rate: US$ 1.00 = R$2.00

These resources shall come from the producers (production commercialization), from the agricultural credit (federal and local credit lines), and from the governmental assistance (partially non reimbursable). In order to promote this plan, a development commission for the northern region shall be established, thus promoting a correct planning of the land use and of the resources utilization. Concerning to the resources, the recently created development fund shall be utilized.



(1) Enterprises related to Agriculture and Livestock Husbandry and to Environmental Conservation

Agricultural Enterprises: The cultivation methods recommended for each production scale are presented as follows.

Methods to be Employed for each Production Scale

Medium and Large-scale Producer (1,972 producers)	Introduction of new areas of grains production; introduction of grains for soil improvement, and mechanization; Introduction of intensive livestock husbandry with the improvement of pastures, silage, crops for the production of roughage for the dry season, pastures rotation and confinement, genetic/quality improvement, early castration, and removal of horns.
Mini- and Small-scale Producer (6,115 producers)	Transformation for an intensive agriculture; Substitution of the bovine milk cattle husbandry to buffaloes husbandry; Introduction of intensive cattle husbandry through the introduction of technology for ration production during the dry season, chopping machinery, quality improvement, etc. Introduction of swine husbandry.
Processing of Agricultural Products	Processing of grains, fruits, greenery, and dairy products.

Environmental Conservation Enterprises: Through everybody's efforts, the environmental standards demanded by the law shall be attained within 35 years. During this study period, the

intention is to recuperate 37% of the necessary area for conservation that is in deficit, implementing the following 6 items:

Commercial reforestation, agro-forestry activity, silvi-pastoral activity, forest management, conservationist reforestation, control of forest fires.

(2) Programs Directly Related to the Government and Governmental Assistance

Programs Directly Related to the Government: Programs aiming at the rendering of technical assistance to the producers and to the improvement of public infrastructure. These programs are composed of the following items:

Program	Characteristics and Contents
Improvement of the Production Infrastructure	Rural Electrification (supply of electricity to all the farmers until 2015): execution with other resources. Improvement of Roads (paving of state roads): execution with other resources.
Improvement of the Commercialization Infrastructure	Improvement of the Transports Facilities (Silos for grains).
Technical Assistance (Agriculture and Livestock Husbandry)	Establishment of model farms (48 locations with direct technical assistance); Strengthening of the rural extension (formation of specialists; improvement of the extension method; formation of farmers for extension; execution of demonstration); Strengthening of the technical assistance to livestock husbandry (execution of campaigns, execution of technical instruction, formation of specialists, and training oriented to buffaloes and swine husbandry); Strengthening of the agricultural research structure (technical development together with the EMBRAPA for the environmental monitoring, and aiming at a sustainable agriculture).
Technical Assistance (Conservation)	Construction of a Conservation Promotion System; Establishment of 2 model farms.

Program of Governmental Assistance: Programs which aim at rendering financial assistance to the producers' enterprises, and this assistance shall be the minimum necessary for that the producers can carry out their own enterprises.

Program	Characteristics and Contents
Assistance to the Production Inputs	Support in the promotion of soils improvement (related to the use of lime as soil improvement input, to be carried out at the short term); Support in the machinery rental (creation of an agricultural machinery rental company in order to reduce the expenses with machinery on the part of the producers. The rental charges shall be cost price); Promotion of the buffaloes husbandry introduction (the government shall purchase 8,000 heads of buffalo outside the region, and then introduce an exchange system to reduce expenses).
Consolidation of the Financial Assistance	Assist the elaboration of the cultivation plan (in order to allow the producer to receive the credit); Promotion of the utilization of the existing credit lines (establishment of a guarantee fund to supply guarantees so that the producers can utilize the existing credit lines); Establishment of a special system of regional credit (establishment of a special system within the development fund, executing agricultural credit with advantages); Improvement of the guarantees system (supply the necessary guarantees to the financing agents so that the producers can obtain the agricultural credit).
Organizational Assistance	Formation of leaders (through training); Organizational assistance (technical assistance related to the organization); Technical training (technical assistance for technicians, producers and regional leaders).
Consolidation of the Seedlings Production and Distribution system	Formation of seedlings producers (supply financial assistance for the formation of 165 seedlings production facilities, at the short term); Consolidation of the seedlings distribution system (distribution or sale of seedlings according to the objective).
Consolidation of the Financial Assistance System for Reforestation Enterprises	♦ Consolidation of the credit system (necessary funds); ♦ Consolidation of the assistance system with non reimbursable funds.

(3) Projects

Project of Utilization of the Development Fund related to Agriculture and Livestock Husbandry: Program oriented to the promotion of agricultural enterprises composed of agricultural credit, directly related to the government, governmental assistance, and consultants. The contents of each component is presented as follows:

Component	Characteristics and Contents
Agricultural Credit (Mini-/Small-scale Producer)	Rotation capital (resources for agricultural production and production of ration for the dry season; Resources for investment (agricultural machinery, transportation machines, choppers, swine husbandry facilities, equipment for the production of dairy products, irrigation facilities, communitarian storehouses, etc.).
(Medium-/Large-scale Producer)	Rotation capital (agricultural production, pasture improvement, and production of dried pasture); Resources for investment (establishment of cultivation areas, acquisition of agricultural machinery, silage, and investment for pastures rotation).
Directly related to the Government	Cost of technicians (administration of model farms); Acquisition of vehicles; Training (Contact farmers, technicians, specialists for bubaline and swine husbandry).
Governmental Assistance	Support with inputs for soil improvement (only at short term); Acquisition cost of agricultural machinery (for the agricultural machinery company); Acquisition of buffaloes (for the promotion of buffaloes husbandry); Cost of technicians (technical assistance for the procurement of agricultural credit, etc.).
Guarantee	Supply guarantee for the producers who are in need of.
Consultanting services	Administration of credit (administration, exposition of measures for the resources utilization, execution of the enterprise); Assistance in the model farms administration; Land use plan, support in the elaboration of cultivation plans in order to obtain agricultural credit.

Environmental Conservation Project: Execution of enterprises and programs related to the environmental conservation, with 3 components according to their characteristics: environmental credit, environmental investment by the government, and consulting services. Each component is presented as follows.

Contents of the Environmental Conservation Project

Component	Characteristics and Contents
Environmental Credit	Credit for reforestation (credit for the acquisition of seedlings, reforestation and sustainable management); Credit for agricultural machinery (control of fires); Credit for pastures improvement (fence and control of fires).
Environmental Investment by the Government	Establishment of nurseries; Distribution of seedlings (seedlings, at short term, and Silvi-pastoral activities and Forest Management at medium term); Reforestation in permanent conservation areas (cost of seedlings and reforestation); Establishment of model farms; Formation of the natural resources exploitation industry (assistance to the formation and improvement of existing facilities); Strengthening of monitoring (monitoring and establishment of Ucs – Conservation Units).
Consulting Services	Establishment of a land use plan (elaboration of the plan); Administration of credit (administration, exposition of utilization measures, execution of enterprises); Improvement of environmental monitoring (construction of a structure for the environmental monitoring execution, guidance about the monitoring).

(4) Development Fund

For the execution of the previously mentioned projects, the necessary financial resources were divided into government resources and portion to be financed. This plan aims at the supply of resources mainly at the short term (R$ 80,000,000) and at the medium term (R$ 450,000,000). The resources shall come from the federal government and from foreign financing, at short

term. After the start of production, besides the federal and foreign resources, the resources coming from taxes shall also be utilized. The administration of these resources shall be carried out within the State development fund, and a development fund for the northern region shall be created in order to supply and to distribute resources for this region. The administration itself shall be transferred to the bank. This plan demand of resources is presented in the following table.

(Unit: Thousand Reais)

	Short	Medium	Long	Total
Agricultural Enterprises	223,588	843,514	1,670,925	2,738,026
Governmental Portion	85,567	165,902	228,816	480,285
Own Resources	138,021	677,612	1,442,109	2,257,741
Conservation Enterprises	30,383	330,625	376,333	723,657
Governmental Assistance	21,248	99,469	166,646	273,679
Producer's Resources	9,135	231,157	209,687	449,979

Remark: Necessary resources for the fund are contained in the grayish lines.

The plan execution, regarding to the demand of resources, consists in the following;

(Unit: Thousand Reais)

	Short	Medium	Long	Total
Agricultural Enterprises	122,483	426,783	898,710	1,150,178
Governmental Portion	85,567	165,902	228,816	480,285
Necessary Resources to the Agricultural Credit	33,560	237,164	608,994	608,994
Resources for Guarantee	3,356	23,716	60,899	60,899
Conservation Enterprise	30,291	337,357	603,080	723,797
Government Portion	21,248	99,469	166,646	287,362
Necessary Resources to the Agricultural Credit	8,222	216,263	396,759	396,759
Resources for Guarantee	822	21,626	39,675	39,675
Fund	152,774	764,140	1,501,790	1,873,975
Governmental Portion	106,814	265,371	395,462	767,647
Necessary Resources to the Agricultural Credit	41,782	453,427	1,005,753	1,005,753
Resources for Guarantee	4,178	45,342	100,574	100,574

Remark: The difference between the necessary resources is the result of the credit resources circulation percentage.

The enterprise will start operation with the supply of R$ 153,000,000, at short term, and of R$ 764,000,000, at medium term.

5.2 Land Use Plan

5.2.1 Present Land Use

Out of the 37,050.5 km^2 of the Study Area, 53.4% correspond to pastures, 18.5% to forests, and 21.6% to cerrado. The current land use is presented as follows.

Present Land Use

Land Use	Area (km^2)	Percentage (%)
Total Area	37,050.5	
Pastures	19,790.1	53.4%
Agriculture	1.1	0.0%
Cerrado	7,987.9	21.6%
Forest	6,866.7	18.5%
Others	2,404.7	6.5%

Source: Calculated by the Study Team with SEPLAN-GIS data.

Since the Study Area is comprehended within the Amazônia Legal Region, the land use plan shall be in accordance with the concerning environmental criteria. The present vegetation distribution and the legal conservation area is presented as follows.

Distribution of the Vegetation and of the Legal Conservation Area

Distribution	Area (km^2)	Percentage (%)
Vegetation Distribution		
Tropical Rain Forest	17,969.5	48.5%
Cerrado	19,081.0	51.5%
	37,050.5	100.0%
Conservation Area based on environmental criteria		
Area according to the Federal Laws	20,099.9	54.2%
Area according to the State Laws	18,525.3	50.0%
Conservation Area in the Current Land Use	6,866.7	18.5%
Necessary Area to Attain the Environmental Standards		
Federal Law	13,233.2	35.7%
State Law	10,537.4	28.4%

Source: The percentage of vegetation was calculated through GIS data.
Remark: The calculation of legal conservation areas was carried out based on the following percentages: Federal – 80% for tropical rain forests, 35% for cerrado. State – 50% for both.

54.2% of conservation area would be necessary according to the federal laws. Currently, there are only 6,866.7 km^2 of forests thus with a deficit of 13,233 km^2. On the other hand, considering the state laws, the deficit would be of 10,537 km^2.

5.2.2 Land Use Potential

The analyzed land use potential, considering the soil fertility, drainage conditions, declivity and the current land use is presented in the Figure 5.2.1 presented as follows. It is remarkable that 45% of the area has potential for agricultural production.

Land Use Potential

Item	Area (km^2)	Percentage (%)
Total Area	37,050.6	
Agriculture and Livestock Potential I	5,606.1	15.1%
Agriculture and Livestock Potential II*	11,007.3	29.7%
Sub-total	16,613.4	44.8%
Silviculture	4,353.5	11.8%
Silvi-pastoral	1,755.5	4.7%
Forest Management	1,246.9	3.4%
Conservation	6,899.3	18.6%
Conservation of Water Sources	3,344.0	9.0%
Others	2,838.0	7.7%
Sub-total	20,437.2	55.2%

Remark: * Land less fertile than the land with Agriculture and Livestock Potential I
Source: Calculated by the Study Team with SEPLAN-GIS data.

The targets of the land use plan, according to the land use potential and to the environmental laws, are presented as follows.

Land Use Plan in accordance with the Environmental Laws

	Land Use Potential		According to the Environmental Laws	
Item	Area (km^2)	Percentage (%)	Federal Law	State Law
Municipal District Area	37,050.6		37,050.6	37,050.6
Developed Area	20,966.9	56.6%	16,950.6	18,525.3
Agriculture and Livestock Potential I	5,606.1	15.1%	5,606.1	5,606.1
Agriculture and Livestock Potential II	11,007.3	29.7%	6,991.0	8,565.7
Silviculture	4,353.5	11.8%	4,353.5	4,353.5
Conservation Area				
Natural Forest (Current)	6,866.7	18.5%	6,866.7	6,866.7
Agro-forestry / Silvi-pastoral			4,016.3	2,441.6

Silvi-pastoral	1,755.5	4.7%	1,755.5	1,755.5
Forest Management	1,246.9	3.4%	1,246.9	1,246.9
Strong Declivity	32.6	0.1%	32.6	32.6
Protection of Water Sources	3,344.0	9.0%	3,344.0	3,344.0
Others	2,838.0	7.7%	2,838.0	2,838.0
Total	16,083.7	43.4%	20,100.0	18,525.3

Remark: The current conservation area is the sum of the remaining forests calculated by the GIS.

5.2.3 General Land Use Plan

Basically, the efficient land use maximizing the utilization of its potential shall be promoted. According to the land use plan, the existing green areas shall be preserved, transforming into conservation areas the land with less privileged conditions. The recuperation is planned to be carried out within 30 years until the demanded environmental standards are attained.

The analysis of the agriculture and livestock potential I and II for each production scale, according to the registration records, is presented as follows.

Production Potential by Property Class

Item	No. of Producers	Area (km^2)
Agriculture and Livestock Potential I		560,610.0
Agriculture and Livestock Potential II		856,570.0
Total		1,417,180.0
Property (Registered)	8,087.0	
Mini	3,386	133,898.9
Small	2,729.0	456,944.9
Medium	1,280.0	694,377.1
Large	692.0	2,141,085.4
Mini-/Small-scale Property		
Agriculture and Livestock Potential I	15.9%	89,400.2
Agriculture and Livestock Potential II	15.9%	136,596.7
Medium-/Large-scale Property		
Agriculture and Livestock Potential I	84.1%	471,209.8
Agriculture and Livestock Potential II	84.1%	719,973.3

The land use by period and property scale is presented as follows:

Land Use Plan by Period (ha)

	Current	Short	Medium	Long	Final
Agriculture and Livestock Husbandry	1,979,121.1	1,957,413.0	1,863,595.3	1,787,861.6	1,259,711.3
Pasture	1,979,010.8	1,899,094.1	1,459,330.1	852,825.3	0.0
Improved Pasture		5,031.6	202,157.6	546,294.4	870,969.5
Introduction of Grains	110.3	31,447.2	158,427.4	319,237.1	319,237.1
Agricultural land for Mini-/Small-scale Producer		21,840.1	43,680.3	69,504.8	69,504.8
Conservation	686,670.0	730,583.7	950,152.0	1,169,720.3	2,161,548.7
Silviculture		14,511.7	87,070.0	159,628.3	435,350.0
Agro-forestry		8,138.7	48,832.0	89,525.3	401,628.7
Silvi-pastoral		5,851.7	35,110.0	64,368.3	175,550.0
Forest Management		4,156.3	24,938.0	45,719.7	124,690.0
Forest (Current)	686,670.0	686,670.0	686,670.0	686,670.0	686,670.0
Water Source Protection		11,146.7	66,880.0	122,613.3	334,400.0
Strong Declivity		108.7	652.0	1,195.3	3,260.0
Cerrado	798,787.7	776,471.8	650,721.2	506,886.6	0.0
Others	240,472.2	240,582.5	240,582.5	240,582.5	283,800.0
Total Area	3,705,050.9	3,705,050.9	3,705,050.9	3,705,050.9	3,705,060.0

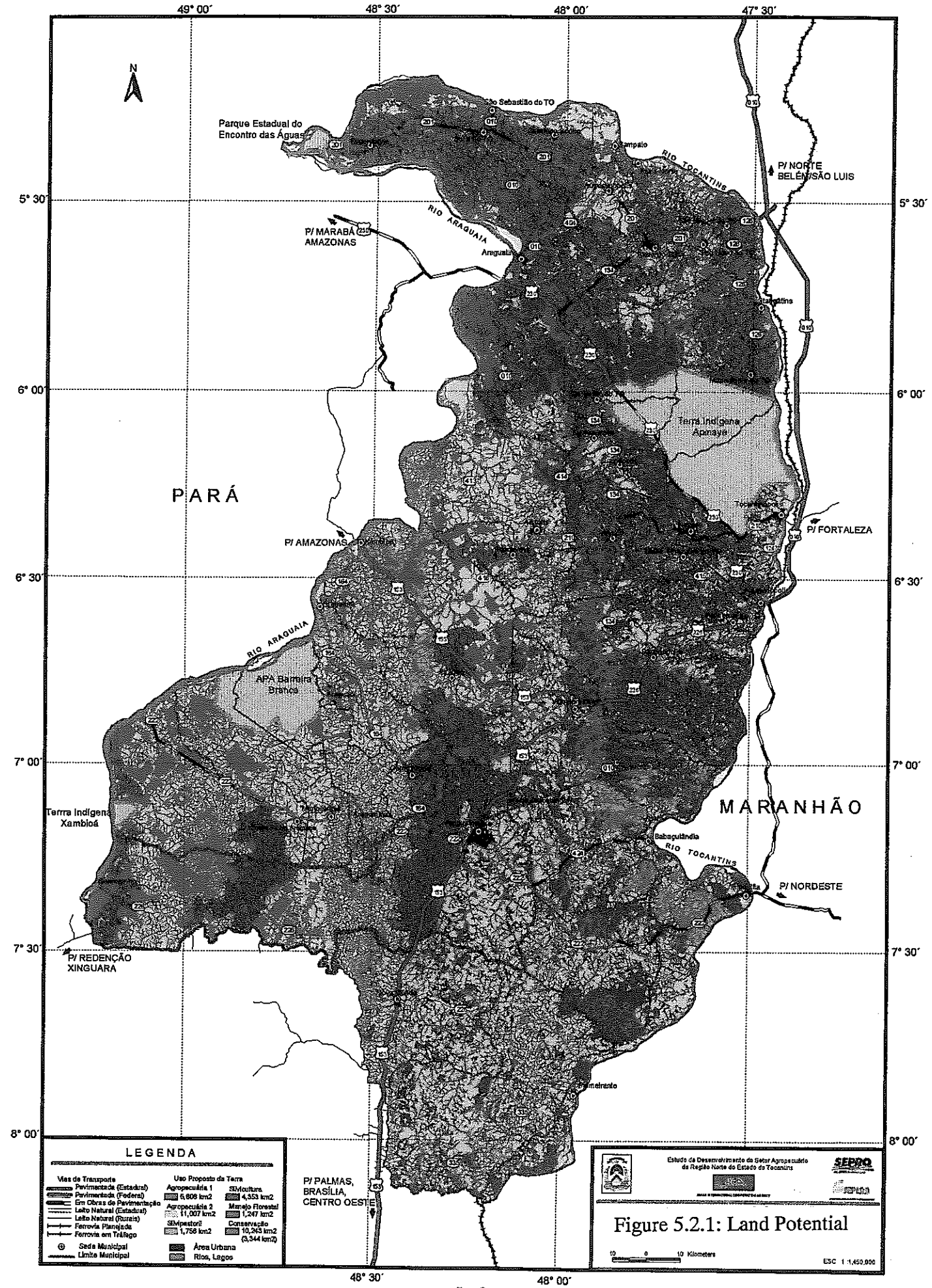


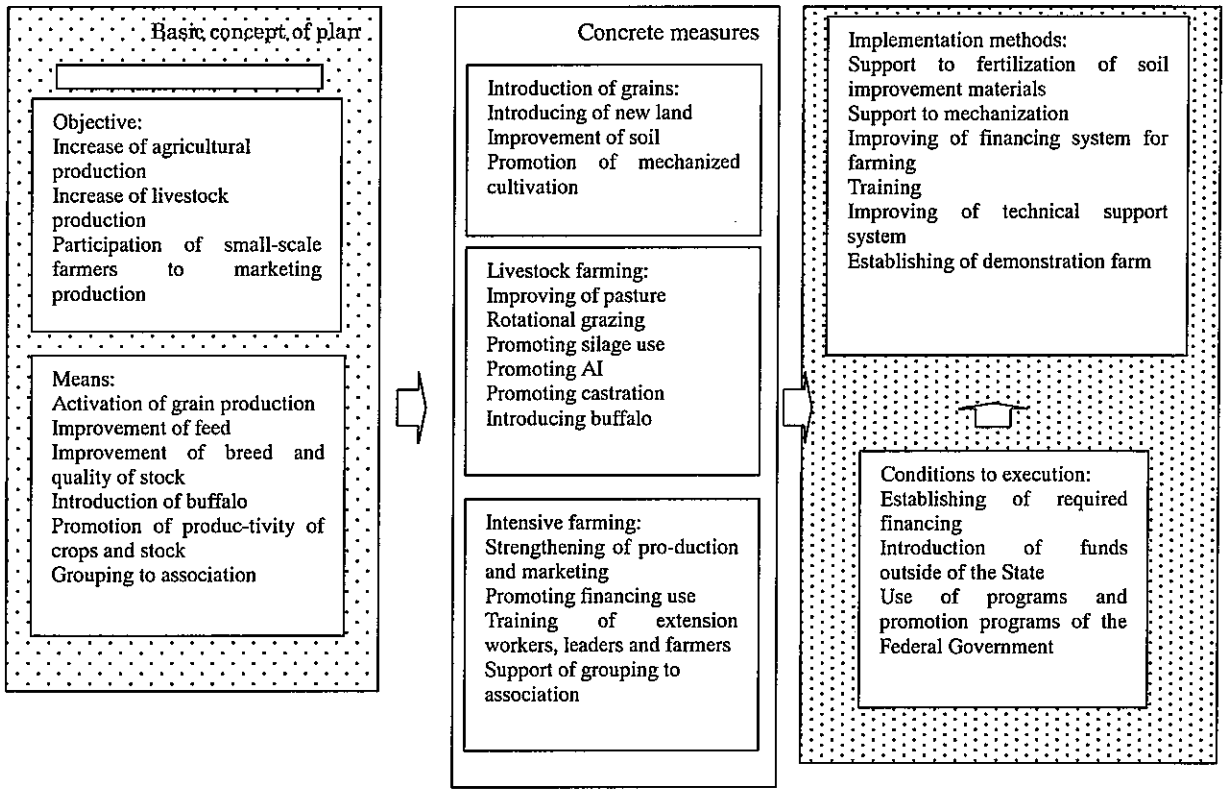
Figure 5.2.1: Land Potential

5.3 Development Plan of Agriculture and Livestock Farming

5.3.1 Outline of the Plan

The objective of the plan is the greatest practical use of land of 1,660,000 ha, which is classified to the potential land for agriculture and animal husbandry in the land use plan of the northern region, through introduction of suitable farming. To achieve the purpose, the various means, such as introducing of grain cultivation, improving of raising methods and breed and quality of livestock, introducing of buffalo, increasing of production of small-scale farmers by improving of productivity in each crop and animal production and grouping to the association, are planned.

Outline of the plan is summarized in the following Figure.



5.3.2 Introduction Plan of Grains

(1) Outline of Plan

The plan is the introducing of the rotation of grains and pasture to the degraded pasture of the medium-scale and large-scale farmers. It is expected that the stock farmers' economies are remarkably improved by the conspicuous increase of the beef cattle production and grain production as a result of the rotation of grains and pasture. When the farmers submit their soil to inspection just before cultivation of grains, and control the soil acidity and fertilize according to the result of soil inspection, the growth of grass after grains cultivation is full of vigor by the effects of the remainder of fertilizer and microelements. The grains in the plan are soybeans for exports and maize, which is expected the larger demand by promotion of the production of dairy, poultry farming and swine raising in the region. To success the project, it

is necessary to change from pasture to grain field, to improve the soil, to plan the cultivation of grain and pasture and to promote the mechanization of grain cultivation. The plan is made every term, and the grain cultivation of about 355,000 ha in the northern region is planned finally in the end of long term. The plan is composed of following items.

- Introduction plan of new arable land for grain cultivation
- Improvement plan of soil
- Plan of grain cultivation
- Promoting plan of mechanization

(1) Introduction plan of new arable land

There are two ways to introduce the rotation farming (rotation of grains and pasture) in the Study Area, one is to initiate by the landowner him/herself (hereafter called “Personal farming type”) and the other is through contracts (hereafter called “contract-farming type”). In the plan, the rotation farming is introduced to the Potential Potential II and I. The total area of pasture feasible to introduce the rotation farming in the northern region is about 1,190,000 ha in the long term plan, and grain cultivation in each term is planned as follows.

Grain cultivation plan

	Short term (5 years)			Medium term (5 years)			Long term (5 years)		
	P I	P II	Sum	P I	P II	Sum	P I	P II	Sum
Soybean (ha)	8,623	13,176	21,799	42,880	65,518	108,398	85,289	130,315	215,604
Maize (ha)	3,817	5,832	9,649	19,791	30,239	50,030	40,995	62,638	103,633
Sum (ha)	12,440	19,007	31,447	62,671	95,756	158,427	126,284	192,953	319,237
Personal farming (ha)	8,708	13,305	22,013	50,137	76,605	126,742	113,656	173,658	287,313
Contract farming (ha)	3,732	5,702	9,434	12,534	19,151	31,685	12,628	19,295	31,924
Pasture (ha)	11,196	17,107	28,303	56,404	86,181	142,585	113,656	173,658	287,313
Cerrado (ha)	1,244	1,901	3,145	6,267	9,576	15,843	12,628	19,295	31,924

Note:

1) P1; potential I land, PII; potential II land
2) It is expected that the contract farming of grain cultivation may be in some ratio of total farming in the short term and the medium term due to lack of experience of grain cultivation and farm machinery, but may be not generally in the long term. Therefore, the prospected extension ratio of each farming type in each term is planned 70%, 80%, 90% in the personal farming type and 30%, 20%, 10% in the contract farming type, respectively.
3) In the introduction of the rotation of grains and pasture to the degraded pasture, a block of pasture is cultivated by cereals during three years and renewed to the new pasture in the personal farming type. On the other hand, a block of pasture is cultivated by grains during four years and renewed to the new pasture in the contract farming type, in order to recover the investment for grain cultivation.

[In case of personal farming type]

The tractors from 100 to 130 HP have capacity for 350~400 ha in the case of the conventional plowing cultivation and 500 ha for non-plowing cultivation. In the first year, the conventional plowing cultivation will be employed for the improvement of soil. Non-plowing cultivation (direct planting) will be introduced from the second year on.

The use of this capacity of machinery, which is about 450 ha, can be planned for the renewal of pasture and the cultivation of grains. That is to say, grain is cultivated a 150 ha in each field of the first year, second year and third year after introduction of grain cultivation in the degraded pasture.

In case of 9 years plan, for instance, the plantation schedule with the use of tractor from 100 to 130 HP is presented as following Table.

The total area would be 1,650 ha where every year 450 ha would be cultivated by grain, and the remaining 1,200 ha would be used for pasture. There would be a reduction of 27% in the pasture area, but this would not be a disadvantage because the areas with grains would return in better conditions than before. The pasture of 1,650 ha is used in the plan of the development of agriculture and livestock farming and called the “Planning Unit in the personal farming” hereafter.

	Field										
	1	2	3	4	5	6	7	8	9	10	11
Year 1	**M**	P	P	P	P	P	P	P	P	P	P
Year 2	**S**	**M**	P	P	P	P	P	P	P	P	P
Year 3	**S**	**S**	**M**	P	P	P	**Old Pasture**			P	P
Year 4	P	**S**	**S**	**M**	P	P	P	P	P	P	P
Year 5	P	P	**S**	**S**	**M**	P	P	P	P	P	P
Year 6	P	P	P	**S**	**S**	**M**	P	P	P	P	P
Year 7	P	P	P	P	**S**	**S**	**M**	P	P	P	P
Year 8	P	**New Pasture**			P	**S**	**S**	**M**	P	P	P
Year 9	P	P	P	P	P	P	**S**	**S**	**M**	P	P
Year 10	P	P	P	P	P	P	P	**S**	**S**	**M**	P
Year 11	P	P	P	P	P	P	P	P	**S**	**S**	**M**
	150 ha	150 ha	150 ha	150 ha	150 ha	150 ha	150 ha	150 ha	150 ha	150 ha	150 ha

Note: **M**: Maize, **S**: Soybean, P：Pasture

[In case of contract farming type]

On the other hand, grain is cultivated a 100 ha in each field of the first year, second year, third year and the fourth year after introduction of grain cultivation in the degraded pasture. In case of 13 years plan, for instance, the plantation schedule with the use of tractor from 100 to 130 HP is presented as following Table.

The total area would be 1,600 ha where every year 400 ha would be cultivated with grain, and the remaining 1,200 ha for pasture. There would be a reduction of 25% in the pasture area. In this case, the pasture of 1,600 ha is used in the plan of the development of agriculture and livestock farming and called the “planning Unit in contract farming” hereafter.

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	**M**	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
2	**S**	**M**	P	P	P	P	P	P	P	P	P	P	P	P	P	P
3	**S**	**S**	**M**	P	P	P	P	P	P	P	P	P	P	P	P	P
4	**S**	**S**	**S**	**M**	P	P	P	P	P	P	P	P	P	P	P	P
5	P	**S**	**S**	**S**	**M**	P	P	P	P	**Old Pasture**				P	P	P
6	P	P	**S**	**S**	**S**	**M**	P	P	P	P	P	P	P	P	P	P
7	P	P	P	**S**	**S**	**S**	**M**	P	P	P	P	P	P	P	P	P
8	P	P	P	P	**S**	**S**	**S**	**M**	P	P	P	P	P	P	P	P
9	P	P	P	P	P	**S**	**S**	**S**	**M**	P	P	P	P	P	P	P
10	P	**Renewed Pasture**				P	**S**	**S**	**S**	**M**	P	P	P	P	P	P
11	P	P	P	P	P	P	P	**S**	**S**	**S**	**M**	P	P	P	P	P
12	P	P	P	P	P	P	P	P	**S**	**S**	**S**	**M**	P	P	P	P
13	P	P	P	P	P	P	P	P	P	**S**	**S**	**S**	**M**	P	P	P
14	P	P	P	P	P	P	P	P	P	P	**S**	**S**	**S**	**M**	P	P
15	P	P	P	P	P	P	P	P	P	P	P	**S**	**S**	**S**	**M**	P
16	P	P	P	P	P	P	P	P	P	P	P	P	**S**	**S**	**S**	**M**
	100ha	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Note）**M**：Maize, **S**：Soybean, P：Pasture

The reclamation cost to introduce grain cultivation in each term is as follows.

Reclamation cost to introduce grain cultivation in each term

	Short term	Medium term	Long term
Cost for pasture (R$ 1,000)	1,415	7,129	14,366
Cost for cerrado (R$ 1,000)	1,604	8,080	16,281
Sum (R$ 1,000)	3,019	15,209	30,647

Note；Reclamation cost for pasture；R$50/ha、Reclamation cost for cerrado；R$500/ha

(2) Improvement plan of soil

Both pasture in “Potential I for agriculture and livestock farming” and “Potential II for agriculture and livestock farming” of the land use classification are feasible to carry out the mechanized cereal cultivation. However, there is difference between two lands in the method of soil improvement.

The soil improvement is divided two categories; one is the control of the soil acidity by lime, and another is the control of density of phosphate in soil by phosphate fertilizer. It is summarized about supply of soil improvement materials that 4 tons/ha of lime are required theoretically to improve the soil of pH 4.5 in land of the potential I, and cost of lime is R$ 504/ha. On the other hand, in land of the potential II, it is theoretically required to fertilize 6 tons/ha of lime to improve soil of pH4.5, and 500 kg/ha of super phosphate.

In the first year of cultivation of grain, the deep plowing in about 30cm deep should be carried out after fertilizing of soil improvement materials, because soybean is the deep-rooted crop.

The amounts of the soil improvement materials required to introduce grain cultivation are as follows.

Required soil improvement materials

	Short term	Medium term	Long term
Grain cultivation area (ha)	31,447	158,427	319,237
Cost of soil improvement materials			
Total amount of lime (tons)	126,265	1,182,024	2,836,678
Total cost of lime (R$ 1,000)	2,273	21,276	51,060
Total amount of super phosphate (tons)	7,326	70,037	167,594
Total cost of super phosphate (R$ 1,000)	2,930	28,015	67,037
Total cost in each term (R$ 1,000)	5,203	49,291	118,098

(3) Grain cultivation plan and production cost

a. Soybean

The medium-ripening varieties of about 130 days of growing duration are desirable in the northern region of Tocantins. Seeding period of soybean in each municipal should be decided according to the instruction of EMBRAPA to avoid the damage of veranico. In the first year, the deep plowing in depth of 30 cm is employed for the improvement of soil. Non-plowing (direct sowing) is introduced from the second year on. The yield of soybean is expected 2.5 tons per ha in the short term, 3.0 tons in the medium term and 3.5 tons in the long term in the plan, respectively.

The yield of grain in the first year of grain cultivation in the degraded pasture is very low. Therefore, the contract farmers require the livestock farmers to extend the grain cultivation years from three years to four or five years in order to recover the investment for grain

cultivation. It is required to research immediately on the causes of the low yield in the first year of grain cultivation and the countermeasures to increase the yield. After harvest of soybeans every year, pearl millet should be cultivated as green manure crop.

The amount of farm materials except soil improvement materials, working hours of machinery and laborer per ha, unit cost and cost per ha are shown in the following table.

Production cost of soybean（R$/ha）

Items	Cost
Materials	295.00
Farm works	174.30
Other cost	9.30
Sum	478.69

The production cost of soybean of 450 ha every year in the Planning Unit in the personal farming of 1,650 ha is R$ 215,410, except the soil improvement materials. As shown in the table, the working cost of machinery is very expensive and forms 35% (R$ 76,275) of total production costs, and the cost of fertilizer forms about 33% (R$ 70,200). On the other hand, in case of the contract farming, the cost of soybean of 400 ha every year in the planning unit of 1,600 ha is R$ 191,476 in total and the working cost of machinery is R$ 67,800.

b. Maize

In the plan, the use of the hybrid varieties is desirable. Seeding period of maize in each municipal should be decided according to the instruction of EMBRAPA to avoid the damage of veranico. The yield of maize is expected 5 tons per ha in the short term, 5.5 tons in the medium term and 6 tons in the long term in the plan, respectively. The yield of 6 tons in the long term is the same with the average yield in Rio Verde in the cerrado of the Goias State, which is attained as a result of improvement during twenty years.

The amount of farm materials except soil improvement materials, working hours of machinery and laborer per ha, unit cost and cost per ha are shown in the following table.

Production cost of maize（R$/ha）

Items	Cost
Materials	264.30
Farm works	150.80
Other cost	8.30
Sum	423.40

In the case of the contract farming, the production cost of maize of 400 ha every year in the Planning Unit in the contract farming of 1,600 ha is R$ 169,360, except the soil improvement materials. As shown in the table, the working cost of machinery is very expensive and forms 34% (R$58,400) of total production costs. Furthermore, the cost of fertilization forms about 39% of the total production cost.

c. Production of grain

The amounts of production of grains in each term are shown in following table.

Amount of grain production in each term

	Unit	Short term	Medium term	Long term
Soybean cultivation area	ha	54,497	325,491	810,005
Production of soybean	tons	163,490	976,472	2,430,014
Gross income	R$1,000	46,595	278,295	692,554
Maize cultivation area	ha	24,121	134,616	384,157
Production of maize	tons	132,668	740,389	2,112,861
Gross income	R$1,000	24,411	136,232	388,766

Note: Gross income is calculated by use of R$ 285/ton of producer price in soybean and R$ 184/ton in maize. These data are the average of producer prices in the several last years.

d. Production cost

The area of grain cultivation and the production cost are shown in following table.

Cost of grain cultivation

	Short term (5 years)			Medium term (5 years)			Long term (5 years)		
	P I	P II	Sum	P I	P II	Sum	P I	P II	Sum
Area of grain cultivation									
Soybean: yearly (av.) (ha)	4,312	6,588	10,899	25,752	39,347	65,098	64,085	97,916	162,001
5 years (ha)	21,558	32,939	54,497	128,758	196,733	325,491	320,423	489,582	810,005
Cost in 5 years (R$ 1,000)	10,320	15,767	26,087	61,635	94,174	155,809	153,383	234,358	387,741
Maize: yearly (av.) (ha)	1,908	2,916	4,824	11,804	15,119	26,923	30,393	46,438	76,831
5 years (ha)	9,542	14,579	24,121	59,019	75,597	134,616	151,965	232,191	384,157
Cost in 5 years (R$ 1,000)	4,040	6,173	10,213	24,989	32,008	56,997	64,342	98,310	162,652
Total cost in 5 years (R$ 1,000)			36,300			212,806			550,393

(4) Promoting Plan of Mechanization

It is required in the large-scale cultivation of grains to mechanize from sowing seeds to harvesting. The farm machines, which are required for grain cultivation of 400 ha to 450 ha, are shown in the following table.

Machinery	Type	Use	Unit price R$	Remarks
Tractor 105PS	MF 292 4x4		53,000	
Tractor 76PS	MF 275 4x2		33,000	
Sprayer	COLUMBIA A-18	Hydraulic	23,000	
Disk plow	ATCR 18x26”		7,000	
Disk harrow	GN 44x22”		5,600	
Trailer	ACTON 4000	Load capacity:4 tons	2,300	With spare tires
Seeding/fertilizing machine	SEMEATO PSE8	Usable for direct sowing	19,000	
Combine harvester	MF 5650		154,000	With air conditioner
Lime distributor	TATU DCA-5500	Load capacity:5.5 tons	7,100	
TOTAL			R$304,000	

One set of these machines can carry out to cultivate grains of 400 to 450 ha in a year. Grain cultivation introduced in the pasture of 1,650 or 1,600 ha of the planning unit in the personal farming and in the contract farming is carried out by one set of these farm machines.

The farmers in Tocantins are classified to four categories by the scales of their land, containing the conservation area of 50% of their lands, namely large-scale more than 1,200 ha, medium-scale from 320 ha to 1,200 ha, small-scale from 80 ha to 320 ha, and mini-scale less than 80 ha, respectively. Program of Integration System of Agriculture and Animal Husbandry is introduced to the degraded pasture of the medium-scale and large-scale farmers.

Therefore, the area of pasture of each farmer falls short of the planning unit of 1,650 ha in some farmers of the large-scale and all medium-scale farmers. It is required to efficient use of machinery of grain cultivation that these farmers introduce jointly grain in their farming with neighbors.

The number of sets of farm machinery required to carry out the grain cultivation in each term and the required funds are shown in the following Table.

Number of required sets of farm machinery

	Short term	Medium term	Long term
Cultivation area of soybean (ha)	21,799	108,398	215,604
Cultivation area of maize (ha)	9,649	50,030	103,633
Sum (ha)	31,447	158,427	319,237
Number of required sets of machinery	70	352	709
Number of introducing sets in each term	70	282	357
Estimated demand of funds (R$1,000)	21,280	85,728	108,528

(5) Summary of demand of funds

The demand of funds required to achieve the introduction plan of grains is summarized in the following Table.

Total demand of funds (R$1,000)

	Short term	Medium term	Long term	Sum
Reclamation cost for grain cultivation	3,019	15,209	30,647	48,875
Improvement cost of soil	5,203	49,291	118,098	172,592
Grain cultivation cost	36,300	212,806	550,393	799,499
(Mechanization cost)*	12,929	75,794	196,030	284,753
Total	44,522	277,306	699,137	1,020,965

Note: Mechanization cost is included in grain cultivation cost. Therefore, total demand does not include it.

(6) Total balance in grain production

The income and the expenditure of grain production in the northern region in each term are shown in the following table.

Balance of grain production

	Unit	Short term	Medium term	Long term
Total income of grain production	R$1,000	71,006	414,526	1,081,320
Total cost of grain production	R$1,000	44,522	277,306	699,137
Balance in grain production	R$1,000	26,484	137,220	382,183

5.3.3 Plan of Invigoration and Diversification of the Cattle Activity

As for the livestock, the pastures improvement should be promoted and of the intensive handling method and, at long term, the confinement creation system introduction should be stimulated. The micro and the small producers should introduce the buffalos creation to increase their income. The method for the intensive livestock are presented to proceed:

- Improvement of the creation method;
- Genetic improvement and of the animals quality;
- Castration and descorna of the fattening animals in a smaller time;
- Introduction of buffalos creation;

- Introduction of the swine production.

(1) Plan target

a. Area to be introduced

The invigoration program and cattle diversification should be planned with base in the following North Area use of the earth plan, where the meat productions will be developed on medium and large properties in pastures and the buffalos creation in areas of silvipastoril activity. In the small farmers case the milk production will be developed with bovine and buffalos.

Plan of Use of the Earth	Unid.	Current	Short	Medium	Long
Pasture (km2)		1,979,010.8	1,909,977.3	1,696,597.6	1,463,488.1
Current pasture	km2	.	1,899,094.1	1,459,330.1	852,825.3
Improved pasture	km2	.	5,031.6	202,157.6	546,294.4
Silvi-pastoral	km2	.	5,851.7	35,110.0	64,368.3
Averages and Great Properties		1,663,419.1	1,618,385.3	1,462,576.6	1,328,326.3
Current pasture	km2	.	1,608,435.2	1,230,908.0	727,928.3
Improved pasture	km2	.	5,031.6	202,157.6	546,294.4
Silvi-pastoral	km2	.	4,918.5	29,511.0	54,103.6
Small Properties	km2	315,591.7	291,592.0	234,021.0	135,161.8
Current pasture	km2	.	290,658.8	228,422.0	124,897.0
Silvi-pastoral	km2		0,0	0,0	0,0

b. Pasture Capacity of Support

The support capacity for each area is presented to proceed.

(animal/ha)

	Types	Short	Medium	Long
Medium and great properties				
Current pasture	**Cut**	0,7	1,2	1,5
Improved pasture	Cut	1,0	2,0	3,0
Silvi-pastoral activity	Buffalos	1,0	1,0	1,0
Small properties				
Current pasture	Milk	90%	60%	20%
	Buffalos	10%	40%	80%
Improved pasture	Milk	1,0	1,0	1,0

Obs: current Average of the Animal Unit. 0,48/ha

- To consider the capacity of support of 1 animal/ha for the current bovine production, increasing it through the silage use and of the pasture rotation at the medium and long period;
- To produce better quality pastures, silages use, rotation of pastures, sugarcane in the pastures area for the bovine of cut production improvement;
- As for the milk production in the improved pasture area, the same methods of handling as the bovine of cut should be used and in long period, making the change to the confinement system, to increase the support capacity;
- The necessary silage quantity at the drought time it is of 2 m3/animal.

(2) Cattle Handling Improvement Method

This plan has for objective the increase of cattle head number through the increase of the recovered pastures area, besides the introduction of cattle handling improved methods, as described to proceed.

- Silage production as supplemental food for the drought period;
- Sugarcane use as supplemental food for the drought period;
- Pastures rotation and of the confinement system introdution for the fattening livestock;
- Use of the confinement system for the cattle of milk, in long period.

The following conditions will be observed for calculation on the necessary facilities:

- The compensation for the foof shortage in the drought period should be made with the natural pasture capacity of support spare portion.
- The volume of the silage should be calculated with base in the consumption in the drought period (2 t/cabeça).
- The sugarcane production to be used as source of animal food for the drought period should be calculated with base in 20 animals/ha.
- The producer should promote the sugarcane cultivation (20%) besides the use of the silage (80%) to compensate the drought foods shortage.
- It should be prepared the structure to execute at the medium term rotation of pastures.

The necessary silage volume to supply the planned flock and the complemental forage production area for the drought period is presented in the table to proceed.

	Current situation	Short period	Medium period	Long period
Planned flock (Bovine of cut, bovine of milk and Buffalos)	1,446,900	2,062,495	3,351,650	4,563,209
Pasture capacity of support (heads)	1,781,110	1,718,980	1,526,938	1,317,139
Deficit (heads)	-	343,515	1,824,713	3,246,070
Silage dependent flock (heads)	.	274,812	1,459,770	2,596,856
Suplementation dependent flock in the drought period (heads)	.	.	3,386	2,729
Necessary silage volume (t/ano)	.	68,703	364,943	649,214
Facilities for necessary silage	.	549,624	2,919,540	5,193,712
Area cultivated for the forage production for the period of the drought (ha)	.	2,748	14,598	25,969
Area of pasture rotation (ha)	.	3,435	18,247	32,461

(3) Genetic and Quality Improvement glide

The bullocks and calf of the cattle of milk creation, produced by the small and medium producers, they are bought by the large producers especialized in the fattening activity, therefore there would be the need to accomplish a qualitative improvement of this flock. This improvement is accomplished efficiently through the artificial insemination, but as it is treated of an extensive system exploration, besides little wish from the producer because of difficulties, this method could not be introduced by normal means. Therefore, it should be

selected the best animals among the one than exist now, containing them in a certain place. Like this, using the method of rut standardization, it could take place AI at short term. The born males would be used as reproducers promoting the genetic improvement. This rut standardization program should have the government's technicians' effective participation and the extension service accomplished by the semen company technician.

(4) castration and Precocious " Descorna - horn remove"

In January of 2001, the Tocantins state was declared aftosa free area, allowing like this the commercialization not only for the Northeast area but also for several places of the country, turning the castration practices and precocious descorna of the bullock an indispensable condition.

(5) Introduction of Buffalos creation

The buffalo is an appropriate animal for the tropical regions. For presenting the following advantages in comparison with the bovine cattle, it intends to promote the buffalos creation introduction for the mini and small producers.

- The volume of milk production is superior when compared to the bovine in the Area of the Study;
- The cheese production with buffalo milk yields the double of the bovine milk;
- Recently, the cheese mussarela produced with buffalo milk began to be very appreciated by the Brazilian consumers being sold by higher prices than the ones of bovine;
- The buffalo meat contains low cholesterol tenor and low caloric value, and it is attracting the attention not only in the great urban centers but also at whole world;
- The buffalos average useful life is almost 3 times the useful life of the bovine;
- The buffalos milk fat tenor is twice larger than the one of the bovine milk, also it has a superior commercial value;
- The buffalo has immunity against the cow-lunatic's disease that is causing problems recently;
- The bubalino presents larger food use with vegetable base in comparison with the bovine cattle;

a. Objective of the Buffalos Creation

The plan has as target the increase the current number of animals from 900 heads to 50.000 heads in short period and at long term reach 280.000 heads. The quantitative target are presented in the table to proceed.

	Unid.	Short	Medium	Long
Current pasture	heads	42,750	123,400	194,600
Silvi-pastoral		7,250	39,600	83,400
Total flock	heads	50,000	163,000	278,000

b. Methods for Buffalos Flock Increase

It should be made the introduction of riverine species (mainly the Murrah) from out of the

State, and the distribution to the producers in a change system with the existent cow milk. The buffalos being introduced in the current conditions to the small and medium producers, the facilities and machines can be used without problems.

As for the buffalos flock increase, the following methods are proposed:

- Taken the base the current flock and being considered his growth, at long term, the flock will only grow up to 20.000 animals. Therefore, 8.000 new animals should be introduced (female) in the initial phase;
- With the introduction of those 8.000 animals in the initial phase, it will be possible to reach at the long term goal of 280.000 animals with the reproduction in natural conditions;
- As it is difficult the introduction of the buffalos creation with own producer resource, this action should be organized by the State Government;
- The acquisition of the females (with pedigree) it should be done initially from out of the State, due to the small number of existent animals in the State;
- The distribution of the buffalo female to the current mini and small milk cattle farmers should be done through the change system in the proportion of 1:1, that is, a buffalo with a cow milk pan as initial condition.
- The State Government, it should create a Buffalos Fund acquisition through the sale of the animals received in the change;
- As the buffalos are worth 2 times more than the bovine ones, the difference should be payed with animals. In the case of receiving a female, a female with 2 years old should be returned. In the case of a male, a male with 2 years old should also be returned to the Government;
- The animals received as payment form, they should be reviewed for new producer interested in the creation;
- The Government should intervene until the changes finalization. Then, this activity should be reviewed to the private section;
- After the finalization of the animal payment due to the State, the producer will be free for the handling and sale of the remaining animals.

The ideal size estimated for each producer should contain 20 adult females, 1 adult male, besides calves and animals in growth in the total from 50 to 60 animals.

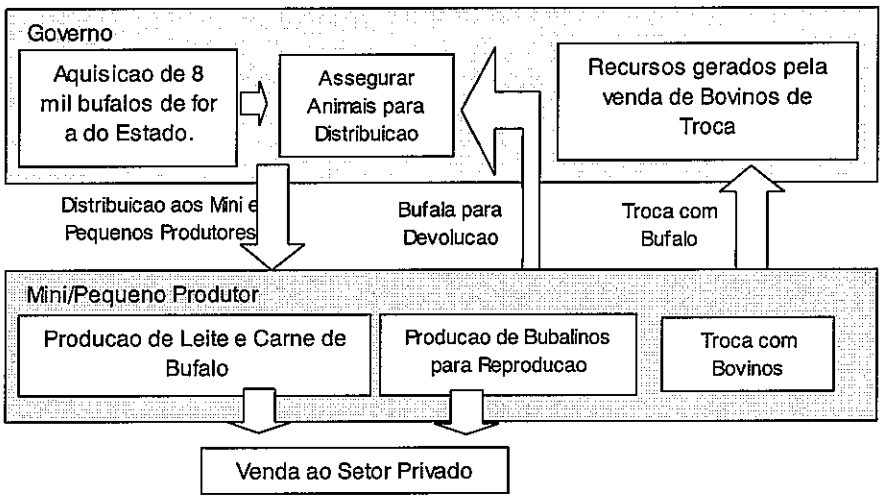
c. Reproduction and Distribution of the Buffalos

The animals for distribution from the Government should be acquired only in the firsty year. Then, the returned animals should be used for new distribution. The government, selling these encourages, it will recover the investment value in the 8.000 heads and it should finish his participation in the process.

Number of Animals	Current	Short	Medium	Long
Increase in relation to the current number. (Heads)	900	2,000	6,000	19,000
Female	(300)	(780)	(2,340)	(7,410)
Increase with the introduction of 8.000		48,000	157,000	259,000

heads				
Females (Heads)		(16,220)	(61,660)	(101,010)
Total	900	50,000	163,000	278,000
Total of Females (Heads)	(300)	(17,000)	(64,000)	(108,420)

The distribution system will be in the following way:



At short term, to assure the sanitary control of the distributed flock, government support should be given to cover the vaccines and mineral salts acquisition.

(6) Swine Production Development

The swine production should be introduced in the present Development Plan, being taken by base the swine meat market deficit in the Study Area and of the Tocantins State. The swine meat processed product as ham, sausage, smoked bacon has been elevating consumption demand in the area and in other consumption centers.

The advantages of the swine creation are the followings (1)- speed in the capital turn; (2) - No need for great areas; (3) - possibility of family hand work use in the creation; (4) - possibility of agricultural by-products use for the feeding; (5) - especially, the milk whey use that is an excellent protein source to the swine; (6)- their organic dejections, after dispersed on the soil, serves as a excellent fertilizer; (7)- this activity is practiced already at the long time in the region, therefore the resistance from the producers don't exist; (8)- many mini and small participant producers of Workshops, they manifested interest in the activity.

The problematic points are: (1)- difficulty getting in the State reproductive animals of the races Landrace, Yorkshire or Duroc, wich are modern and of superior quality races; (2)- the support system, of immunization and of creation administration is lower in relation to the bovine, buffalos and birds production; (3)- inexistence, in the Study Area, the commercialization system and slaughterhouses.

Being estimated the gradual increase of the demand by the swine meat, it should be adopted the following providences: (1)- to implement the modern system of creation (appropriate facilities, supply of agricultural by-products derived rations, immunization service); (2)- to establish the commercialization plan, organized by the swine producers.

In the initial stage, the crossing system with modern races should be adopted, like with Yorkshire, Duroc or Gran-Landrace for the existent race- Piau. Starting from the medium period, with the introduction of the agriculture rotative system, corn will be produced in great scale, which can serve as main food for the swine. As the future predominant race suggestion is the crossing of Yorkshire with Landrace and Duroc.

a. Viability

Being an activity of easy introduction with the minimum of necessary capital, it supposes hereafter the product value fall with the production the increase, like this needing the establishment of production control plan.
As example of the high markup, for a plantel of 1 male Yorkshire with 10 females Piau, the annual production cost will be R$ 9,260,00, and the meats sale (income) will be R$ 28,800,00, wich mean a total result of R$ 19,540,00, or R$ 1,950,00 for each female.

b. Rations Suppliment

At the beginning, the whey originating from the dairy products should be used as ration, besides the rice meal, cassava, fruits peels, green vegetables and corn, that it will be produced in wide climb. With the creation of the swine producing association, the same can produce and supply to the associates, concentrated or balanced ration.

c. Diffusion of the Creation Techniques

The problematic points are: (1). Lacks of the technical body with specialization in swine activity in SEPRO, ADAPEC, RURALTINS, being necessary to activate the formation of the same; (2). Inexistence of the immunization providences in the swine diseases (including measures against the cholera). As solution for this problem, it should be propitiated to the organs concerning technicians courses and training returned for the creation administration, immunization process, inspection and sanitary control, concentrated and balanced ration production technology.

d. Facilities

The facilities should be for the semi confinament system, with an earth part and other part covered with the cement floor. It should be an installation of multiple use so much for the reproductive animals and of fattening, being of 16 m2 of covered area and 24 m2 de earth, resulting in the total of 40 m2, each installation. With this it will be possible the creation of 10 fattening animals and 3~4 females for reproduction.

e. Swine Slaughterhouse

It exists a slaughterhouse in the Araguaína municipal district (now processing 100 cattle head/day). We should take advantage this same slaughterhouse, with the repective sanitary inspection done by the State, for the discount of swine and to offer hygienic and low cost meat, promoting the increase of the demand.

The discount capacity is 110 head/day, with the following future production planning: 180 at short term ; 240 at medium term and 330 long term. Because of this limited capacity it should incentive the production of processed products, as sausage and smoked bacon, accomplished by the swine association.

f. Necessary resources

The annual necessary resources are the following ones:

	Unit	I tan Period	Medium Period	Long Period
Number of Animals		25.000	35.000	45.000
Facilities	R$ 800 / installation	14.000	8.000	8.000
Ration	R$ 36 / year / head	4.589	6.425	8.260
Total		18.589	14.425	16.260

(7) Production Plan

The plan consists in the improvement of creation handlings for bovine of cut and milk and buffalos. The production forecast calculation should be based on each plan individually.

a. Bovine of Cut

The bovine of cut production calculation will be in the following way:

The meats production base should be constituted of bullocks of the production plan;

The female bullock for the cut should correspond to 30% of the total bullock flock;

The calculation of meats production should be made with base in the current proportion.

Cattle for slaughter Handling Plan

	Unid.	Short	Medium	Long
Total of animals	Heads	1,730,332	2,878,549	4,178,087
Total of female bullocks	Heads	201,930	335,927	487,583
Female bullock for cut	Heads	60,579	100,778	146,275
Bullocks	Heads	432,583	719,637	1,044,522
Animals for discount	Heads	493,162	820,415	1,190,797
Meats annual production	t	103,564	172,287	250,067

b. Bovine of Milk

The milky flock doesn't only consist of animals for the milk production, but also of male animals and spare females for cut. The base for the calculation is the following.

- The females are used for the milk production and the surplus is used for fattening;
- The female bullock proportion for the cut is of 50%.

Bovine of milk handling Plan

	Unid.	Short	Medium	Long
Total of animals	Heads	280,166	251,630	57,328
Female	Heads	79,287	71,211	16,224
Unitary production	l/ano/cabeça	1,000	2,000	2,500
Production of milk	l/ano	79,287	142,422	40,559

Novilhas	Heads	32,695	29,365	6,690
Transfer for the cut	Heads	16,348	14,683	3,345
Bullocks	Heads	70,042	62,907	14,332
Total of animals for discount	Heads	86,389	77,590	17,677
Total production of meats	t	18,142	16,294	3,712

Obs: the current production of milk is of 50.000m3/ano.

c. Buffalos

The buffalos creation consists in the milk production and males for the discount. The base for the calculation is the following.

- The females are used for the milk production. At the long term, it should be made the distribution of calves to other producers;
- The young males animals will be used for the cut.

Plan of Buffalos Production

	Unid.	Short	Medium	Long
Current animals	heads	51,996	221,471	327,795
Female	heads	14,715	62,676	92,766
Unitary production	l/ano/cabeça	2,000	2,000	2,000
Total production of milk	.	29,430	125,353	185,532
Males for cut	heads	12,999	55,368	81,949
Meat production	t	2,730	11,627	17,209

d. Swine

The production of meats will overcome the regional market medium demand after the medium period, needing therefore to sale for the other Areas market. The basic evaluation will be the following ones

	Current	Short	Medium	Long
Total animals (Heads)	20,525	25,000	35,000	45,000
Females (Heads)	2,000	2,500	3,500	4,500
Animals for Fattening (Heads).	18,525	22,500	32,000	41,500
No. of annual discounts (head)	33,345	45,000	64,000	83,000
Animals for fattening (head)	1.8	2.0	2.0	2.0
Meat unitary production	70	70	70	70
Annual production of meat (t)	2,334	3,150	4,480	5,810

Data of ADAPEC, 2000

- The productivity of each female is of 10 leitões, being 2 a year;
- The breast-feeding period will be of 45 days and the discount on 180 days with the weight of 75 Kg

5.3.4 Nuclei of Production program

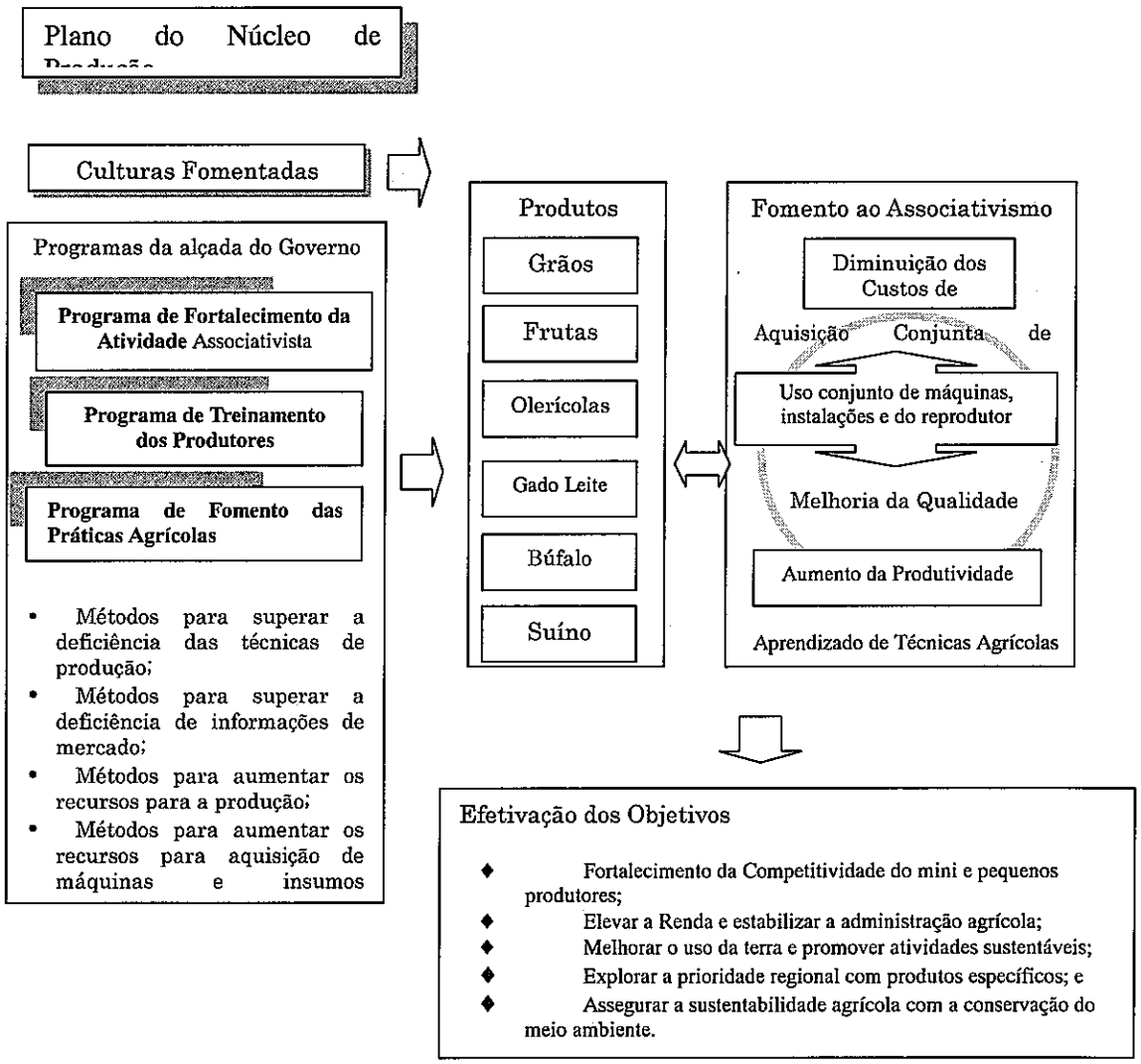
The present Programs aims the elevation of the resident population conditions of life through the improvement in the agriculture administration, fomenting the mini and small producer with high economical value cultures, result of market projection researches. It intends this Program to foment and to motivate the productions of cereals, fruits, vegetables, livestock, swine, taking into account the current technological level, the future market, the characteristic and priority of the area. For the planning, it will be suggested the following

products.

- Cereals (rice, bean, corn and soybean)
- Fruits (pineapple, banana, papaya, passion fruit, cashew)
- Vegetable (industrial tomato, cassava)
- Livestock (cattle and buffalo, for milk)
- Swine

As implementation plan, intends to motivate the producers formation groups to make possible to obtain: the necessary productive technology, the low productive cost with the machines and agricultural equipments collective, the low cost in the agricultural materials acquisition with the practice of purchase and sale of agricultural and cattle inputs in common. Besides these, it will be suggested the access to the Federal Government's financing.

The Nuclei of Production Program summary is presented to proceed:



(1) Beneficiaries and Area

The present Programs aims at to assist, among the 8.087 producers of the area, the mini

producers (3.386) and the small producers (3.383), wich represents the family farmers.

Beneficiaries and Area

Item	Total of th e Area	Mini Producer	Small Producer	Total	% in relation to the Total
Families number	8,087	3,386	2,729	6,115	75.6%
Area of the Properties (registered) (ha)	3,426,306	133,899	456,945	590,844	17.2%
Tax of occupation of the earth%		3.9	13.3	17.2	
Potential Agricultural I	560,620	21,864	74,562	96,426	17.2%
Agricultural potential II	1,100,720	42,927	146,396	189,323	17.2%
Total	1,661,340	64,791	220,958	285,749	17.2%

According to the Plan, priority will be given, insofar as possible, to the agricultural potential I area development. However, in the areas of low agricultural development potential, the agricultural potential II areas will be used.

b. Quantitative Target

Through the Nuclei of Production Introduction Program, it intends to improve the mini and small producers conditions of life. The program quantitative target are presented in the table to proceed.

Conditions of Life Referencial Level
(Reference: Minimum wage)

Item	Producing mini	Small Producer
Short Period	1,0	1,5
Medium Period	2,0	3,0
Long Period	3,0	5,0

In order to achieve the levels above mentioned, it is necessary to accomplish the planting of the following products in the respective areas

Necessary area for Each Product (ha)

PRODUCT	Minimum wage					
	1,0	**1,5**	**2,0**	**3,0**	**5,0**	**10,0**
Cereal, Rice (Prod.2,4 t/ha.)	10,0	15,0	20,0	30,0	50,0	100,0
Pineapple (Prod.30 t/ha)	0,4	0,6	0,8	1,2	2,0	4,0
Cassava (Prod.10 t/ha)	1,6	2,4	3,2	4,8	8,0	16

Obs.: Estimate of the value was calculated with base in the main production.

To reach those quantitative goals, just the products above mentioned can be produced. However, it intends to introduce the diversification practice with the livestock to make easier the income increase.

With base in the interviews result and questionnaires applied to the associations and producer, it was made the use of the earth planning, second each production type and the participation tax of the producers.

Necessary cultivated area for the Standard of living elevation

Type of Producer	In the one of Families				Necessary area (there is)		
	Mini		Small				
	Tax	Families	Tax	Families	Short	Medium	Long
Production of Cereal	20	677	20	546	14,959	29,918	47,606
Production of Fruits	30	1,016	30	819	898	1,795	2,856
Vegetable	50	1,693	50	1,365	5,984	11,967	19,042
Total		3,386		2,729	21,840	43,680	69,505

OBS.: He/she esteemed not to increase the number of the agricultural families.

Recommended Cultivars/ Creation and Methods of Administration

It was defined as recommended cultivar, independently of the existence or not of own production area, market conditions, perspectives and technology of the production, the cereals (rice, bean, corn, soybean), the fruits (pineapple, banana, papaya, passion fruit, cashew), vegetables (industrial tomato, cassava), the products of the livestock (cattle milk and of buffalo) and swine.

Regarding the agricultural practices, each producer should integrate the agricultural activities into the cattle activities. Basically, it is planned that all the producers participate in the cows of milk pans and of buffalos creation.

a. Cereals (rice, bean, corn and soybean)

1) Development of the Agricultural Practices

As for the cereal production, it is considered the rice and the bean as consumption products inside of the area. The corn and the soybean will be produced in great scale inside of the grains introduction plan in the pasture areas, and they will be produced also by the small producers. The quantitative goal to be produced, the short, medium and long periods, it is presented as follows.

Quantitative goals of the Production of Grains

Type of Production	Area Cultivated Current (ha)	Proportion	Produtivity		I tan Period		Medium Period		Long Period	
			Short / Medium Periods	Long Period	Area (ha)	Production (t.)	Area (ha)	Production (t.)	Area (ha)	Production (t.)
Average of the Míni Produtores					10		20		30	
Average of the Small Producers					15		30		50	
Type of Product		.	.	.	14,959	.	29,918	.	47,606	.
Rice	14,825	5	2.4	4.0	7,480	17,951	14,959	35,902	23,803	95,212
Bean	2,340	1	1.5	2.4	1,496	2,244	2,992	4,488	4,761	11,425
Corn	15,985	2	5.0	7.0	2,992	14,959	5,984	29,918	9,521	66,648
Soybean	-	2	2.4	3.5	2,992	7,180	5,984	14,361	9,521	33,324
TOTAL	33,150	.	.	.	14,959	42,334	29,918	84,668	47,606	206,610

Regarding the cereal cultivated area, it is intended, at short term, to change the little developed practices for a more organized agriculture, with elements for the productivity increase, reducing the cultivated area in relation to current, but without the reduction of the production volume.

2) Techniques and Necessary Inputs

The details of the soybean and rice production is contained in the Introduction of Cereal Program item, being the productivity goal: 2.4 t/ha for the soybean and 5.0 t/ha for the corn.

As for the rice cultivation, they will be introduced the improved seeds from EMBRAPA that are presenting high productivity. It is due, however, to select the varieties considered own with base in the researches result done in the State by UNITINS, considering the goal of 2.4 t/ha. In the rotative cultivation with the soybean, the sowing should be made from middles of February to March, soon after the soybean crop in February, using a precocious varieties.

In the case of producing only the rice, it should be planted in November. As for the bean, an own species should be selected for area or a precocious variety, introduced by UNITINS, or still the new variety of EMBRAPA or of international seed producers.

As planting system, the soybean as of the rice, the sowing should be made soon after their harvest, with corn or "milheto" as safrinha (safrinha means planting done taking advantage of the rain time, just after the main crop production).

It expected to have an productivity increase for the Program quantitative goals are reached. For so much, it becomes necessary the technology extension to the producers, with the appropriate planting definition, the crop form, after the crop processing, among others.

However, for the mini and small producers the purchase of the items 1, 2 and 3, listed below with ends to increase the production will be difficult if done in an isolated way. This way, it suggests the inputs purchase in comomon as well as the equipments common use.

1. Fertilizers, defensive and products to the soils correction
2. Agricultural equipments (earth preparation, crop and pulverization)
3. Transport equipments

For the bean planting, it is planned the irrigation sytem adoption at the medium and long period, being considered that the system can get qualitative and quantitative improvement of the production. The irrigation system will be central pivot type, destined to the small producer with an irrigated area of 20 ha. It exists however, problems related with the existence or not of water sources and electric power provision. It is considered that at medium term 50% of the families and long term 100% of them are producing bean.

3) Cost of the Production

In the table to proceed, the necessary capital resources are presented for the cereal production:

Necessary capital resources (Annually)

	Arroz	Bean	Corn	Soybean	Total
Expected production (t/ha)	2.4	1.5	5.0	2.4	.
Total cost of the Planting (R$/ha)	482.4	858.6	423.4	478.8	.
Cost of the Inputs	234.0	502.1	264.3	295.0	.
Price of Market (R$/t.)	337.50	750.00	193.50	278.50	
Income (R$/ha)	810.00	1,125.00	967.50	668.40	
Balance between the Income and Expense (R$/ha)	328.03	266.45	544.10	190.10	
Area - (ha)	.	.	.	.	.
Short Period	7,480	1,496	2,992	2,992	14,959
Medium Period	14,959	2,992	5,984	5,984	29,918
Long Period	23,803	4,761	9,521	9,521	47,606
Capital Resources (R$ thousand)	.	.	.	.	.
Short Period	3,608	1,284	1,267	1,432	7,592
Medium Period	7,216	2,569	2,533	2,865	15,183
Long Period	11,483	4,087	4,031	4,559	24,160
Cost of the Inputs (R$ thousand)	.	.	.	.	.
Short Period	1,750	751	791	883	4,175
Medium Period	3,500	1,502	1,581	1,765	8,349
Long Period	5,570	2,390	2,516	2,809	13,285

The cereal section capital investment calculation was not made, being considered that will only be possible after the end of the medium period, with the increase of the area to be explored.

b. Fruits (Pineapple, Banana, Papaya, Passion fruit, Cashew, etc.)

1) Development of the Agricultural Practices

Regarding the fruits production, the planning was made with base in the demand projection, considering as main products the pineapple and the banana. The pineapple and the cashew can be produced in wide climbs, optimizing the use of the area where the soil is sandy.

The Quantitative Goals at the short and medium periods are presented in the table to proceed.

Production of Fruits Quantitative goals

Type of Production	Area Cultivated Current (ha)	Composition	Planned volume		Short Period		Medium Period		Long Period	
			Short and Medium Period	Long Period	Area (ha)	Production (t)	Area (ha)	Production (t)	Area (ha)	Production (t)
Average Producer Mini					0.4		0.8		1.2	
Average small Producer					0.6		1.2		2.0	
Type of Production		.	.	.	898	.	1,795	.	2,856	.
Pineapple	250	3	30.0	.	269	8,078	539	16,156	857	25,707
Banana		3	25.0	.	269	6,732	539	13,463	857	21,423
Passion fruit		2	12.0	.	180	2,154	359	4,308	571	6,855
Cashew		2	1.0	.	180	180	359	359	571	571

2. Techniques and Necessary Inputs

As for banana's production, the important point is as selecting the variety. In that sense, the variety was adopted with base in the results obtained by EMBRAPA of the Bahia State. Regarding the planting system, the culture introduction should be fomented associated with Cupuaçu and the Mogmo, in the form of an agriculture-forest activity. As for the pineapple, his production in wide climbs in the municipal district of Miracema of Tocantins generated a knowledge and accumulated experience about the production and commercialization, which should be taken advantage in his development at the Study area. The cashew, natural Brazil fruit, is quite abundant in the region because of the favorable climatic conditions for his growth. The cashew should be introduced through the graft system for the production precocity as well as for the quality improvement. Of the cashew, it should not take advantage only the chestnut, but also the pulp for production of natural juice. Basically, it is intended with the Plan to diversify the fruit varieties cultivated.
Regarding the irrigation facilities, necessary for production, a cost of R$ 4.000 was calculated by hectare. It will be necessary also for the production: fertilizers, defensive, inputs for the soil correction, planting techniques and handling, irrigation and processing facilities, distribution centers and other.

3. Cost of the Production

The necessary costs for the fruit production are presented to proceed:

Volume and Cost of the Production of Fruits

.	Pineapple	Banana	Passion fruit	Cashew	Total
Expected production (t/ha)	30	25	12	1.0	
Total cost of the Cultivation (R$/ha)	4,914	2,121	4,300	661	.
Cost of the Inputs (R$/ha)	3,401	1,386	2,626	397	.
Price of Market (R$/t.)	266	230	500	2,000	
Income (R$/ha)	8,000	5,750	6,000	2,000	
Balance of the Income and Expense (R$/ha)	3,086	3,629	1,699	1,337	
Area - (ha)	.	.	.	.	.
Short Period	269	269	180	180	898
Medium Period	539	539	359	359	1,795
Long Period	857	857	571	571	2,856
Resources of Capital (R$ thousand)	.	.	.	.	.
Short Period	1,323	571	772	119	2,785
Medium Period	2,646	1,142	1,544	237	5,570
Long Period	4,211	1,818	2,456	378	8,862
I cost of the Inputs (R$ thousand)	.	.	.	.	.
Short Period	916	373	471	71	1,832
Medium Period	1,832	746	943	143	3,663
Long Period	2,914	1,188	1,500	227	5,829

c. Vegetable (Industrial Tomato, Cassava).

1) Development of the Agricultural Practices

The cassava production was planned to assist the demand of starch and manioc flour factory, installed in the Araguaína municipal district and also to assist the demand of the swine production that should be developed in the area. The industrial tomato should be produced in a ray of 200 km around of Araguaína, considering that a tomato processing factory exists in the city industrial . The cassava should be produced in an area that makes possible the product transport in to 24 hours to the factory.

In the Extreme North Region, mainly in Araguatins, appropriate soils exist for the vegetable production. Therefore, the use of the area natural resources is recommended at long term, for the vegetable production. For this reason, also in Araguatins processing factories should be installed.

The table to proceed presents the vegetable production quantitative goals

Type of Cultivation	Current Cultivated area (ha)	Proportion	Productivity (t/ha)		Short Period		Medium Period		Long Period	
			Short and Medium Period	Long Period	Area (ha)	Production (t)	Area (ha)	Production (t)	Area (ha)	Production (t)
Micro Producer					1.6		3.2		4.8	
Small medium Producer					2.4		4.8		8.0	
Type Vegetable		.	.	.	5,984	.	11,967	.	19,042	.
Industrial tomato		1	60.0	.	598	35,902	1,197	71,803	1,904	114,254
Cassava	3,595	9	27.0	.	5,385	145,401	10,770	290,803	17,138	462,730
Total		.	.	.	5,984	181,303	11,967	362,606	19,042	576,985

2) Techniques and Necessary Inputs

For the industrial tomato, the variety VIRADORO should be adopted, indicated by EMBRAPA. This variety adapts to the all of the soil types since the correct handling is adopted. Therefore, to cultivate it is necessary the soil analysis accomplishment. For the medium and long period, the irrigation system should be adopted at drought time and, for occasion of the rains, a plastic covering should be used.

The cassava will be cultivated by the mini and small producers as in the current way.

The necessary elements for the cultivation of industrial tomato and cassava are the following ones.

- Machines and agricultural equipments (to the earth preparation, planting and pulverization);
- Transport vehicle;
- Fertilizers, defensive and materials for correction of the soil;
- Partial formation of agricultural area;
- Facilities for irrigation.

3) Cost of the Production

The vegetable production costs are presented to proceed:

	Tomato	Cassava	Total
Expected production (t/ha)	60	27	.
Total cost of the Cultivation (R$/ha)	5,122	1,109	.
Cost of the Inputs (R$/ha)	3,193	337	.
Market price (R$/t.)	100	80	
Income (R$/ha)	6,000	2,160	
Balance of the Income and Expense (R$/ha)	878	1,050	
Goal of the Area to Be planted	.	.	.
Short Period	598	5,385	5,984
Medium Period	1,197	10,770	11,967
Long Period	1,904	17,138	19,042
Resources of Capital (R$ thousand)	.	.	.
Short Period	3,065	5,972	9,037
Medium Period	6,130	11,944	18,074
Long Period	9,754	19,006	28,760
I cost of the Inputs (R$ thousand)	.	.	.
Short Period	1,911	1,815	3,725
Medium Period	3,821	3,630	7,451
Long Period	6,080	5,776	11,856

d. Livestock (production of bovine milk and bubalino)

The production of milk should be developed as the cattle section invigoration plan. Basically, the mini and small producers should produce the bovine and the buffalo milk. However, in general, the production of bovine should be substituted by the buffalos. The planning production at the short, medium and long periods are presented to proceed.

(head/ha)

	White	Short Period	Medium Period	Long Period
Traditional pasture (Small Producer)		0,7	1,2	1,5
Division of the Creation	Bovine milk	90%	60%	20%
	Milk Bubalino	10%	40%	80%
Improved pasture	Bovine milk	1,0	3,0	5,0

Obs.: The current average of the Animal Unit is of 0,40/ha.

(4) Agricultural Administration forms

The Agricultural Administration forms in the area should be developed with the cultivates previously mentioned according to the following combination:

Type - Cereal: Production of cereal + Cattle of milk (including the buffalos) + creation of swine

Type - Fruits: Production of fruits + Cattle of milk (including the buffalos) + creation of swine (optional)

Type - Vegetable: Production of Olerícolas + Cattle of milk (including the buffalos) + creation of swine (optional).

Basing on the medium area of the mini producers that is of 40 ha (3.386 families) and of the small producer of 160 ha (2.729 families), the medium area use of the earth plan will be made in the following way.

a. Type - Cereal

This form of agricultural administration has as objective to promote the rural family development with the cereals cultivation introduction and consequently their income increase, with an efficient administration through the agricultural machines and grocery stores community use. As final objective, for the mini producers should be established 30 ha of cultivation area and 10 ha of conservation and, for the small producers, inside of their 160 ha, 50 ha will be destined for the cultivation, 30 ha for pasture and 80 ha for the conservation.

The use of the earth plan for this type of agricultural administration will be in the following way.

Use of the Earth Plan Type - Cereal

	Mini Produtores (677 families)				Small Produtores (546 families)			
	Short	Medium	Long	Final	Short	Medium	Long	Final
Area (ha)	40	40	40	40	160	160	160	160
Cultivation of grains (ha)	10	20	30	30	15	30	50	50
Pasture area (ha)	25	12	0	0	130	100	65	30
Conservation area (ha)	5	8	10	10	15	30	45	80
Creation of livestock of milk (Heads)	15	8	0	0	82	72	20	9
Creation of buffalos (Heads)	3	5	20	20	13	40	52	70
Creation of Swine (Heads)	9	12	16	16	9	12	16	16

Obs 1: The livestock of the mini producers should be made in the confinement system through the pastures on production of grains area;

Obs 2: At the end, the creation of buffalos will be accomplished in extensive pastures or in areas for Silvi-pastoral activities. The mini producers should use the natural pastures and of areas of cereal planting for the creation of buffalos in confinement system.

b. Type - Fruits

This type of agricultural administration has as objective to promote the rural families development through the fruit cultivation introduction and consequently their income increase, making the fruit production and pasture combination. The use of the earth plan for this administration type is presented to proceed.

Use of the Earth Plan Tipo - Fruits

	Mini Producer (1,016 families)				Small Producer (819 families)			
	Short	Medium	Long	Final	Short	Medium	Long	Final
Area (ha)	40.0	40.0	40.0	40.0	160.0	160.0	160.0	160.0
Cultivation of fruits (ha)	0.5	1.0	1.5	1.5	1.0	1.5	2.0	2.0
Pasture area (ha)	34.5	31.0	28.5	18.5	144.0	128.5	113.0	78.0
Conservation area (ha)	5.0	8.0	10.0	20.0	15.0	30.0	45.0	80.0
Cattle of milk (heads)	22	22	8	8	90	90	30	20
Buffalos (heads)	3	15	34	34	16	62	136	156
Swine (heads)	9	12	16	16	9	12	16	16

Obs: The buffalos will be created in extensive pastures or in areas of Silvi-pastoral activity.

c. Type - Vegetable

This glides of agricultural administration has as objective to promote the mini and small producers families development, through the vegetable cultivation introduction and the consequently their income increase. The rotation of cultures should be accomplished to avoid the damages caused by the consecutive planting, being planted 8 ha all of the years. The areas that were cultivated should be used as pastures areas.

The use of the earth plan for this administration type is presented to proceed.

Use of the Earth Plan Type - Vegetable

	Mini Producer (1,693 families)				Small Producer (1,365 families)			
	Short	Medium	Long	Final	Short	Medium	Long	Final
Area (ha)	40.0	40.0	40.0	40.0	160.0	160.0	160.0	160.0
Olerícolas cultivation (ha)	1.6	3.2	5.0	5.0	2.5	5.0	8.0	8.0
Pasture area (ha)	33.4	28.8	25.0	15.0	142.5	125.0	97.0	72.0
Conservation area (ha)	5.0	8.0	10.0	20.0	15.0	30.0	45.0	80.0
Cattle milkman (heads)	22	22	8	8	90	90	30	20
Buffalos (heads)	3	14	30	30	15	60	116	120
Swine (heads)	9	12	16	16	9	12	16	16

Obs: The buffalos will be created in extensive pastures or in areas of Silvi-pastoral activity.

(5) Strategies for the Agricultural Administration Promotion

For the promotion of the current plan, it will be necessary the obtaining of resources (initial investment, land preparation, producers necessary infrastructure, agricultural machines, planting and transports credits), learning of the production techniques (on the agricultural promotion methods) and promotion of home-made industries for the product valorization.

Because of financial and technique information level of the area are incipient, in practice, the associations formation should be promoted in order to overcome the concerning difficulties to these subjects.

As for the technological qualification, the technological training should be promoted through the associations, once the learning at individual level would be very difficult. These measured will be implemented through the following activities to be promoted to reach, ultimately, the program final objective, that it is the regional agriculture invigoration.

- Reception of financial resources;
- Implementation of the associations activity invigoration program.

- Implementation of the producers training program.
- Implementation of the production promotion program.

a. Strategies for Reception of Financial Resources

The necessary credit for the producers to execute the agricultural promotion methods, it will be classified in investment funds and planting funds, being the necessary amount presented in the table as follows:

Necessary amount of Funds a year (1000 Real)

	Production of cereal	Production of fruit	Production of vegetable	Production of milk	Production of buffalos	Production of swine	Total
Producers (families)	1,223	1,835	3,058	6,115	6,115	4,500	6,115
Necessary resources (R$ thousand)	.	.	.	.	.	.	.
Short Period	-	-	-	824	4,000	14,000	18,824
Medium Period	-	-	-	9,558	21,350	8,000	38,908
Long Period	-	-	-	27,410	59,650	8,000	95,060

Obs: For the buffalos - to use the change system with the bovine ones.

It should be made the effort of creating a special investment line to be used by the producers. For the buffalos creation, the change system should be used, in order not overloading the demand of financial resources.

Annual Necessary resources for the Cultivation (R$ 1.000)

	Production of grains	Production of fruits	Production of vegetables	Production of milk	Production of buffalos	Production of swine	Total
Producers families)	1,223	1,835	3,058	6,115	6,115	4,500	6,115
Necessary resources	.	.	.	.	.	.	.
Short Period	7,592	2,785	9,037	-	-	917	20,330
Medium Period	15,183	5,570	18,074	-	-	1,284	40,111
Long Period	24,160	8,862	28,760	-	-	1,652	63,434
Costs of the Inputs	.	.	.	.	.	.	.
Short Period	4,175	1,832	3,725	-	-	-	9,732
Medium Period	8,349	3,663	7,451	-	-	-	19,463
Long Period	13,285	5,829	11,856	-	-	-	30,970

The producers credits acquisition should be obtained by the access of the Federal Government agricultural credits lines.

The resources reception plan at the short, medium and long periods will be defined as presented to proceed.

Short Period: Introduction of Federal Government existent credit lines use;

Medium and Long Period: Increase of production with the producer financial capacity and of the new financial resources reception increase.

b. Program of Associations Activities Invigoration

For the farmers (mini and small) their organization is an indispensable factor to make possible the cultivation techniques training, the financial resources reception, the agricultural machines and agricultural inputs acquisition, among others. Referred her importance increases excessively, in the Area of the Study, once most of these farmers has income equal or inferior to a minimum wage. In this sense this program, should be contributed to their organizations formation and invigoration for each agricultural product with the specialization level for activity.

Hereafter, the agricultural cooperatives formation should be promoted, as a result of the ripening and union of the several activities producers organizations. The authorized activities for the agricultural cooperatives are that related to the agricultural inputs collective acquisition, agricultural product processing, storage, commercialization, among others.

The organization of producers for activities exists in varied areas, as cereals, fruits, vegetables, milk and derived, cattle, swine, among others. Now the number prevails of cereals producer and of milk and flowed producers, and, the formation and organization for the product processing are moving forward on these last years. In the initial phase, therefore, it is necessary to give emphasis in the dairy products producer organization invigoration, counting with the demonstrative effect of them as association model, in order to motivate the organization of the other activities.

The producers organization invigoration should be promoted through the wide adoption of the participative model, in way that the person in charge for the promotion of the agricultural administration program together with the production nuclei assume the difusion function, in an exhibition process to the associates that it stimulates them to study the relative subjects carefully to the current situation and the municipal district farming tendencies, of the enterprises progress, of the commercialization and transport system. As starting point the information and the GIS data about the quality and adaptation of the lands should be made available so that they can think objectively with base in the recommendations about the use of the lands in each culture.

With base in the conjuncture evaluation result, the production plan elaboration should be promoted, that reflects the opinions of the organization or of their associates. In this case, it is necessary to accomplish a careful study the financing system invigoration and, mainly, on the loan payment plan. Besides, the efficiency increase should be promoted with the activities difusion to the producers, through the training with the associations formation advisors and production nuclei as well as the institution of the producer-of-contact (contact-farmer) besides the training multipliers that will make the information collection from the research institutions and to the reference producer, promoting, at the same time, the intensification and grouping of the production.

c. Training of Producers (Association activity, production, etc)

It should be accomplished for the mini and small producers, the training for the choice of the appropriate variety, production and of quality increase, handling, appropriate planting, mechanization promotion and of facilities, work efficiency and production improvement, soil appropriate handling and no use of burning, and other items, with the purpose of the administration through the learning of these techniques.

As it is financially difficult for the mini and small producers the individual acquisition of machines and facilities, it should promote the their colletive use, being shown in the figure to proceed:

Items for the training, machines and facilities for the collective use

Area	Training items	Machines and facilities for the collective use
Cultivation of Cereals	Method of use of agricultural machines Cultivation techniques Method of use of fertilizers and defensive agricultural Method for the prevention against the erosion of the soil	Tractor Trucks for transport Storage installation
Fruit	Recommended method of cultivation for culture Methods of selection of fruits and withdrawal of the	Trucks for transport Installation for the processing

	load Use method of defensive agricultural	Grocery store (preferably with cold storage facility)
Vegetable	 Cultivation techniques Use method of defensive agricultural	Trucks for transport Installation for the processing Grocery store
Production of milk (Included buffalos)	Processing method of derived of milk Commercialization method	Trucks for transport Cold store
Production of buffalo milk	Processing method of derived of milk Commercialization method	Trucks for transport Cold store
Swine	Creation technique Processing method of having flowed (ham, hotdogs, etc.)	Trucks for transport Cold store
Financing section	Access method to the financing Method of formulation of projects	
Administration of associations	Administration method and maintenance of the associations Administration method and accounting Method of collective administration of the use of machines	

d. Promotion of Administration (Production, Trade, Methods of use of Financings)

The current program consists in facilitating the agricultural financing transfer for the producers and also of the promotion of the invigoration measures of the home-made industry in order to increase the agricultural production joined value. With the introduction of such measures, it should be guided the producers in the sense of potentiating the Area of the Study peculiarities.

In this program, it should be implemented the organization programs and the producers training, as above mentioned, besides implementing the following plans for the production promotion so that in fact the implantation of the proposed agricultural administration method will be possible.

- Agricultural credit to the producer;
- Activation of the agricultural credit through Guarantee's Fund;
- Special support destined to the agricultural products processing industry with growth potential.

5.3.5 Production Drainage Plan

(1) Production volume

It is considered a great increase in the production volume for the agricultural activities execution. The production foreseen by the plan execution are presented in the picture below.

Production of the plan activities

	Atual (2000)	Short (2005)	Medium (2010)	Long (2015)
Related to the livestock	.	.	.	.
Meats anual production (t/ano)	73,379	103,564	172,287	250,067
Meats production volume for the milk cattle change to cut (t/ano)	14,246	18,142	16,294	3,712
Meats production volume for the change of the buffalos flock to cut (t/ano)	3	2,730	11,627	17,209
Meat production volume of swine (head/year)	0	121,077	605,385	1,210,770
Milk production volume (m3/year)	62,260	79,287	142,422	32,448
Buffalos milk production volume (m3/year)	31	29,430	125,353	185,532
Agricultural production	.	.	.	.
Soybean production (t/year)	0	65,396	325,193	646,812

Corn production (t/year)	.	53,067	275,163	569,981
Corn production (t/year)	17,469	17,951	35,902	95,212
Bean production (t/year)	829	2,244	4,488	11,425
Pineapple production (t/year)	5,167	8,078	16,156	25,707
Banana production (t/year)	0	6,732	13,463	21,423
Passion fruit production (t/year)	0	2,154	4,308	6,855
Cashew nut production (t/year)	0	180	359	571
Industrial tomato production (t/year)	0	35,902	71,803	114,254
Cassava production (t/year)	45,452	145,401	290,803	462,730

Obs: The colored parts correspond of the production for the medium and big producers

(2) Market

The main market places will be below defined as display the picture:

Main agricultural market places

	Market		
	Short 2005	Medium 2010	Long 2015
Soybean	Export	Export	Export
Corn	Regional provisioning establishment	Regional market; Northeast	Regional market; Northeast Export
Rice	Regional provisioning establisjment	Regional market	Regional market
Bean	Regional provisioning establishment	Regional market	Regional market
Fruits	Regional provisioning establishment; Market of Belém, São Luís; Center-west; Southeast.	Regional market; Market of Belém, São Luís; Center-west; Southeast.	Regional market; Market of Belém, São Luís; Center-west; Southeast; Export.
Vegetables	Regional market	Regional market	Regional market
Bovine meat	Regional provisioning establishment; Northeast.	Regional market; Southeast; Export.	Regional market; Southeast; Center-west; Export.
Milk	Regional market; Southeast	Regional market; Southeast	Regional market; Southeast
Derived products of the milk Cheeses	Regional market; Northeast; Southeast; Center-west	Regional market; Northeast; Southeast; Center-west;	Regional market; Northeast; Southeast; Center-west; Export (buffalo cheese)
Swine meat and yours derived	Regional market	Regional market	Regional market; Southeast

a. Soybean

The soybean production will be destined to the export market by the great companies as CEVAL and CARGIL, in form of grains or in oil from the Itaqui port, in São Luís. The infra structures for the soybean production drainage are being accomplished, as the silos, transport system for the railroad north-south and the Itaqui port facilities construction.

b. Corn

In the beginning, it should be marketed directly with destinies to the regional poultry integration and as animal feeding in the intensive livestock system. Hereafter they will be established the trade through cereal traders with the use of the transports systems for the Northeast provisioning. The corn will be a great potential product together with the soybean, produced with the culture rotation method.

c. Rice

The trade will be destined to supply where there are product deficiencies, as the regional internal market, the State and close areas. It is expected a great consumption demand increase hereafter in the Northeast market.

The associations and the small producers should market the production to middlemen, manufacture facilities destined to the market direct, big producers that possess industrial facilities for packing.

d. Bean

It should have as objective at the short period the internal market provisioning, and at the medium and long period, to destine the commercialization to the Northeastern market. The drainage should be accomplished by the intermediate companies.

e. Fruits

It should be installed distributions centers with the purpose of sending the production to the great consuming markets and to organize the products remittance in agreement with the qualitative and quantitative demands of each market.

f. Vegetables

All the production should be destined to the regional processing industries. The cassava production will be destined to the area flour factory and for animal feeding. For the production with industrial purpose, it should be made contracts with terms notifying the responsibility on each side, of the producer and of the industry respectively.

g. Bovine meat

As the production increase is waited hereafter, the trade at the short and medium period should be destined to the Northeastern market, and at the long period, reaching the condition of aftosa fever free area, it should be destined to the Southeast and export market.

The current slaughterhouse tax operation should be increased and it is necessary to establish a tax systems administration wich brings the meat derived products trade advantageous when compared with the trade of alive animal.

h. Milk

It should be destined to the internal trade and the exedente should be destined to the other areas of the State, Pará, Maranhão, Piauí and other Northeast States.

i. Buffalos product

The buffalos milk production should be destined for the production of mussarela cheese that is highly tasty and of high commercial value. The demand of the product is getting bigger in the country and also in the exterior, however for the regional trade will need advertisement program to increase the population product knowledgement

j. Swine

It possesses a regional and State market promissory hereafter. This is noticed by the high demand of the product by the low current index of regional consumption per capta of 4 kg/year, being the national average of 10.9 kg/year. It is sought at the short and medium period the regional internal provisioning, and at the long period to participate in the Belém and São Luís markets.

(3) Transport methods and Route

a. External market

1) soybean

The transport from North producing area to Porto Franco in the State of Maranhão will be by road, where there are CEVAL and CARGIL multimodal patio facilities to storage , and through north-south railroad until the Itaqui port in São Luís, and than exported to the international market.

For Extreme-north's production, road transport should be used up to Imperatriz city (Maranhão State) and later through railroad until the Itaqui port.

The costs for the transport of 1 ton to the port of Itaqui are: R$ 69.21 from Araguaína, R$ 64.09 from Araguatins and R$ 64.19 fromTocantinópolis.

2) corn, Fruits and Bovine Meat

The transport methods and the route will be same as the soybean.

For fruits and fresh meats, it will be necessary the transport in refrigerating containers and also of refrigerating facilities among the producing area until the port.

The transport costs to the port of Itaqui for the corn are same as soybean, however for the pineapple it will be of R$ 772.07/ton from Araguaína and R$ 760.33/ton from Araguatins. For the meat it will be R$ 377.39/ton from Araguaína.

b. Internal market

The transport to the internal market will be mainly by road. The costs of this will half be willing in the" Graph of distances of shorter routes from producing area to the consuming market or distribution centers (Un. km) for the ideal conditions of the transport general cost", that it is in elaboration phase.

5.3.6 Agricultural products industrial processing activity development plan

(1) cereals

As there was a quick increase of the demand in the international market of the soybean meal, it should activate the implantation of an oil industry in São Luís in the Maranhão State. This industry will possess a scale warranty, or be matter readiness excels with production originating from other producing areas like Mato Grosso and Goiás by fluvial transport through the Araguaia river.

The production of soybean meal originating from oil extration, corn, bone flour and rice meal, it will open the economical possibility to install the animal food factory to the poultry integration plan in Aguiarnópolis and Porto National municipal districts.

(2) Fruits cultivation

For the great distance that separates the Area of the Study to the Southeast where is the largest consuming market, it is noticed that hereafter will be better the fruit industrialization, because it will facilitate the handling and it will increase the product validity time. To the other side, as there is a tropical fruits demand increase in the external market, it rises the economical possibility of installation of juices and pulps industries.

The pulp will be destined to the market of the Northeast Area, Southeast and for export.

Item	Crop time	Production for processing		
		Short	Medium	Long
Pineapple	Dez/maio	1,200 t	2,200 t	4,000 t
Passion fruit	Jan/Set	2,000 t	4,000 t	7,000 t
Cashew nut	Out/mar	4,000 t	7,000 t	11,000 t
Other fruits		2,000 t	5,000 t	10,000 t
Total		9,200 t	18,200 t	32,000 t
Capacity of the necessary installation		3t/h	6t/h	10t/h
Capital.Un.R $.			600,000	1,000,000

Obs: Pineapple/ papaya 15%, passion fruit-50% of the production for processing ends, cashew nut 100%, other-as the mango and acerola. Included the native fruits of the area. Necessary costs for investment-cost of machines

The pressuposition of the fruit production in close lands of area where the facilities of small industries are foreseen, and also close to the railroad north-south in Babaçulândia where there are plans of installation of an industry of medium load, foreseeing that the close municipal districts of this industry, Araguaína, Philadelphia and Babaçulândia will be the largest producing areas.

(3) vegetables

a. Tomato Processing Industry (CPV) Cooperative of Vegetable Production of Araguaína

All the production of industrial tomato should be destined for this industry that is located in the Araguaina municipal district industrial area, and it possesses a capacity of industrialization of 12t/h.

The production increase is waited in the Região Extremo-Norte through the agricultural diversification implementation. Therefore the construction of processing industries in the municipal districts of Araguatins is expected. The products will be marketed at places like Belém, São Luís and Teresina. It is necessary the investment of R$ 1 million to the construction of a tomato processing industry.

b. Cassava factory

It is considered the increase of the cassava production from the small and medium producer, being the production destined for the flour production and also as animal feeding.

It is expected the lack of the product in the market destined to the animal feeding at the short and medium period, therefore it will be necessary for the cattle producers to find other way to guarantee the animal feeding in the drought period. At the long period however it will be necessary the construction of new factory.

The manioc flour is a product wich also is possible to export. Because of the logistic advantage of Tocantins for export it should in the future to take the advantage of this market.

b. Babaçu Palm heart

For the increase of the production of the babaçu palm heart is waited in the Região Extreme-North. It should be made the production combining with the control of trees number, and like this conserving them.

(4) Other Livestock Derived Products

As other derived product can mention the leather, where there is a factory in Wanderlândia. His production is destined to the regional internal market. For the raw material increment is waited by the bovine production increase, however it will need great investments in the

facilities for the chemical products used in row leather treatment. Therefore the establishment of a subsidy system is necessary. Other products, as the bone and the blood will be used in the animal food factory.

a. Milk Derived Products

1) Production in small climbs

With the objective of buffalos products value increasing, the micro and small producers should produce ice creams, cheeses, yogurt and other products to the local market.

2) Production in industrial scale

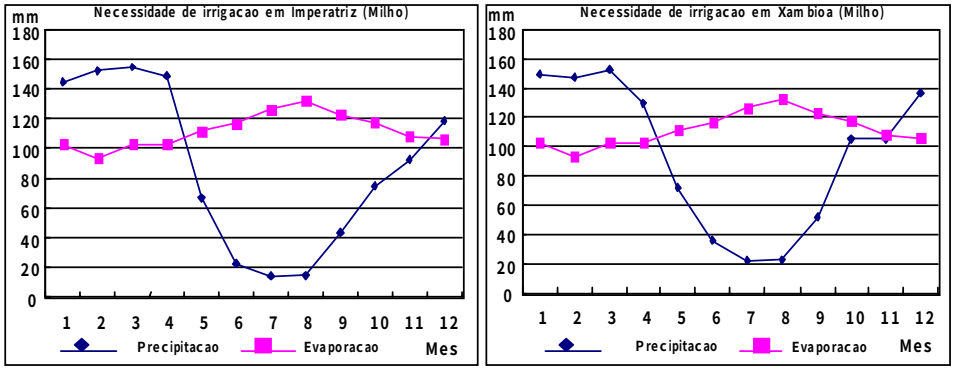
Established the production in great scales for the medium and big dairy products processing plant implantation with the Federal Government's approval, it is establisheb the base for export and the sale in other States. It also supposes the entrance of great companies with the buffalos milk production increase.

Irrigation Plan

The current activity plan to the farming has as objective the production increase through the diversification, being the main cultures for this purpose the cereals (soybean, corn, rice), fruits (pineapple, banana, papaya papaya, passion fruit and cashew nut) and vegetables (industrial tomato and cassava). The main method for the production will be with natural climatic conditions. Also the irrigation use are planned for the production of fruits and vegetables in small areas because of their high markups.

(1) Irrigation need

It is noticed the cultivation possibility in natural conditions from November to April, comparing the amount of precipitation rate and of evaporation. From May to October the precipitation level is scarce, being the most rigorous from June to September.



Analising the cultures characteristics that it will be introduced in the area, the base for the irrigation introduction will be in the following way:

- Not to introduce the overhead irrigation in the cereal cultivation of the medium and big producers
- With the objective of increasing the bean production, the irrigation should be introduced in 50% to the medium period and 100% to the long period.
- The irrigation won't be introduced for the pineapple cultivation, cashew nut and cassava
- The irrigation will be introduced at the initial stage for banana's, passion fruit and industrial tomato cultivations. As method, at short term, should be for furrows for all of the cultures, medium term it will be for micro-aspersion for banana's cultures and passion fruit and for the

tomato it will be for furrows.

(2) Irrigation area

The areas that will be irrigated in the production by the diversification will be the following ones:

Irrigated area (for periods)	Short (2005)	Medium (2010)	Long (2015)
Micro and small producers	.	.	
Planted area of bean (ha/ano)	-	Aspersão.1,446	Aspersão.4,761
Planted area of banana (ha/ano)	Sulcos.269	Personal computer-aspersores.539	Personal computer-aspersores.857
Planted area of Passion fruit (ha/ano)	Sulcos.180	Personal computer-aspersores.359	Personal computer-aspersores.571
Planted area of tomato industrial (ha/ano)	Sulcos.598	Sulcos.1,197	Sulcos.1,904
Area irrigated by aspersion (ha)	0	1,446	4,761
Area irrigated for micro-aspersores (ha)	.	898	1,428
Area irrigated for furrows (ha)	1,047	1,197	1,904

(3) Necessary Capital for the overhead irrigation installation

It should be used agricultural financings by the producers for the overhead irrigation installation.

The costs for the installation are presented in the picture below:

Costs for the irrigation system installation (R$ 1000)

	Short	Medium	Long	Total
Irrigation for aspersion (R$2,000/ha)	0	2,892	6,630	9,522
Irrigation for micro-aspersores (R$3,000/ha)	0	2,694	1,590	4,284
Irrigation for furrows (R$1,000/ha)	1,047	150	707	1,904
Total	1,047	5,736	8,927	15,710

5.4 Programs Directly Related to the Government

5.4.1 Summary

The execution and promotion of activities related to agriculture and livestock husbandry shall increase the production volume and commercialization and thus the immediate preparation and maintenance in good conditions of the roads network aiming at reducing transportation costs and at preventing the losses and damages to the production is extremely important. Similarly, the rural electrification for the improvement of rural producers lives' conditions is vital. Currently, the Tocantins state rural electrification program – PERTINS – is being carried out, and the continuation of this program is extremely important for the total electrification of all rural properties in the region.

On the other hand, new administration and management methods shall be introduced in the region, thus the promotion of production techniques and assistance to producers is vital. The governmental agencies responsible for technical assistance shall be strengthened, allowing a step by step development together with the producers.

The present program consists in the elaboration and promotion of the region's agricultural development foundation, and the State government is the responsible for the execution of this activity. This program contents is presented as follows.

- Programs of infrastructure and production commercialization ways improvement;
- Programs related to technical assistance.

5.4.2 Programs of Infrastructure and Production Commercialization Ways Improvement

(1) Rural Electrification

Currently, the Tocantins Rural Electrification Program (PERTINS) is being carried out with a financing obtained with the JBIC, of 100 millions of US dollars, by the State Government, with the target of electrification of 19 thousand rural properties until October 2002.

Thus, at medium and long terms, the electrification of all rural properties until de year 2015 shall be carried out.

The costs of necessary facilities at medium and long terms are presented in the following table:

Item	Medium (2005-2010)	Long (2010-2015)	Total
Electric cable 34.5 kV (km)	170	170	340
Transformer (Unit)	2,200	2,200	4,400
Electric cables 13.8 and 34.5 kV (km)	4,400	4,400	8,800
Costs (Thousand US$)	11,550	11,550	23,100

(2) Rural Roads

The present conditions of roads are presented in Figure 5.3.7. The federal roads are almost completely paved while most of the state and municipal roads are not. The present plan aims at long term at least the general paving of state roads.

Together with the roads which are being paved at present, we can observe the paving plan, at medium term, in Figure 5.3.7-2. The plan foresees an extension of 689.2km of roads, and a cost of 20 millions of Reais.

At long term, the total paving of 323.4km of roads connecting all the municipal districts is expected, with a cost of 90 millions of Reais.

There is also the problem of paving the roads near the Apinayé indigenous land due to the fact that the indigenous people are against this work, thus being necessary to change some stretches connected to the BR-230.

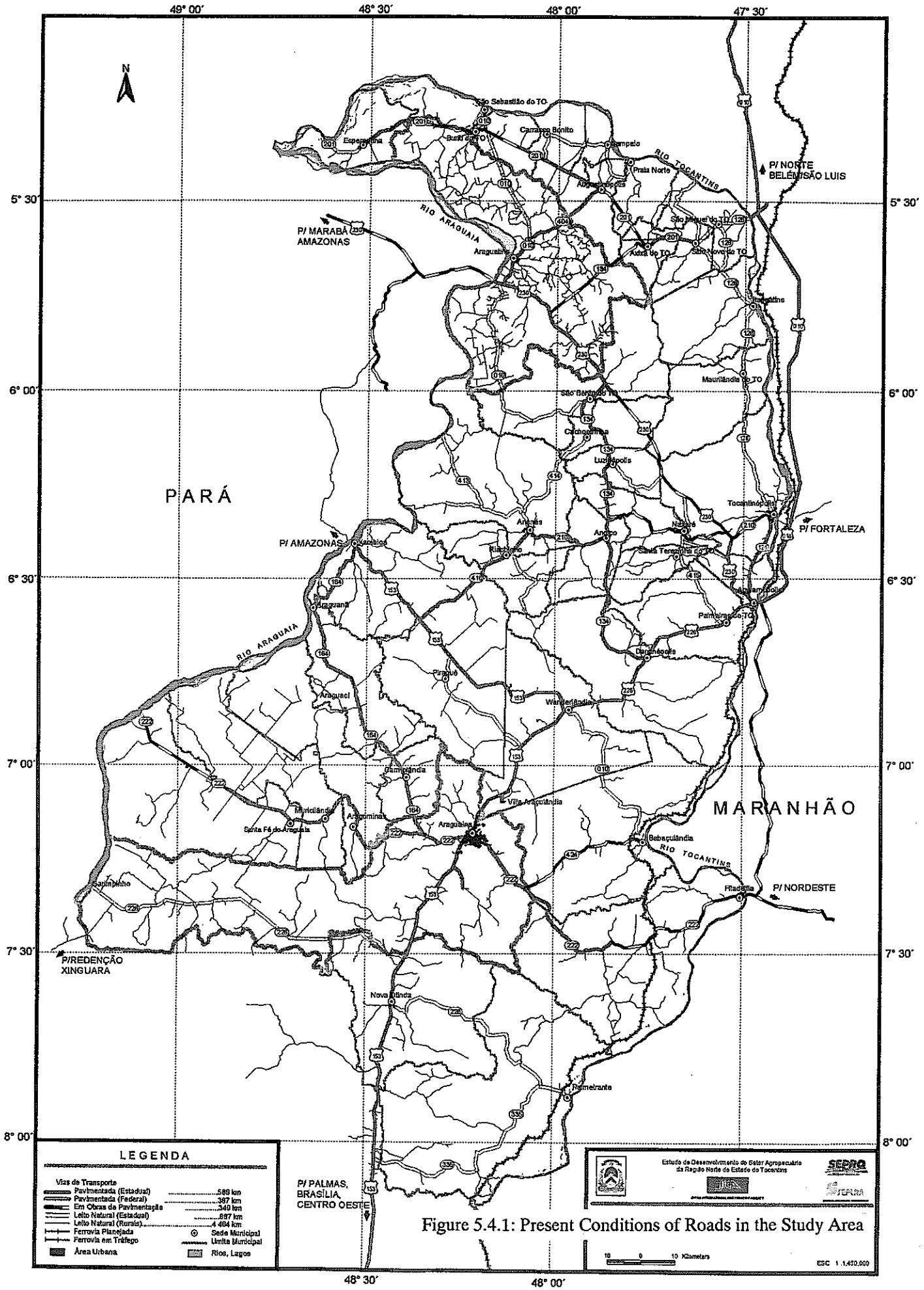


Figure 5.4.1: Present Conditions of Roads in the Study Area

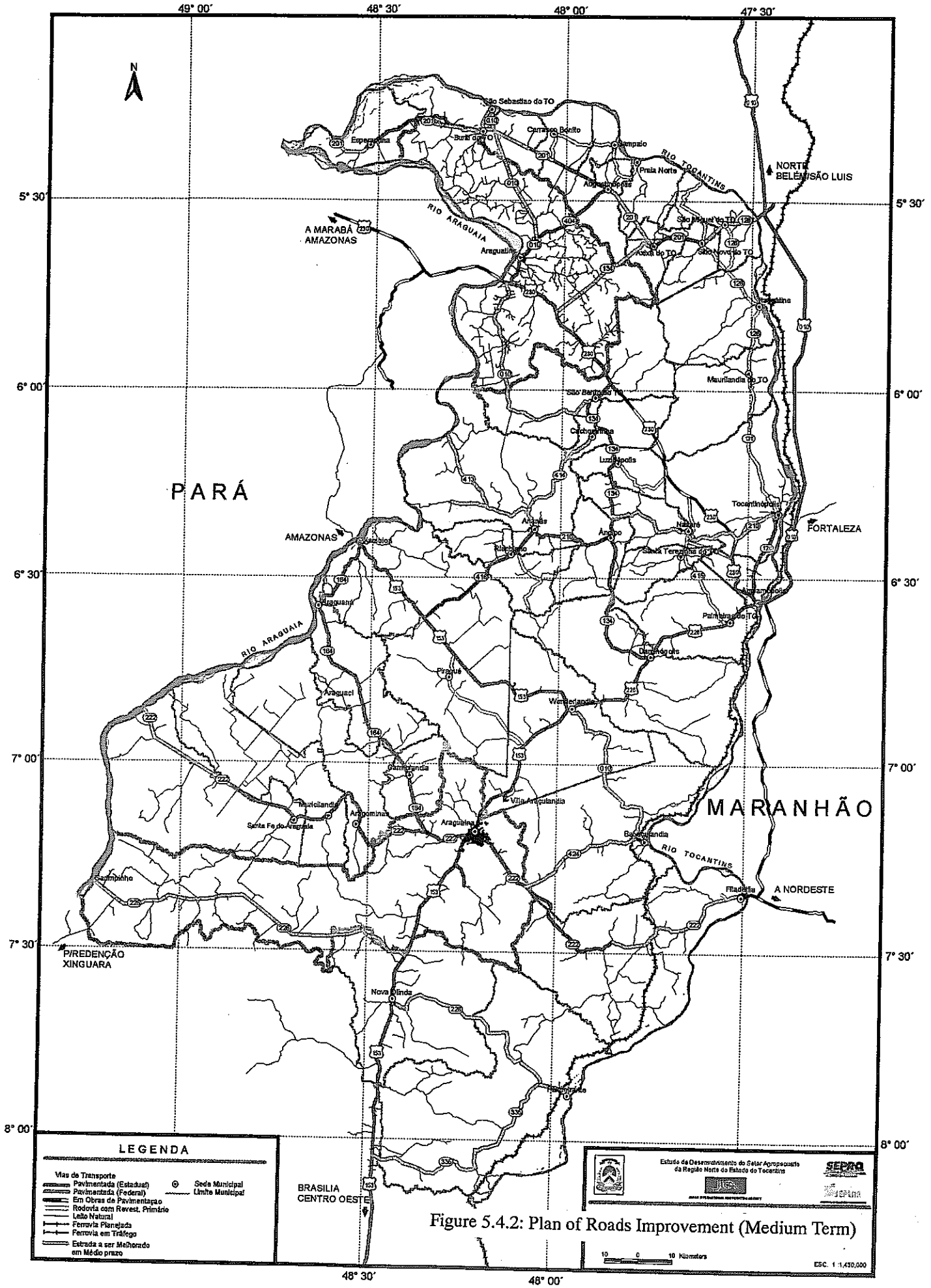


Figure 5.4.2: Plan of Roads Improvement (Medium Term)

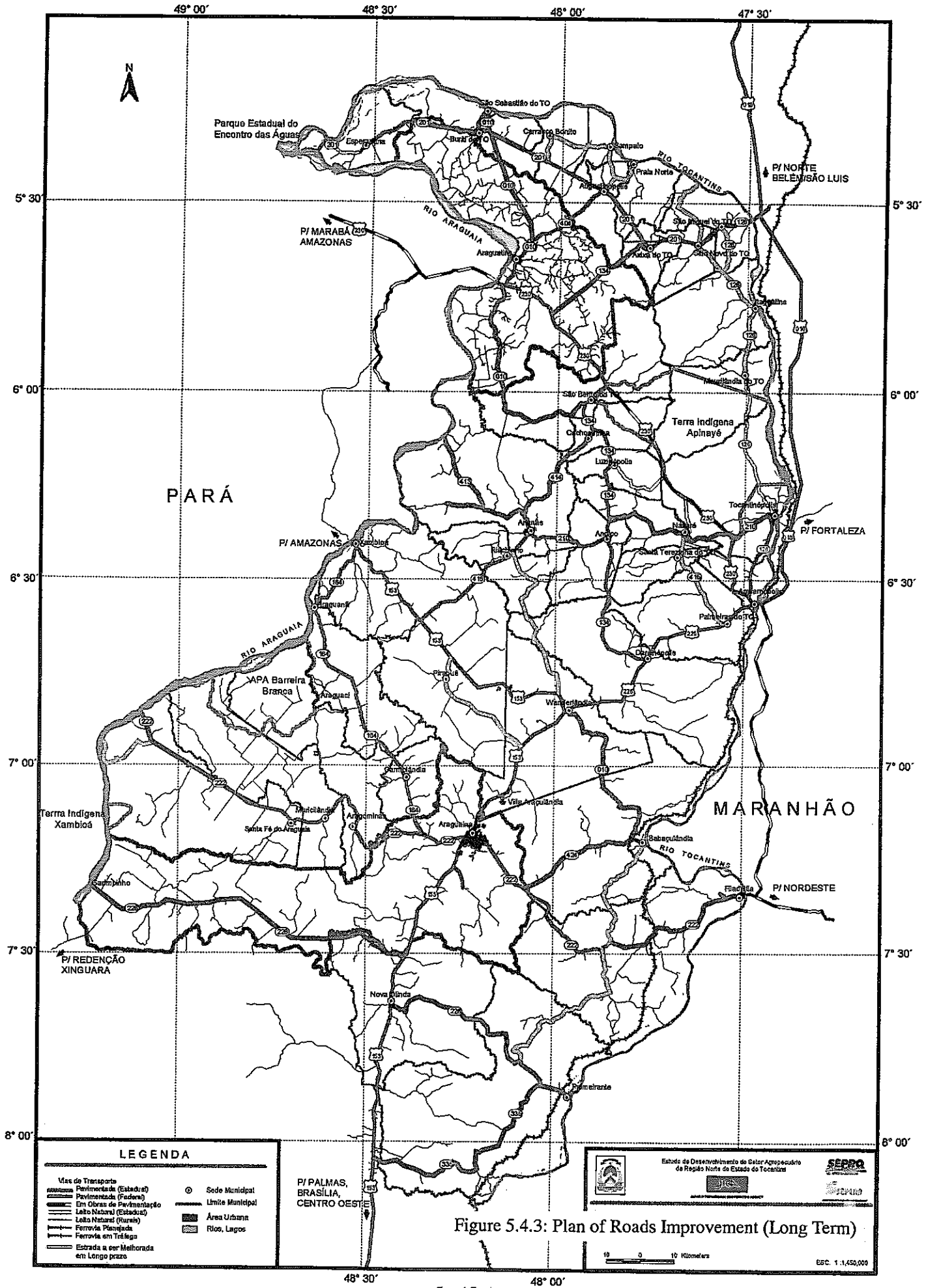


Figure 5.4.3: Plan of Roads Improvement (Long Term)

(3) Storage Structures (Silos)

Plans for the construction of drying, storage and distribution facilities are being elaborated by companies such as CARGIL and CEVAL, in strategic points of the north-south railway. Therefore, the probability of construction of similar facilities by these companies are high since there is the increase of grains production in the region.

The execution of the present plan shall start the grains production. However, since at the initial stage no private sector investment will be made, the State shall provide the support for the construction of these drying and storage facilities (silos). These facilities shall be small-scale ones due to the fact that the initial production volume shall be small. At medium and long terms, with the increase of production, there will probably be private companies investment, sufficient for storage. The construction of the first facilities shall be carried out in Araguaína, where the highest production is expected.

Silos Size and Installation Cost

Year	Production t	Storage Capacity	Investment Plan	Set	Pre-cleaning	Dryer	Silo 3000 t	Silo 6000 t	Cost/year Investment	Cost/ Accumulated Total
2005	65,000			1	2	1	2	1		
2010	370,000	12,000	4%	1	2	1	2	1	1,200,000	1,200,000
2015	850,000	30,000	5%	1	2	2	2	4	1,800,000	3,000,000

Remark: Investment value (R$ 1.00)

These values include the basic construction costs (silos foundation, offices, measurement machines).

5.4.3 Program of Technical Support

The technical support program is one of the political programs under direct control of the State Government necessary to carry out successfully the project through the extension of new technologies of agriculture and animal husbandry for farmers. The program consists of the following five sub-programs.

- Establishment of the model farms and the practical demonstration committee to spread the new technologies for farmers.
- Strengthening of RURALTINS.
- Strengthening of technical extension of livestock farming.
- Strengthening of research of agriculture and animal husbandry.
- Support system on organization of small-scale farmers.

(1) Establishment of Model Farms

The most effective method for the extension of modern technologies is the practical demonstration, by which the inexperienced farmers can verify directly the new technologies. The model farms in the Study Area are selected from the farmers' properties, which farmers are eager and able to introduce the new technologies. To guarantee the project success, the model farms shall be supported with finance, farming materials and technical advice. The model farms are classified into the following types.

- Rotation farming : introduction of grains cultivation and intensive livestock farming
- Integrated farming I (grains cultivation and raising buffaloes and swine)
- Integrated farming II (fruits cultivation and raising buffaloes and swine)
- Integrated farming III (*mandioca* cultivation and raising buffaloes and swine)

The model farms of the rotation farming type for the medium and large-scale farmers are supported specially with the technical advice of the Practical Demonstration Executive Committee, which consists of the secretary of SAG of the State as the chairman, EMBRAPA, RURALTINS, ADAPEC, companies and groups, and other specialists. On the other hand, other types' farms are supported with technical advice of the local progressive farmers, local specialists of each technology, RURALTINS, ADAPEC, etc. The consultant companies assist suitably with management of the model farms.

These activities of technical advice and assistance are carried out under the management of the Regional Development Committee.

1) Types of Model Farms

Rotation farming: introduction of grains cultivation and intensive livestock farming (medium and large-scale farms)

The farms are established to demonstrate the methods of grains cultivation and intensive livestock farming in the large-scale farms through the rotation farming method, in which grains cultivation for several years is introduced in degraded pasture and then the intensive livestock farming is carried out in the renewed pasture. The model farms are selected from farms, which are over 1,600 ha and have a good condition of access. The items of demonstration in the farms are as follows.

- Methods of land use (rotation of grains and pasture)
- Technologies of soil improvement and grains cultivation
- Methods of mechanization of grains cultivation and maintenance and repair of farm machines
- Technologies of renewal of pasture and use of improved pasture
- Cultivation method of complementary fodder in dry season
- Methods of silage production and use
- Method of rotational grazing and feedlot
- Methods of castration in early stage and dehorning

Integrated Farming I (grains cultivation and raising buffaloes and swine)

The farms are established to demonstrate the methods of integrated farming of grains cultivation and raising buffaloes and swine in the mini and small-scale farms. The items of demonstration in the farms are as follows.

- Methods of introduction of grains cultivation and land use
- Technologies of grains cultivation and use of crop residues
- Raising methods of buffaloes and swine (preparation of feed, raising techniques, etc.)
- Cultivation method of sugar cane as complementary fodder in dry season
- Methods of use of soiling forage crops and chopper
- Methods of change from grazing to zero-grazing and construction of simple cow shed

Integrated Farming II (fruits cultivation and raising buffaloes and swine)

The farms are established to demonstrate the methods of integrated farming of fruits cultivation and raising buffaloes and swine in the mini and small-scale farms. The items of demonstration in the farms are as follows.

- Technologies of fruits cultivation
- Spraying techniques of chemicals and fertilization methods
- Technologies of harvest and post-harvest of fruits
- Land use methods, especially land use to raise buffaloes
- Use of fruit residues as fodder
- Methods of swine raising and production of organic fertilizer
- Cultivation method of sugar cane as complementary fodder in dry season
- Method of rotational grazing and feedlot
- Technologies of dairy products production

Integrated Farming III (*mandioca* cultivation and raising buffaloes and swine)

The farms are established to demonstrate the methods of integrated farming of *mandioca* cultivation and raising buffaloes and swine in the mini and small-scale farms. The items of demonstration in the farms are as follows.

- Technologies of *mandioca* cultivation
- Method of land use
- Methods of swine raising and production of organic fertilizer
- Construction methods of pigsty
- Technologies of use of *mandioca* as fodder
- Technologies of dairy products production and use of residues
- Method of rotational grazing and feedlot

2) Locations and Number of Model Farms

In case of the rotation farming type, six model farms are located at places that have a high potential for grains cultivation, and two farms are located at the Tocantins basin and the Araguaia basin in order to spread the rotation farming in the whole northern region. On the other hand, in case of the integrated farming types, one demonstration farm is established in each municipal district, and 38 farms are established in total in the northern region. Each municipal development committee decides the type of the model farm under the coordination of the regional development committee. The number of farms is shown in the following table.

Model farms	Planned number
Rotation farming type	10
Integrated farming I (grain, buffaloes, swine)	18
Integrated farming II (fruits, buffaloes, swine)	8
Integrated farming III (mandioca, buffaloes, swine)	12
Total	48

3) Management

The farmer manages the model farm in cooperation with the demonstration committee, RURALTINS, ADAPEC and the Consultants Company. The farmer supplies his land, technologies and funds to carry out the production in the model farm, and the demonstration committee, RURALTINS, ADAPEC supply the production technologies without charge. The Consultants Company supports the farmer on his land use, management of his farming and obtaining of financing. The role of each participant in the management of the farm is shown in the following table.

Participants	Role of participants
Farmer	♦ Carrying out production, providing funds ♦ Demonstrating the farming methods
Demonstration Committee	♦ Technical support of farming
RURALTINS	♦ Technical support of farming ♦ Technical support of home manufacturing ♦ Supporting the application of financing
ADAPEC	♦ Technical support of livestock farming ♦ Supporting the application of financing
Municipal Development Committee	♦ Guarantee of security for financing from banks ♦ Supporting in procedures of financing from banks ♦ Suggesting on farmers' land use ♦ Filling for cost of technical support (2% of financing) ♦ Bearing consultants charge
Consultants company	♦ Presenting the farmer's land use ♦ Executing the farming plan ♦ Executing the integrated farming plan and supporting in procedures of financing from banks ♦ Coordination among RURALTINS/ADAPEC/Municipal Development Committee

The cost of the technical support for the model farms, which corresponds to 2% of financing, is borne by the development fund while the model farm is approved.

4) Cost of the Program

The program is enforced until 2010 when the farming technologies are supposed to be acquired by the farmers. The implementation cost of the program is shown in the following table.

Cost of Program Implementation of Model Farms (Unit; R$ 1,000)

Items	Cost			
	Short term	Medium term	Long term	Sum
Model farms (48)				
Demonstration Committee	450	650	-	1,100
Engineers of RURALTINS and ADAPEC	5,886	9,910	-	15,796
Personnel expenses of consultants	432	720	-	1,152
Purchase cost of vehicles	600	0	-	600
Miscellaneous expenses (10% of total)	677	1,128	0	1,805
Sum	8,045	12,408	0	20,453

(2) Strengthening of Technical Extension (Strengthening of RURALTINS)

The activities of technical extension of RURALTINS are very important to achieve a great success of the project. Therefore, RURALTINS should assign its excellent technical staff to the Study Area, and should train the staff to raise specialists or employ specialists, who are few in some technical fields. Besides, RURALTINS should introduce new technologies with assistance of UEP and UNITINS, and should carry out the extension activities, especially in cooperation with ADAPEC in the field of livestock farming.

The northern region development committee should advise suitably about the strengthening of RURATINS and should support some budget, including improvement of staff's conditions and training.

1) Strengthening of RURALTINS

The plan of RURALTINS staff strengthening and of the improvement of extension activities is presented as follows.

a. Training of staff as specialists

- The information system should urgently be established by connecting the headquarters and the local offices through a network and by unifying the information items.
- RURALTINS should make good use of the specialists abilities, those who live in the Study Area. For this purpose, the local offices of RURALTINS should list up and file in computers excellent farmers and associations and these specialists, such as retired scientists of EMBRAPA, universities and technological schools, or the specialists of private companies.
- RURALTINS should train the staff as specialists. The specialists of each field, such as mechanized cultivation of grains, pasture management, soil management, plant disease control, plant insects control, beef cattle, dairy cattle, swine raising, fruits, vegetables, silviculture and environmental conservation, should be assigned to the regional offices of Araguaína and Araguatins.
- The extension activities of the RURALTINS specialists should target not only the small-scale farmers and INCRA settlers, but also the medium- and large-scale farmers as well.

b. Improvement of extension methodologies

- As the measures to meet the problem of insufficient staff, RURALTINS should consider to get the advanced farmers to help extension activities as the contact farmers.
- The effective method for the extension is not only the available audiovisual resources, such as picture, cinema, video, puppet show, etc., but also demonstration activities in which farmers take part.
- RURALTINS should arrange the study tour of advanced farming, through collection and management on the information of the advanced farming cases.
- Local offices of RURALTINS should function as the center of local information, such as fluctuated market prices of products and farm materials, new technologies, etc. RURALTINS should plan to promote the exchange of information and opinions about the present conditions of associations among them to activate their activity.
- RURALTINS should carry out sufficient explanation of the financing system, providing rapid information of progress and guidance to effective financing, and should train associations to enable active management with self-sufficiency.
- RURALTINS should support the model-associations in selecting the association, planning of farming, planning of financing, planning of marketing to activate the model-associations.

2) Cost of RURALTINS Strengthening

Cost of RURALTINS strengthening is shown in the following table.

Cost of RURALTINS Strengthening (Unit; R$ 1,000)

Items	Cost			
	Short term	Medium term	Long term	Sum
Improvement of local offices	7,600	7,600	7,600	22,800
Listing up specialists	380	380	380	1,140
Training staff as specialists	150	250	0	400
Training of contact farmers	190	0	0	190
Demonstration of farming techniques	1,056	2,640	0	3,696
Improvement of information system	380	380	380	1,140
Training for farmers	1,320	3,300	0	4,620
Miscellaneous (30% of total)	3,323	4,365	2,508	10,196
Total	14,399	18,915	10,868	44,182

(3) Strengthening of Livestock Husbandry Techniques and their promotion (ADAPEC Strengthening)

The strengthening of livestock husbandry guidance and the establishment of a joint work with RURALTINS is very important. Currently, the vaccination against FMD was finished and thus the technicians involved in that activity can be trained in new activities which shall be introduced such as swine and bubaline cattle husbandry.

The ADAPEC works are related to the promotion of livestock improvement techniques, and: 1) Without methods against animal diseases, the establishment of an efficient livestock husbandry is not possible; 2) The ADAPEC technical staff has a great direct contact with the producers; 3) ADAPEC has a large number of vehicles for locomotion; 4) It also has a large number of veterinarians; and 5) ADAPEC has local offices in all municipal districts.

a. Contents of the Livestock Husbandry Techniques Promotion

The technical assistance contents shall be as follows: measures against diseases, raising methods, examination of diseases signs, artificial insemination, dehorning, and castration. Each veterinary shall be in charge of the guidance on his/her specialty. The training of specialists shall be carried out at EAFA and at the farms, with advanced techniques brought from the south or southeast regions of the Country, in short term courses (3~4 months). The following, the transference of technology to farmers shall be carried out.

The specialist shall be in charge of elaborating the cattle raisers training plan, among others, in giving guidance to the livestock processing industries, to new veterinarians and livestock industries. He shall specially get to know swine and bubaline cattle husbandry techniques, considering EAFA the main location for training.

Execution of campaigns (6 themes, 38 municipal districts);
Execution of technical guidance (6 animal species, 38 municipal districts);
Formation of specialists (3 months a year, about 6 persons);
Training for swine and bubaline cattle husbandry.

b. Costs for ADAPEC Strengthening

The necessary costs for the strengthening of livestock husbandry techniques are presented as follows:

Item	Costs			
	Short	Medium	Long	Total
Execution of campaigns (6 themes)	3,800	3,800	3,800	11,400
Execution of technical guidance	7,600	7,600	7,600	22,800
Formation of specialists	180	360	720	1,260
Training in swine and bubaline cattle husbandry	250	250	0	500
Others (30% of the above value)	3,549	3,603	3,636	10,788
Total	15,379	15,613	15,756	46,748

(4) Strengthening of Research System of Agriculture and Livestock Husbandry

1) Strengthening of Research System

UEP (Unidade de Execução de Pesquisa e Desenvolvimento do Tocantins) which is the first branch of EMBRAPA Cerrado (CPAC) was established at Palmas in July 2000. UEP consists of 4 departments responsible for grains, stockbreeding (meet and milk cattle), fruits and soil. State and UNITINS staff members will be engaged in as counterparts of CPAC researchers.

At the initial stage, one researcher is allocated for each department, and the construction of building facilities will be started in UNITINS, Palmas, on September 2000. UEP's activity is the extension of EMBRAPA's basic research to farmers and the development of applied techniques. Research on agriculture and livestock farming will thus be started in Tocantins mainly carried out by the UEP from now on.

2) Urgent Technological Research Tasks in the Study Area

The results of research on Cerrado by CPAC and the results of the project-type technical cooperation by the Japanese team shall be effectively utilized. As an extension of the research activities, the application of sustainable agriculture technique, which is appropriate to the Tocantins conditions, shall be carried out taking into consideration the environmental conservation. UEP shall act as the leading agency for the development of useful planning and promotion techniques.

All the results so far obtained are the basic research on experimental level. New techniques to be applied in the general management scale shall be developed under this program.

The research on applied technology and the experiments for verification shall be performed not only at the UEP farm in Palmas but also at the veterinary faculty farm of UNITINS in Araguaína. UEP shall collaborate with the UNITINS veterinary faculty on the research of crop rotation (including grains production), livestock breeding and raising. On the other hand, the research on applied techniques for grains and fruits is proposed to be carried out at the UEP farm located in Palmas. The contents of technical development and experiments for verification are as follows.

1) Development of Environmental Monitoring Technique

- Measurement and evaluation of the impacts of agriculture and stockbreeding on natural environment (soil, rivers, air, etc.);
- Experiment and evaluation of forest conservation methods;
- Experiment and evaluation of soil conservation methods.

2) Technical Development for Sustainable Agriculture and Stock Farming

- Rotation farming (renewal period, fertilization system, cultivation method, farming practice) and evaluation from the viewpoint of soil conservation, especially clarifying the causes of the low yield in the first year of grain cultivation and the countermeasures, and reducing cost of soil improvement;
- Evaluation of non-tillage cultivation technique in large-scale farms;
- Effective mechanized cultivation method of ground cover plants (including selection of varieties) and management;
- Selection of varieties for grains, vegetables and fruits considering their practical use;
- Selection of grasses for grazing, breeding and cultivation method against erosion;
- Improvement of mechanized cultivation method and establishment of mechanized system;
- Development of farm designing based on the environmental conservation and designing method of farm management planning.