

## **(2) Modernization of Livestock Sector**

In agriculture sector, the livestock sub-sector in Tocantins has been considerably growing and has contributed to the state's economy. To promote modernization of livestock industry and improvement in livestock productivity, establishment of Foot and Mouth Disease (FMD) free zone and strengthening of animal health status are essential.

The strategy for developing each sub-sector within livestock modernization approach should be carried out as follows:

1. Establishment of animal disease-free zone
2. Strengthening of animal health laboratory

### **1) Establishment of Animal Disease-Free Zone**

According to the data currently available, per capita livestock population of cattle, buffalo, and hog in Tocantins has been third largest in Brazil. This indicates that there is an over supply to the local demand in the state, thus Tocantins has to rely on external markets, such as the Northeast region and Amazon areas, to sell their livestock and livestock products. There are four major beef packing plants in which modern facilities are equipped in the state, but they cannot export their products to other countries because of its incidence of FMD. To solve this problem, an animal disease free zone must be established in the state. Tocantins is geographically isolated from other states as there are two large rivers in east, north, and west, and a mountain area in south, so it is not very difficult to shut off livestock animals without vaccination for the disease including Swine Fever at its borders. These activities will be performed by the SAG livestock services. By conducting mass vaccination campaign followed by intensive surveillance program, the Tocantins can declare itself as a FMD and Swine Fever free state. There have been already such disease free zones in two southern states, in which meat export is significantly increased. Especially their pork exports established a new record in 1996. There is no doubt that Tocantins will be a competitive meat exporting state once such disease free zone is created and livestock health condition is much improved. Plans for OIE (Office des International Epizootic) to approve Tocantins to be FMD-free state by 2015.

### **2) Strengthening of Animal Health Laboratory**

Disease is one of the major factors that constrain livestock productivity. The provision of an efficient animal health service will require pursuance of a two-pronged strategy: i) development of a disease reporting system, and ii) creating a disease control program. The disease reporting system is supposed to contain information on the incidence, mortality, distribution area, occurrence season, dynamic of the situation and epidemiological interactions of hosts, agents and environment within a temporal frame. This reporting system will be useful to make decision on conducting countermeasures when tackling disease outbreaks.

Once the disease reporting system is established, following two approaches are taken in the disease control program: i) strategic planning, and ii) delivery system. Strategic planning for controlling different diseases which affect economically encompasses: i) short term planning (5 years) to reduce incidence and economic losses, ii) medium term planning (5 - 10 years) to decrease incidence of a disease to negligible levels and to start its eradication from parts of the state, and iii) long term planning (10 years) to eradicate the disease from the state. The delivery system calls for vaccination programs, sanitation, quarantine, test and slaughter, treatment and extension programs for farmers. Its supporting system must consist diagnostic laboratories, vaccine laboratories, and research units.

At present, there are no qualified animal disease inspection laboratories in the state, and farmers ask an animal disease research institute in other states for diagnosis. It is difficult for an institute to make proper diagnosis as it usually takes many hours until they receive a specimen from Tocantins. Moreover, a wrong specimen is sometimes delivered. Once a sound principle management for an appropriate and timely diagnosis is realized, about 80% of the disease problems can be eliminated. It is almost impossible for farmers to make a diagnosis by themselves, so local laboratories must provide assistance. There is emergent need to consult a laboratory where equipment and trained/experienced staff are available. There has been a significant population grow that will cause shortage of food reserves, especially livestock products. Moreover, the improvement of socio-economic conditions all over the world will require more value added products. Therefore, we need a further intensify on livestock production in more efficient and cost-effective manner.

### **(3) Intensification of Agricultural Technologies Research and Extension Services**

#### **1) Strengthening of UNITINS Agriculture Division at Gurupi**

The technological level of each farmer varies according to the social and natural conditions such as soil and climate. The technology to be adopted by each farmer shall be specific for each region in order to increase and stabilize the production. The only research organism in the State is UNITINS. However, this organism has facilities and equipment below the standard and some items are missing. In order to propitiate the development of Tocantins State it is necessary the installation and materialization of research organisms. Furthermore, it is necessary to choose adapted technologies for each state region through research, having as a base for that the UNITINS. With this purpose, it is necessary to improve the UNITINS facilities and to insert a new research department in RURALTINS, thus creating a research network.

The important themes to be researched in the following 10 years could be the following:

1. Evaluation of soils (reevaluation and revision of the existing soils map, elaborating a more detailed map) and land agricultural aptitude in the State.

2. Selection of crops per region, formation of new species (soybean, corn, feijão beans, irrigated rice, upland rice, pasture, greenery, etc.)
3. Researches about soil conservation technology, environmental protection, quality improvement and productivity, reduction of production costs.
4. Research of post-harvesting technology (transportation, storage).
5. Research in the field of fruitculture (including post-harvesting).
6. Research about irrigation systems and agricultural mechanization utilizing heavy machinery.
7. Research on methodology of regional development plan, farms design, farm management and applied agricultural technology.

For the fast execution of these items, new departments shall be installed such as rural engineering and fruitculture, which are not existing in the UNITINS, and at the same time the staff, facilities and equipment shall be strengthened.

## **2) Strengthening of School of Veterinary Medicine of UNITINS**

The State of Tocantins has great potential of land and water resources for the development of agriculture, specially the livestock sector. On the other hand, there are several epidemic and tropical plagues which shall be prevented, being necessary for such a task the formation of experimented veterinarian staff. The State shall promote the livestock sector, increasing the exportation of meat to other states and countries, thus stabilizing the economy. For this purpose it is necessary to combat the Food and Mouth Disease and other diseases to reach this goal. The faculty of veterinary of UNITINS is the newest one in Brazil. In order to improve the livestock activity in the State, it would be necessary to strengthen the research in the field of animal health and the formation of human resources, having as the center of activities the faculty of veterinary of UNITINS. Especially for the establishment of disease free zones and animal health inspection posts, it would be vital the formation of highly qualified veterinarian doctors.

The present program aims to strengthen the faculty of veterinary, still young, having as main goals the animal health as a central line for research and the formation of human resources. Together with the improvement of education quality, it is intended to establish hospitals and experimental fields, to raise the clinic technology level of the students, raising the technological level of veterinary, which would also serve for the training of already graduated veterinarian doctors.

## **(4) Human Resources Development**

Among the weakness of the state institutions of agriculture and livestock, the lack of human resources development is as one of the factors which impede their activities. This put many difficulties in the agricultural extension activities including social assistance for rural community. Furthermore, the low qualification of education and low

literacy rate in rural areas makes a serious limitation to introduce new agricultural techniques and to carry out smoothly organization of farmers and its management. The lack of women's' education constrains rural life improvement. Consequently, these problems will be solved by the strengthening of human resources development in the public institutions and vocational education of agriculture and livestock, and basic education system. The program consists of the following sub-sectors:

1. Agricultural Vocational Training
2. Educational Institution Strengthening
3. Farmers' Organization Promotion

#### **1) Agricultural Vocational Training**

Vocational training/education in the agricultural and livestock sector is considered the strengthening of man-power training for extension staff (agricultural extension and social assistance) of RURALTINS and farm producers in line with the integrated development plan of agriculture and livestock. The program is as follows:

##### **Technical Training for Extension Staff**

The lack of knowledge for farming management on crop cultivation and animal raising among extension staff is given distrustful of technical assistance for farm producers. It hinders development of regional agriculture. In terms of social assistance (home economics-income generation, nutrition, health and hygiene, etc.), improvement of rural life environment is an obstacle from lacking leadership qualities in spite of strong demand of farmers.

In line with the integrated development plan of agriculture and livestock, increase of technical training course in each region and participation of extension staff will be promoted. The training course will be implemented and managed by RURALTINS as a working organ, and it makes substantial training course with collaboration of SENAR, SEBRAE and UNITINS. Implementing human resources development as vocational training project by PLANFOR, and the strengthening and continuation of the project by the State government is anticipated.

##### **Intensification of Training Programs for RURALTINS's Staff**

The RURALTINS is an institution which performs an important driving duty on implementation of the integrated development for agriculture and livestock of the Tocantins State, due to this institution has a responsibility on farm design, operating plan of farm and guidance of farming directly to farmers. Accordingly, it is necessary to strengthen and expand RURALTINS previously to implementing the development plan. In addition to that, through the staff training of RURALTINS, the improvement of the capacity of extension staff toward to the development will be essential.

Presently, the Coordination of Qualification and Development of RURALTINS in Palmas is carried out the planning and implementation of staff training. However, the staff training cannot held regularly due to lack of budget. In 1997, the training courses such as irrigation, coconut, handicraft, environmental issues are scheduled, and dispatch of extension staff to Goias, UNITINS, and DATER is also planned.

For improving the qualification of extension staff toward to the development, intentional personnel interchange with the Goias State which is advanced state of development, and implementation of intentional staff training follow the training program needed to the development is essential. In addition, the provision of budget, facilities and machinery and equipment for training is required.

### Intensification of RURALTINS's Training Program of On-Farm Training

Through the strengthening and expansion of RURALTINS toward to the development plan, implementation to cover every eventuality of practical skill training for small-scale and mini farmers is indispensable. In particular the following regional offices as development bases should be imposed the duty of receiving on-farm training for settlers in case of settle to colony (INCRA, NPA).

Cereal production plan of small-scale farmer: North, Center-south and Southeast regions

Vegetable production promotion plan: Araguaina, Palmas, Gurupi

Farming plan of undeveloped areas: Bico do Papagaio, Jalapao

In the above development areas, the regional offices which have responsible to the above plans will establish the practical skill training center, and carry out on-farm training for settlers. The trainees are considered mainly successors to agriculture who come out active members of the rural producers association organized by small-scale farmers, i. e., young men's group. Considering low literacy rate, the audiovisual and practical skill training system will be adopted. Therefore, the provision of budget, training facilities and machinery and equipment will be required.

The details of the programs are as below.

#### 1. Preparation of Training Program

- Methodologies of design on regional development plan, farm design, and farm management design, and of technical and managerial evaluation of farming
- Method of mechanized cultivation for cereals and pastures
- Technologies of prevention of soil degradation in order to perform sustainable agriculture, environmental preservation, increase of yield and improvement of quality, and reduction of production costs
- Technologies of post-harvests

- Technologies of vegetables and fruit cultivations
  - Methodologies of operation and maintenance of irrigation facilities and farm machinery and their utilization techniques (operation)
2. Securing of Training Instructor
  3. Provision of Training Facilities: Training room, Workshop for educational materials, library, farm for training, dormitory, etc.
  4. Provision of Machinery and Equipment for Training
    - Provision of irrigation facilities for farm and farm machinery
    - Provision of audiovisual aids (portable audio system, videocorder, video camera etc.)
    - Provision of printing machinery
  5. Technical Training for Farmers of Familiar Agriculture

The guidance of agricultural techniques for farm producers by the public institutions is a few. Especially, technical assistance of crop cultivation has been nonexistent. At present, the training course is concentrated beekeeping, fruit processing, animal raising and so on. Most the farmers follow the traditional farming practices.

In the agricultural development plan, introduction of cash crops and crop diversification will be promoted. In order to achieve the goal of the plan, RURALTINS will be held continuous and regular training courses in each region, by selecting effective time for crop cultivation. In addition, the demonstration and trial farm will be established with collaboration of progressive farmer. It will be set up a demonstration farm for some villages as an unit. RURALTINS will be implemented definite on-farm training at the farm.

## **2) Educational Institutions Strengthening**

The strengthening of educational institutions in the rural areas will be considered to attain the goal through the strengthening of basic education including improvement of the quality of teachers and the expansion of vocational education system of agriculture. With the implementation of this plan, a bright future of the agriculture and livestock sector in the Tocantins State will be expected.

### **Strengthening of Basic Education**

The disparities of the quality of basic education in the rural areas are an obstacle to improve agricultural management caused by manifest the low literacy rate of adults. In particular the low quality of teachers and school lesson by combine class of four series brings about reduction of an incentive to learning and leave school without completing the course. In order to solve these problems, SEC provides training systems for improve the quality of teachers. The implementation of this training systems with collaboration of UNITINS is essential.

In terms of secondary education (high school level-2nd grade), new training system for teachers under the agreement between the State government (SEC) and UNITINS starts from 1997. However, there is no regular training course for teachers of the 1st grade schools which is conducted by regional education office. The training courses by short term base are carried out irregularly. The majority of the 1st grade school in the rural areas has only four series (primary course). The 1st grade school with secondary course (four series) exists in mainly urbane areas. Moreover, teacher's low salary reduces their professional awareness.

The basic education in the rural areas, aiming to improve the education level of farmers which makes progress and improve farming environment, will be strengthened.

### Strengthening of Vocational Education (Agriculture)

Presently, an institution of vocational education such as technical school of agriculture, which is in practice nurseries for technicians in agriculture and livestock sector, is only four schools in the State. It is found the differentials among the schools as to the level of educational contents, teacher's qualification, and substance in educational materials and equipment. Poorly educational institutions in this sector keep the potentialities of limited factor against future economic growth of the Tocantins State.

In order to achieve the goal of agricultural development plan, from these circumstances, the improvement of teacher's qualification of the technical school of agriculture, adoption of the school curriculum conformable to regional agriculture, and provision of educational materials and equipment in existing schools with cooperation of the State government, UNITINS and Federal agricultural institutions will be planned. Furthermore, the State government will construct the technical school of agriculture at each region, especially agriculture-based region. It is essential to educate a capable rural people who will be the backbone of agriculture, through the strengthening of vocational education of agriculture.

### **3) Farmers' Organization Promotion**

At the national level, Ministry of Agriculture of the Federal government is promoting an organization of the Rural Producers' Association for small-scale and mini farmers who perform familiar agriculture, supported by UNDP. The SAG and RURALTINS are conducting the support to establish the association. Through the establishment of the association, it will facilitate the access to agricultural credit and technical assistance, and the improvement of rural communities' environment such as health, education, and social infrastructure. The formation of this association aims to strengthen the rural community. Accordingly, promotion of the establishment of the association for familiar agricultural producers will be planned. In particular, the strengthening of rural community in the following regions, which have a remarkable regional difference caused by underdeveloped compared with other region in the State, will be planned.

### Bico do Papagaio Region

This region belongs to the Extreme North region by administration division of SEPLAN, and is the most backward region in the development within the State. Most the people is landless and mini farmers, and there are existing high population density and poverty. Under the circumstances, INCRA is implementing selectively the settlement projects for this region in the State. Number of the INCRA's settlement in the region as of 1997 is 50 (43% of the State) with 3,276 families.

In the INCRA's settlement in the region, the supporting activity for establish the rural producers' association is conducted in cooperation with INCRA and RURALTINS. Presently, the associations are established in 14 settlements, and most of them are organized by a part of settlers (990 families).

On the other hand, the associations organized by small-scale farmers except for settlers of INCRA are 32 associations with 2,113 families. Within the associations, the Bico do Papagaio rural working women's association (162 members), which aims at collecting and processing of babacu coconuts by rural women, is included.

Regarding the agricultural cooperatives, the Bico do Papagaio agriculture and livestock mixed cooperatives (COMBIPA) organized by large- and medium-scale farmers (180 members) exists in Augustinopolis. Recently, the cooperatives' activities are stagnated because the agricultural financing policies by the government have been applied pressure on agricultural management.

Establishment of the rural producers' association which assists to familiar agriculture contributes to strengthen and stabilize the rural community through the improvement of farming and living environments of small-scale farmers and mini farmers in the region. In order to improve the regional difference, establishment of the association in the whole rural area is an important problem to be promoted.

### Jalapao Region

According to the administration division by SEPLAN, this region belongs to the East region. The region remains an underdeveloped area within the State. Low population density (0.81) and high poverty following the Extreme North region are in existence. Presently, six rural producers' associations are organized in the region. Number of the member is 377 (12% of the total farm household). Though the region consists of 8 municipalities, the association has not been organized in four municipalities. By the results of farm survey, over 60% of farmers are not participate the association. Because the most farmers are working at cattle farms and/or large farms as farm worker and perform self-sustaining agriculture, organization of farmers does not step ahead.



#### **4) Improvement of Rural Women's Status**

The disparities in the living environments (health, education, etc.) between rural community consisting of producers of familiar agriculture who are broadly distributed in the rural areas and the urbane area in the Tocantins State are existent. In order to rectify the differentials, it is indispensable to improve the living conditions through the improvement of food, nutrition, health and hygiene, etc., increase of cash income, and securement of water resources for domestic use through the rural women's participation to community development. The improvement in the social status of rural women will be promoted through incentives in community participation. On this account, formation of women's group and provision of a place for women's activities will be facilitated.

#### **5.4 Environmental Conservation Program**

In spite of the abundant land resources, major part of the land were exploited at past, the existence of the natural forest are scarce. Major part of the State is covered by the Cerrado Vegetation which is fragile to the environmental change. Major problem of the environmental aspect in the State are the gold mine problem at Southeast part of the State, and the colonization program realized at the 1970 without accompanying the land use planning.

Considering the future development trend for the State because of the World Food balance situation, adequate planning for the preservation of the natural resources will be necessary.

As a measure for the future development trend, followings programs will be implemented;

1. Environmental Conservation (Formulation of land use plan in harmony with conservation of natural resources, promotion of sustainable forestation, control of burning off natural vegetation, environmental enlightening and education and establishment of environmental monitoring system)
2. Green Village (Improvement of rural environment, sustainable farming model, promotion for rural organization for specific)
3. Demonstration Farm

##### **(1) Environmental Conservation**

Major parts of the State land are utilized for the livestock pastureland in the form of extensive livestock with low efficiency of utilization. At the pasture land, burning to maintain pasture are practiced. Owing to this burning practice of the pastureland, natural land covered by the original Cerrado vegetation is damaged. The number of the occurrence of fire caused by the pasture burning account more than 80,000. The reason of the fire are many time very simple, some as to maintain road, to prevent the animal

attack, etc. And the preservation of the rare spaces is too important for the State. This Program is composed by the following components;

1. Promotion of Sustainable Forestation
2. Control for Burning off of Natural Vegetation
3. Mitigation of Water Contamination
4. Environmental Enlightenment and Education
5. Establishment of the Environmental Monitoring System

#### **1) Promotion of Sustainable Forestation**

This Program is the same project executing by the IBAMA as a sustainable forest. Taking into account the importance of the sustainable forest for the conservation of the environmental aspect, this project was included in the program, objecting the faster of the forest.

1. Incentive of Reforesting
2. Incentive of Forest Management
3. Incentive for the recovery of degraded areas
4. Incentive of the Agroforest system

#### **2) Control for Burning Off of Natural Vegetation**

This subprogram aim to control the practice to burn off natural vegetation that is one of the most serious environmental programs found in the State of Tocantins. The following activities shall be developed within this plan:

1. Incentive of evasion of Burning off practice
2. Incentive of Extrativism (Natural Extraction) activities

Control method of the burning varies from the regional habit. Each type of burning control adequate for each region will be formulated through the participation of rural residents. Burning control will be achieved by the credit for the farmers to give incentive the implementation of the burning control and by the extension service to teach the burning control method.

#### **3) Mitigation of Water Contamination**

This project aims to mitigate contamination of water in rivers caused by emission of sewage discharged from agro-industrial sector by means of providing credit to owners of agro-industry

#### **4) Environmental Enlightenment and Education**

The Environmental Education sub-program aims the formation of the population to carry out this environmentally feasible activity, propitiating the improvement of their life quality. In this sense, it is necessary to implant the State Environmental Education

program that was already elaborated to the substantiation of the proposed objective. The following activities will be implemented:

1. Environmental Education
2. Creation of an Environmental Laboratory Center
3. Creation of an Agroecological Center
4. Implementation of Agenda-21

#### **5) Establishment of Environmental Monitoring System**

This sub-program will be carried out as a public sectors action program. Objectives of this Sub-Program will be achieved by the implementation of the following actions;

1. Monitoring for Burning off natural vegetation
2. Construction of Laboratory Center (UNITINS)
3. Installation of Agro-meteorological Observation System
4. Monitoring for Agriculture, Livestock and Industries Activities
5. Installation and Maintenance of the Naturaltin's Regional Center

#### **(2) Green Village**

The present program aims to preserve the Cerrado environment, defining agricultural development models in harmony with the characteristics of each region. Basically, this program comprehends the increase of green area with the participation of the inhabitants of the region. It is composed of the following items:

1. Improvement of Rural Environment
2. Distribution of Seeds and Seedlings
3. Sustainable Farming Model

The enterprise aims to create model development areas considering the environmental point of view, extending the methods utilized in these models to the neighboring producers, propitiating thus an environmental improvement in the State.

#### **1) Improvement of Rural Environment**

##### **Project for Introduction of Sustainable Agriculture by Mini and Small Scale Farmers in the Bico do Papagaio Region**

It is recommended to encourage the activities of mini and small farmers in the Bico do Papagaio region, through the formation of associations with approximately 10 farmers, for the development of activities such as horticulture, fruitculture, swine and poultry raising, utilizing irrigation facilities, in order to improve the life and income conditions of this population.

Therefore, based on the plans of improvement of agricultural credit conditions and

investment for mini and small farmers, it is planned to create farms with management conditions to obtain better income and a sustainable production of fruits, greenery (including the planing of environmental protection areas), elaboration of rural management plans and testing their efficiency, allowing the effective implantation of efficient rural management, farms design and agricultural credit.

### Introduction of Integrated Sustainable Agriculture of Buffaloes Raising and Fruit Cultivation in the Jalapão Region

The Jalapão region has good natural soil, climate, geomorphology and water conditions, requiring the improvement of social infrastructure such as roads and electrification, investment and rural credit to encourage the small farmer's production. Through the sustainable production of fruits and buffaloes raising, it is intended to raise their condition turning them into medium producers, utilizing adequate management methods.

#### **2) Distribution of Seeds and Seedlings**

The following organisms are proposed and shall be evaluated: State Agricultural Cooperatives Association (composed of regional associations of already existing associations) and Agricultural Materials Supply Company (creation of a new organism or reform of existing ones). Through RURALTINS, it is intended to reduce production costs, increase the competitiveness and reduce the price of agricultural materials to the producers. For this purpose the above mentioned organizations will be necessary. The first one will act in the purchase of agricultural materials and in the production of animal feeding ration and the second one will produce and commercialize these materials. Investment will be necessary to install these organizations.

As for the supply of agricultural materials, they shall be supplied as a loan (credit service) to the members. Furthermore, for an efficient utilization of these materials, SAG and RURALTINS shall provide technical guidance.

#### **3) Sustainable Farming Model**

The present project aims to realize a sustainable agriculture at the farm level, initially improving the social infrastructure (roads and electrification) in regions with proper conditions regarding to soil, climate, geomorphology, water resources. Planning of farms and management will be carried out in order to implement a sustainable production of grains in this region.

The present sub-program consists of the following projects, namely:

1. Integrated Vegetables and Swine Production Farming by Mini and Small Farmers in Suburbs
2. Integrated Cereals and Beef Cattle Production Farming by Small Farmers

3. **Integrated Cereals and Beef Cattle Production Farming by Middle and Large Scale Farmers**

4. **Fruit Production in Tocantins State.**

**Integrated Vegetables and Swine Production Farming by Mini and Small Farmers in Suburbs**

The basic objective is to create green belts around urban centers through the formation of producers associations composed of 10 members. These green belts will be located in the surroundings of Gurupi (South), Palmas (Central) and Araguaína (Norte), in which the integrated production of greenery and fruits, in irrigated areas, and swine and poultry raising will be carried out. It is intended to raise these small producers to the level of medium producers through programs of farm management planning, also regarding investment and rural credit.

**Integrated Cereals and Beef Cattle Production Farming by Small Farmers**

This project aims to cover the small farmers with holding in the range of 100 - 500 ha (41% of all the farms, 25% of the total area). The proposed model farm shall be established in such areas as are endowed with favorable natural conditions such as soils, climate, topography, water resources as well as are equipped with social infrastructure represented by water supply system and electricity. The project comprises privilege measures to attract investment of small farmers and promotion program of rural credit. The model farm is to be designed so as to realize sustainable production of grains aiming at elevating income level of small farmers to that of medium farmers. In this farm design, reserves of ecosystem is also taken into account. In sum, this model farm has objective to demonstrate its fruits to other farms of similar natural and socio-economic conditions.

**Integrated Cereals and Beef Cattle Production Farming by Middle and arge Scale Farmers**

Eligible one model farm shall be located each in north, central south and southeast regions of the State and these model farms are proposed to undertake production of grains and pasture in combination with unconventional beef cattle farming. The project involves design of farm including reserves of ecosystem. The objective of this project is formulation of farm operation plan and demonstration of its effect so as to attract investment of middle and large farmers in this type of farming activity.

In so far as beef cattle farming is concerned, it is proposed to get rid of conventional raising system and to embark innovated one with introduction of European hybrid breeds so that effective beef cattle production with shorter fattening period might be realized. As long-term target, exportation of local beef is conceived.

### Fruit Production in Tocantins State.

Fruit production plan to suit local agro-climatological conditions is to be forged. For this purpose, selection of seedlings shall be made for respective region after making research on it at both domestic and international markets. Agro-industry-oriented fruit shall be identified once marketing research on geographic positioning, availability of raw materials and shipment and storage of produce for establishment of relevant industry will have been conducted. The project also contemplates proposal for supply of seedlings and extension of adequate farming technologies.

Bearing in mind that small farmers can also undertake fruit production, design of model farms (reserves of ecosystem are included) aiming at these small farmers will be made. With this model farm, income of small farmers is expected to rise to that of medium farmers and it will serve as guideline for attracting investment in this type of farm activity.

#### **(4) Demonstration Program**

In the Tocantins State, otherwise the extensive agriculture and livestock activities, intensive agricultural methods which considered as a exploitation of natural resources, such as soy beans and pineapple cultivation, are increasing recently.

The Tocantins State locate in an Amazons Legal Area on which has a restrict development policies. Taking into consideration that the existence of the Indians Reserves and Banal Island "one of the world Patrimony" and state location as a Amazons Legal area , establishment of the environmental preservation system and attainments of the sustainable development paid to environmental aspect, is urgent subject for the State.

The Demonstration Program has a objective to research and collect necessary data for the attainment of a sustainable agriculture, association forming method and adequate technology for the State, through the cooperation between State and Federal Government, and rural resident.

The results of the studies at the demonstration farm will be applied for the model farms at various regions, in order to study the applicability for each region. On the demonstration farms, method of the sustainable agriculture, planning for the appropriate development , environmental preservation method and monitoring method will be examined.

In this Program, demonstrative work to examine development technology, promotion system appropriate for the State will be done. This Program contains following items;

## 1) Contents of Demonstrative Program

### (Operation System for the Promotion of Environmental Type Agriculture)

1. Examination and Operation of Promotion System for the Agriculture and Livestock Development, and Environmental Conservation
2. Examination of the Natural Resources for the Agriculture and Livestock and Development Model
3. Examination of Development Technology and Environmental Assessment
4. Others

### (Research Works)

1. Rotation of Crop and Pasture
2. Cultivation of leguminosae such as crotalaria in between the harvests
3. Non arable Cultivation and Cultivation by Minimum Agricultural Input
4. Suitable Farming Pattern at Amazons Legal Are
5. Selection of Suitable Crops and Vegetables
6. Cultivation Technology
7. Selection of Suitable Fruit Cultivation
8. Integrated production of meat cattle and grains
9. Integrated production of greenery and livestock around urban centers

### (Extension and Training)

1. Demonstration and Extension of Sustainable Agriculture Method
2. Explanation and Publication of Results
3. Training
4. Extension Activities
5. Technology Transfer for the SAG and RURALTINS Staff
6. Demonstration of application of agricultural input
7. Distribution of Seedling and seed

### (Monitoring)

1. Evaluation of Environmental Effect
2. Forest Conservation Method
3. Control of Soil Erosion

## 2) Installation of Demonstration Center

In order to demonstrate for more number of visitors, the proposed site for this installation is highly recommended to construct on where has a good access, because of the objective of this installation is to demonstrate the research, extension and monitoring activities. The installation will contain followings;

### 5.5 Specific Sector Development Program

Judging from the necessity of the implementation of the project, otherwise does not included into the Regional Development, Agricultural Sector Reform and Environmental Conservation Program, following projects are considered as necessary to carried out;

1. Water Resources Development Plan
2. Acuaculture

Water Resources Development Plan aim to carry out the necessary studies to survey the water resources potentialities in an agriculture and hydroelectric sector. AS a first stage, the execution of the data collection related to the climate and hydrology will be required.

For the acuiculture plan, the execution of the detailed studies to survey the market and technical conditions will be required.

### **(1) Water Resources Development Plan**

In the Tocantins State, two big rivers, the Araguaia river (which is the border between the states of Pará and Mato Grosso by one side and Tocantins by the other) and the Tocantins river (which crosses the state territory in the north-south axis) flow down south to north, constituting a dense fluvial network. With the high rainfall and non-exploited resources, the possibility to explore the water resources is high.

As a strategy of State development, water resources development regarding to the agricultural use, industrial use, waterway transportation and electrical explorations are necessities to implement with the detailed studies. However, the situation of study to the state water resources was not implemented until now. The implementation of the following studies will be necessities/.

#### **1) Basic Hydrological Study**

In order to survey the basic data, the studies for the following will be required.

- a) Hydrometeorological Study
- b) Geohydrological Study
- c) Sedimentation Study

#### **2) Model of Evaluation/Management of Water Resources**

The model of evaluation and management of water resources (hereon called "model") shall be elaborated or adjusted to already existing models with the objective to evaluate/manage the region superficial water resources, also concerning to floods, through proper modeling techniques at the available information level supplied by the Basic Hydrological Study.

#### **3) Inventory of Regional Water resources**

This inventory consists in an informative technical document about the State water resources availability, aiming not only to support the Project elaboration but also to give information about this theme to interested public and private organisms. The inventory document shall contain a synthesis of the results aiming the utilization of regional water



resources, distinguishing the following aspects:

- a) Utilization of Superficial Water resources
- b) Utilization of Underground Water resources
- c) Support System to the Monitoring of Water resources Utilization

#### **4) Meteorological and Hydrological Stations**

The knowledge of climatological and hydrological conditions, together with other natural factors such as soils, topography, etc., are the base for that the various planning, research, execution organisms can carry out precise and reliable works. All the natural factors are important, although individually their utilization is limited. Each natural factor interacts, influencing the others, thus becoming difficult to evaluate them individually. Therefore it is essential to collect several factors data parallel forming a set of basic natural data.

The Tocantins State has several measurements of natural conditions. However this data is incomplete and partial, not proportioning full conditions for more refined work. Another important item is the availability of this data. The access to this data shall be easy, which doesn't happen in the reality, hindering the execution of many projects and plans.

The basic studies previously presented will only be effective if there is availability of meteorological and hydrological data. In this document it will be talked about two basic factors: Meteorological and Hydrological. Considering the present conditions of the meteorological stations in the State, in principle the following measures can be proposed:

- Establishment of agreements between the State and organisms responsible by the measurement;
- Checking of the stations operation conditions;
- Re-construction of the data exchange and storage system;
- Ecadastering of all stations in the State;
- Reevaluation of location and number of stations;
- Training of technicians;
- Project of standard stations;
- Evaluation of the necessary quantity of stations;
- Selection of necessary software.

#### **(2) Aquaculture**

According to FAO, the consumption of aquatic foods was 65 million tons in 1992, of which 25 %, or 16 million tons were produced by aquaculture. Also, FAO foresees that the fishery production is reaching the maximum exploring capacity of 100 million tons per year, and will not sustain the demand.

The Brazilian fish consumption is approximately 5 kg/year/person, while in developed countries, this average is over 20 kg/year/person. Applying this already low national

average for the state of Tocantins, the State would need at least 5 million-kg, whereas only 600 thousand-kg of fish will be produced (estimate for 97/98).

This state, which was created in 1988, offers favorable natural conditions for tropical aquatic animals, with a large variety of aquatic forms, few prominent reliefs and compatible land prices for this activity. But the aquaculture needs more information about the reasonable exploring limit.

Therefore an Aquaculture Development Program could be formulated through the information attained through a Feasibility Study on Aquaculture in the state of Tocantins, which would mention productive and market aspects and would contain the following information;

- a. Situation (information level and technical level) of fishery farmers;
- b. Appropriate and available sites;
- c. Level of technicians who follow the future Program;
- d. Markets of exotic and native fish;
  - in the state;
  - in the country;
  - in the world;
- e. The most productive species, where and how to sell them;
- f. The study must cover all over the state;
- g. Profile of the state's fish culture associations;
- h. Infrastructure for implementation of fishery industry.

## 5.6 Private Sector Program

Private sector program needs no financial assistance from the State government and its implementation may be carried out entirely within the private sector. Considering the characteristics of the area, the programs are categorized as follows:

Sub-programs	Projects
Incentive for Exports Processing Zone	Exports Processing Zone Installation of Dry Port (Inland Custom Clearance Station)
Modernization for Marketing of Agro-products	Incentive to the Creation of Commodities Stock Market
Encouragement of agro-industry	
Program for Effective Utilization of Agricultural Inputs	Promotion for Supply of Lime Promotion for Supply of Chemical Fertilizers
Improvement of Livestock Products	Modernization of Slaughterhouses for Swine

### (1) Incentive for Exports Processing Zone

#### 1) Exports Processing Zone

The Federal Government created the Export Processing Zone (ZPE) in the 15 cities through the Federal government's decree at 1989, in the purpose of to promote regional development. In the Tocantins State, the ZPE was established in the Araguaia City located near the national high way BR153, with the area of 25 ha. There is customs

office and warehouses at the site but operating companies are none. At present, in the ZPE, the installation of some company is not stated. Since ZPE Federal Law enacted in 1989, world's trade situation has been greatly changed making measures that will meet the demand of the times necessary.

At long term, the necessity of the installation of the ZPE is clear, in order to promote the regional development. However, the review of the incentive method is inevitable through the following method;

1. Introduce special tax concession for the enterprises that will decide to operate in the zone at an early stage.
2. Facilitate the extension of South north railway leading to Araguaina ZPE from Imperatriz/Estoreito in order to improve the transportation means to the export/import Port of Sao Luis.
3. Official finance to introduce facilities for preventing environmental pollution such as the ones for treating wastewater and for air cleaning.
4. Execution of detailed feasibility study with official fund.
5. Application of special rate for public utilities such as electricity and water supply for about five years (1998--2003).

## **2) Installation of Dry Port (Inland Custom Clearance Station)**

As a measure to solve the State transportation problems which located inner side of continent with the more distance of 1,000 km from the port site, the installation of the dry port which has the objective to facilitate the import and export procedure, is necessary to promote the vitalization of State industries. By this installation, the product of the State will secure the access to the international market. The proposed site to install the dry port is where has a good condition of transport facilities and easy accessibility to other cities.

## **(2) Program for Modernization of Agricultural Commodities**

### **1) Incentive to the Creation of Commodities Stock Market**

Considering the deficiencies in the agriculture and livestock commercialization in Tocantins State and the potentiality represented by the negotiation through the Stock Market, it is proposed to evaluate the possibility to create or to establish a regional representation of the Stock Market in the State, aiming the constitution and strengthening of future markets. The supplier side is that the group composed by the agricultural producer, association and CONA and the buyer side are that the group composed by the rice mil maker and grain stock companies. In the attempt to modify this situation, the Future and Commodities Stock Market - BMF, is trying to raise the volume of negotiated agriculture and livestock products participation, through the creation or modification of financial instruments negotiable during the sellers cry and destined to the agricultural sector.

## **2) Modernization Project for Marketing Agricultural Produce**

Presently, there is no wholesale market that functions for collection and distribution of agricultural produce specially vegetable grown within the State of Tocantins or outside the State and transported into the State. It means that there is no price formation function and it is difficult to obtain marketing information. In the way of promoting vegetable production in Tocantins State, if there is no wholesale market for wholesaler, growers will have to find there

own produce outlets, which is not easy. For this reason, public wholesale market (also retails) should be built mainly for vegetables within the State to improve their marketing

In the implementation of this project, the regulation of establishment of city market and the construction of transport and communication infrastructure by the state government are required. The operation of the City market will be made by the private sector composed by the association of dealers. However, considering the Inexistence of the vegetable production in the Tocantins State, as a first step, the introduction of vegetable production techniques from other state are required. Agricultural produce grown in Tocantins State is presently sold directly by growers within the State to dealers (wholesaler) outside the State. In this case, growers have no market information and cannot effectively control the shipment.

## **(3) Encouragement of Agro-industry**

Processing of agricultural produce is to be made in principle with use of locally available raw materials, thus it differs from other industries which rely on raw materials imported from outside the State. Agro-industry represented by processing paddy, cattle and lumber has already established an important position within economic sector in Tocantins. In order to accomplish an expansion of the industry, it is prerequisite to make an optimum and use of agricultural produce and their by-products in Tocantins.

The growth in production of grains, fruits, vegetables and livestock in the future shall inevitably accompany an expectation for development of processing industry of these products, but an attainment of this development would not be made unless combined efforts of both public and private sectors should be made for integration of such components as procurement of raw materials, processing technology, finance and marketing. Furthermore, production of elevated quality of raw materials is an indispensable factor for development of agro-industry.

### **1) Processing of Paddy**

Processing of paddy is the leading sector of agro-industry in Tocantins and its technological level is considered to be of standard. For attaining further development, it is essential that seeking for wide variety of markets and cultivation of products to comply with needs of consumers. Besides, cultivation of by-products, such as

processing chaff, rice bran and broken rice for production of animal feed is also expected.

## **2) Extraction of Oil**

Subject to hiked increase of production in soybeans in such level as to promise consistent supply of raw materials, an establishment of soybeans processing factory may become viable; to elevate value-added of soybeans, the factory has to launch to produce not only crude oil but also refined oil and by-products.

Babacu is less competitive than oil palm, processing of the same is advisable to seek not for oil but for actives out of husk.

## **3) Concentrated Feed**

The incorporation of animal feed manufacturing factories depends on an increase of grains, above all maize, in Tocantins. Apart from feed made from grains, it is worth while to assess the possibility to manufacture concentrated feed with processing by-products of paddy, grounds of soybeans, etc. for supplying feed for farming of poultry, swine and freshwater fish.

## **4) Tanning Industry**

In order to improve quality of leather product, quality control of tanned product is essential. In addition, residual sewage discharged from tanning factories causes environmental problem which calls for urgent solution. It is thereby necessary to take precaution against contamination of water resources affected by tanning factories.

## **5) Supply of Fertilizers**

The consumption of chemical fertilizer in Tocantins remains far lower than other states, but it may be grown keeping pace with an enlargement of cultivated area. In order to respond to this proposed expansion of demand for fertilizers, consolidation of their supply system including saving in cost of their transportation is required.

This proposal aims to establish consolidated transportation network of imported fertilizers and to arrange circumstances to produce mixed organic fertilizers within the State. Imported fertilizers are to be unloaded at Itaquí Port, the State of Maranhão, and then transported to the State of Tocantins by means of Carajás and South-North Railways. Thus transported fertilized will be mixed with other raw materials to produce organic fertilizer. This proposal has advantages of saving transportation cost as well as providing fertilizers suited local agro-climatological conditions. An expected saving of transportation cost shall be 40-50 dollars per tonnage cheaper than the products coming from South and East Regions of the country, which contributes to saving of production cost of crops.

As the case of the State of Minas Geras, it should be evaluated technical and financial feasibility to produce organic fertilizers with use of the leftover at urban areas as a long-term target.

#### (4) Improvement of Livestock Products

##### 1) Modernization of Slaughterhouse of Swine (Private Investment Option)

Existing meat processing industry in Tocantins is limited to 4 privately-operated beef processing factories and 2 slaughterhouses (exclusively for cattle) located in Araguaina and Palmas. Without relevant slaughterhouse, processing of swine is actually made outside the State in an absence of inspection system for meat. Local demand of pork and its processed product such as ham bacon, sausage is high, but these products processed in the State are home-made ones at farms in which inspection equipment is not provided.

Swine farming within context of diversification of livestock industry is promising activity in the future and so as to forge this activity it is vital that processing facilities of meat equipped with modernizes and sanitary devises would be incorporated. These facilities should be located where have dense population and elevate head of swine in and around lest processed products should not affected by outbreak of such diseases as brucellosis, tuberculosis or anthrax. Operation of slaughterhouses is to be undertaken by the private sector, meanwhile the public sector (SAG and municipal offices) shall take charge of technical assistance and sanitary supervision for their operation.

#### 6 Programs Implementation Method

The implementation method of the programs is variable according to the characteristics of the programs and is summarized in the following manner.

Programs	Sub- Programs	Planning				Implementation	
		M/P	F/S	D/D	Others	I/P	O/P
<b>Regional Development Program</b>							
	Optimization of land	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pr	Pr/Pr	Pr/Pr
	Roads	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu-B	Pu/Pu-B	Pu/Pu-B
	Productive infrastructure	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu-B	Pu/Pu-B	Pu/Pu-B
	Public works	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu
<b>Structural Reform of Public Institutions</b>							
	Land titling	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu-B	Pu/Pu-B	Pr/Pr
	Reform of organizations	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu
	Agro-products quarantine	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu
<b>Modernization of Livestock Sector</b>							
	Free zone	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu-B	Pu/Pu-B	Pu/Pu-B
	Disease control system	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu-B	Pu/Pu-B	Pu/Pu-B
<b>Intensification of Agricultural Technologies Research and Extension Services</b>							
	Supporting services	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu

	Agricultural research	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu
Manpower Development Program		Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu
Environmental Conservation		Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu-B	Pu/Pu-B	Pu/Pu-B
Green Village		Pu/Pu	Pu/Pu	Pu/Pu	Pu/B	Pu/B	Pu/B
Demonstration Farm Development		Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu	Pu/Pu
Private Sector Program		Pu/Pu	Pu/Pu	Pr/Pr	Pr/Pr	Pr/Pr	Pr/Pr

Note: Pu/Pu – Public Option for both program implementation and cost sharing (federal and state government)  
Pu/Pu-B – Public option for programs implementation; public and beneficiaries option for cost sharing  
Pu/B – Public option for programs implementation; beneficiary's option for cost sharing  
Pu/Pr – Private option for both programs implementation and cost sharing (partial participation of public sector)  
Pr/Pr – Private option for both programs implementation and cost sharing (without participation of public sector)

## 6.1 Regional Development Program

The present program shall be implemented on the basis of the development plans formulated for respective region and financing proposal for the program shall consist of the public investment option and private investment option. Prior to implementation of programs, a master plan will be prepared first of all, which is followed by implementation of a feasibility study, in view of decelerating disordered development of natural resources and optimization of these resources. Projects contemplated in the public investment option shall coincide basically with social infrastructure development, meanwhile projects relevant to the private investment option shall be such works as are required in connection with the resettlement program. The formulation of development projects shall be made with attention paid to the following aspects:

- 1 To economize the public portion of the project cost as far as possible, both by beneficiary and by unit development area.
- 2 To diffuse benefits of project to a wide variety of beneficiaries
- 3 To identify projects of high economic returns

In so far as the projects of the private investment option, care shall be taken to contribute to capital formation of existing farmers. Proposed sources of finance for this option shall, but not be limited to, the transfer of the federal government's fund and loan from foreign governments and international banking institutions.

## 6.2 Agricultural Production Supporting System Strengthening Program

This program pretends to render more adequate institutional supporting services to farmers by means of an improvement of task executing capacity of agriculture-related organizations represented by SAG, RURALTINS and INTERTINS; INTERTINS is a responsible agency in reform of land titling system; SAG takes charge of formulation and implementation of agricultural development plans and plants and animals disease control system; RURALTINS engages in rendering extension services directly to farmers. The upgrading quality of services rendered by these organizations is closely concerned with an improvement and encouragement of farmers' farming activities. The

implementation of this program will be made under the realm of the public investment option, thus procurement of required finance for the program is prerequisite prior to formulation and implementation of the program.

### **6.3 Environmental Conservation Program**

The formulation of environmental conservation programs shall fall basically on the responsibility of governmental agencies, but part of the finance for the program shall be covered by beneficiaries of the program. It is recommended that the portion of finance by beneficiaries should be procured as far as possible through the rural credit program. Nevertheless, in hastening private investment in environmental conservation program which is suffered from less economic impact of investment, it is recommended that the governmental sector would take some measures to support farmers who are willing to embark on environmentally friendly farming practice. Besides, it is proposed to establish an environmental monitoring system through institutional strengthening of NATURALTINS in an attempt to elevate economic effect of investment.

The present program has high priority in the realm of mitigating environmental deterioration of natural resources, so earlier implementation of the same is highly anticipated. The fund earmarked for implementation of the program may be procured from sources of foreign governments with an eye to providing farmers with rural credit of lower interest to be used for launching environment-oriented farming practice.

Advised in effective implementation of the program is to encourage participation of various public institutions like SAG, RURALTINS, SEPLAN and NATURALTINS.

### **6.4 Program for the Development of Technologies for Sustainable Agriculture and Livestock Development**

The executing entity for this program shall be incorporated newly with participation of SAG as a core organization, UNITINS and RURALTINS. The program is proposed to comprise three tasks: investigation, research and extension and these three shall be carried out in parallel. The participation of farmers is a vital factor of this program and it will be intended that the fruits of the program to be demonstrated at farms of the program would be extended directly to farmers.

### **6.5 Private Sector Program**

This programs shall be put into implementation with exclusive finance of the private sector from planning phase and the role expected by the public sector shall be development of infrastructure and elaboration of incentives, both of which are indispensable factor to attain expected outcome of the program.



## **7 Selection of High Priority Projects**

The present Agriculture and Livestock Master Plan Study shall consist of four schemes: regional development, agricultural productive structure strengthening, environmental conservation and so on, with a target year of 2015.

### **7.1 Criteria for Selection**

The prioritization for long-listed projects/programs shall be on the basis of their needs for urgent implementation, side effects, economic returns, environmental conservation, etc.

General speaking, the coordination with the federal and state development plans as well as the sectoral development plans other than the agricultural sector shall be taken up first of all as the criterion for selection of high priority projects, and high priority is given to projects corresponding to the agendas which call for urgent measures for easing prevailing constraints confronting the agricultural development of the state of Tocantins. Furthermore, it is of importance to judge projects whether their benefits to be anticipated after their implementation would have high impact on regional society and economy bringing about a wide range of side effects.

On the other hand, it is also important to delineate projects with technological levels acceptable to project implementation agency. Nonetheless, it is necessary to introduce new technologies, to upgrade traditional technologies, to promise farmers with foreseeable prospects of farm operation and to contribute to agricultural development of unconventional fields, thereby the proposed projects should also be evaluated from these points of view. Although an implementation of projects independently is reasonable, an integration of a project with other project(s) is advisable in view of the fact that integrated projects would produce greater synergy effects.

The state of Tocantins belongs to the region where predominates "cerrado" soils. These soils are characterized by vulnerability to be difficult to recuperate their original structure once they are eroded. This leads to the consideration that the sustainability of development with attention paid to environmental conservation is an indispensable factor that should not be eliminated in prioritization of projects.

Bearing all of above considerations in mind, the prioritization of projects among projects/programs proposed in the chapter 9 shall be made. The said projects/programs are divided into two categories: the public investment and the private investment; the latter category projects/programs shall not be a target for prioritization of projects, because this type of projects are proposed to be put into implementation at such phase as will have been arranged circumstances for investment with the progress of state development projects/programs based on the present integrated agriculture and livestock master plan together with activation of productive sectors and consolidation of infrastructure. The public investment category is further divided into two sub-categories: programs for small area development or strengthening of public

organizations consist of 1) Environmental conservation program, 2) field demonstration program and agricultural productive structure improvement program and regional development program with large development area, and selection of high priority area for the latter category shall be made among ten (10) administrative regions established by the state government.

Because the target programs for selection of high priority projects have substantially distinct characters, the criteria applied for respective program are different as exposed hereinafter.

(1) Programs for small area development or strengthening of public organizations

1. High public interest
2. Responsible to agendas calling for urgent solution of problems confronting agricultural sector of the state
3. Viability for implementation from the viewpoint of the state's budgetary capability
4. Practical implementation without requiring complicated skills of project executing agency
5. Sustainability to accord with environmental conservation
6. Rectification of social disparities among regions
7. Easy applicableness to other similar areas
8. Impact on improvement of circumstances for attracting private investment
9. Contribution to capital formation of producers
10. Generation of multiple effects with combination other projects/programs

(2) Criteria for prioritization of regional development programs

1. Extension of lands with higher suitability for crop farming and facility for development
2. Higher grade of infrastructure development and advantage on marketing agricultural inputs and produces
3. Existence of SAG, RURALTINS and other relevant institutions and accessibility in rendering extension services
4. Consolidation of land tenure and progress of capital formation among producers
5. Comparative dense population easily available as labor force of development projects
6. Anticipation for higher economic return and multiple development effects

## 7.2 Selection of High-priority Programs and Projects for Environmental Conservation and Agricultural Production Supporting System Strengthening Programs

These programs have the following sub-programs and projects.

Programs	Sub-programs	Projects
Agricultural Production Supporting System Strengthening	Structural Reform of Public Institutions	<ul style="list-style-type: none"> <li>- Land titling and registration system improvement</li> <li>- Structural reform of SAG</li> <li>- Structural reform of RURALTINS</li> <li>- Plants inspection system and agro-products quarantine system</li> </ul>
	Modernization of Livestock Sector Intensification of Agricultural Technologies Research and Extension Services Human Resources Development	<ul style="list-style-type: none"> <li>- Establishment of animal disease-free zone</li> <li>- Strengthening of animal health laboratory</li> <li>- Strengthening of UNITINS agricultural division at Gurupi</li> <li>- Promotion of school of veterinary medicine of UNITINS</li> <li>- Agricultural vocational training</li> <li>- Educational institutions strengthening</li> <li>- Farmers' organization promotion</li> </ul>
Environmental Conservation	Environmental Conservation	<ul style="list-style-type: none"> <li>- Promotion of sustainable reforestation</li> <li>- Control of burning off natural vegetation</li> <li>- Environmental enlightening and education</li> <li>- Establishment of environmental monitoring system</li> </ul>
	Green Village	<ul style="list-style-type: none"> <li>- Improvement of rural environment</li> <li>- Sustainable farming model</li> <li>- Distribution of seeds and seedlings</li> </ul>
	Demonstration Farm	
Technologies Development For Sustainable Agriculture and Livestock		

Having evaluated above sub-programs and projects relevant to criterions cited before, all of them are considered to be eligible ones to implemented within context of the Integrated Development Master Plan for Agriculture and Livestock in the State of Tocantins. Hence, detailed formulation of their contents shall be made in the subsequent chapter.

## 7.3 Selection of High Priority Area for the Regional Development Program

The salient features of ten (10) regions as target areas for selection of the high priority area are resumed in 9.2 and they are taken into account in prioritization of ten regions in accordance with the criterions exposed in the section 10.1(2). As a result of this prioritization task, the North Region has been identified as the high priority area supported by the following justifications.

- The greater majority of the region is represented by the lands with the class II of the crop suitability classification; in particular, the sector between the

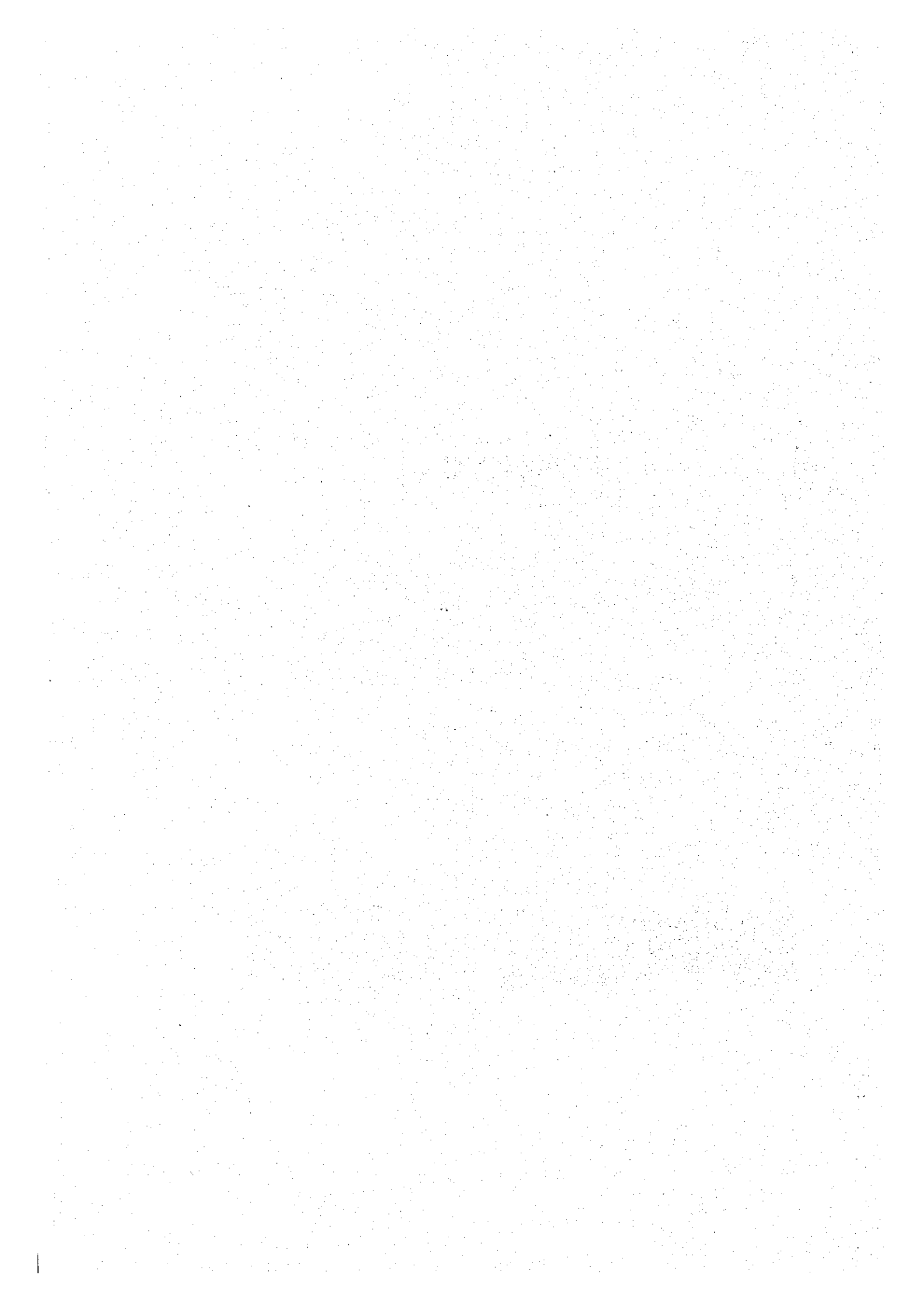
national highway BR153 and the Araguaia River is endowed with lands highly suitable for crop farming.

- Large holders predominate in the region, and capital formation among farmers is advanced.
- Road network is comparatively dense and is advantageous geographically due to accessibility to the city of Estreito, which will become an entrepot of agricultural commodities.
- The city of Araguaia, the most populated city in Tocantins, is situated in the region and thus marketing of agricultural inputs and produces is activated.
- The ZPE is also located within the region and is advantageous from the viewpoint of agro-industry development in the future.
- Regional offices of SAG, RURALTINS and other governmental institutions as well as the Faculty of Veterinary Medicine of the UNITINS are established in the region. The existence of these public institutions will enable to render more appropriate supporting services for farmers.
- With greater extension of lands suitable for crop farming together with advantageous position on marketing agro-products, the development of the region is anticipated to produce higher economic returns in comparison with the remainder of the regions.

Because the total area of the North Region is around 2,100 thousand ha, it is vital that more detailed data and information should be collected in advance to putting development programs/projects into implementation in this region. In this context, it is recommended that a master plan to cover the whole region should be formulated and a feasibility study on high priority projects/areas proposed in the said master plan should be carried out. All these considerations lead to the suggestion that a detailed survey on establishment of the scope of the work for the master plan to cover the North Region should be conducted during the subsequent step of the present study.

**ANNEX XI**

**REGIONAL DEVELOPMENT  
PROGRAM**



## ANNEX XI

### REGIONAL DEVELOPMENT PROGRAM

#### **1 Outline of the Program**

##### **1.1 Background on Formulation of the Regional Development Program**

One of the principal targets of the agricultural policies of the Federal Government's Multi-annual Plan 1996-99 is identification of appropriate region(s) for development of agricultural production and, in this regard, establishment of comparative advantage for production of crops and livestock produces (soybeans, maize, meat, rice, etc.) was pursued as specific strategy of the said policies. The multi-annual development plan 1996-99 of the state government have been elaborated in conformity with the said multi-annual plan of the federal government, which has laid a special attention on sustainable economic growth by promoting the agriculture and livestock sector-the mainstay of the economic sector of the state. For attaining this target, the state government seeks, through development of new agricultural productive units, to produce and export diversified high-quality agricultural and livestock commodities aiming at both domestic and international markets.

It is generally recognized that the worldwide supply and demand of foodstuff from 2010 onward would become tight judging from the prevailing international circumstances for the subject. Despite this gloomy forecast, arable land of the world for grains is saturated even now without leaving room for further substantial expansion except for the "cerrado" regions located in the central and northern regions in Brazil. The State of Taconites is situated within this worldwide strategic regions.

##### **1.2 Development Targets of Regional Development Program**

The targets of the regional development program within the context of the Integrated Agriculture and Livestock Development in the State of Taconites are to create and incorporate mass production system of agricultural and livestock products which are anticipated by both domestic and international markets as well as are easily cultivated locally being suited with physical conditions (land and water resources and climate), to realize diversification of farming activities and to contribute for the reinforcement and stabilization of economic units of the state.

During the course of accomplishment of the said targets, it is prerequisite to consolidate traffic infrastructure, to upgrade educational and public health system, to expand and modernize marketing network of agricultural products and to fulfill socio-economic infrastructure in parallel with agricultural and livestock development. In this context, the regional development program shall comprise components relevant to this prerequisite as its subprograms.

On the other hand, in creating and incorporating mass production system, special attention should be paid to formulation of environmental conservation program covering an influential area of the development program to enable sustainable growth in agricultural production.

### 1.3 Procedure for Formulation of Regional Development Program

The regional development program shall be formulated in the following manner:

- (1) Collection and analysis of basic data and information covering the proposed development area
  - Physical conditions (soils, hydrology, climate, topography, vegetation, etc.)
  - Socio-economic conditions (population, agricultural production, education, public health, land tenure, rural organization, etc.)
  - Development of traffic and industrial infrastructure (road network, marketing facilities, market, etc.)
  - Regional and local administrative organization
- (2) Field survey of the proposed development area and interview survey on local farmers
- (3) Analysis and compilation of field survey results
- (4) Preparation of report for regional development plan

### 1.4 Implementation Methodology of Regional Development Program

Subprograms to be contemplated in the regional development program shall be formulated with due consideration of constraints and potentials on development of proposed area. It is supposed that there would be some subprograms which can not be put into implementation with individual efforts of local farmers; furthermore, there would be another subprograms beyond the administrative capacity of regional and municipal governments. For realization of these subprograms, it is essential to create new organization which shall take charge of promoting and implementing them. As for this new organization, more detailed information will be given in the subsequent section. Proposed implementation agencies for respective subprogram are as given hereinafter.

Subprograms	Proposed Implementation Agencies
New Production Units Development (Crop-Pasture Rotation Units)	New Organization (Public Corporation)
Traffic System Development	Federal and State Governments
Agricultural Research and Institutional Supporting System	State Government and its Affiliated Organizations
Marketing Infrastructure Development	New Organization, Regional and Municipal government, Private Sector
Marketing System Improvement	Private Sector, New Organization
Upgrading Education and Public Health	Federal and State Governments
Environmental Conservation	New Organization, State Government



## **2. Criteria for Identification of High Priority Region and Selection of Model Development Region**

### **2.1 Criteria for Identification of High Priority Region**

The criteria applied in identification of high priority region are as follows:

- (1) **Physical conditions**  
Adaptability of soils, availability of water resources and climate conditions
- (2) **Development of traffic infrastructure**  
Access from origins of production to markets
- (3) **Socio-economic development**  
Population density, relative fulfillment of education and public health infrastructure, modernization level of urban area, etc.
- (4) **Marketing system and facilities**  
Concentration of marketing facilities (stockyard including warehouse) and prevailing transaction system of agro-products
- (5) **Accumulation of capital among private industrial sector**
- (6) **State government's policy in regional prioritization**

### **2.2 Selection of Model Development Region**

Under the present Master Plan Study for Integrated Development of Agriculture and Livestock in the State of Tocantins, the North Region has been selected among ten (10) regions divided by the state government for the sake of development as the model development region of the regional development program, as a consequence of an exchange of opinions between the Study Team and the state government of Tocantins. For putting the highest priority to the North Region, the criteria (1), (2) & (3) have been duly taken into consideration.

## **3 Comprehensive Implementation Schedule of the Regional Development Program**

The comprehensive implementation schedule of the regional development program for 10 regions including the North Region is prepared as given in the table below, following the criteria cited in the 2.1 above as well as in consultation with the State government.

Implementation Schedule of the Regional Development Program

Programs/Projects	Short-term					Medium-term					Long-term					2015					
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009		2010	2011	2012	2013	2014
<b>Regional development program</b>																					
<b>North Region</b>																					
- Implementation of M/P and F/S		█																			
- Infrastructure development and start of production			█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
- Rendering extension services																					
- Provision of rural credit																					
- Encouragement of agro-industry																					
<b>Extreme North Region (Zone I)</b>																					
- Implementation of M/P and F/S																					
- Infrastructure development and start of operation																					
- Operation of development projects																					
<b>South &amp; Central Regions (Zone II)</b>																					
- Implementation of M/P and F/S																					
- Infrastructure development and start of operation																					
- Operation of development projects																					
<b>Southwest &amp; Northwest Regions (Zone III)</b>																					
- Implementation of M/P and F/S																					
- Infrastructure development and start of operation																					
- Operation of development projects																					
<b>Northeast &amp; North Regions (Zone V)</b>																					
- Implementation of M/P and F/S																					
- Infrastructure development and start of operation																					
- Operation of development projects																					
<b>Southeast Region (Zone IV)</b>																					
- Implementation of M/P and F/S																					
- Infrastructure development and start of operation																					
- Operation of development projects																					

**4 Profile of Development Program of the Model Region**

**4.1 Potentials and Constraining Issues for Development of North Regions**

**4.1.1 General Feature of the Region**

**(1) Location and Area**

The North Region lies in the northern part of the state of Taconites with latitude 6 – 8° S and longitude 47 – 49° W and, is limited by the Taconites river to the east and by the Arguaina river to the west. The total extension of the region is 21,082.1 sq. km.

**(2) Administrative Division and Population**

The region is administratively divided into 13 municipalities and the population of the region is estimated to be 172,447 (1996), equivalent to 16.4% of the population of the state (1,049,823). The region has the second largest population among ten regions next to the Central Region to which Palmas, the capital city of the State, belongs. The regional population has grown with an average annual rate of 2.6% for the period 1991 – 96. Araguaina is the largest city of the region in term of territorial extension, the number of inhabitants and population density.

### **(3) Soils and Topographic Conditions**

The soils of the regions are classified in accordance with their adaptability for agricultural use as given in the Figure II-5.1(2). The soils with Class 2 & 3, which are considered as suitable soils for crop farming, are extended to the west of the Federal Highways BR-153 & BR-226 (Belem – Brasilia Highway), which pass through the region from south to north. In contrast, with exception of some sectors in the municipalities of Babaculandia and Filandelfia (in which soils with Class 2 dominate), the greater portion of the eastern part of the region is covered with sandy soils which are suitable neither for agricultural use nor livestock one. Hilly lands with an average elevation of around 300 m are found to the west of the federal highways mentioned before from the municipality of Xambioa to the municipality of Nova Olinda; the rest of lands in the region are extended within the elevation range of 140 – 170 m, except for hilly lands in the municipalities of Babaculandia and Filadelfia located on the basin area of the Taconites river.

#### **4.1.2 Prevailing Agricultural Production and Constraints**

The region, which is characterized by the earliest settled and exploited region among regions located to the north from the capital city of Palmas, has been developed as the leading livestock farming, in particular cattle farming, region of the state. As cited later, crop farming in the region has been rudimentary in comparison with other regions of the state.

##### **(1) Actual Livestock Production**

The number of cattle raised as of 1995 is 1,137,200 (IBGE/TO), which accounts for 20.29% of the total number of the State occupying the primary position in number of head. Likewise, minor animals such as hog, sheep, goat, poultry, etc. are raised predominately within the state. The region is biased to livestock farming.

##### **(2) Actual Crop Production**

In contrast with the livestock sector, this sector plays less important role within the state; the 1994/95 data indicate that the region occupies within the states as small portion as 7.0% in cultivated area and 5.2% in output of major crops. The leading crops are maize, upland rice and feijão (in order of importance) and, as minor crops, mandioca, suger-cane, banana and pineapple are numerated; of these crops maize and mandioca share higher proportion within total output of the state with 10.4% and 11.7%, respectively. Although not supported by quantified data, production of vegetables has started recently in some areas of the region.

##### **(3) Constraints of Livestock Farming**

The productivity has shown downside slide for a couple of years and decreased returns of farming becomes a serious issue among producers. The leading marketing destination

of the products is the Northeast Part of the country and the region's products face difficulty in maintaining their comparative advantage there. In addition, the activity generates less job opportunity and has less impact on socio-economic development of the region accordingly.

#### **(4) Constraints of Crop Farming**

This activity is engaged in its great majority by medium or smaller holders. The total extension of their holding reach close to 900 thousand ha., but the actual cultivated area is lowered to only 280 thousand ha. approximately; the remaining portion (620 thousand ha. or around 70% of the holding) are left as fallow or reserved areas. Besides, the marketing of harvests constitute the principal factor that decelerates an expansion of crop production.

#### **(5) Issues and Strategies for Agricultural Development**

The issues to be tackled for relaxing the said constraints together with strategies for future development of the agricultural sector are as resumed hereinafter.

##### **a) Livestock Farming**

The deteriorated productivity in recent years is closely linked with loss of high quality pasture caused by degradation of soil fertility. On the other hand, in so far as marketing of products is concerned, the protection of animal health and the cost of transportation are highlighted. Taking this situation in mind, issues and strategies are summarized as follows:

Issues to be Tackled	Strategies for Development
- To Mitigate the progress of soil degradation and to cultivate high quality pasture	- Implementation of crop-pasture rotation
- To strengthen market competitiveness of products	- Upgrading animal health protection system, promotion for exportation and consolidation of traffic infrastructure
- To diversify livestock activity	- Encouragement of dairy industry and swine farming

##### **b) Crop Farming**

The low crop intensity rate among producers of the region (which is estimated to be around 30%) is attributable to immature marketing information system, absence of appropriate farming technology, deficient provision of agricultural inputs including machinery, with regard to the crops which are highly suitable to local soil and climatological conditions and are promising in markets. The under-development of marketing and trading system constitutes another bottleneck which discourages

produces from expanding crop production. Issues and strategies are as summarized below:

Issues to be Tackles	Strategies for Development
- Development of New Production Units (Intensification of Land Use)	- Production of grains (crop-pasture rotation) - Creation of new organization (Public corporation, etc.)
- Encouragement for expansion of farming activity	- Expansion of public market - Consolidation of traffic infrastructure - Establishment of domestic and international market information system

## 5 New Production Units Development (Crop-Pasture Rotation Units)

### 5.1 Land Use Plan

Information relevant to the actual land use of the North Region has not been arranged adequately up to date. In formulating regional development programs, it is indispensable to elaborate information related with land use and land map classified by crop cultivated area, pasture, fallow and reserved areas and urban area for respective municipality. Hence, elaboration of these information is an immediate task.

In formulating feasible land use plan for the regional land development program, important physical conditions are soil fertility, water resources and topography, which are preliminarily compiled as a consequence of reconnaissance survey conducted during the course of the present field work in the following manner.

#### (1) Soils, Land Suitability and Identification of Areas Suitable for Agriculture

##### 1) Soils

The information collected through various surveys such as RADAM Project, RADAMBRASIL Project, EMBRAPA/SNLCS are used to compile the soil of the Tocantins State in a scale of 1:1,000,000 (PRODIAT). The soil map of the Northern Region is shown in Figure XI -1.

The major soils in the region are oxisols, quartz sands, concretionary soils, podzolic soils, lithosols and hydromorphic soils. Although these are the predominant soils in the region, these soils also occur with their soils associations in smaller extensions.

The oxisols in most part of the region are acidic and are deficient in phosphorus, calcium, magnesium and potassium. Although the present topographical characteristics of these oxisols facilitate for agriculture and livestock farming, liming and manuring need to be carried in order to improve the fertility of these soils.

Quartz sands are deep soils of weak horizon and sandy texture with reddish and yellowish colors. They are porous, strongly drained and with high permeability along the whole profile. They are dystrophic with strong acidity and the predominant vegetation in these soils are Brazilian savanna (cerrado).

Hydromorphic laterites are mineral soils of little depth, average clayey texture or sandy in some cases, not too porous, not too permeable and imperfectly drained. They occur on flat or slightly undulated terrain and the predominant vegetation in these soils is open fields or savanna.

Podzolic soils are normally characterized by a horizon in which iron (and aluminium) or organic matter, or both have accumulated normally underlying a bleached layer. Podzolic soils are normally used for extensive grazing. Deep ploughing, lime application and fertilizer application are necessary for these kind of soils.

Lithosols are shallow soils and there is no B-horizon of any kind. These soils are continuously coherent and hard rock occurs within the top 30 cm of the surface. Most of these lithosols normally occur on slopes with excessive run off and erosion. These soils are normally dystrophic in nature and are not suitable for agriculture. Concretionary soils are also normally not suitable for agriculture because of its resistance to perform agricultural works due to the hardness of the soil.

At this point it is also necessary to emphasize that the soil classes described in the soil maps contain the information which were carried out on a larger scale and therefore, in most of the cases, there are also other classes associated with the principal soil classes. But they are in smaller extension and they were not included in the maps because of the scale of these maps.

## **2) Land Suitability and Identification of Areas Suitable for Agriculture**

Land suitability map of the northern region is shown in Fig. XI - 2. The land suitability of the State is divided into six classes and the areas of classes 2,3,5 and 6 are 51.3%, 0.3%, 43.8% and 4.6%, respectively. Classes 1 to 3 are considered as soils suitable for agriculture which cover an area of approx. 1,090 thousand ha. In the Northern region, the total area is clearly divided into two distinct areas of western and eastern area with the western area has more area of higher land suitability which are suitable for agriculture. Most of the eastern part of the area except the area which are adjacent to the Babaculandia municipality and some parts of Filadelfia municipality fall under the capability class of 5, which are suitable for natural vegetation and silviculture.

Livestock farming is the predominant activity in the region, which are carried out big landholders and agriculture is basically performed by small land holders as a subsistence activity. The cultivated area of food crops in the region in 1995-96 for rice (non-irrigated), maize, feijao bean, cassava, banana, and pineapple are 9.3%, 13.5%, 9.1%, 14.6%, 6.8% and 14.0% of the cultivated area in the state.

Although most of the lands in the western part are suitable for agriculture, where the food crops such as soybean, beans, maize etc. can be cultivated, mostly livestock farming is carried out in the region, since most of the area are owned by big land holders. However because of the lower prices of meat cattle, some of the farmers are looking for a suitable alternative. Besides, there is also a problem of land degradation caused by leaching and erosion.

In order to maintain the soil fertility status for a long period and to perform sustainable agriculture development, a new method of combining agriculture and livestock development shall be proposed as a new alternative. During the field survey, when the farmers were interviewed, most of the small farmers and some of the big farmers showed interest in adapting the new alternative provided, suitable technology, machinery, credit and other facilities are available. When the farmers are interviewed about the areas suitable for introducing the new development, they proposed some areas in their municipalities as shown in Figure XI – 3.

However, these areas were proposed just by the interview survey, and no detailed soil surveys were carried out in these areas. In order to introduce the new development plan, there is a need to carry out more detailed soil surveys in the region.

## (2) Potential for Development of Irrigation System

The reconnaissance survey conducted in the course of the present field works has disclosed that the region is generally vested with abundant water resources and thereby potential for development of irrigation system is evaluated to be high. Nevertheless, in formulating water resources development plan, information relevant to river discharges including those in the dry season which are extremely deficient at present, is essential.

Processing preliminary information collected in the course of the reconnaissance survey, the rivers which have potential water resources for development of irrigation system are illustrated in the Figure XI – 4. On the basis of river discharges in the dry season (lowest river discharge) the available discharge for irrigation at the dry season is presumed to be 1.0/s, and irrigable area without construction of water storage facilities like dam, etc. has been estimate in the following manner:

Rivers	Discharge (l/s)	Irrigable Area (ha)	Rivers	Discharge (l/s)	Irrigable Area (ha)
Lontra	5,000	2,500	Correntes	3,000	1,500
Muricizal	3,200	1,600	Arraias	6,500	3,000
Lajaes	6,000	3,000	Joao Aires	6,000	3,000

Without availability of detailed information, irrigable areas under influence of other rivers are not estimated in this occasion, although the existence of surface water even in the dry season has been conformed for these rivers.

### (3) Topography

An outline of the topographic condition of the region is given in the general feature of the region. At the time of formulating the development plan, it is necessary that a land use plan which entails the co-relation between topography and river, access to specific locations, etc. should be prepared. This land use plan has to contain information on topographic condition.

### 5.2 Modernization of Livestock Activity

The livestock activity, which is a mainstay in the North Region, confronts at present deteriorated productivity caused by loss of nutritive pasture being traced to degradation of soil fertility. In an eye to alleviating this situation, an introduction of crop-pasture rotation farming is proposed. Besides, the upgrading of prevailing animal health protection system should be considered in pursuit of reinforcement of competitiveness of local livestock products exportable to international market, subject to establishment of foot and mouth disease-free zone.

At the same time, diversification of livestock activity which is extremely biased to cattle farming at present, is another issue to be tackled in the development plan; an expansion of swine farming is a promising proposal in view of tight projection of supply and demand in the future and the possibility for introduction of other minor animals should be also evaluated. This diversification of livestock activity leads, without doubt, to development of dairy industry producing milk, ham, cheese, etc. and, in turn, to generation of job opportunities as its side-effect.

The potential for modernization of livestock activity by 13 municipalities is as summarized hereinafter:

**Xambioa:** Nearly 60% of the municipal land is occupied by only 40 large land holders who are engaging in cattle farming and about 805 of these holders live out of the municipality in which their farm exists. According to the interview survey carried out to these large holders, they are anxious about deteriorated productivity of cattle farming and, in this context, are interested in introduction of crop-pasture rotation farming.

Since the enforcement of the "Real Plan", the profit of meat industry has decreased, and, as a result, some farmers have started to produce banana and other tropical fruits in some lots of their large lands under difficulty in marketing them.

In the municipality, the number of farmers who engage in raising dairy cow has increased recently among small holders, but absence of any processing facility of dairy products would hamper further substantial expansion of dairy farming.

**Araguana:** Almost the whole rural area of this municipality is occupied by 22 holders and most of them are absent landowner. Therefore, an intention of farmers (landowners) has not been revealed. Furthermore, due to significantly undulated topographic



condition, an introduction of crop-pasture rotation is not technically feasible and it is judged that modernization of livestock activity should face with severe difficulty.

It is worth while to indicate that, being located along the Araguaina River, the potential for development of the tourism sector of the municipality should be assessed.

**Piraque:** As the case of the municipalities cited before, 80% of the territory of this municipality is occupied by about 30 holders, of which 80% are absent landowners. These holders engage in their great portion in cattle farming and lands held by them had fertile soils in the past. Nevertheless, without paying attention to conservation of soil fertility, productivity of cattle farming associated with degradation of both pasture and soils becomes conspicuous recently. Under the circumstances, in response to an expectation of some resident landowners, the crop-pasture rotation system may be introduced in some lands, which are viable from topographic standpoint.

Actually, some farmers have undertaken swine farming (Landrace species) and the activity may have potential for further expansion subject to consolidation of traffic infrastructure.

**Wanderlandia:** Most of large holders in this municipality engage in fattening of cattle and some are producing calves. Medium holders, who had been engaged in grain production before, have abandoned their cultivation being discouraged by their deteriorated profitability and have changed to livestock farming. This background supports these medium holders to embark crop-pasture rotation farming, which contemplates realization of both crop and livestock farming.

Another noticeable event in this municipality is construction of freshwater fish farming pond as a joint venture of some large holders and the impact of this undertaking is worth to observe.

Small holders, who are engaged in small-scale farming of swine, apiculture and freshwater fish at present, have an interest in embarking mixed farming of crop and livestock production under joint-operation or association of farmers, if technical and financial assistance for the undertaking should be rendered. Swine farming is proposed activity for these small holders.

**Aragominas:** The number of large holders in this municipality reaches approximately 80 with an average holding of around 2,000 ha. The major activities among these holders are fattening of cattle in the northern and central sectors of the area and production of calves in the south sector. Most of these farmers are not satisfied with prevailing stagnated cattle farming, hence they are eager to undertake crop-pasture rotation.

Some small holders are engaged in rearing dairy cow, but an absence of dairy plant is a bottleneck for future expansion of the activity.

**Carmolandia:** Almost the whole territory of the municipality is occupied by large holders and some of them cultivate maize to feed directly to their raised cattle. It is supposed that most of farmers adhere to continuing their actual farming, so proposal for modernization of livestock farming in this municipality would be invalid.

**Badaculandia:** Lands in the area are in their great majority held by absent landowners and their productivity tends to deteriorate without proper management of pastures. Some landholders have embarked fruits culture.

Judging from topographic condition, mechanized agriculture, which aims at introduction of crop-pasture rotation might be infeasible. Therefore, promising proposal to strengthen farming activity there is to introduce improved pasture through amelioration of soil fertility. With consolidation of traffic condition and implementation of rural electrification, production of fruits may be accelerated.

Proposal for small holders shall consist of swine farming and fruit cultivation under joint-operation of producers.

**Filadelfia:** A total of 100 owners of pasture carry out cattle farming; 70% engage in production of calves and 30% in fattening of cattle; 30% of owners also engage in fruit culture. Soils and topographic conditions are not optimum in introduction of crop-pasture rotation system, which induces to conduct further detailed study in the future.

Small holders are limited to subsistence farming with cultivation of grains, so they are anticipating to embark crop and livestock farming which promises higher return. Proposal for improvement of farming activity with introduction of mixed farming of crop and livestock production (upland rice, soybean and swine) shall be presented with regard to such areas as have fertile soils together with mild topographic condition which enables to realize agricultural mechanization.

It should be bear in mind that urban area of the municipality, which is situated along the Taconites River, has high potential in development of tourism sector.

**Palmeirante:** About 20 large holders have pasture of 1,000 – 2,000 ha. for rearing cattle and most of them are absent landowners. With deterioration of productivity of cattle farming, one livestock farmer having a pasture of 2,000 ha. has embarked in crop-pasture rotation with cultivation of soybean and upland rice and extension of this farming technology to other farmers is anticipated. Nevertheless, it should be taken into account that soils unsuitable to crop production are predominant in the area with exception of some sectors.

Because small farmers in this municipality are anxious for outgrowing actual farming practice, it is advisable to enlighten cooperatives among them in view of introduction of mixed farming of crop and livestock (soybean, maize and swine) under joint-operation to be accordance with local soil and topographic conditions. Improvement of road network and consolidation of rural electrification are premises prior to putting into

implementation of this proposal.

**Nova Olinda:** Close to half of the territorial extension of this municipality is held by about 50 landowners who are engaged in production of calves and fattening of cattle. Soils of the area are generally not suited to crop farming, so introduction of crop-pasture rotation system is not technically viable.

Small holders are mainly conducting subsistence farming, although some of them have started to rear dairy cow; producers engaging in dairy farming have formed an association to market milk and the state government has proposed to support them in construction of dairy processing plant.

The municipality has comparative advantage in geographical location and road network, so the future development of the area should be focused on encouragement of dairy farming.

**Muricilandia:** A total of 15 farmers are engaged in livestock activity, mainly in fattening of cattle under dismal circumstances for farm operation. Despite this situation, there are some sectors with fertile soils extended from the central part to the western part where leave room for improvement of farm operation by means of introduction of crop-pasture rotation system.

Some 70 small farmers who live within the outskirts of the urban area has formed a syndicate with an objective of undertaking agricultural mechanization and this situation would lead to realization of crop-pasture rotation farming under joint-operation of farmers. It is advisable, from farmers' experience in production, that this unconventional farming contain dairy cow, swine and grains farming. Consideration on marketing of agro-products including better utilization of existing cheese production factory should be also taken into.

**Santa Fe do Araguaia:** Large holders, most of them are absent landowners, occupy nearly 70% of the municipal territory and are engaged in fattening of cattle. Without proper management of pasture, productivity in these lands shows downside slide. Furthermore, an absence of environmental conservation is a sign to spoil sustainable production of lands. The greater portion of lands in the western part of the North Region including those in this municipality have been exploited prior to an enforcement of the Amazonian Act, relevant land resources are faced with serious situation in terms of environmental conservation. It is thus suggested that some measures should be taken to proceed with reforestation in area covering 10-20% of their lands.

Small farmers mainly engage in subsistence farming and some of them undertake fruits and maize production as well as rearing dairy cow. In addition, one project comprising both upland and irrigated rice cultures is in progress. The proposal for improvement of farming activity among small farmers is to introduce agricultural mechanization seeking for crop-pasture rotation system (cultivation of rice and maize and rearing of dairy cow and swine).

**Araguaina:** The western sector of this municipality from the federal highway BR-153 is occupied by about 120 large holders whose land extension covers nearly 85% of the sector's area. These farmers, who are engaged in fattening of cattle, are suffered from deteriorated productivity, so they are interested in embarking crop production. Major constraint confronting crop farming is lack of proper farming technologies. An introduction of crop-pasture rotation (soybean, maize, feijão, and rice) should be studied for assessing its viability.

Small farmers are mainly engaged in subsistence farming, although some of them carry out fruit production as well as farming of swine, dairy cow and poultry at commercial basis. Promising farming judging from comparative advantage of the municipality among them are fruits cultivation and rearing swine, so intensification of farming system and establishment of marketing system should be proposed.

Above description is on the basis of preliminary reconnaissance survey, in this regard, further detailed study is substantial in formulating regional development plan. The Fig. XI- 3 illustrates potential area for introduction of crop-pasture rotation farming.

### **5.3 Diversification of Crop Farming**

Crop farming in the North Region, which is generally conducted by small holders, is inactive in comparison with other regions of the state. Generally speaking, crop farming has been stagnated in the state without finding economically optimum crops suited to local physical conditions under the circumstances of elevated price of inputs in contrast with depressed farm-gate price, geographical disadvantage from the major entry points of the country, etc. Undertakings to put prevailing subsistence farming to end have not born fruits up to date. As a consequence, an estimated 600 thousand ha. of arable lands are left at present in vain as fallow or reserved lands.

An intensification of use for these arable lands is a pressing issue, which should be tackled in the course of the formulating agricultural development proposal of the North Region. This development proposal shall comprise development of grains production, which is foreseeable under the international circumstances of supply and demand of foodstuff as well as promotion of fruits and vegetable production, which is anticipated in response to increased demand at markets both inside and outside the state.

As for the production of grains (rice, maize, soybean, etc.), it is highly recommended that, in view of attaining sustainable production of land resources by mitigating the progress of soil degradation, the crop-pasture rotation system should be put into implementation for development of new production units contemplated under the regional development program.

Under limited field reconnaissance survey conducted in the course of the present field

works, the potentiality for diversification of crop farming has been evaluated preliminarily by municipality of the North Region in the following manner:

**Xambioa:** The number of small holders in this municipality reaches more or less 400 in total and they hold an average land of 20 ha. Leading farming activities of these farmers are fruits culture, production of small-scale grains and rearing dairy cows. Equipped with suitable soils for crop farming, it is suggested to develop, where topographic condition permits agricultural mechanization, agricultural production units with forming association among small farmers. Farming activities to be proposed in these production units are vegetables and fruits cultivation besides dairy cow farming. An introduction of crop-pasture rotation system shall also be studied its possibility from technical points of view.

**Araguana:** Small farmers in this area are exclusively landless tenant farmers or farm workers, so no potential for development of crop farming is envisaged.

**Piraque:** Farmers in this municipality have manifested their willingness to embark farm diversification subject to forming an association. Supported by favorable soils and topographic conditions as well as availability of water resources, the area offers development opportunity for mixed farming of horti-fruticulture, grains production and swine farming.

**Wanderlandia:** Although farmers in this municipality have also shown their interest in diversification of farming activity. Despite their interest, unsuitable soil condition of the area would make up serious limitation in realization of crop diversification. Practical proposal for this area would be development of mixed farming with emphasis laid on rearing swine.

**Aragominas:** Some small farmers in the area have formed an association in cultivating and marketing tomato and others ones produce milk rearing dairy cow; the latter have not attained economically reasonable level of profit. It is suggested that development of the area should be focused on formation of production units of fruits and on mixed farming of vegetables cultivation and rearing of dairy cow or cattle for fattening.

**Carmolandia:** Although the great majority of the territorial extension of this municipality is occupied by large holders engaged in cattle farming, the existence of suitable soils for crop farming and geographical advantage easily accessible to the city of Araguaia would suggest to evaluate the possibility to develop mixed farming of vegetables production and cattle farming among small farmers with formation of association.

**Babaculandia:** Small farmers in the area in their greater portion conduct at present no other farming but subsistence one. Suitable soils for crop production are extended over in the vicinity of the urban area and alongside the Taconites river, so there remains potential for development of the production unit of vegetables with formation of association among small farmers, if consolidation of traffic (road network) should be

carried out.

**Filadelfia:** Farmers in this municipality are characterized by major concentration of small holders, who are engaged in subsistence farming. Suitable soils for crop farming are scattered over some portion of the municipal territory and, taking into account of convenient access to such municipalities of the State of Maranhão as Carolia, Balsa and Estreito, all of which are located to the opposite bank of the Taconites river, it is worth whilst to evaluate the possibility to introduce mixed farming of horti-fruticultural production and small animals (swine and poultry) there.

**Palmeirante:** Some small farmers in the area cultivate grains in small scale, and cassava and raise cattle and swine. The potential to develop mixed farming of crop and livestock should be assessed subject to consolidation of water resources, rural electrification and traffic network.

**Nova Olinda:** Due to the fact that soils in the area are not suited in principal to crop farming, the proposal for agricultural development there would be limited to dairy farming in combination of encouragement of dairy industry and fruits production.

**Muricilandia:** The rural structure in this municipality is featured by major concentration of small holders, and it was disclosed as a consequence of interview survey to them that they are willing to embark farm operation under formation of association. In this regards, proposal to be presented in this area shall be proceeding with mixed farming of crop and livestock which aims to convert existing extensive farming of grains, cassava and vegetables production into more effective, profitable and sustainable one. Although more detailed survey is required, it is supposed that soils in the area are suitable for crop farming.

**Santa Fe do Araguaia:** Small holders in the area, although in small scale, produce grains and they ship maize to markets outside the state. Milk production and fruits farming are also conducted at commercial base. Bearing in mind that soils in the area are suitable for crop farming, the crop-pasture rotation system, which conceives grains production and rearing dairy cow is recommended proposal for agricultural development of the area, subject to an assessment of water availability.

**Araguaia:** Different condition of soils dominates between areas divided by the federal highway; soils in the western sector are suitable for crop farming, meanwhile those in the eastern sector are unsuitable. Hence, the proposal for agricultural development of this municipality shall be mixed farming of swine and cattle farming in combination with grain production (soybean, maize and rice) to be carried out by association of small holders for the western sector, whilst intensification of fruit production for the eastern sector.

It is reported that cotton is cultivated in some lands of the western sector from the federal highway and the potential to expand this crop will be evaluated after studying the area's comparative advantage to cultivate the crop.

The description above is a preliminary summary of the proposal for diversification of crop farming, which is subject to elaboration as a consequence of realization of more detailed field survey together with collection of relevant necessary data and information.

#### **5.4 Irrigation System Development**

The critical factors in putting into implementation of various programs/project to be formulated under the present regional development program are suitability of soils for agricultural use and availability of water for irrigation use. Features of soils in the region have been disclosed as a result of the field reconnaissance survey conducted in this opportunity as well as by interpretation of existing relevant information. By contrast, the availability of water resources has not been analyzed due to absence of information on the amount of discharges (in particular in dry season) for rivers having influence over the North Region.

The core concept of the agricultural and livestock development of the regional development program of the North Region is introduction of crop-pasture rotation system to promise sustainability of farm production and the success of this unconventional farming system depends highly on availability of irrigation water. Therefore, an implementation of detailed hydrological survey is an indispensable component within context of the regional development program.

#### **5.5 Agro-products Marketing System**

Whatever nature it may be, the development of an industry can not be attained unless it contains a marketing mechanism that permits: 1) effective transactions of products in the market, 2) utilization of the funds coming from the sales of that transactions for further production (re-production) of goods, and 3) reasonable profits to producers. Thus consolidated marketing mechanism is an anticipated target that the agriculture and livestock sector should pursuit for. In formulating marketing system development proposal for the regional development program of the North Region, an emphasis should be laid on devoted diagnosis of prevailing marketing circumstances and identification of issues to be tackled.

##### **(1) Animal Products**

The livestock sector has been the leading sector of the regional economic activity without confronting serious bottleneck on marketing of its products. Nevertheless, large producers are not satisfied with the prevailing marketing channel through which their products are shipped to retail dealers with intervention of middlemen; they wish to ship directly to retail dealers for getting more profits.

To make above producers' wish feasible, it is prerequisite that the commercial facilities (supermarket and so on) of the Northeast Part of the country – the major destination of the region's animal products – should be consolidated; this consolidation measure

encompass, among others, standardization for quality of meats and an establishment of open auction market of meats and it is expected that it will lead to creation of new marketing channel. Detailed methodology for this proposal shall be presented at the opportunity of next step of the regional planning.

As for swine industry, which has not been developed in the region, an establishment of its marketing mechanism is critical within the present regional development program. For this end, the marketing information on evolution of prices and supply and demand of meat (actual situation and future projection) should be surveyed with regard to developed states of the industry in the country so that the marginal marketing price (potential sales price) and the marginal marketing quantity (projection of demand in the future) might be foreseen.

Subsequent to above-mentioned survey, technical proposal on swine farming (to be described in detail afterward) will be presented and, on the basis of the technical efficiency of this proposal, the production cost for swine farming will be calculated so as to evaluate the feasibility for development of swine farming. With premises of this feasibility study an establishment of the marketing channel of swine which comprises installations of processing facility (publicly and privately operated) and open auction market should be proceeded. In this regard, it is important to undertake the diffusion of information on products of regional swine to both within and outside the state.

The animal products actually marketed in the region are not exportable due to the influence of foot and mouth disease, so the control of this disease (establishment of foot and mouth-free zone) is indispensable so as to promote an exportation of pork. In particular, in view of the comparative advantage of the region from geographic point of view, pork is considered to be promising exports. Consideration on establishment of freezing and packing industries should be also made.

The foreseeable marketing expectation of pork at international market is supported by the international statistical index for the year of 1997 which shows a deficit of 1.3 million tons of pork worldwide caused by export ban of the products originated from Netherlands and Taiwan, the second and fourth largest exporters of pork. In contrast with beef, the demand of it has been stagnated worldwide recently; the demand of pork has shown upward slide under inconsistent supply of the product. It is thus considered that Brazilian pork should have potential to be exported to the international market.

It is supposed that the production of milk is not profitable business for producers. So as to relax this constraint, it is important that producers should undertake cattle breeding system, which enables to reduce the production cost. In the short run, it may be necessary that an arrangement to regulate an output of milk production compatible with demand should be embarked, subject to implementation of survey on demand of dairy products within the region, as well as in Tocantins and the surrounding states; on the other hand, in the medium and long runs, presuming the diversification of preference of consumers in the future, the expansion of market for supply of raw materials for dairy industry should be also anticipated.



## (2) Crops

In the diversification proposal envisaged in the regional development program of the North Region, target crops are grains (rice, maize, soybean, feijão, etc.), vegetables and fruits. These crops are currently produced in the region by small holders, but most of the harvests are used as subsistence of farmers' family and farm workers and very few are traded at markets. Hence, the realization of crop diversification should accompany an establishment of marketing system as an indispensable factor of the proposal.

Due to limited time allowance and availability of relevant information, it failed to prepare specific proposal for development of marketing system, therefore the description hereinafter is confined to characterization of crop production, issues to be taken into mind in trading of crops under prevailing marketing practice, and subjects to be investigated in formulating marketing plan.

**Rice:** The productivity (unit yield) and quality of harvests are the primary concern for marketing this grain. This means that, with the region's productivity inferior to the national average, reasonable profit would not be brought about to producers, who, in turn, would spoil the industrial background of the product. Similarly, as the market offers higher price to higher quality of product, impaired quality of product would be shut out from the market.

Under these circumstances, a survey on production factors of rice in developed regions of the country is necessary so that the comparative advantage or the comparative equivalence for the production of rice in the North Region might be established within the domestic market. With an establishment of this comparative advantage or equivalence, the marketing of rice will be made without facing with serious bottleneck, judging from prevailing domestic market practice of the grain.

It is presumed that the Brazilian rice would not be exportable in the short run but may be the case in the medium and long run, so production of high quality rice to be traded at international market is advisable. It is commonly recognized that the supply and demand of rice would be balanced worldwide by the year of 2020, so development of new productive lands of rice would be an international expectation.

**Soybean:** Soybean is an international product traded at Chicago Grain Exchange and other exchange and the South American products are important because the grain is shipped at off-crop season of the Northern hemisphere. In this sense, soybean to be produced in the North Region is an exportable crop.

Soybean is exported in three different forms: in beans, bran and crude/refined oil and its marketing channel is generally as follows; beans are shipped from producers to major traders/exporters (CARGILL, CEVAL, SANTISTA, etc.), and the latter processes the grain for shipment of international market. Of the three forms of exportable soybean mentioned before, oil and bran are also traded at domestic market. In this process, large-

scale storage facility (silo) and oil extraction factory are generally constructed and operated by major traders/exporters.

In accordance with the diversification of preference on foodstuff worldwide, the demand of soybean as a source of vegetable protein has increased recently, and, in line with this increased trend of demand, the international price of the grain has shown upward slide since 1993/94.

In addition, the State of Taconites, in particular the North Region, will benefited greatly by the completion of the South-North Railroads to connect Estreito with Imperatriz; with completion of this railroad, the marketing route from the origin of production to the export port of Sao Luis (Itaqui) shall be secured and the region shall bear the comparative advantage due to saving of transportation cost. It is worth while to point out that the shipment from the port of Itaqui to the European markets shall have the comparative advantage in comparison with that from the neighboring countries like Argentina, Paraguay and Uruguay.

In the port of Sao Luis (Itaqui), an exporting infrastructure of soybean is equipped; loading facility of soybean is already installed and construction of oil extraction factory is underway.

Should soybean be cultivated in large extension in the North Region, it is suggested that intermediate storage facilities would be installed and operated by associations/cooperatives formed by producers, and themselves would transport the grains stored there directly to the storage facility of exporters. Producers would surely benefit by the installation of this type of facility, because they can ship their grains observing the fluctuation of prices at international markets. To enable this enterprise it is essential to beef up forwarders who undertake shipment of the region's grain.

**Maize:** This grain also constitute an exportable product, but the local products are not eligible for exportation because of their inferiority in quality. In this connection, the priority in marketing of this grain should be given to an improvement of its variety of seeds; with this attainment, the local products may be exported in the medium and long run.

The importance for production of maize in the North Region is closely linked with the promotion of swine farming proposed in livestock development of the present regional development program. The milled maize in combination with rice bran, cassava, etc. is an important and nutritious feed for minor animals which is actually imported from the South and Central Regions of the country (mainly from the state of Goias). Realization of self-sufficiency of animal feed would benefit greatly to swine farmers and, in turn, to regional economy of the state.

The strategy to foster animal feed processing industry through production of maize is considered to be an important strategy from the standpoints for diversification and modernization of the regional agro-industry. Furthermore, poultry farmers in and around

Belem in the adjoining state of Parana get feeds from the state of Goias, and an animal feed processing industry to be established in the region would have a comparative advantage.

**Vegetables (including feijão):** At present, the great majority of vegetables consumed in the urban area of the state of Taconites are imported from the Central and South Regions of the country, mainly from the state of Goias. Under the circumstances, the target for production of vegetables in the North Region shall be an accomplishment of self-sufficiency within the region as well as within the urban area of the state of Taconites in short and medium term. The proposed constraints on marketing of vegetables are deficit operation of farming and excess of output as well as competitiveness in quality.

In order to relax the said constraints, it is of importance that the public organizations including the State government should conduct market survey consistently so that producers may be accessible to necessary marketing information which will serve them in selection of the vegetable(s) to be cultivated and in deciding the amount of harvests to be shipped.

As producers learn adequately marketing system, free competition of market will be secured, and the desirable market where the quality governs the competition will be formulated. As premise for establishment of desirable market, it is essential that public market, as entry point of local products, should be operated for conducting free and fair transactions of middlemen. In addition, as cited in the section of soybean, fostering of forwarders should also envisaged.

**Fruits:** It is recommended that specialization of crops in the region should be made after making identification of the comparative advantage of the region in terms of quality and productivity of fruits.

Besides, referring to the climatological characteristics of the other part of the county outside the state, the selection of fruits, which can not be produced in other regions due to climatological conditions, may be a practical proposal.

The post-harvest loss is a serious problem in development of fruits production, so expansion of marketing destination from inside the state to outside the state would be hard to come true unless refrigeration system including vehicles equipped with cooling devices to maintain the quality of products would be incorporated.

Fruits to be produced in the region are expected to be shipped to the domestic market in the short and medium term, but some of them (tropical fruits and cashew) are potential exports in the long term, provided that their processing industry should be established.

## 5.6 Consolidation of Traffic System

The consolidation (pavement) of road network is undertaken currently by the Secretary of Transport and Works/Technical Advisory and Planning of the state government. The Figure XI-5 illustrates completed road network up to date (October, 1997). According to the future consolidation plan of the state government, the whole municipalities of the North Region will be connected to the federal highway BR-153 & BR-226 by paved roads. This consolidation will improve inter-regional traffic system including substantial saving of traffic time. Concrete road network development plan with the target year of 2007/2008 is as given below (See Figure XI – 6).

**Road Network Development Plan in the North Region**

Roads	Section	Length (km)	Period
TO-210	Xambioa/Ananas	58	1997/1998
BR-153	Xambioa/Wanderlandia	89	1997/1998
TO-222	Araguaina/Filadelfia	100	1997/1998
TO-222	Araguaina/Aragominas	38	1997/1998
Ligação	Piraque/Entronc.BR-153	7	1999/2000
TO-335	Colinas/Palmeirante/Goiatins	148	2003/2004
TO-010	Wanderlandia/Babaculandia	61	2005/2006
TO-164	Bandeirantes/Aragominas	133	2005/2006

The regional development program of the North Region should be formulated in line with the above road network development plan.

On the other hand, it should be noted that the “Waterway System Development Project for the Araguaina River and the Taconites River” and “Extension Project of the South-North Railroad “, which is proposed to extend the railroad from Estreito southward to go through from south to north of the North Region, would not be referred as an important impact on the regional development program of the North Region, because these projects are rudimentary at present.

## 5.7 Strengthening of Institutional Supporting Services

The strengthening of the institutional supporting services shall be formulated in accordance with the program contemplated in the Annex XII, Section 4: Agricultural Technologies Research and Extension Organization.

## 5.8 Markets and Marketing Facilities Development

As explained in the agro-products marketing system above, the development of market and marketing facilities is an dispensable component in formulating agriculture and livestock development, especially in encouragement of sustainable agricultural production, of the regional development program on the North Region.

In this context, taking account of the guideline to be prepared in the Annex XVI: Private Sector Development Program, proposal for markets and marketing facilities development shall be prepared to comply with local conditions.

### **5.9 Upgrading Educational and Public Health System**

In implementing various projects envisaged in the regional development program, the local population's willingness to ameliorate their living standard based on fulfillment of educational needs and their accomplishment of healthy life supported by improvement of public health system are substantial basic factors. In this regards, the upgrading of educational and public health system plays an important role within formulating the regional development program.

Although it is said that the North Region has attained higher level of socio-economic development in comparison with other regions of the state of Taconites, but problems relevant to the rural society of the region will be disclosed with realization of the detailed field survey, and upgrading proposal regarding educational and public health system will be presented in line with the guideline shown in the Annex XII, Section 5: Human Resources Development Subprogram of the present Master Plan Study.

### **5.10 Promotion of Rural Organization**

The proposal for crop farming development contemplated in the regional development program of the North Region is aimed mainly to beef up small holders under their joint efforts, so organization of small holders and joint operation of crop production activity are an indispensable premises prior to development of crop farming development.

In the course of the study for formulating the regional development program, the prioritization of subregions in promoting rural organization which shall be made to prepare implementation schedule of the crop farming proposal. For this purpose, reference shall be made to the guidelines presented in the Annex XII, Section 5: Human Resources Development Subprogram.

### **5.11 Environmental Conservation**

The basic objective of the regional development program is an establishment of sustainable crop and livestock farming system which necessarily entail program for implementation of development in coordination with conservation of the natural resources to cover whole area of the region. Study related with environmental conservation shall be focused on identification of environmentally vulnerable area in both natural and social aspects as well as on specification of items, which shall have negative effect on environment.

The contents of the environmental conservation in the regional development program shall be designed referring to the guideline presented in the Annex XIII: Environmental Conservation Program of the present Master Plan Study.

### **5.12 Program Implementation Methodology**

The regional development program of the North Region has proposed unconventional farming systems (crop-pasture rotation and associated farming by small holders) which have not been put into implementation in the area up to date.

Farmers in the area are not familiar with the above farming systems and in realizing these systems consolidation of basic infrastructures for farming (irrigation system, establishment and reclamation of farm for operation by association, etc.), procurement of farm inputs including agricultural machinery, research and extension of agricultural and livestock farming technologies applicable to local conditions, installation of storage for harvests, improvement of marketing system and facilities, etc. are prerequisite.

The consolidation of farming conditions mentioned above would not be realized technically and administratively with solo spontaneous efforts of producers nor with supports of public institutions. It is thus suggested that new organization responsible for promotion of the development should be created. The profile of this new organization is proposed in the Annex XIII, Section 4: Green Village Subprogram and a definite proposal for this organization, which makes up a critical factor within context of the regional development program, would be elaborated in consultation with relevant counterpart of the state government.

### **5.13 Subsequent Study**

Described above are the general and preliminary features of the regional development program for the model development in the region (North Region). This description is no more than conceptual proposal under the circumstances of limited time allowance and availability of relevant information for implementation of the reconnaissance survey, therefore a subsequent detailed study for elaboration of the contents of the program should be followed. This detailed study comprises technical survey on local natural conditions and socio-economic survey on rural society for formulating development projects relevant to unconventional farming system of the North Region, and the same also accompanies suggestion for implementation schedule of the program and economic evaluation on selection high priority projects.

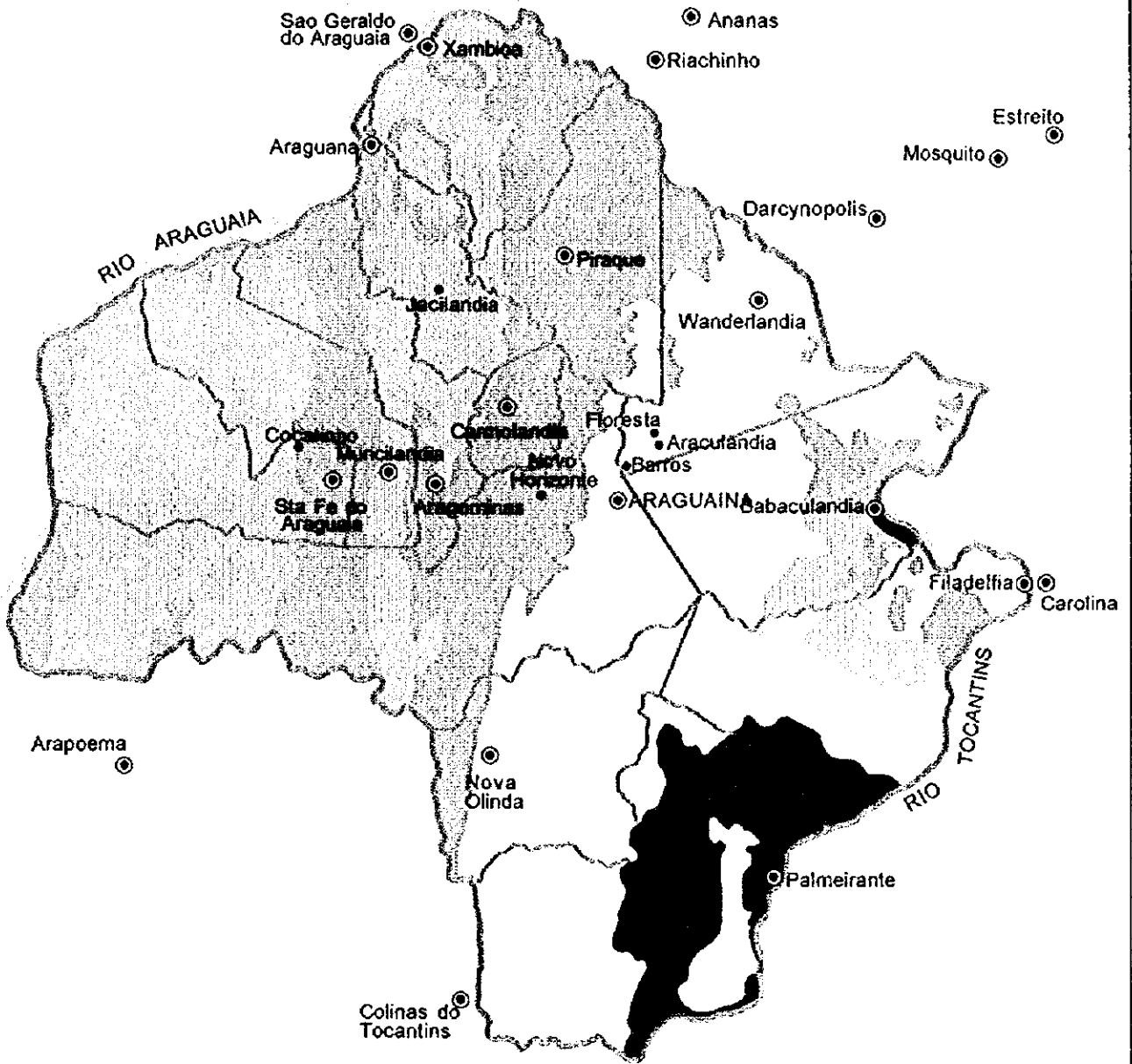
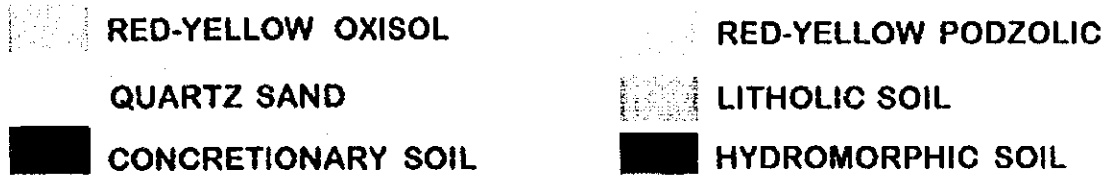


Figure XI-1: Soil Map

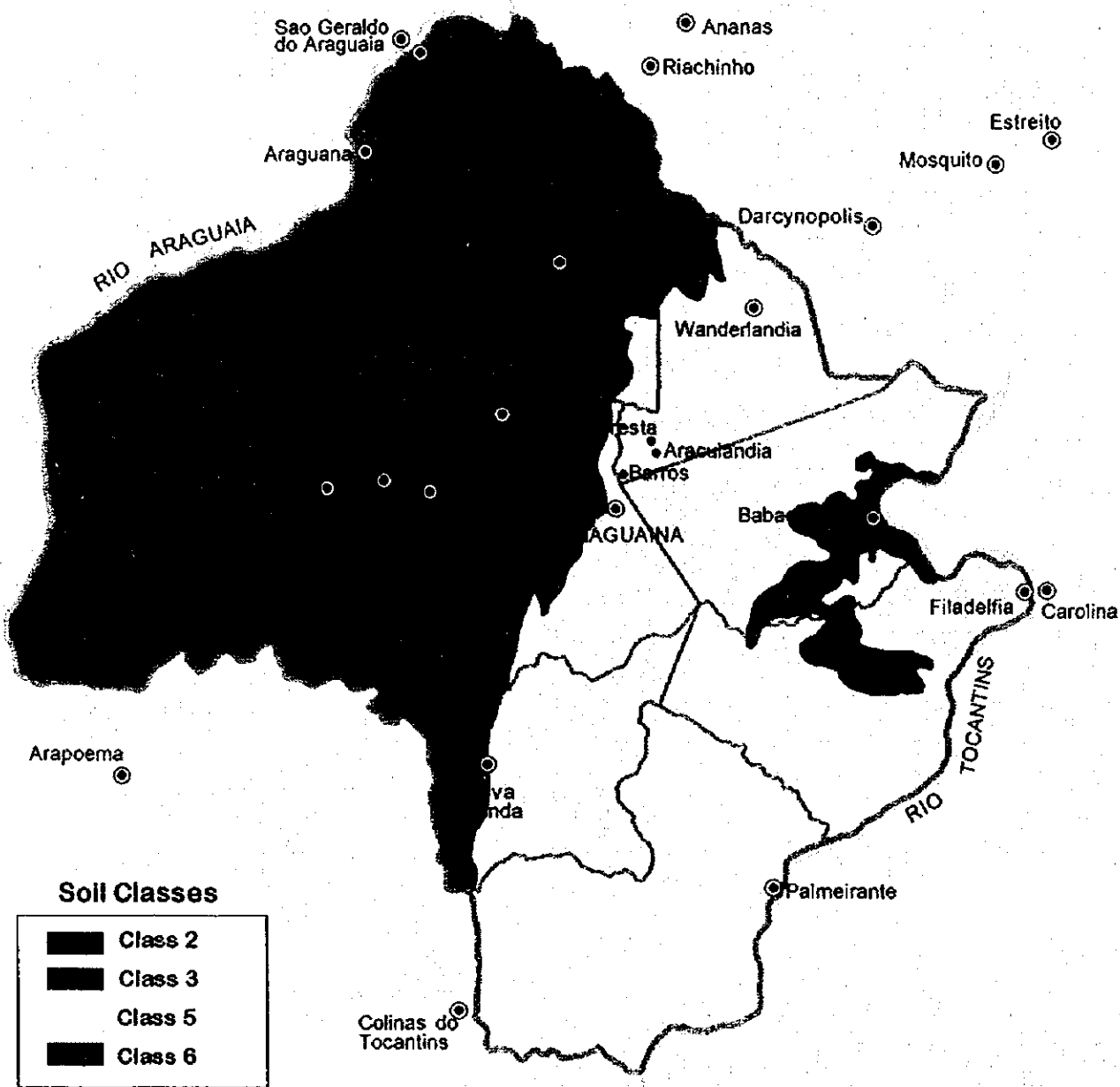


Figure XI-2: Soils Suitability Classification



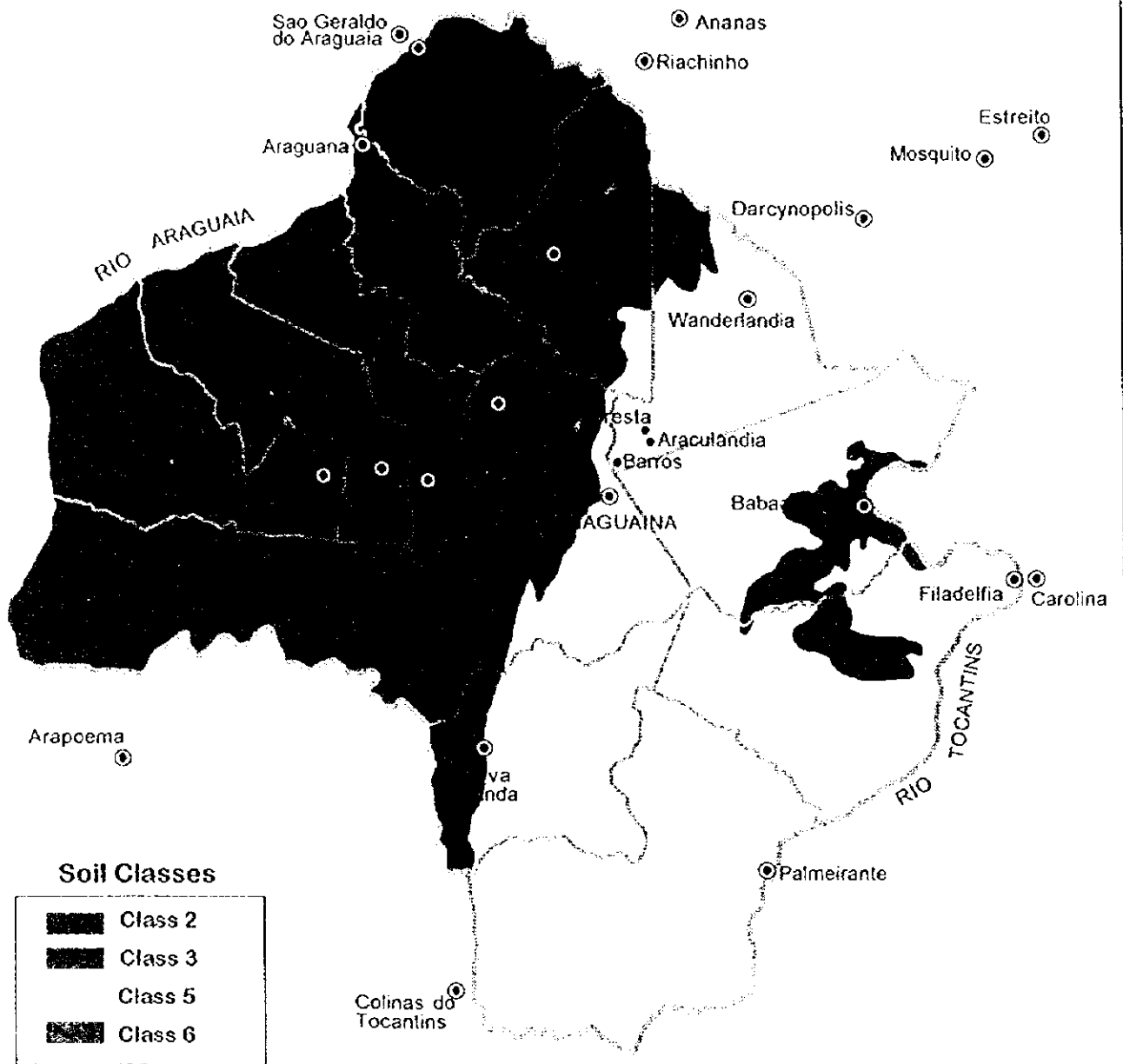
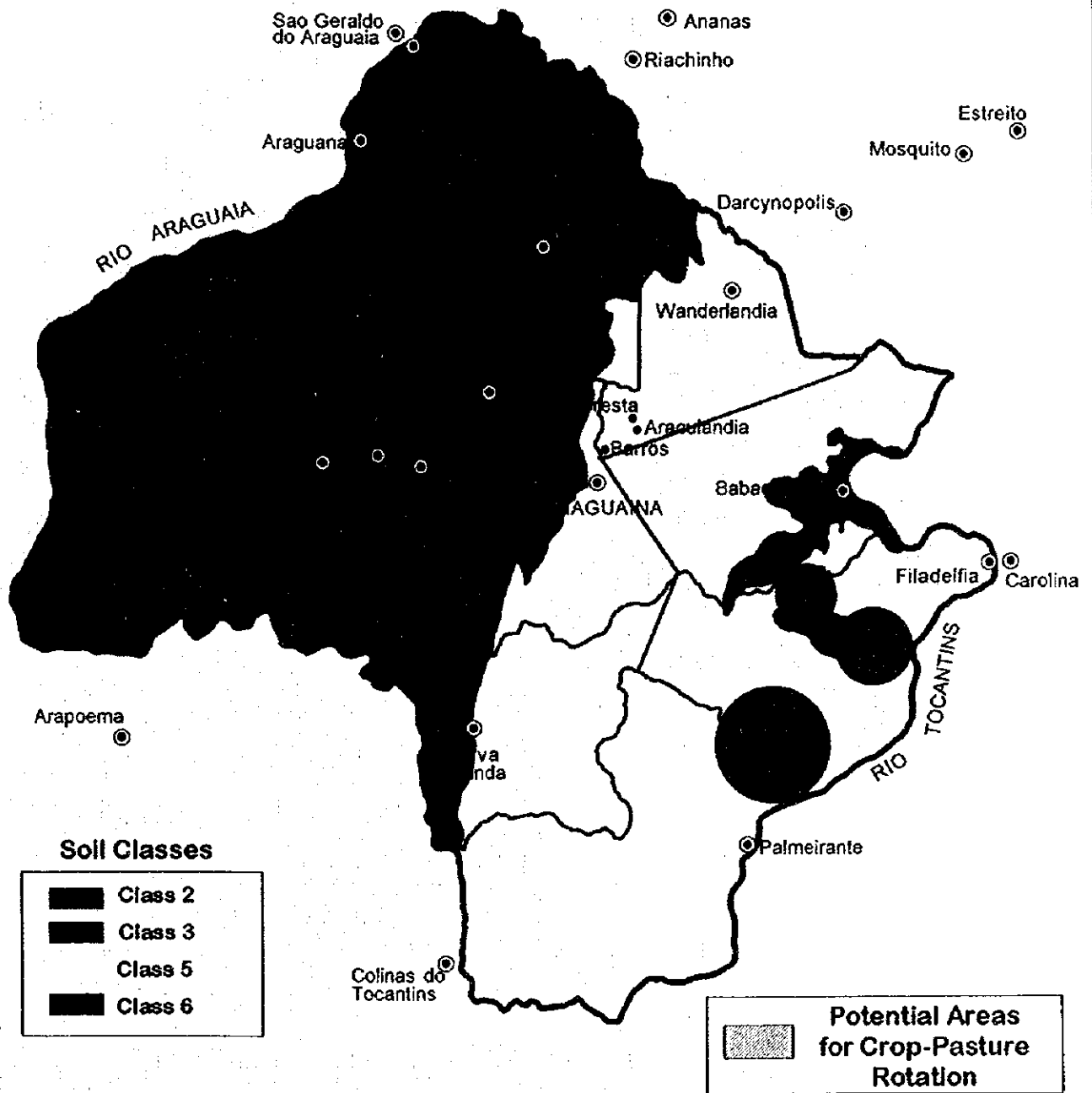
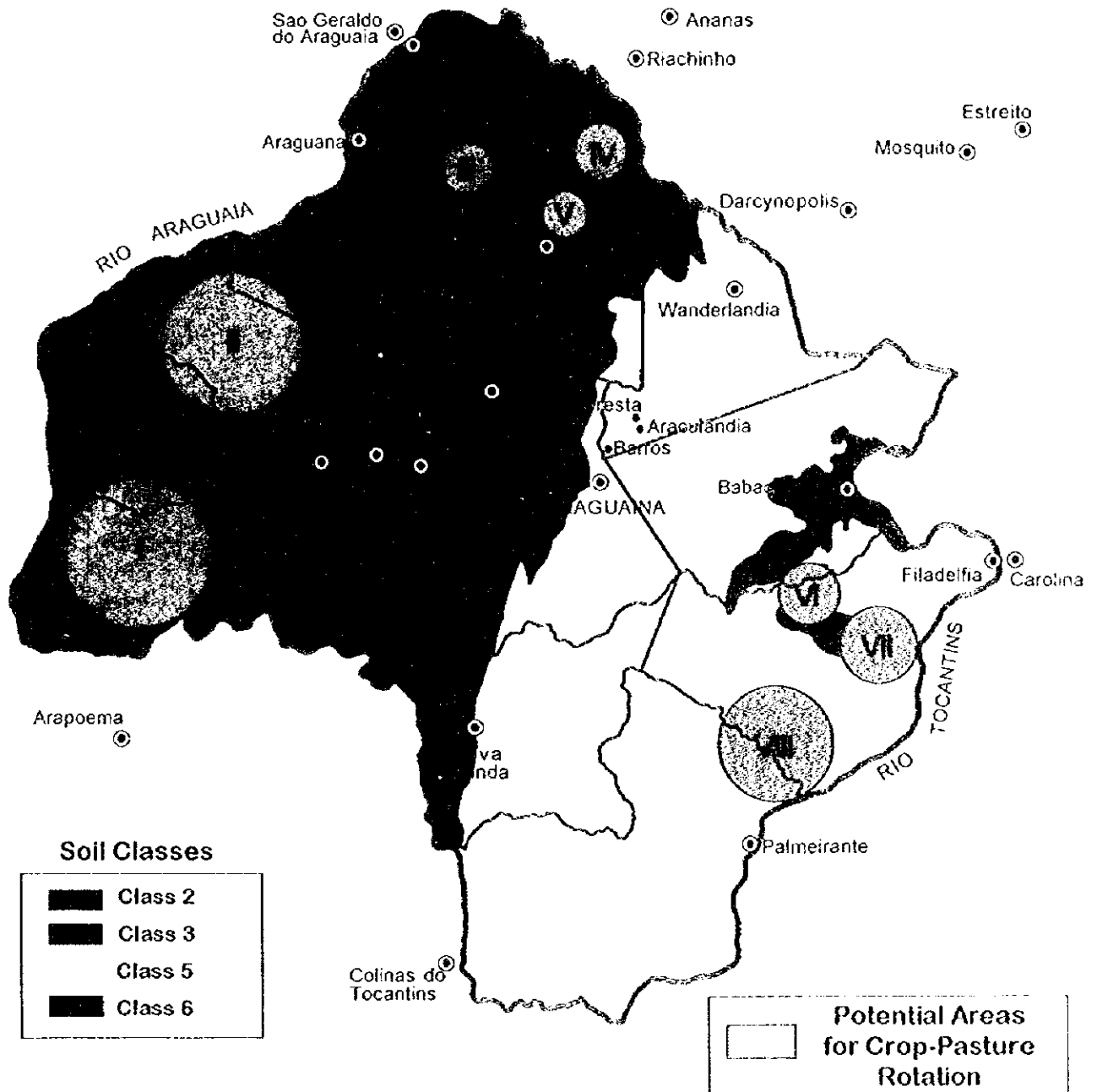


Figure XI-2: Soils Suitability Classification



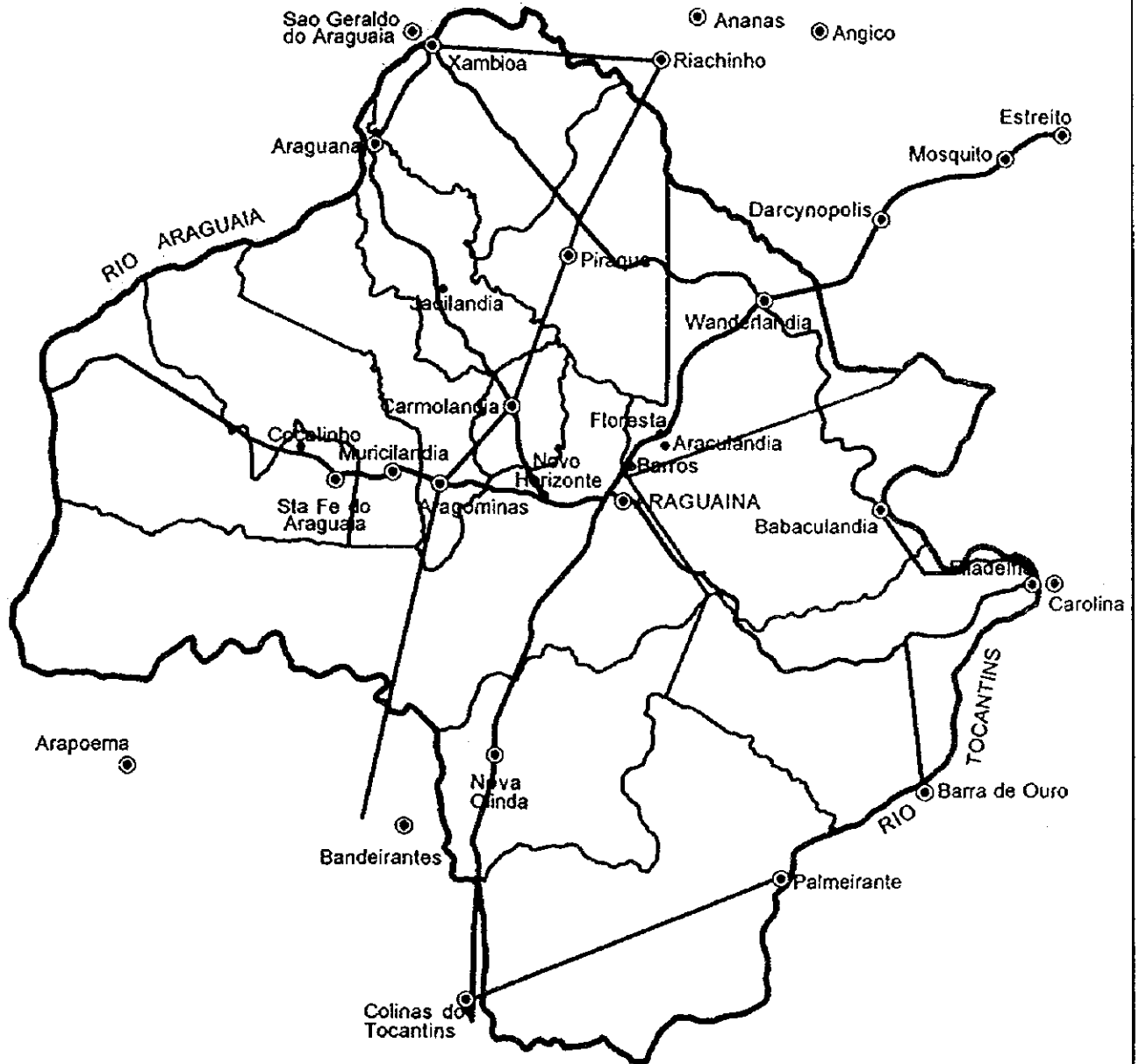
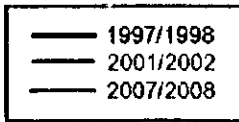
**Fig. XI-3 : Potential Areas for Agriculture Development**



**Fig. XI-3 : Potential Areas for Agriculture Development**



**Legend**



**Fig. XI-5: Road Network Development**

