CHAPTER 9

MASTER PLAN FOR RECUPERATION OF DEGRADED AREAS

CHAPTER 9

MASTER PLAN FOR RECUPERATION OF DEGRADED AREAS

9.1 Objectives of the Master Plan

The Master Plan for the Recuperation of Degraded Areas aims at harmonizing the economic activities and the environment of the Marabá micro region located in the Amazon region, through the sustainable land use, aiming at the recuperation of Degraded Areas. The final objectives of the Master Plan are as follows:

a. To recuperate the degraded areas due to the disordered development, through the introduction of sustainable agrosilvipastoral activities in harmony with the environment, aiming at consequently the control of the anthropogenic advance over the natural forests of the Amazon region;

b. To appraise the promotion of productive activities in such a way to assure the harmony between the environmental preservation activities and the economic activities. The sustainable silviculture and the agroforestry and silvopastoral systems will be promoted, as environmentally good economic activities. Through these activities, measures will be adopted to also harmonize the environment and the improvement of the rural population life conditions, not only focusing on the preservation concept overestimating only the environment.

c. The methodology proposed in the Master Plan is expected to contribute, as a model, to the recuperation of degraded areas and to the preservation of natural forests in other regions of Pará State.

9.2 Targets of the Master Plan

9.2.1 Duration of the Master Plan

The duration of the Master Plan is established in 30 years, from 2002 to 2031, taking into consideration the following periods: (i) 25 years established as the target for the execution of the PROECO[1] - Program of Ecological Compensation for the use of Forest and Altered Areas in the State of Pará, which occupies the position of the Master Plan superior plan; and (ii) the necessary time for the reforestation, agroforestry and agrosilvipastoral projects that are the main components of the Master Plan.

It is worthy to mention that the Master Plan shall be gradually executed, considering execution strategies for the recuperation of degraded areas at short, medium and long terms, according to the characteristics and interrelations among programs and projects that are the components of the Master Plan.

[1] PROECO aims at creating technical-economic-financial support mechanisms for the re-introduction of areas altered by the anthropogenic action, through the reforestation and sustainable management of natural forests areas, which primordialy are at the same region, and that can be framed within the rules established by the Program.

9.2.2 Execution Targets

The Master Plan establish targets of recuperation of degraded areas compatible to the PROECO, proposing feasible programs and projects which are also compatible to the financial situation of the State Government. The PROECO establishes, as execution targets, the annual recuperation of 70,000 ha of degraded areas, i.e. 0.1% of the object area of 72,760,000 ha. At the Study Area of the Master plan, with a total area of approximately 20,000 km^2 (2 millions of hectares), there are 340,000 ha of degraded areas, corresponding to 17% of the total area (these figures are based on the results of the 2000 satellite images analysis). Taking into consideration of the targets established in the PROECO, the Master Plan defines approximately 3,500 ha per year (0.175% of the total Study Area) as the object area of the Recuperation Plan. If 10 years are established as the implementation period of projects directly oriented to the degraded areas, approximately 10% of the total existing degraded area in the Study Area, i.e. 35,000 ha will be recuperated.

9.2.3 Objective Areas of Recuperation

The degraded areas in the Study Area are classified into 4 types, that is juquira, capoeira, capoeirão and bare land, and capoeira includes the areas dominated by babaçu. However, the analysis of the satellite images identified no significant bare land in the Study Area, where there is no large-scale mining exploitation which could cause the appearance of bare land. Apart from this, the legislation stipulates that the recuperation of bare land caused by mining exploitation is the responsibility of the causing agent itself. Thus, the Master Plan does not include the recuperation of bare land.

9.2.4 Target Public

The possible beneficiaries of the Master Plan for the recuperation of Degraded Areas in the micro region of Marabá are several: Settled farmers (mini-scale producers), Small-scale producers, Medium-scale producers, Large-scale producers and their respective representations (Associations, Syndicates, Federations), Governmental Organizations, Wood Exploiters and Lumber-mills, Seedlings producers, Private Companies, etc. On the other hand, the executing agencies of the Master Plan are mainly composed of the local social actors particularly settled farmers including familiar farmers, small-scale producers, medium- and large-scale cattle raisers, and wood sector companies.

9.3 Strategies to Attain the Master Plan Objectives

9.3.1 Necessary Considerations

(1) Compatibility with Higher Plans

The Master Plan, through its objectives, has as main purpose to contribute to the consolidation of the forestry program – PROECO, whose action strengthens significantly the basic guidelines of the government of “Develop without Devastating”, encompassing the raise of income level as well as the reduction of social inequalities. Therefore, the Master Plan shall also be compatible with programs such as: PPA of the Pará State, PPA of the municipalities within the Marabá microregion, Pilot Program of Tropical Forests – PPG-7, and the National

Program of Environment (PNMA).

(2) Considerations on Environment

The recuperation of degraded areas through their sustainable inclusion in the productive system, leads to the idea that the development and the environment conservation are a central and indissoluble binomial. There is an increasing interest on the sustainable exploitation through the forestry management. However, the reality shows that apart from the small number of successful experiences, there is the risk of the current legislation be used to legalize the total exploitation of any forest area. While there is market, the exploiters are not likely to self-restrain themselves in a natural way, thus continuing to advance on forests, increasing the degraded areas. In the elaboration of the Master Plan, care must be taken so that the programs and projects for the recuperation of degraded areas do not induce to the forests deforestation or cause negative effects on the environment.

(3) Considerations on Rural Society

In the elaboration of the Master Plan, not only the natural conditions shall be considered but also the origins and cultural references of the Object Area population and their distribution in the regional context. In the micro region of Marabá there are several social problems such as: a) large influence of the Carajás Project; b) strong demographic growth; c) many occurrences of land invasion and occupation by the landless rural workers; d) many conflicts for land. Furthermore, most of the population are migrants from other regions, initially large-scale land owners (animal husbandry farms) from the south of Brazil, and more recently settlers and occupants from the northeastern region of the country, without knowledge about the local natural conditions and the traditional production systems. For the Master Plan success, the careful consideration of the Object Area characteristics is extremely important. The social structures, traditions and cultural references, as well as the Object Area local population habits shall be taken into consideration. This consideration shall be remembered when the study and planning methodology of the Master Plan for the recuperation of degraded areas is applied in other regions of Pará State.

(4) Importance of Conservation Units

Considering the relevance of the theme “preservation and conservation of natural forests”[2] which are the higher targets of the Master Plan, preserving the remaining forest areas with degradation hazard as conservation areas (ecological conservation units) is very important, thus avoiding the increase of degraded areas. These conservation units can be considered as storage areas (germ plasm bank) of genetic resources that can contribute for the Master Plan execution, by utilizing them for the collection of forest species seeds. For this, necessary research projects for the creation of Conservation Units are included in the Master Plan. As a result of field survey, the following 3 areas were considered important to be conserved from the view point of natural and ecological conditions:

a. The terrestrial and aquatic areas of the Araguaia river mouth and adjacent areas, between the Tocantins river, the Transamazônica road and the municipal seat of the São João do Araguaia municipality (8,700 ha). This proposed area is the last one with high biodiversity in the municipality.

[2] Conservation: action of protecting or assure something as a natural good.
Protection: strategic measure for the restrain of deterioration (technical/scientific, periodic or permanent)

b. A 4,700 ha area between the municipalities of Marabá and Nova Ipixuna. This is a high priority area for the conservation of the Pará State biodiversity.

c. Northwest region of the municipality of Marabá, within the basin of the tributaries Bernardino, Itapirapé, Tapirapé and Preto, in the region of the Itacaíunas river beginning.

(5) Formation of Human Resources of the Environment Related Organizations

The environmental management of the Pará State government, based on the principle "Develop without Devastating", has as objectives the following actions: a) conserve the untouched areas; b) recuperate the altered areas; and c) search for economic alternatives to the population in order to reduce the pressure on the forest areas. The Master Plan has the item c) as its higher objective, and the item b) as the immediate objective. The item a) will be carried out through environmental monitoring, supervision and control. These activities will be carried out jointly by the organizations encompassed in the Environment State System, under the SECTAM coordination. In elaborating and executing the Master Plan, these organizations' activities are extremely important, being indispensable to strengthen the environment related organizations through their organizational and managerial qualification. The organizational strengthening will also contribute for the future execution of PROECO.

(6) Clarification and Systematization of the Land Ownership

Historically, the land ownership issue in the Amazon region has developed without systematic processes of land ownership and registration, resulting in several uncertainties in regard to the land ownership. Besides the information from the past, the current movements of occupation or land sale and acquisition are also not organized. The lack of official procedures for land ownership due to the absence of titles, lack of land demarcation or land ownership maps, hinders the execution of medium- and long-terms investments, becoming impossible to carry out recuperation projects for degraded areas. Consequently, the creation of a system aiming at the clarification of this land ownership information for the execution of the Master Plan is necessary. The installation at the ITERPA head office of a data bank or data warehouse which should be fed through terminals installed in strategic points such as the Real Estate and Documents Registration Offices, Municipal Land Secretariats or similar organizations, ITERPA, INCRA, IBAMA and FUNAI offices is of high priority. Furthermore, technical assistance in the installation and operation of this system is necessary.

(7) Environmental Education and Technological Training

Considering the Study Area characterization, the control of burning and forest fires is a priority. The efficient utilization of forest products is also useful for the settlers with small income source. The environmental education for the population is also significantly important also to avoid the increase of degraded areas. Apart from this, in order to promote the permanency of the population on the land and its prolonged utilization, the promotion of human resources formation is important. These human resources may be able to organize the rural producers and to manage the rural organizations. The management of farms through the communal activities, technological training, the extension of new technologies including the processing of agricultural products due to the good aggregated value shall also be promoted. The rural population technological training is indispensable, taking into consideration their

cultural and educational references, since they would act as the projects executing actors for the recuperation of degraded areas.

(8) Multiple Effects and High Aggregated Value

Some of the Master Plan components (programs/projects) can be carried out independently without interrelating to one another. However, a global view so that the Master Plan objectives can be effectively attained is necessary, besides the close relationship among the components for the attainment of the multiple effects.

On the other hand, the Master Plan includes agrosilvipastoral activities which are economically efficient to concretize the sustainable land use. In order to attain a high economic and sustainability level, the products shall have a good aggregated value. Besides, the creation of measures for the increase of work opportunities at the rural areas is also important.

(9) Participation of the Executing Agencies

The Master Plan executing agencies will be formed mainly by the local social actors, who are diverse, including farmers mostly coming from other States, mainly from Maranhão; and the target groups of the national settlement projects. On the other hand, in terms of occupied land, the latifundia are still predominant, i.e. large areas destined to the extensive cattle husbandry. The group of large-scale producers dedicated to the extensive cattle husbandry is different from the group of small-scale farmers dedicated to the subsistence agriculture (familiar farmers) in terms of technological level, life standards, educational level, administration manner and financial availability. As for the analysis of which measures for the recuperation of degraded areas are appropriate for each group of executing agencies and how such measures shall be executed, this shall be carried out through the broad and direct participation of the involved executing agencies. For this, several events shall be carried out (workshops, meetings, etc.) in order to search for a participatory definition of these items.

(10) Procurement of Financial Resources

Programs and projects forming the Master Plan are split into public and private actions in terms of financial resources source. Considering that the State government has a limited financial availability, studying the adoption of projects which are not based on public enterprises is necessary, analyzing the possibility of introducing as much as possible foreign resources. For the private sector, the existing farmers' formation of capital can be taken into consideration as well as new investments by private companies. Basically, the necessary resources for projects' execution shall be procured within the existing options, including the federal government credit lines. On the other hand, even considering fast growth forest species, 15 years are necessary until reaching the logging time, thus long term financing with low interest rates becomes necessary to meet this demand. Furthermore, insurance and exemption of responsibilities in case of fires, natural calamities, occurrence of diseases and pests, and other technical risks shall also be taken into consideration.

9.3.2 Method for Attaining the Targets

In order to recuperate the degraded areas according to the Master Plan targets, reforestation, enrichment, agroforestry and agrosilvipastoral activities shall be carried out in the degraded

areas of the Study Area. The executing agencies of the Master Plan are classified as follows: a) settled farmers and small-scale farmers who carry out subsistence production through slash-and-burn system and a small-scale animal husbandry (less than 100 ha); b) medium-scale producers mainly performing cattle husbandry (100 to 1,000 ha); and c) large-scale producers mainly performing meat cattle husbandry (over 1,000 ha).

The degraded areas recuperation models proposed in the item 8.5 are classified into 2 groups, according to the necessary technology for the recuperation of degraded areas, initial investment, management and maintenance expenses, as well as profitability: a) models 1 to 5, cultivation of fruit species and silvopastoral system, through the introduction of the agroforestry technology (cultivation of inter-cropped fruit species with irrigation; cultivation of agricultural products intercropped with fruit/forest species; cultivation of agricultural products intercropped with forest species that can be used as fodder; silvopastoral system intercropped with coconut plantation, etc.; reform of pastures utilizing babaçu); and b) models 6 to 10, silviculture through the application of reforestation technologies (reforestation using fast growth forest species, heterogeneous intercropping reforestation and silvopastoral system; reforestation intercropped of the Taunya and silvopastoral system; heterogeneous reforestation intercropped with rubber trees; homogeneous reforestation using exotic species).

The agroforestry technology models shall be mainly executed by small- and medium-scale producers that basically live on agriculture and for whom the short-term yield prevails. On the other hand, the reforestation technology models can be executed by large-scale producers as well as by small-scale ones, since the models are likely to be executed with a relatively low initial investment by area unit and that can be implemented in small areas. However, the reforestation model of the silvopastoral system intercropped with coconut plantation shall be executed by medium- and large-scale producers, considering that this model demands a relatively high initial investment and needs to be implemented in large areas in order to get the income generated by cattle husbandry. The homogeneous reforestation model using exotic species such as eucalyptus aims at the high technology intensive silviculture, and thus shall be executed by large-scale producers and companies.

The annual target of recuperation established in the Master Plan, i.e. approximately 3,500 ha per year, shall be attained through the combination of recuperation models based on applicable technologies of degraded areas' recuperation. Area units and number of projects to be annually executed, according to the technologies applicable to the manner and to the scale of each producer, are defined as follows.

Table 9.3-1 Annual Plan of Execution of Degraded Areas Recuperation Models

Scale of Producer	Applied Technology	Number of Models	Unit Area (ha)	Number of Projects	Total Area (ha)
Application of Agroforestry Technology					
Large-scale Producers	Silvopastoral system intercropped with coconut plantation, etc.	4	25	2	50
Medium-scale Producers	Intercropped cultivation of Fruit species with Irrigation	1	1	50	50
	Intercropped cultivation of common crops with Fruit and Forest Species	2	1	50	50
	Silvopastoral system intercropped with coconut plantation, etc.	4	3	20	60
	Reform of Pastures utilizing Babaçu, etc.	5	5	20	100

Scale of Producer	Applied Technology	Number of Models	Unit Area (ha)	Number of Projects	Total Area (ha)
Small-scale Producers	Intercropped cultivation of Fruit species with Irrigation	1	1	50	50
	Cultivation of Agricultural Products intercropped with Fruit and Forest Species	2	1	200	200
	Cultivation of Agricultural Products intercropped with Forest Species which can be used as fodder	3	1	100	100
	Reform of Pastures utilizing Babaçu, etc.	5	5	68	340
Sub-total				560	1,000
Application of Reforestation Technologies					
Large-scale Producers	Reforestation using Fast Growth species	6	20	5	100
	Heterogeneous Reforestation and Silvopastoral System	7	20	5	100
	Intercropped Reforestation of the Taunya and Silvopastoral System	8	50	4	200
	Homogeneous Reforestation using Exotic Species	10	300	3	900
Medium-scale Producers	Reforestation using Fast Growth species	6	1	10	10
	Heterogeneous Reforestation and Silvopastoral System	7	2	20	40
	Intercropped Reforestation of the Taunya and Silvopastoral System	8	50	2	100
Small-scale Producers	Reforestation using Fast Growth species	6	1	240	240
	Heterogeneous Reforestation and Silvopastoral System	7	2	300	600
	Heterogeneous Reforestation intercropped with Rubber trees	9	1	210	210
Sub-total				799	2,500
Total				1359	3,500

Remark: See the item 8.5 concerning the number and description of each model.

For the 2 projects with the application of agroforestry technology, i.e. reforestation intercropped with fruit species and the cultivation of agricultural products intercropped with with fruit species / forest species and forest species utilizable as fodder, an 1 ha area is established as a project unit, taking into consideration the familiar manpower and the financial capacity of the target public, small- and medium-scale producers. On the other hand, in the case of the silvopastoral activity intercropped with coconut plantation and the formation of pastures in babaçu areas, the object areas are degraded pastures and thus demand less manpower in comparison with cultivation. In this fashion, for these projects the project unit can be established from 3 to 25 ha, depending on the scale of the target producer and on his/her property area.

In regard to the reforestation using fast growth forest species and to the heterogeneous system, with application of forestry technology, the main object areas are the degraded pastures,

which can be implemented with a relatively low initial investment and annual administrative cost, as well as with a small utilization of manpower, thus the project unit is established as 1 to 20 ha depending on the scale of the target producer. The intercropped reforestation of the Taunya and silvopastoral system shall be implemented by medium- and large-scale producers since demands a high initial investment and aims at the increase of productivity of cattle husbandry through the improvement of pastures. In this case, the project unit is of 50 ha. The heterogeneous reforestation intercropped with rubber trees shall also be implemented by medium- and large-scale producers, and the project unit is 1 ha. In case of the uniform and homogeneous reforestation, the target public are the companies and large-scale producers who aim at the production of wood paste or wood for the production of firewood and charcoal, thus the project unit is established in 300 ha.

The Master Plan includes the execution of development project and improvement of family agriculture as recuperation model with the use of agroforestry technology, and the reforestation and enrichment project with the utilization of native and exotic species as model of reforestation technology utilization. In terms of planted areas for the recuperation of degraded areas, the first model of agroforestry system will have 10,000 ha in 10 years (1,000 ha per year), and the second model of reforestation will have 25,000 ha (2,500 ha per year), amounting to 35,000 ha (3,500 ha per year). These 2 projects shall be part of the central components of the Master Plan.

9.3.3 Components of the Master Plan

The central components of the Master Plan shall be the projects that have the degraded areas as the direct objective of their actions. Preparatory actions for the execution of central projects and assistance activities for their execution shall also be planed. Furthermore, the activities to aggregate value to the products generated at the central projects are also very important. The Master Plan components are as follows.

Table 9.3-2 Components of the Master Plan

Composition of the Master Plan	Description of Components
Designation of Conservation Units	Protection of the basins of the Araguaia and Tocantins rivers Protection of the Itacaiúnas river basin
Assistance for the Execution of the Projects for the Recuperation of Degraded Areas	Assistance for the Strengthening of Environmental Organizations and Systems. Assistance for the Land ownership, Registration and Cartographic Survey. Assistance for Environmental Education and for Training in Technologies.
Preparatory Actions for the Execution of Projects for the Recuperation of Degraded Areas	Collection of Seeds and Production of Seedlings of Fruit and Forest Species. Utilization of Organic Manure made from Sawdust and Trees bark.
Execution of Projects for the Recuperation of Degraded Areas	Family agriculture (Agroforestry, Silvopastoral System, etc.), Development and Improvement. Reforestation and Enrichment.
Good Aggregate Value for the products generated in the Projects for the Recuperation of Degraded Areas	Development of the Agroindustrial System

The Master Plan components shall be formed in such a way to offer the higher multiple effect,

being closely interrelated in terms of input and output (Figure 9.3-1).

9.4 Contents of the Master Plan

9.4.1 Programs and Projects encompassed in the Master Plan

The list of Programs and Projects to be executed in order to concretize the Master Plan components are presented as follows:

a. Project to Study the Designation of Conservation Units in the Basins of Araguaia and Tocantins Rivers
To study in detail to select the necessary areas to be protected, and to create conservation units in the basins of the Araguaia and Tocantins rivers.

b. Project to Study the Natural Resources and Socioeconomic Conditions for the Conservation of Basin at the Northwest of Itacaiúnas River
To carry out detailed research on natural resources and socioeconomic conditions in order to protect the basin of Itacaiúnas river and to concretize the sustainable development, where natural forests are suffering from intensive deforestation activities.

c. Program for Institutional Support to Environmental Organizations of the State and Municipalities
To strengthen the environment related organizations, providing institutional support so as to make them capable of elaborating the recuperation plan of degraded areas and for properly executing the recuperation projects.

d. Project of Land Ownership Survey, Registration and Mapping
To organize land ownership data in a data bank, aiming at generating subsidies in the form of cartographic and informative material to be used in the execution of projects of recuperation of degraded areas.

e. Environmental Education and Technical Training Program
To provide the farmers and their families the environmental awareness, organizational qualification, qualification for the rural property management, technological training and diffusion of new technologies and technical assistance.

f. Project of Collection of Seeds and Production of Seedlings of Forest and Fruit Trees
To collect seeds and produce seedlings of species necessary for the reforestation, enrichment, agroforestry and silvopastoral projects that aim at the recuperation of degraded areas.

g. Project of Utilization of Organic Manure made of Sawdust, Manure and Bark of Trees
To produce organic manure, recycling sawdust and trees bark, aiming at the efficient execution of reforestation, enrichment, agroforestry and silvopastoral projects.

h. Project of Development and Improvement of Family Agriculture through Agrosilvipastoral Activities
To introduce agroforestry and silvopastoral systems appropriate for the family

agriculture, aiming at the recuperation of degraded areas, creating work opportunities and improving the income level.

i. Project of Reforestation and Enrichment with Native and Exotic Species
To carry out reforestation in several systems for the production of wood and the enrichment of forests, besides the silvopastoral system, through the use of forest species, aiming at the recuperation of degraded areas and at the increase of agrosilvipastoral production.

j. Project of Agroindustrial Development
To strengthen and promote the existing agro industries, improving the aggregated value of agricultural products such as fruits, castanha, babaçu, etc. produced in degraded areas.

The Characteristics Programs and Projects are presented as follows.

Table 9.4-1 Characteristics of Programs and Projects

Programs and Projects	Effect to attain the Higher Targets	Pre-requisite for the execution of other projects	Emergency	Contributing Effect	Population Demand	Technological Feasibility	Contribution for the Environmental Preservation	Exhibition Effect
Project to Study the Designation of Conservation Units in the Basins of Araguaia and Tocantins Rivers	◎	○	◎	△	△	○	◎	○
Project to Study the Natural Resources and Socioeconomic Conditions for the Conservation of Basin at the Northwest of Itacaiúnas River	◎	○	◎	△	△	○	◎	○
Program for Institutional Support to Environmental Organizations of the State and Municipalities	○	◎	◎	△	△	○	○	△
Project of Land Ownership Survey, Registration and Mapping	○	◎	◎	◎	◎	○	○	△
Environmental Education and Technical Training Program	◎	◎	◎	△	○	○	◎	○
Project of Collection of Seeds and Production of Seedlings of Forest and Fruit Trees	◎	◎	○	○	◎	◎	○	◎
Project of Utilization of Organic Manure made of Sawdust, Manure and Bark of Trees	○	◎	○	○	○	◎	○	◎
Project of Development and Improvement of Family Agriculture through Agrosilvipastoral Activities	◎	○	○	◎	◎	◎	◎	◎
Project of Reforestation and Enrichment with Native and Exotic Species	◎	○	○	◎	◎	◎	◎	◎
Project of Agroindustrial Development	△	△	△	◎	◎	◎	△	◎

Remark: ◎ High; ○ Medium/Regular; △ Relatively Small

On the other hand, the appropriate areas for the implementation of programs and projects were selected according to the Study Area zoning, and are distributed as shown in the Map of

Plans for the Recuperation of Degraded Areas (Figure 9.4.1).

9.4.2 Position of Programs and Projects

The programs and projects composing the Master Plan are divided into 2 groups, i.e. policy and supporting programs which main executing agency shall be the Pará State Government, and the entrepreneurial projects which main executing agency shall be the producers (farmers) and/or their groups. Apart from this, the 3 entrepreneurial projects which will directly contribute for the recuperation of degraded areas are regarded as the Central Projects of the Master Plan.

Table 9.4-2 Position of the Suggested Programs / Projects

Policy and Supporting Programs	Entrepreneurial Projects
a. Project to Study the Designation of Conservation Units in the Basins of Araguaia and Tocantins Rivers b. Project to Study the Natural Resources and Socioeconomic Conditions for the Conservation of Basin at the Northwest of Itacaiúnas River c. Program for Institutional Support to Environmental Organizations of the State and Municipalities d. Project of Land Ownership Survey, Registration and Mapping e. Environmental Education and Technical Training Program	Central Projects f. Project of Collection of Seeds and Production of Seedlings of Forest and Fruit Trees h. Project of Reforestation and Enrichment with Native and Exotic Species i. Project of Development and Improvement of Family Agriculture through Agrosilvipastoral Activities g. Project of Utilization of Organic Manure made of Sawdust, Manure and Bark of Trees j. Project of Agroindustrial Development

The Master Plan core is constituted by the Central Projects oriented directly to the recuperation of degraded areas through reforestation and planting, aiming at the prevention of additional deforestation, and consequently attaining the effect of recuperation of degraded areas productivity, aggregating economic value to them.

9.4.3 Cost Estimation of Projects Execution

The execution costs of programs and projects, components of the Master Plan, were calculated as presented as follows. The total value of the initial investment shall be approximately R$ 86 millions, and the total operational cost shall be approximately R$ 12 millions/year.

Table 9.4-3 Execution Cost of Programs and Projects

Program / Project	Initial Investment (R$)	Investment Period	Annual Operational Cost (R$)	Operation Period	Source of Resources
Project to Study the Designation of Conservation Units in the Basins of Araguaia and Tocantins Rivers	2,100,000	3 years	-	-	SECTAM
Project to Study the Natural	2,050,000	3 years	-	-	SECTAM

Program / Project	Initial Investment (R$)	Investment Period	Annual Operational Cost (R$)	Operation Period	Source of Resources
Resources and Socioeconomic Conditions for the Conservation of Basin at the Northwest of Itacaiúnas River					
Program for Institutional Support to Environmental Organizations of the State and Municipalities	5,106,000	5 years	1,153,000	5 years	SECTAM
Project of Land Ownership Survey, Registration and Mapping	5,100,000	2 years	300,000	5 years	ITERPA
Environmental Education and Technical Training Program	5,754,000	10 years	293,000	10 years	SECTAM
Project of Collection of Seeds and Production of Seedlings of Forest and Fruit Trees	1,846,000	2 years	750,000	10years	SAGRI / Project Benefit
Project of Utilization of Organic Manure made of Sawdust, Manure and Bark of Trees	1,811,000	2 years	228,000	15 years	SAGRI / Project Benefit
Project of Development and Improvement of Family Agriculture through Agrosilvipastoral Activities	19,545,000	10 years	1,592,000	19 years	Project Benefit
Project of Reforestation and Enrichment with Native and Exotic Species	37,043,000	10 years	3,031,000	34 years	Project Benefit
Project of Agroindustrial Development	5,836,000	2 years	4,659,000	23 years	Project Benefit
Total	86,191,000		12,006,000		

9.5 Execution Plans of Programs and Projects

9.5.1 Execution Schedule of Programs and Projects

The Master Plan for the Recuperation of Degraded Areas encompasses 10 components, which shall be implemented in a 30 years period, from 2002 to 2031. The Master Plan is a long-term one, and its components, programs and projects, shall be implemented systematically according to their objectives, importance and need to be implemented urgently.

The programs and projects shall be executed in 3 stages, as short-, medium- and long-terms plans, according to the period and duration of execution of each program / project. The first 5 years are considered as the preparatory period for the execution of the Central Projects of the Master Plan. During this period, the supporting system and the necessary human resources shall be developed for the implementation of the reforestation and agroforestry and silvopastoral projects. After this preparatory period, the Central Projects directly oriented towards the degraded areas shall be executed as medium-term plans. Finally, the long-term plans aiming at the increase of aggregated value shall be implemented.

The execution period of Programs and Projects are shown in Figure 9.5-1.

9.5.2 Short-Term Plans

The main objectives of the short-term plans are presented as follows:

- To identify and protect the conservation units, and Plan the sustainable development.
- To strengthen and Improve the environment related organizations and systems.
- To install land ownership data bank.

In anticipation of execution of medium-term plans, the following 2 projects shall be implemented:

- Project to Study the Designation of Conservation Units in the Basins of Araguaia and Tocantins Rivers
- Project to Study the Natural Resources and Socioeconomic Conditions for the Conservation of Basin at the Northwest of Itacaiúnas River

The improvement and strengthening of the environment related organizations and of the environmental control systems is very important for the implementation of all the Master Plan components. Therefore, a program for the strengthening of the environment related State and Municipal organizations and systems shall be planned.

The project of land ownership survey, registration and mapping includes the systematization of land ownership information and the acquisition of necessary computer sets, before the execution of the Central Projects of the Master Plan, i.e. the reforestation and enrichment project, as well as the development and improvement of family agriculture project. This project will provide the basic conditions for the implementation of several projects.

The research projects shall be finished within 3 years, while the other short-term plans within 5 years. In the first 1 to 2 years, the plan of financial resources procurement, the structuring of executing agencies and of the collaborating system shall be elaborated.

9.5.3 Medium-term Plans

The medium-term plans aim at the execution of recuperation projects directly oriented towards the degraded areas, including the following 5 programs/projects:

- Environmental Education and Technical Training Program
- Project of Collection of Seeds and Production of Seedlings of Forest and Fruit Trees
- Project of Utilization of Organic Manure made of Sawdust, Manure and Bark of Trees
- Project of Reforestation and Enrichment with Native and Exotic Species
- Project of Development and Improvement of Family Agriculture through Agrosilvipastoral Activities

These 5 programs/projects are interrelated, and the production of one project feeds the other. For instance, the reforestation and enrichment project shall become feasible through the utilization of the collection of seeds and production of seedlings. Therefore, these projects shall be systematically executed.

The medium-term plans shall be finalized within 15 years. The maintenance and administration of the 2 projects, the reforestation and enrichment project and the project of development and improvement of family agriculture, shall continue until the last year of the

Master Plan.

9.5.4 Long-term Plans

The agroindustrial development project shall continue until the last year of the Master Plan in order to allow the continuous aggregation of value to the medium-term plans' products, such as fruits, wood, forest products, among others. This project preparation shall be accomplished before the start of the production of the project for the development and improvement of family agriculture, a medium-term project.

9.6 Execution Structure of the Master Plan

9.6.1 Execution Method

The strategies to be developed towards the implementation of programs and projects can be split into two approaches. The first one includes the five activities that aim at creating the most favorable conditions in the institutional environment and in the nature conservation activities, such as the survey of basic information that allows a sound decision making about the natural resources use, the support of agrarian organizations in the control of land ownership and the structuring of an environmental education program with a strong component of professional qualification. The other approach, for the attainment of the Master Plan objectives, includes other five programs/projects which objectives are directly related to the production and processing of agroforestry products through the reforestation, agrosilvipastoral intercropping, and the production verticalization.

The first approach projects execution shall be carried out at short- and medium-terms, preferably adopting the foreign technical cooperation and the partnership system among the federal, State and municipal organization that act in the coverage area of the Master Plan (Study Area). The other programs/projects can be implemented at long-term, mainly through the supply of credit to the small- and medium-scale rural producers, credit to be managed by a Committee for the Recuperation of Degraded Areas and operated by a Gurantee Fund[3] of the State bank. In this stage, the participation of non governmental organizations, Syndicates of Rural Workers, Producers' Associations and Environment Protection Organizations is extremely important since they can access credit and technical assistance in the implementation of the Programs/Projects implementation. The implementation and results of the Master Plan are directly related to the active participation of SECTAM and of the State Government as for the procurement of resources and the establishment of a structure so that the actions can be carried out in a synergic manner.

9.6.2 Executing Organizations

The Master plan will be executed by the government of the state of Pará, through SECTAM. The execution of programs and projects, components of the Master Plan, shall be carried out with the participation and technical and economic support from the public organizations as well as local social actors, who are indispensable for their execution. The required structure encompasses the establishment of a Committee composed by technical staff of the main

[3] The Guarantee Fund is a mechanism operated by the financing agent, which objective is to mitigate the guarantees problems, aiming at exclusively supply guarantees for the credit operations contracted by the financing agent, fulfilling the operational terms and conditions of each of them, also as for the term.

organizations involved with the Recuperation of Degraded Areas. This Committee shall be responsible for the described activities, according to the tendencies of the national and international financing markets. On the other hand, reforestation projects and the project of family agriculture and agroindustry project will be executed by the local population and the communities. When the international resources are used, the service rendered by consultants will be included in the execution system. SECTAM will participate as the main executive organization of programs/projects, to structure the execution system, to control and to coordinate the several organization and agencies, necessary to promote the actions. The system of execution of the Master plan is shown in Fig. 9.4-1.

The Committee for Recuperation of Degraded Areas will be responsible for the activities mentioned below:

a. Request of international financing cooperation for the implementation of the Programs / Projects of policies and support of Master plan;
b. Allocation of resources of the state budget or of other sources for the initial investments of the two projects of Study;
c. Allocation of State budgetary resources or from other sources for the maintenance and operation costs of Programs and Projects of policies and support;
d. Request of international financial cooperation for the credit to the main enterprise Projects;
e. Evaluate and inform the above projects' beneficiaries about the existence of other national financing sources;

The Committee for the Recuperation of Degraded Areas is also responsible for contracting Foreign Consultants, already negotiated within the financing contract, so that they became responsible, in a non biased way, for the formulation of the Guarantee Fund, follow-up of the financing management, and elaboration of governmental investment plans. As for the implementation of projects/programs of support policieis, the Committee is responsible for the search of partners among public and private institutions, and with international cooperation agencies, that contemplates in their actions the donation of machinery and equipment, besides specialized training.

The Master Plan programs and projects will be executed under the responsibility of executing organizations as mentioned below.

Table 9.6-1 Execution System of Programs and Projects

Programs / Projects	Executing Organization	Main Executing Organization	Collaborating Organizations
Project to Study the Designation of Conservation Units in the Basins of Araguaia and Tocantins Rivers	SECTAM	SECTAM	INCRA, ITERPA, FCAP, MPEG
Project to Study the Natural Resources and Socioeconomic Conditions for the Conservation of Basin at the Northwest of Itacaiúnas River	SECTAM	SECTAM	INCRA, ITERPA, FCAP, MPEG
Program for Institutional Support to Environmental Organizations of the State and Municipalities	SECTAM	SECTAM, Municipal Governments	MMA, MCT, IBAMA, CNPq,

Programs / Projects	Executing Organization	Main Executing Organization	Collaborating Organizations
			Universities, NGOs
Project of Land Ownership Survey, Registration and Mapping	SECTAM, ITERPA	SECTAM, ITERPA, Municipal Governments	INCRA, MMA, IBAMA, FUNAI, NGOs, Land Register Offices
Environmental Education and Technical Training Program	SECTAM	SECTAM, SAGRI, EMATER, FCAP	INCRA, MMA, MIN, MCT, IBAMA, EMBRAPA, SENAR, ONGs, Municipal Governments
Project of Collection of Seeds and Production of Seedlings of Forest and Fruit Trees	SAGRI	Municipal Governments, FETAGRI, ASSIMAR, COSIPAR	SECTAM, EMATER, EMBRAPA, AIMEX, FUNAI
Project of Utilization of Organic Manure made of Sawdust, Manure and Bark of Trees	SAGRI	Municipal Governments, ASSIMAR, Cooperatives of Farmers	SECTAM, EMBRAPA, EMATER
Project of Development and Improvement of Family Agriculture through Agrosilvipastoral Activities	SAGRI, SECTAM	Small and Medium Farms (Family Agriculture), Organizations of Producers	EMATER, EMBRAPA, AIMEX, INCRA, Municipal Governments, COCAT, ASSIMAR, FETAGRI
Project of Reforestation and Enrichment with Native and Exotic Species	SECTAM	Rural Producers (Farmers, Lumberers, Private Enterprizes)	SAGRI, EMATER, EMBRAPA, AIMEX, ASSIMAR, COSIPAR
Project of Agroindustrial Development	SEPROD, SECTAM	Cooperatives, Organizations of Producers, Private Enterprizes	Municipal Governments , ONGs, SEBRAE, Financial Organizations

9.7 Procurement of Financial Resources of the Project

9.7.1 Procurement of Financial resources

The programs and projects included in the Master plan are divided according to investment and financing such as public sector or private sector investment based on the source of

financial resources. Considering that the State has limited financial resources and there is a limit on investment for public enterprises, it is necessary to analyze the possibility of introducing the maximum possible external resources. As for the private sector, the formation of capital for existing farmers and the new investments of private companies are considered. Basically the necessary resources for execution of projects should be analyzed based on the existing options, besides the credits of the government or international credit agents. It is important that the credit agents should participate in the process from the initial phase as one of the executive agencies so as to make it possible for these agencies to be involved in the execution of the programs/projects of the Master plan. This participation will make it possible for the appropriate programming of credit for execution of the Master plan.

There are two main financial systems, which can be used for the implementation of proposed Programs/Projects .The resources of these systems are FNO and PRONAF, which are executed through several Programs. At present, the Amazonian bank (BASA) provides finance for FNO and Bank of Brazil (BB) provide finance for PRONAF. Besides, Development Fund of Science and Technology is available for financing to research institutions and NGOs to promote researches related to the recuperation of degraded areas.

While the beneficiaries take the loans to implement the proposed projects, assuming the risks of the investment, the State Government using its financial resources shall carry out incentive measures through the activities such as the formation of a Guarantee Fund, preparation land use plan, Ecological-economical Zoning, Maintenance of Conservation Units and Permanent Reserves, and support to the Forest Management and Monitoring. Such activities have a great influence on the expected results of the Master plan. Besides, it will be indispensable that the state government involves positively in carrying out political and administrative measures to secure a basic budget, which provides support for maintenance and management of program/projects.

9.7.2 International Financing

At the international level, there are financial sources, multilateral financial agents such as BID and BIRD; international programs of financial cooperation such as PPG-7 and bilateral financial institutions such as the Japanese Bank of International Cooperation (JBIC) and other external cooperation organizations. In case of bilateral financing, it can be requested by the State and to be made available directly through the bank of Government of Pará or BASA to be used in specific programs/projects. It is necessary to consider a possible loan framework of the state government to attain a national guarantee for receiving loan.

Although there are systems of national finance, this Master plan proposes for international resources with a lower interest rate and a longer term of grace period. In this case, the procedure is basically as follows.

The Pará State Government requests to International Financing Institutions the necessary resources. While the usual conditions are negotiated, such as conditions for the release of resources, grace period, interest rates and commission charge, among others, the State Government starts the process at the COFIEX (Commission of Foreign Financing); upon the process approval, the documents are submitted to other concerning federal organizations such as the National Treasury Secretariat – STN, BACEN and the Senate Finances Commission, for the approval by the Federal Government. After the financing contract signature between the State Government and the International Financing Agent, the requested resource is

transferred to a State bank, in this case BANPARÁ. This bank then creates credit lines with specific conditions for the implementation of the Master Plan main projects.

9.8 Evaluation of the Master plan

9.8.1 Guidelines of Evaluation

The evaluation of programs and projects should be made by the quantitative and qualitative analysis of the impact on the socioeconomic conditions, that can be expected by the execution of the Master plan. The basic guidelines of the evaluation of programs and projects are as follows:

a. The quantitative evaluation can be realized for the entire master plan, and for the individual program / projects. All costs of each program/project must be considered as execution costs in the evaluation. But in the case of benefits, only the production benefits generated by the projects linked to the agrosilvipastoral activities will be included, and the quantitative benefits of the environmental conservation are not included.

b. The economical effects must be analyzed for the entire master plan in case that the programs/projects are executed as an integral plan.

c. The feasibility of the producers executing the projects must be analyzed when they are considered independently. This analysis of the individual projects must be realized for the main projects.

d. In relation of the effects of environmental improvements, the level of contribution to the recuperation of degraded areas through the Master Plan execution for achieving the State forestry conservation targets must be analyzed.

e. The quantitative evaluation must include the calculation of the investment efficiency, considering the investment justification for the proposed projects.

9.8.2 Approach and Conditions of Evaluation

The project evaluation method to assess implementation validity of the Master Plan is emphasized on the economic analysis since public profitability is high. The economic analysis is applied to analyze the economic impacts of the Master Plan on the basis of project benefits and project costs.

The evaluation conditions of the economic analysis are as follows:

a. The project life is set as 30 years.
b. The currency used for the estimation is the Brazilian Real (R$).
c. The foreign exchange rate used is US$ 1.00 = R$ 2.58, which was the average exchange rate of the Bank for Foreign Trade for July 2001.
d. For the prices of agricultural products, farm-gate prices are used and for the prices of production input materials and construction materials, delivery prices at the production and construction sites are used.

e. An economic discount rate of 10% is applied in the economic evaluation. This figure represents the opportunity cost of capital and is used to determine the present value of future flow of costs and benefits of the Master Plan.

9.8.3 Benefits and Costs

The benefits of the Master Plan refer to a difference of net profit expected between with- and without-project conditions through the whole project life. The project benefits consist of tangible benefits (monetary benefits) and intangible benefits (non-monetary benefits). Tangible benefits are the benefits occurred by 5 enterprising projects and directly subjected to economic analysis. Intangible benefits are analyzed considering socio-economic impacts.

Project costs are consisted of initial investment cost, operation and maintenance cost and replacement cost of the Master Plan. Therefore, replacement cost is required for some machines and equipment with shorter working life at the end of economic working life of them. Residual value is the negative cost for the principal structures and equipment which appears at the final year of the project life.

In this project evaluation, the economic value of the degraded areas and operation and maintenance cost without-project conditions are very low, are set to zero. Also, project benefits and project costs at the final year of the project life are set to zero.

9.8.4 Economic Analysis

(1) Evaluation Index

The evaluation uses three interrelated indexes: a) net present value (NPV), b) benefit-cost ratio (B/C) and c) internal rate of return (IRR). The project benefit and project cost which are estimated based on implementation schedule of the Master Plan are discounted by the opportunity cost of capital through the project life. The term NPV is a difference between accumulated benefits and accumulated costs, and B/C is the ratio of the former to the latter. The term IRR means a discount rate by which accumulated benefits are equalized to accumulated costs.

The criteria to economically validate the implementation of the Master Plan are that NPV is positive, B/C is more than 1 and IRR exceeds the opportunity cost of capital. The opportunity cost of capital (economic discount rate) is social marginal productivity of capital input in the Master Plan, and the economic discount rate is considered to be 10%.

(2) Evaluation Results

The value of the initial investment, operation cost / maintenance and cost of renewal of equipments and total benefits are analyzed as cash flow. IRR of the Master Plan is 4.0% using an economic discount rate of 10%, and NPV is R$ -18,420,000 at prices of July 2001, and B/C is 0.8 with the same discount rate. The results of the economical analysis show that the IRR is lower than the capital opportunity cost, the NPV is negative, the B/C is smaller than 1, and therefore the project implementation is not viable economically. However, if it is considered that the benefits of 5 program/projects of government assistance is not measurable, the contribution for the priority plans and the effects on the environmental conservation, etc., it can be considered that the project implementation is appropriate. Besides, the economic

analysis of the project costs and project benefits of only 5 enterprising projects shows that IRR is 11.1% with the economic discount rate of 10%, NPV is R$ 1,695,000 and B/C is 1.02 at the same discount rate. IRR is above the opportunity cost of the capital, with a positive NPV and a B/C of above 1. Therefore the execution of the Project is considered justified economically.

9.8.5 Socio-economic Evaluation

As stated before, the Master Plan generate the following secondary or indirect intangible benefits, which are important in reviewing the validity of the implementation of the Master Plan, besides the direct or tangible benefits.

a. The Master plan will be applicable to other areas or other development plans, as a model for recuperation of degraded areas, which involves the technologies of the agroforestry and silvopastoral systems and reforestation and enrichment. By extending to larger areas, the planning methodology and elaboration of the Master plan for recuperation of degraded areas will contribute to promote the State Government's basic guidelines of 'Developing Without Devastating'.

b. The PROECO, considered as the priority plan of the Master Plan, plans to realize 5,000 ha of agroforestry activities and 20,000 ha of reforestation in consorcium, with a target of 50,000 ha of reforestation. The Master Plan aims at reaching 20% (1,000 ha) of the first and 12.5% (2,500 ha) of the second target, contributing a lot to reach the targets of the PROECO.

c. The implementation of the study projects proposed will result in creation of conservation units in the areas, where the deforestation of natural forests has been accelerating, contributing consequently to the preservation of the biodiversity.

d. Through the execution of the programs of supporting policies, strengthening and improvement of the organizations related to the environment will be accomplished, formation of the human resources, diffusion of technologies, and technical training etc., making it possible for the success of the enterprise projects to generate the quantitative benefits. Besides, they will integrate and coordinate the activities of preservation of the state and municipal governments' environment and of the rural communities, intensifying the effects of those activities.

e. The program of environmental education can induce the awareness of the rural population about the preservation of the environment, resulting in reducing the causes of appearance of degraded areas such as improper land use, burning practice, forest fires, cut illegal of wood, etc., contributing to contain the human pressure and social effect on the forest areas.

f. The implementation of the project of land ownership survey, registration and mapping can generate reliable information on the reality of land ownership, regularizing the ownership of the properties, which is an indispensable factor for acquisition of credit. As a consequence, the investments will be promoted for medium and long term projects, contributing to execution of the projects for recuperation of degraded areas as the agroforestry and reforestation activities.

g. Through the execution of the enterprise projects, it can increase the income and improve the quality of living of the small farmers. Besides, it will contribute indirectly to formation of the social infrastructure and restrict the typical diseases such as malaria, and will contribute to the mitigation of the poverty in the rural area.

h. The execution of the Master plan will induce the increase of investments in the Area of the Study, with generation of jobs and revitalization of the regional economy.

i. Efficient use of the degraded areas will make it possible for the increase in production of the agrosilvipastoral products, stimulating activation of markets and making possible to improve the commercialization system. Besides, it can assure the stabilized supply of raw materials of the agro industries that seek aggregation of the value of the generated products, contributing to the development small scale agro industries.

j. Reforestation in larger areas and planting of fruits will increase the biomass in the area and improve the ecosystem, and have a better effect on the climate. They will contribute consequently to stabilize the environment in the world scale.

However, the execution of 5 programs of supporting policies does not generate quantitative benefits, and will contribute in the sense of providing of prerequisites to implement the enterprising projects which will generate quantitative benefits. While it is necessary to reach the goals of the Master plan, it is also important to implement similar plans in other areas due to greater consequent effects than can be generated.

The total cost for the initial investment of the 5 programs of support will be of approx. R$ 20 million (US$ 7.8 million). This value is considered to be appropriate as investment in the projects related to forest activities and of environment, being lower in comparison with the total value of PPG-7, which is US$ 291 million (of which, the Japanese Government's participation is US$ 19.2 million), and of their main programs: Subprogram of Natural resources (SPRN) - US$ 88 million, Program of Promotion of Demonstrative Projects of NGOs (PD/A) - US$ 22.2 million and Program of Promotion of the Integrated Forest Management of Tropical Forests in the Amazon (IBAMA) - US$ 18 million.

9.8.6 Comprehensive Evaluation

Through the implementation of the Master Plan it would be possible to predict that the living conditions of local people in and around the Study Area will be greatly improved, which comes from an increase in agricultural production, increase in employment opportunity, expansion of income through the recuperation of the degraded areas. The implementation of the Master Plan is highly expected to stabilize the inhabitants' living and welfare conditions in the Study Area, and to have a deep impact on production activities and to contribute to the national economy. As a result, it is estimated a reduction in the natural forest destruction.

So, the Master Plan is not feasible economically, if evaluated through the measurable benefits. But, the socio-economic impacts evaluated from intangible benefits are also considered to be significant. Moreover, the implementation of the Project is justified to be feasible from technical and organizational operational viewpoints. Accordingly, it is recommended that a high priority should be given to the Project for its implementation in the early stage.

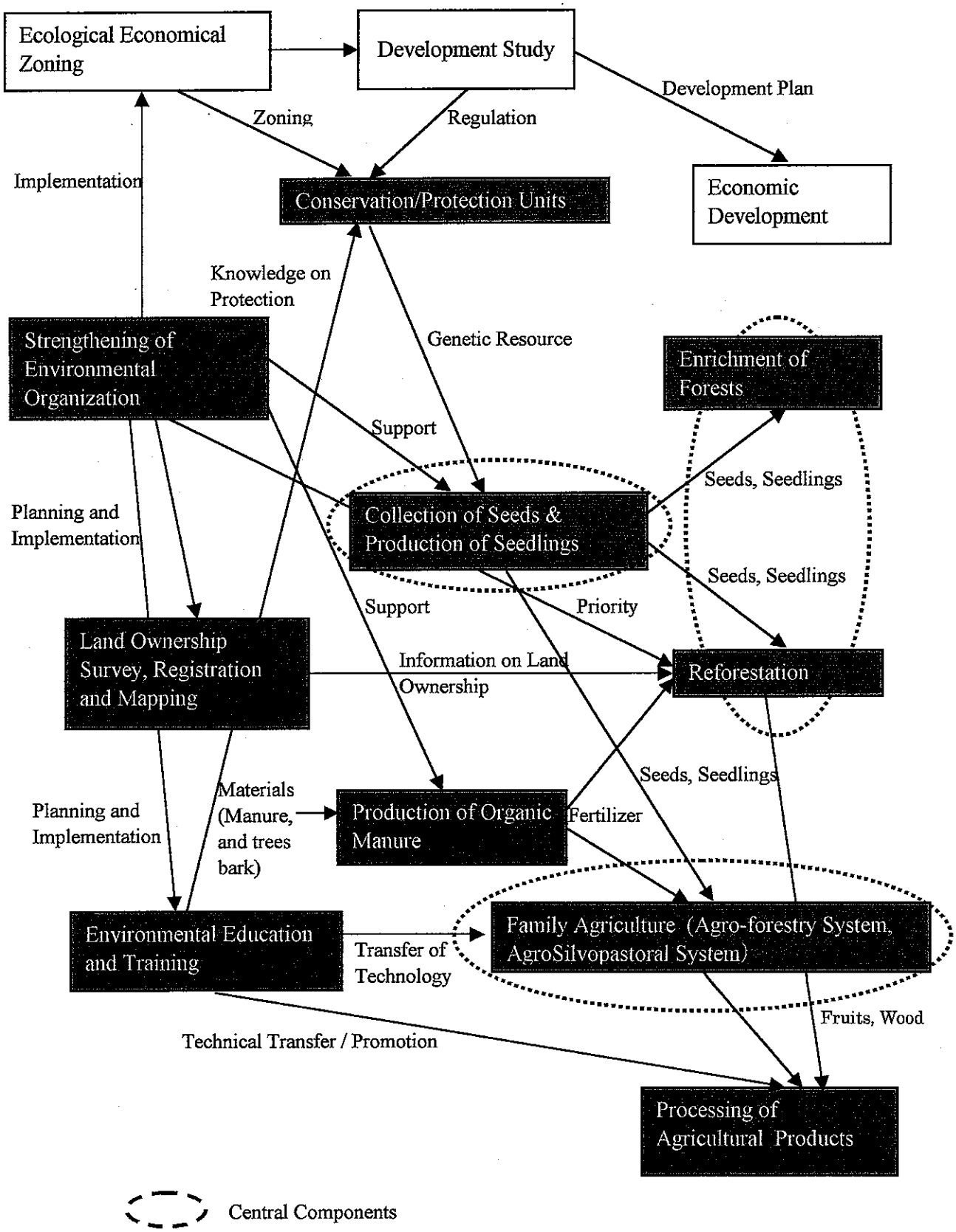


Fig. 9.3-1 Relationship of the Factors in Formulation of the Master Plan

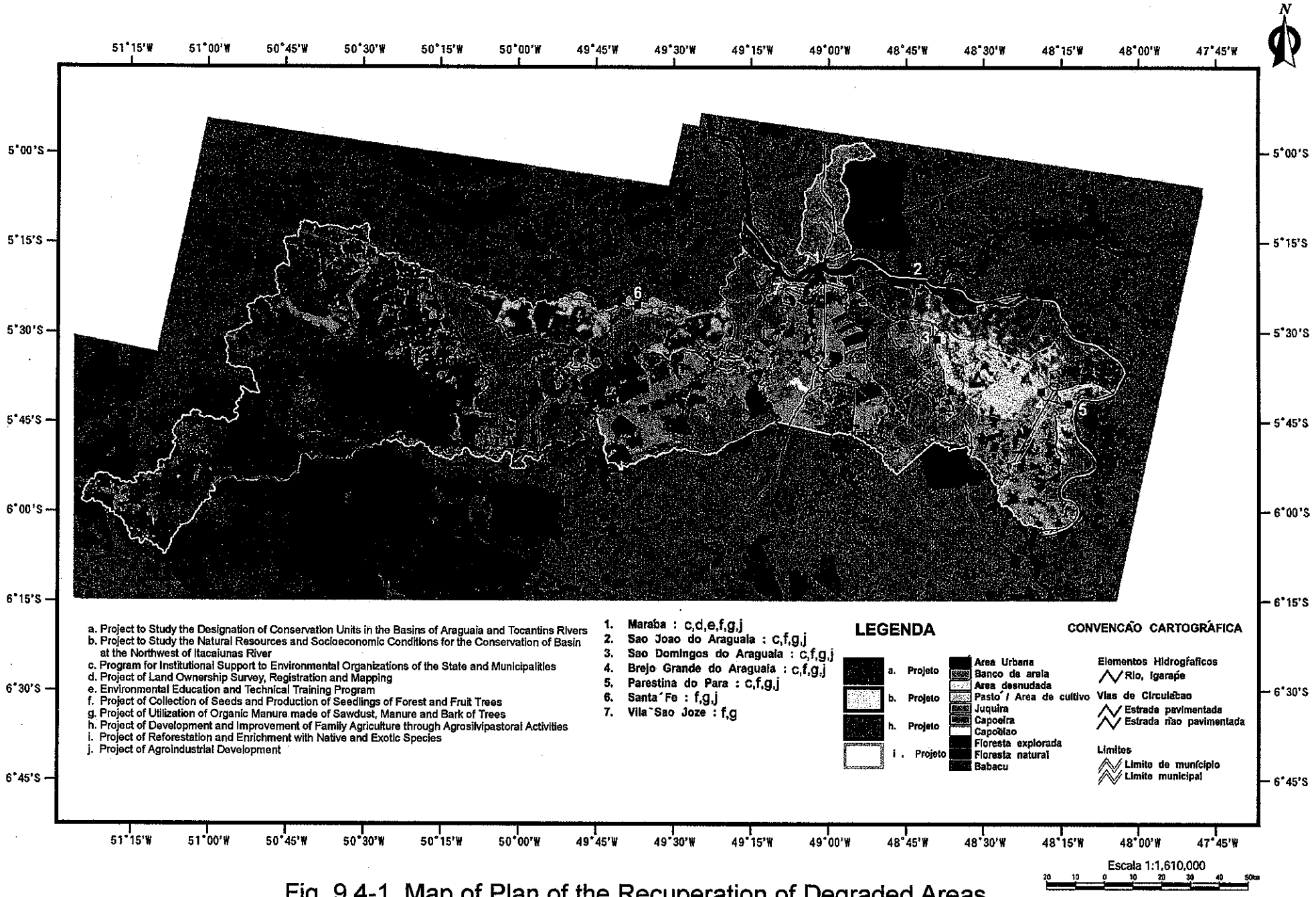
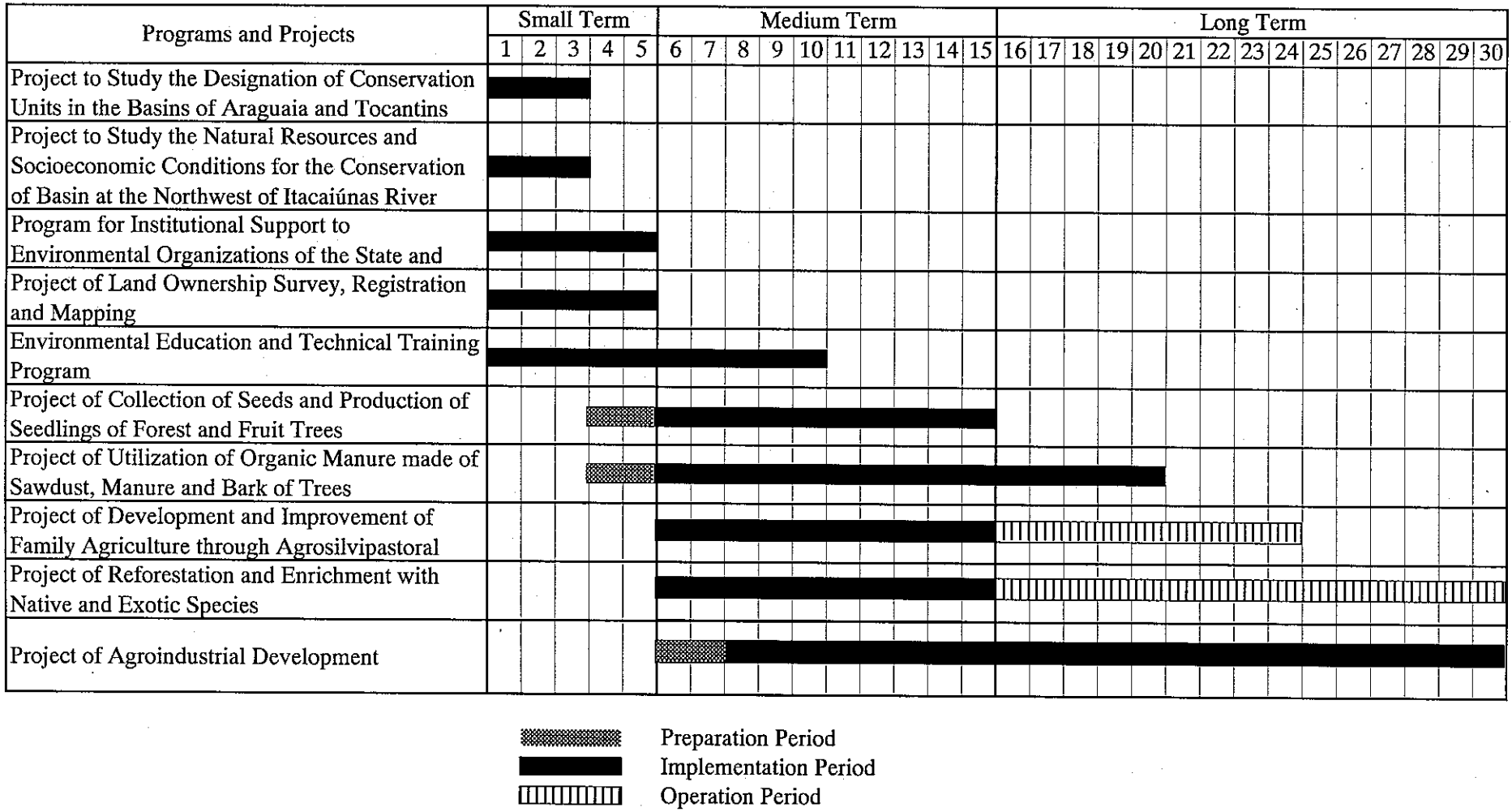


Fig. 9.4-1 Map of Plan of the Recuperation of Degraded Areas

Fig. 9.5-1 Period of Execution of Programs and Projects



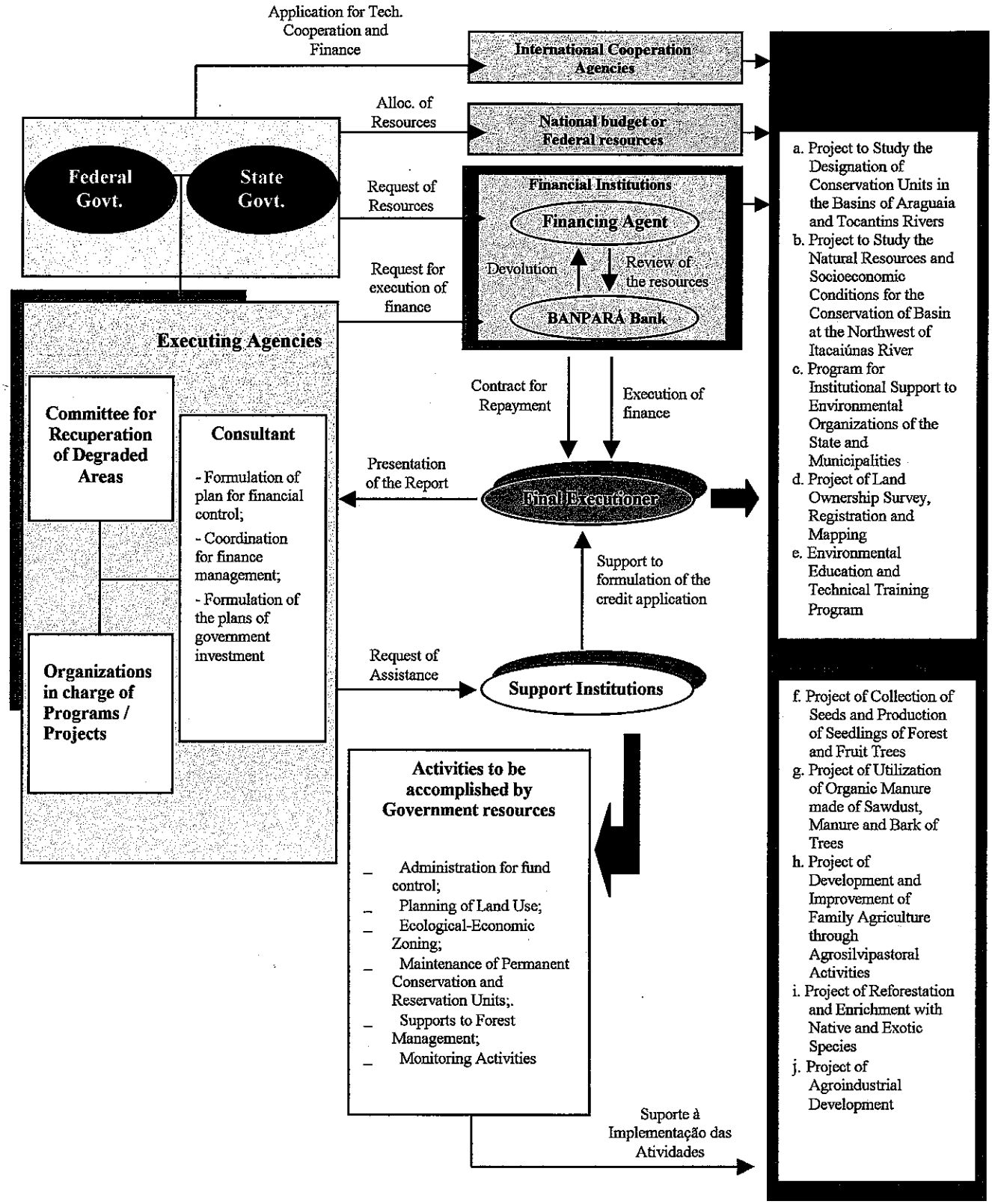


Fig. 9.6-1 Structure for Implementation of the Master plan