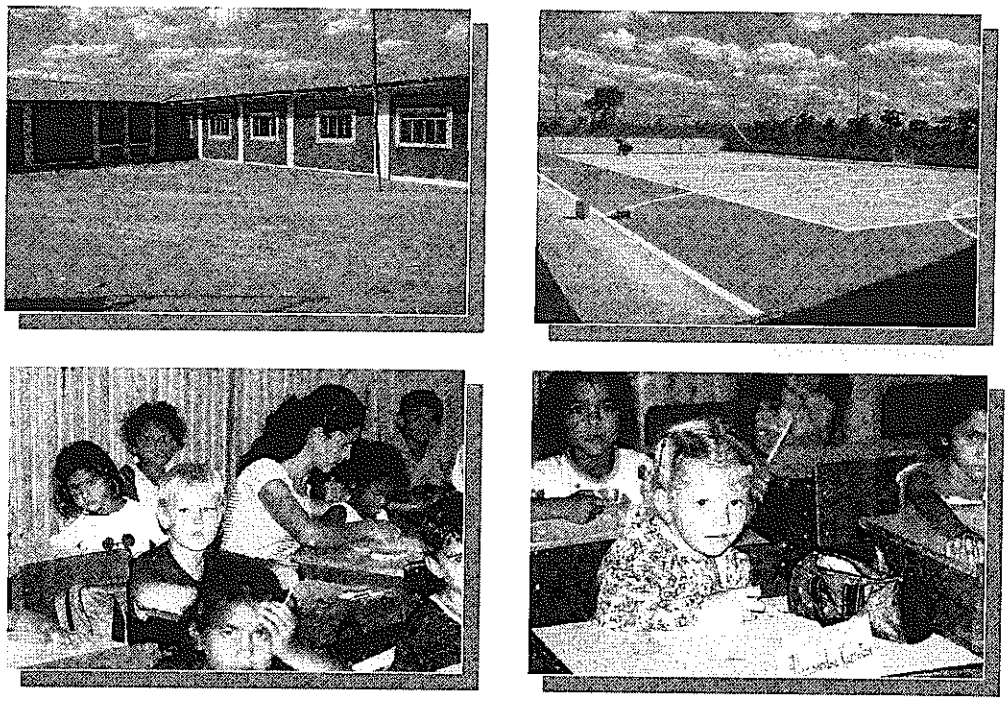


Fig. 5.2.4 – Photos of Balsas' school

5.2.3 Impact on regional agriculture

(1) Agriculture production increase in Prodecer surrounding region

Local producers as well as farmers coming from other regions, have acquired new areas in the surrounded region of Prodecer implementation sites, increasing the cultivated area of the municipalities that hosted Prodecer. Table 5.2.4 shows the growth of the total number of farmers in some municipalities that were part of the Prodecer projects.

Table 5.2.5 Number of Participant Producers of Prodecer and Number of Producers Settled on their Own

Project	Municipality	Farmers settled through the project	Farmers settled on their own	Accumulated Total	
				1985、1989	1996
Prodecer I					
Irai de Minas	Irai de Minas	26	39	65 (1985)	347
Mundo Novo	Paracatu	48	15	63 (")	1.491
Coromandel	Coromandel	18	70	88 (")	1.687
Prodecer II					
Alvorada	Água Clara	56	49	105 (1989)	—
Paineira	Campo Alegre	29	250	279 (")	—
Entre Ribeiros, I, II, III	Paracatu	89	161	250 (")	1.491

(Remark: Paracatu Municipality includes the Entre Ribeiro area)

Source : 1) Prodecer, JADECO - 1986
2) Prodecer II Expansion Project – Evaluation Report JADECO, 1989
3) Ministry of Finance, National Treasury Secretariat (STN), 1996/1998
4) IBGE, 1998

Figure 5.2.5 presents the production volume and soybean planting area evolution in the surrounding areas to Prodecer projects according to collected data and information. The data analysis reveals that the great increase on the production volume and on the soybean cultivation area corresponds to the time when the projects implementation started.

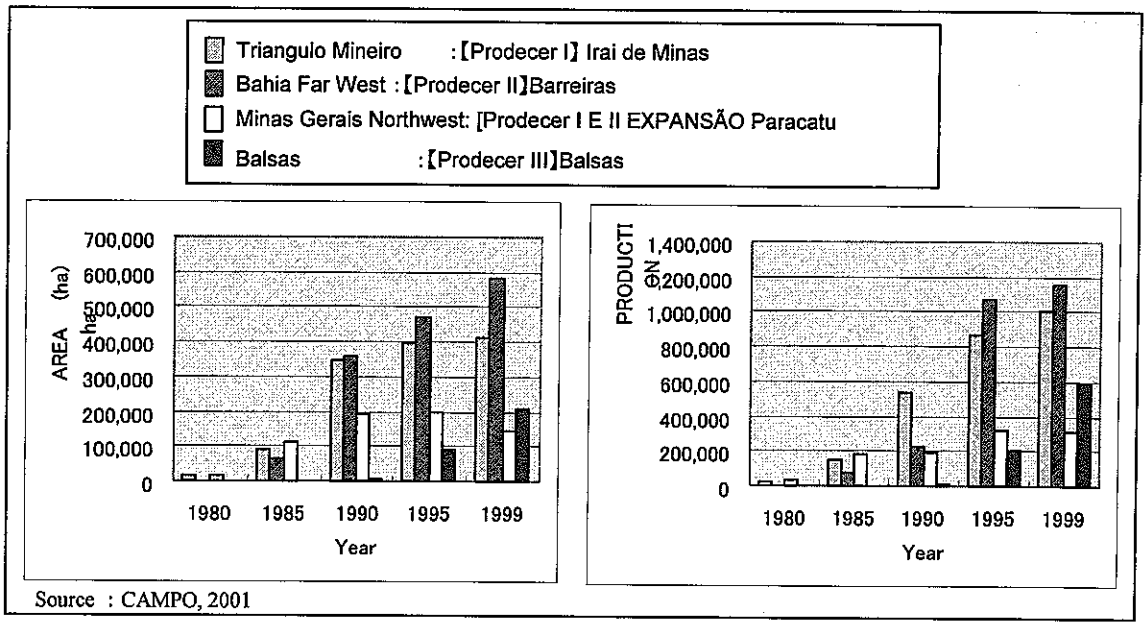


Fig. 5.2.5 Evolution of the Production Volume and Soybean Planting Area in the Surrounding Area to Prodecer projects

THE BIRTH OF A TOWN – Sapezal Municipality, in Mato Grosso State

PC Piúva and PC Ana Terra projects of Prodecer II were implemented in Mato Grosso State, starting a process that would lead the State to become the biggest soybean producer in the country. The Sapezal region, located close to the two projects, became, from the last part of 1970, an important agriculture frontier due to Maggi Group investments (a trading company with national capital specialized in grains). The Group turned the Sapezal region, which did not even appear in maps at that time, into a prosperous soybean producing region, leading to the process of Sapezal Municipality establishment which occurred in 1997.

Following the Maggi Group installation in the region with farms being administrated directly and with a soybean storage system, other companies such as cotton and rice processing companies, machinery and agriculture implements retailers, fertilizers and pesticides retailers, etc. began successively to establish their businesses in the region. In 1987, Sapezal had 1,900 inhabitants and this number increased to 10,000 in 2000, which represents a growth rate of 24% per year, in the last 5 years (1996 ~ 2000). The Maggi Group has been in business for almost 30 years, building the production basis of Sapezal and leading the process for city establishment.

The first mayor of the Town was Mr. André Maggi, the Group's president. The beginning of Prodecer has somehow influenced Mr. André's decision to start soybean production. The increase in soybean production in the Sapezal Municipality caused the increase of the number of people working in complementary areas and the rise of municipality revenue. Nowadays, 25% of the municipality revenue comes from the Maggi Group. In an environment where the soybean flow and export from Cerrados are practically dominated by multinational companies dealing with grains, the Maggi Group, a national company, has been exporting soybean to Europe and even to Japan. Some Japanese Trading Companies have also bought soybeans directly from the Maggi Group and they have a positive evaluation about the export route through the North Region of the country developed by this Group.

The birth of this Municipality, the strength of this private Group and the consolidation of the Mato Grosso State as an agricultural State are good examples of how Prodecer implementation stimulated the dynamism of the private sector, thus contributing to regional development and local progress.

PHOTO (A view of Sapezal City in Mato Grosso State)

(2) The agro-industry development

The expansion of the agricultural activity stimulated by Prodecer made possible the diversification of crops such as rice, maize, feijão bean, cotton, coffee, fruits and soybean, of course. At the same time it has motivated the expansion of complementary commercial sectors: for example, the development of a Cooperative, already settled in the area and participant of Prodecer, the great expansion of the cotton processing agro-industry in the Barreiras region, the increase of swine husbandry in Mato Grosso State, etc.

1) COOPERVAP dairy products production

The Cooperative COOPERVAP, located in the Paracatu Municipality, in Minas Gerais State, has participated in Prodecer PILOT I and Prodecer II EXPANSION. It is a producers cooperative that, even before becoming participant of Prodecer, had previous experience in the dairy products business. When grain production in the region increased due to the projects, the cooperative used its own funds and took advantage of Prodecer financing to build many facilities, including a modern milk processing factory, capable of receiving and cooling milk, a cheese factory, etc. The Cooperative also expanded its other businesses such as supermarket, gas station, etc. The increase of milk production / reception, made the manufacturing of many kinds of dairy products possible. The total volume of the Cooperative milk reception is described in the table below. This Cooperative has been making an effort to increase the quality of its products, and has recently obtained ISO 9002 certification.

Year	Volume of milk reception (1,000 ton)
1990	12,000
1995	28,000
2000	40,000

Source: COOPERVAP Cooperative 2000

The number of the Cooperative members which in 1980 was 1,047 with a total of 15,000 head of cattle, has increased to 1,517 members and 25,000 head of cattle in 2000, and 70 to 80% of the members are milk producers. In 1980, 70% of all the members were mini-producers (less than 60 liters of milk a day), but nowadays this percentage has fallen to 35% thanks to the upgrade of production techniques. The change in the milk transport system, from large cans to refrigerated trucks made possible a 50% reduction in the cost of this item, increasing by 10% the producers income. These factors have led to an increase in the number of members.

Pasture planting was intensified, due to Prodecer implementation, and in many cases it substituted the traditional method of extensive husbandry in natural pastures; this

change increased the milk production. In 1992, the Cooperative built an animal roughage factory, meeting all the region's demand: 2,000 tons a year. The high quality animal roughage produced with the region's raw materials lifted the milk production volume when this was used as supplementary food. Nowadays, the factory is operating at a little over 15% of its capacity. The opening of new markets must raise this percentage.

Most of the pasteurized milk produced by COOPERVAP is sent to Brasília, where it is the third most consumed brand in the Capital of Brazil. The cooperative expects to increase by 10% its other processed products such as butter, cheese, cream cheese, etc.

5.2.4 Comparing Prodecer to other colonization projects in the Cerrados region

The comparison between Prodecer and other colonization projects was performed through the selection of projects which had similar concepts to Prodecer and that could provide objective data, therefore allowing the analysis. The comparison was done between Prodecer II PILOT projects and four projects described below. Data such as the colonization method, number of settled families, exploited areas and the projects dynamics are shown in Table 5.2.6.

Prodecer II	Projects for Comparison	State
Ana Terra - MT	PER LRV (Special Project Lucas do Rio Verde).	MT
Piúva - MT	Coopermosa (Barro Preto Project– Cotrel)	BA
Ouro Verde -BA	PAD/DF (Guided Settlement Project-DF)	DF
Brasil Central - BA	Gorutuba (Gorutuba Irrigation Perimeter)	MG

All projects used in this comparison, except the Coopermosa Project, were implemented by State governments that provided the necessary infrastructure such as roads, electricity, health care centers, schools, houses, etc., as well as donated to the producers part of the production equipment and supplies. The Gorutuba project is not exactly in the Cerrados Region. Among the projects, the Coopermosa (PER-LRV) is different from the others and was implemented without government aid, by the Cotrel Cooperative (Cooperative of Wheat Producers of Erexim) and has some infrastructure problems. There are differences in the installed degree of project infrastructure. In the case of Prodecer, the facilities were built and the equipment installed by the cooperatives, using program financial funds, resulting in a heavy financial burden for the producers.

Many projects like those already mentioned were implemented in many regions to promote Cerrados development. These projects have attracted other producers who, using their own means, decided to settle in the surrounding areas to the Projects,

contributing therefore to the increase of the cultivated area. Furthermore, the implementation of social and economic infrastructure facilities and the establishment of agriculture related companies in the region have attracted a large number of independent farmers, resulting, due to the multiplier effect, into the expansion of agriculture production and pushing Cerrados development forward.

In the comparison to these projects, the number of farmers who have abandoned their land is noteworthy. Table 3.5.2 from CHAPTER 3 shows that the percentage of farmers who gave up Prodecer is 35%. In the other projects implemented with the same objective as Prodecer, the PER-LRV project presented a discontinuance rate of 95% and for the Coopermosa project, 67% (whereas the percentage of producers who have given up the Piúva Project from Prodecer is 7%). The high rate of discontinuity observed in the other projects can be understood as indicative of the degree of difficulty that the opening of the agriculture frontier in the Cerrados presents.

Therefore, after a comparative analysis, it can be stated that the staying rate of the producers in Prodecer was relatively high.

Table 5.2.6 General aspects of other colonization projects in the Cerrados Region

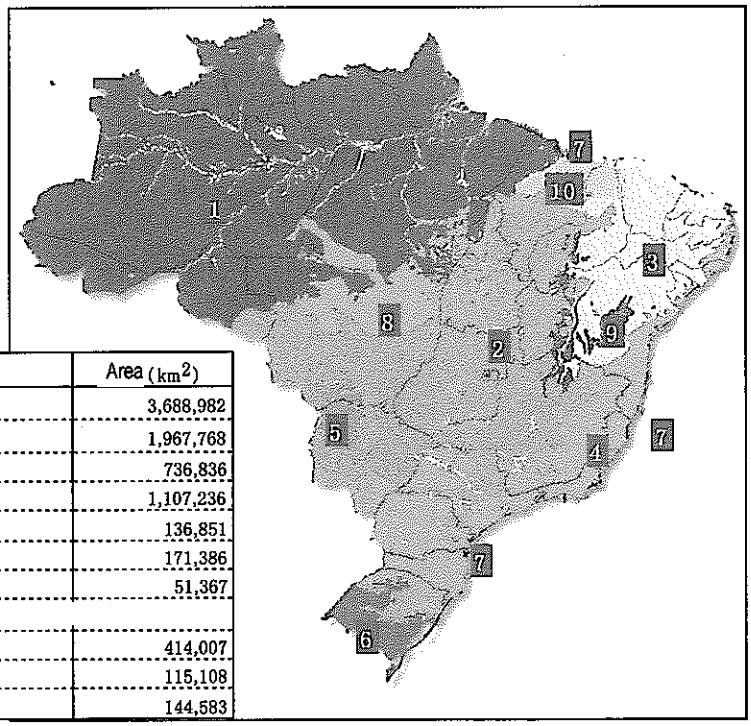
	Gorutuba Project	Lucas do Rio Verde Project	Coopermosa-Barro Preto-Cotrel Project	Guided Settlement Project of the Federal District
PROJECT AREA	Janaúba and Nova Porteirinha Municipalities - North of Minas Gerais	Lucas do Rio Verde Municipality - Center-North Region of Mato Grosso	Formosa do Rio Preto - West part of	Federal District (DF)
IMPLEMENTATION YEAR	1978 - Beginning	1982 ~ 1987	1985 - Beginning	1977 ~ 1983
PROJECT OBJECTIVE AND THE IMPLEMENTATION METHOD	A colonization project that had the support of the Federal and State Governments, which implemented the social and production infrastructure. The objective is that small-scale producers and agricultural companies produce grains and fruits.	A Project that is part of the agrarian reform program of the Federal Government, which has implemented the social and production infrastructure such as roads, electric energy, health center, schools and etc.	Project implemented by the Wheat Cooperative of Erechin-Cotrel, without the government support. The objective was to expand the land area of the members, that used to be 20 hectares, in average, in the region of origin.	The objective of this Project was to supply food for the Brasília market. It was implemented, based on the PADAP and on the first PRODECER studies. The basic concept was to increase the production of maize, wheat, coffee, rice, feijão bean, fruits, livestock husbandry and aviculture.
EXECUTING ORGANIZATION	CODEVASF	INCRA	The Cooperativa Cotrel initiative	Agriculture Secretariat of the DF (Federal District)
THE ORGANIZATION DUTY	Project of the São Francisco River Basin Development	Agrarian Reform	Colonization through a cooperative	Food supply for the DF (Federal District)
FINANCING INSTITUTION	World Bank / Federal Government	Federal Government	The Cooperative	DF (Federal District) Government and Bank of Brazil
SELECTION OF PRODUCERS	Project for small-scale producers Agricultural Company : bidding	Constituted by local producers from the south region and the Holambra Cooperative.	A selection did not took place.	Selected by the Agriculture Secretariat and the Zoo-Botanic Foundation.
EXISTENCE OR NOT OF A COOPERATIVE	Nowadays there many cooperatives in activity.	No new cooperatives have been after the beginning of the project.	The Coopermosa (Coop.Mista Agropec.Formosa do Rio Preto) was founded, but it is now closed, and there are no support structure for the	The CCOPA/DF cooperative was responsible for receiving, drying and stocking the grains.
EXPLOITED AGRIC. AREA	7,064 ha out of which 4,745 ha are irrigated	202,545 ha	43,025 ha	3,000 ha
SETTLED FAMILIES	390 small farmers and 50 companies	972 families	126 families	155 families
AREA PER FAMILY	—	208ha	341,50 ha.	206,5 ha.
FARMING CONDITIONS AND THE MAIN CROPS	Nowadays, fruits like mango, lemon, coconut, grape and banana.	Rice in the beginning and now soybean.	Mainly soybean.	Soybean, maize, irrigated feijão bean and wheat.
THE CONDITIONS OF THE SETTLED PRODUCERS	Small producers using traditional technology. Irrigation through dropping. 40% of the producers gave up and 60% of the agricultural companies' areas have changed their landholder.	There are agrarian problems in the project. From the 972 families settled in the beginning, there are left only 15, even though all the area is cultivated.	From the 126 families settled in the beginning of the project, there are only 42 families left today.	Many famers living in the rural or urban areas of Brasília.
INFRASTRUCTURE	CODEVASF has supported the implementation of the infrastructure.	INCRA was supposed to implement roads, electric energy, health center and etc.. but it did not happen.	Without the govenment support, there are problems with the roads, electric energy, transport, health care and etc.	The COOPA/DF cooperative has implemented the infrastructure.

Source: Prepared according to a survey carried out by JICA, through a contracted service of a consulting company

5.3 IMPACT ON THE ENVIRONMENT

5.3.1 Brazilian ecosystem and the influence of agricultural development

In Brazil, there are many and vast ecosystems, all of them with a very rich biodiversity. The most important ones, starting from the north part of the country, are as follows: Amazon, *Cerrados, Caatinga, Mata Atlântica* (Rain Forest)and *Pantanal.* Figure 5.3.1 shows the classification of the Brazilian ecosystems.



Legend	Biomes	Area (km^2)
1	Amazonia	3,688,982
2	Cerrado	1,967,768
3	Caatinga	736,836
4	Mata Atlantica	1,107,236
5	Pantanal	136,851
6	Campos Sulinos	171,386
7	Zona Costeira	51,367
	Transitional Area	
8	Amazonia-Cerrado	414,007
9	Cerrado-Caatinga	115,108
10	Amazonia-Caatinga	144,583

Source: "A Nova Aquarela do Brasil" WWF-Brasil, 2001, complemented.

Fig. 5.3.1 Classification of Brazilian Ecosystems

Since the beginning of Brazil's exploitation process, from the 16th Century until today, agriculture has been developed through the exploitation of fertile land, especially Rain Forest (*Mata Atlântica)* land. As a result, today only 7% of the *Mata Atlântica*'s original vegetation is left.

The development of Brazilian Cerrados started during the 70's, and today, approximately 57 million ha, out of the total Cerrados area of 204 million ha, have been exploited. Prodecer is responsible for a little over 345,000 ha of this development. However, the program has played, together with other projects, an important role by stimulating the opening of Cerrados agriculture frontiers, which had a great impact on the global development of this vast region. Consciousness of the importance of practicing sustainable agriculture and preserving Cerrados is growing, and new

technologies are been used, such as seeding cultivation, to minimize erosion effects, to carry out control of biological plagues, and to avoid soil and water contamination, etc.

Nevertheless, there are many aspects, concerning the region's agricultural development, demanding attention such as:

- Reduction of the flora and fauna diversity due to the natural vegetation destruction.
- Variation in the local meteorological conditions due to the exploitation and deforestation, carried out in an extensive and rapid way.
- Presence of diseases and blight due to the practice of monoculture.
- Soil and water contamination due to the use of large quantities of fertilizers and pesticides.
- Erosion and loss of soil caused by the plowing of large areas.
- The accumulation of sand in rivers due to erosion.
- Water resource drainage due to the non-organized installation of irrigation equipment.
- Influence on the flora due to the use of rivers as waterways.

(1) Reduction of specific biological species and impact on the ecosystem due to destruction of natural habitat

According to CONSERVATION INTERNATIONAL, a non-governmental organization that works with environment preservation on an international level, the natural vegetation area still untouched is approximately 35 million ha. This represents, approximately, 20% of the total Cerrados area. The WWF-Brazil (World Wildlife Foundation) also presents similar data. However, there are data discrepancies, due to differences in calculation methodology used. Even if those discrepancies are considered, it is clear that the native vegetation has been reduced since the 70's. That is why the Cerrados biome is considered, as well as Mata Atlântica, one of the "Hotspots" of the world.

CONSERVATION INTERNATIONAL AND THE HOTSPOTS

Conservation International is a non-governmental organization, founded in 1987, with the head office located in Washington D.C. in the United States, and it operates in more than 30 countries on ecosystem preservation. Their actions aim at the "Conservation of biodiversity and the natural inheritance of the world, developing activities that conciliate human cohabitation with the environment".

Conservation International has selected 25 biomes in the world, considered as "hotspots". Although it does not have official recognition, "hotspots" mean "regions in the world that require special attention, due to the real threat to the natural ecosystem and that have lost 70% of its original vegetation". Among those regions, the ones that have lost more than 90% of their native vegetation are called "the hottest of the hotspots". In Brazil, the Cerrados region is considered a "Hotspot" and the '*Mata Atlântica*' "the hottest of the Hotspots". For a region to be considered a Hot Spot, "the natural habitat endangered level and the number of its survivor specific species are taken into account".

The Cerrados region exhibits rich biodiversity and has many biologic species. Among the 774 identified species of trees and bushes, 429 are specifically from the Cerrados region. Compared to other tropical savanna regions, Cerrados is astonishingly rich in terms of species variety. Among the species of bees, approximately 50% of them are specific to the Cerrados region. A survey done in Brasilia's areas, Federal District, has identified the following number of species: 1,000 butterflies, 550 bees, 40 reptiles, 11 amphibians, 429 birds and 81 mammals (source: internet data from the Conservation International; Bit by bit the Cerrado loses space, WWF-Brazil, 1995). Table 5.3.1 shows the number of species that inhabit Cerrados which are specific to this region and that are endangered.

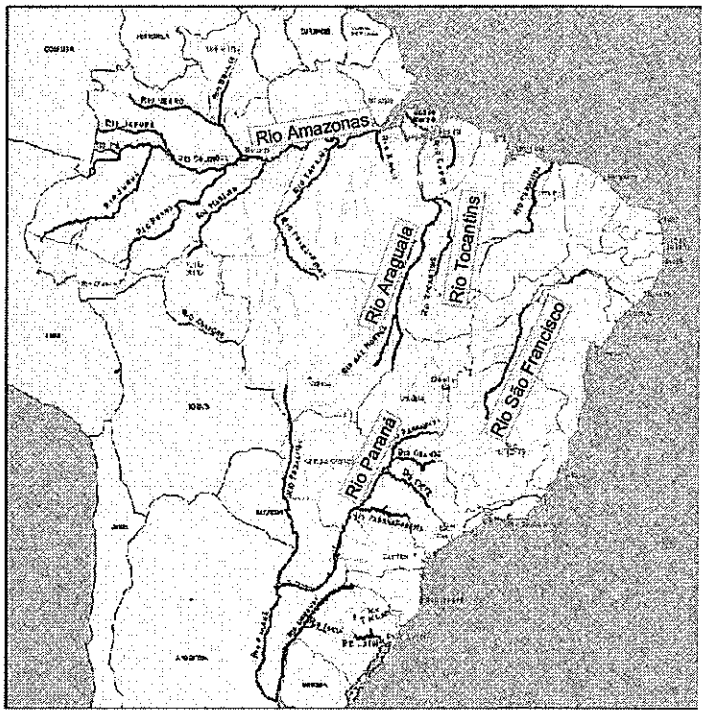
Table 5.3.1 Number of Biologic Species that Inhabit the Cerrados Region

	Species	Specific to the region	Endangered
Reptile (Cerrado)	180	20	15
Reptile (Pantanal)	113	5	15
Amphibian (Cerrado)	113	32	3
Birds (Cerrado)	887	29	33 (14 specific)
Mammals (Cerrado)	195	18	16
Mammals (Pantanal)	132	2	0

Source: Marinho Filho, 1998, and Cardoso, 1998.
Bibliography: WWWF-Brazil, Agriculture Expansion and the Bio-diversity loss in the Cerrado, 2000.

It is said that the preservation of large size animals requires environmental reserves of over 300,000 ha. However, only 10% of these kinds of reserves have more than 50,000 ha.

Regarding biodiversity, the important regions are those concentrated in the following States: Goiás, Bahia, Mato Grosso and Tocantins. The natural biologic habitat, including reserves, was isolated as an island, due to farming activity. It will be very difficult to conserve the biodiversity in those reserves unless a connection (like corridors) between them is built. As shown in Figure 5.3.1, the ecosystem survives through the establishment of corridors between reserves. So, when one considers the general conservation of the Brazilian ecosystems, the disappearance of one of them, can represent the disappearance of the others. Figure 5.3.2 shows that the main water basins of the Araguaia, Paraná and São Francisco rivers start in the Cerrado region and have tributaries that spread like a net. This demonstrates the importance of Cerrados ecosystem preservation to the others.



Source: Agricultural frontier and forestry conservation in the Cerrado and in the Brazilian Amazon region –Soybeans as commodities geared to export-, WWF-Brazil 2000, and Ministry of Transport

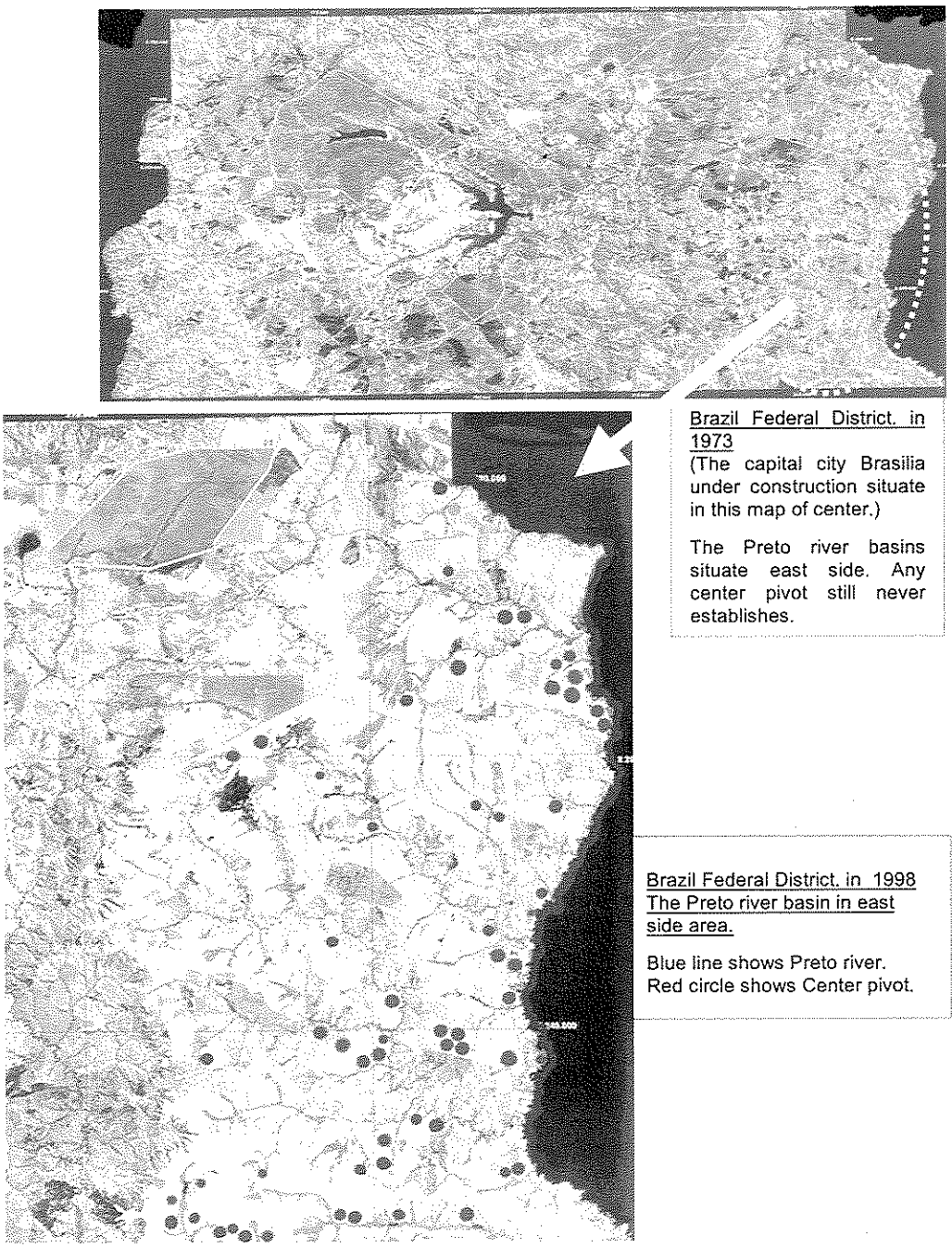
Fig. 5.3.2 Main water basins

(2) Decrease and exhaustion of water resources

In the Cerrados region, there is a rainy season, varying from place to place, that goes from October until April, and annual precipitation varies from 600 to 2,000 mm. There are very rich regions in terms of water resources. However, almost all the regions present, on a larger or smaller scale, the so called "veranico" phenomenon, (short dry periods of approximately two weeks which occur unpredictably during the rainy season).

In some regions where Prodecer was implemented, it is possible to see the exhaustion of water resources, which can put at risk the continuity of the irrigation systems. It is believed that this is caused by the reduction, in recent years, of the annual average precipitation volume and the increase in the use of water for irrigation. In order to rationally use the water resources, the State Secretariats of Water Resources now require the presentation of detailed studies when obtaining financing contracts for irrigation equipment installation. After ECO-92 in Rio de Janeiro, there was an important advance

on the design and establishment of legal rules aiming at the environment preservation in the development process, but it is difficult to confirm if, at this moment, the existent structure for preservation is sufficient. Fig 5.3.3 is a satellite image which shows installation of a central pivot in the Preto River basins.



Brazil Federal District. in 1973
(The capital city Brasilia under construction situate in this map of center.)

The Preto river basins situate east side. Any center pivot still never establishes.

Brazil Federal District. in 1998
The Preto river basin in east side area.

Blue line shows Preto river.
Red circle shows Center pivot.

Source :
Vegetação no Distrito Federal
-Tempo e Espaço-,UNESCO Brasil,
2000

Fig. 5.3.3 Installation of a Central Pivot in the Preto River Basins