EVALUATION REPORT
ON
THE SECOND PILOT PROJECT OF JAPAN-BRAZIL COOPERATION PROGRAM
FOR
THE AGRICULTURAL DEVELOPMENT OF THE CERRADO REGION

August, 1989

JAPAN INTERNATIONAL COOPERATION AGENCY
AND
EMBRAPA, BRAZIL

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Preface

The Japan-Brazil Cooperation Program for Agricultural Development is an agricultural development project which aims to implement large-scale food production in the previously barren Cerrado region under the cooperation of the Japanese and Brazilian Governments and the private sectors.

The on-going expansion program which follows the First Pilot Project (started in 1979) was commenced in March, 1985, and is to be terminated in February, 1990. This project consists of the Full Scale Project aiming to expand the accomplishments of the First Pilot Project, and the Second Pilot Project which is carried out in two other states.

In March of this year, the preliminary consultation team for the evaluation was dispatched to Brazil. As a result of consultation with Brazilian authorities, both parties agreed on the time schedule and the means of evaluating this program. According to the agreement, the Japanese team (JICA) and the Brazilian team (EMBRAPA) jointly evaluated the Second Pilot Project from May 15 to June 12, this year. This report summarizes the results of this evaluation.

We would like to express our gratitude to the persons concerned of both Japan and Brazil for their great cooperation throughout our study.

Members List of the Evaluation Team on the Second Pilot Project of Japan-Brazil Cooperation Program for the Agricultural Development of the Cerrado Region

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4.	Osmar Niccolini	Agricultural Technology Diffusion, Agricultural Technology Development Scheme
5.	Yoshihiko Sugai	Policy, Economic Development, Production Economics, System Analysis, Co-ordinator

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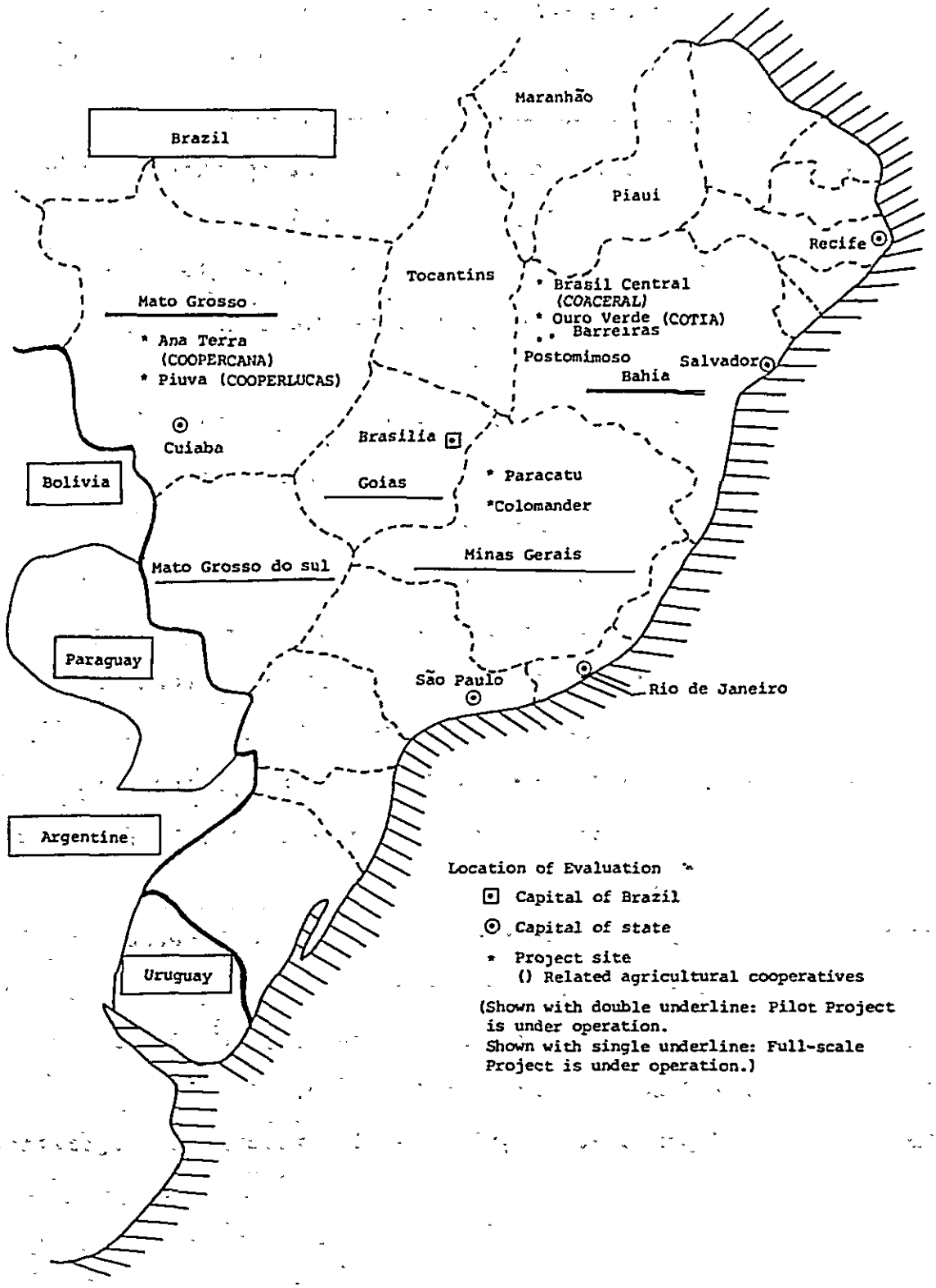
Brazil
Maranhão
Piaui
Recife
Tocantins
* Brasil Central
(COACERAL)
* Ouro Verde (COTIA)
Barreiras
Mato Grosso
* Ana Terra
(COOPERCANA)
* Piuva (COOPERLUCAS)
Postomimoso
Salvador
Bahia
Cuiaba
Brasilia
Bolivia
Goias
* Paracatu
*Colomander
Minas Gerais
Mato Grosso do sul
Paraguay
São Paulo
Rio de Janeiro
Argentine
Uruguay
Location of Evaluation *
Capital of Brazil
Capital of state
* Project site
() Related agricultural cooperatives
(Shown with double underline: Pilot Project is under operation.
Shown with single underline: Full-scale Project is under operation.)

Abbreviations

BACEN	:	Banco Central do Brasil
B.B.	:	Banco do Brasil
BEMAT	:	Banco do Estado de Mato Grosso
BRASAGRO	:	Companhia Brasileira de Participacão Agroindustrial
BNCC	:	Banco Nacional de Credito Cooperativo
CAR	:	Companhia de Ação Regional de Bahia
CMN	:	Conselho Monetario Nacional
CPA or CAMPO	:	Companhia de Promocão Agrícola
CPAC	:	Centro de Pesquisas Agropecuárias dos Cerrados
COTIA	:	Cooperativa Agrícola de Cotia
COACERAL	:	Cooperativa Agrícola do Brasil Central
COOPERLUCAS	:	Cooperativa Agropecuária Lucas do Rio Verde
COPERCANA	:	Cooperativa Agropecuária Mista Canarana
DESENBANCO	:	Banco de Desenvolvimento da Bahia
EMBRAPA	:	Empresa Brasileira de Pesquisa Agropecuária
EMPA	:	Empresa de Pesquisa Agropecuária do Estado de Mato Grosso
EMTER-MT	:	Empresa de Assisténcia Técnica e Extensão Rural do Estado de Mato Grosso
EPABA	:	Empresa de Pesquisa Agropecuária de Bahia
IPC	:	Índice de Preços ao Consumidor
JADECO	:	Japan Brazil Agricultural Development Corporation

ORTN	:	Obrigoções Reajustâveis do Tesouro Nacional
PADAP	:	Programa de Assentamento Dirigido do Alto Paranaiba
POLOCENTRO	:	Programa de Desenvolvimento dos Cerrados
PRONI	:	Programa Nacional de Irrigação
PRODECER	:	Programa de Cooperacão Nipo-Brasileira para o Desenvolvimento dos Cerrados
SEPLAN	:	Secretaria de Planejamento da Presidencia da Repûblica

Result of Evaluation

Contents

RESULT OF EVALUATION

1. SCHEME OF AGRICULTURAL DEVELOPMENT

1.1 Roles and Functions of the Scheme as a Whole

(1) Outline of the scheme

Concerning the flow of funds, JICA executes loans as requested in accordance with the loan contract with Banco Central do Brasil (BACEN). In addition, the team of private banks finances an amount equivalent to 20% of Japan's share. BACEN transfers an amount equal to the financed funds from the national budget and manages it as an additional account of the special program fund of BACEN (FUNAGRI). This fund is disbursed to the settlement farmers and the cooperatives to which they belong through the financing agencies. (Figure 1)

Companhia de Promoção Agrícola (CPA or CAMPO) plays the pivotal role in promoting the project by such functions as the selection of agricultural cooperatives participating in the project, the selection of settlement farmers and the guidance of farm management to farmers. CPA is amalgamated from Japan Brazil Agricultural Development

Coroporator, which is invested partly by JICA, and Companhia Brasileira de Participação Agroindustrial (BRASAGRO).

With CPA's support, the agricultural cooperatives also play an important role in acquiring and distributing settlement lands and in supporting farmers' farm management.

The scheme of the project described above is stipulated by the contracts and agreements between the related organizations. The scheme is constituted with the Record of Discussion (R/D) signed by the representatives of the Japanese and Brazilian Governments in December, 1984, the Project Contract covering the details among JICA, BACEN and CPA and the Loan Agreements (L/A) between BACEN and respectively JICA and private banks; as well as the agreements between CPA, related cooperatives and settlement farmers.

(2) State of Scheme

It may be concluded that the scheme of the project has been functioning favorably on the whole. As a result, the area of development has exceeded the target and the

success of farm management is in sight. The facilities belonging to agricultural cooperatives have been nearly completed. They are ready to process, store and sell products.

The activities of CPA in the scheme are evaluated highly by the Government of Brazil, agricultural cooperatives and immigrant farmers. While agricultural cooperatives are responsible for the acquisition and distribution of land, CPA supports it by preparing relevant criteria. CPA has also been displaying an effective function by documenting farm management manuals.

However, some problems have emerged in the scheme. First, there were instances of some delay in financing owing to the severe change in the Brazilian economic development, the incident of the transfer of FUNAGRI, the currency and price policy and other factors. In addition, farmers are faced with the difficulty in forecasting the income and expenditure for the farm management due to the inflation and currency policy. Secondly, there was a long delay in the improvement of the infrastructure, such as roads and power, for which the state governments were responsible, mainly due to their financial circumstances. Since extremely poor road conditions can increase the

transportation cost and lower the quality of agricultural products, their prompt improvement is especially required.

The period of the project has been extended by one year to approximately five years to recover the delay. As a result, it has become possible for the majority of farmers to harvest twice or more during the period of the project. The facilities of agricultural cooperatives whose construction has been partly behind the schedule will be nearly completed in another year. Therefore, it may be said that the extension of one year was an appropriate measure.

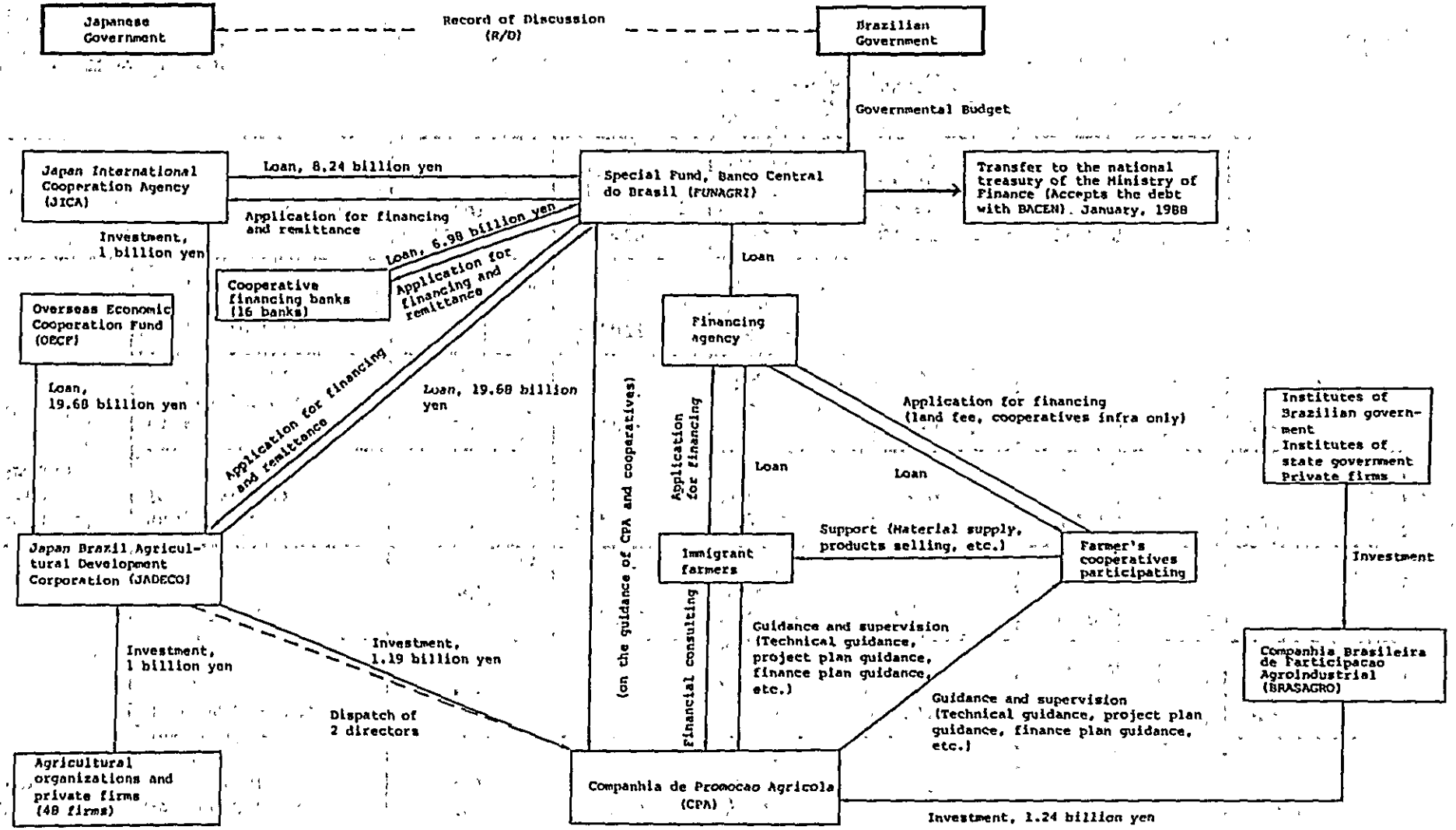

Figure 1 Flow Chart of the Expansion Program of Japan-Brazil Cooperation for the Agricultural Development of the Cerrado Region

Table 1. Project Sites of Second Pilot Project (As of May 31st, 1989)

	Name of region (name of agricultural cooperative)	Numbers of immigrant farmers	Settlement land	Cropping area for annual crops in 1988/1989		Total cropping area including perennial crops	Cropping area per farm household
State of Bahia	Brazil Central (COACERAL)	30 (8)	12,548 ha.	Soybean Rice Feijão	11,587 ha. 525 117	12,316 ha.	324 ha.
	Ouro Verde (COTIA)	35 (12)	13,804	Soybean Rice Feijão	12,810 705 35	13,550	288
	Total	65 (20)	26,352	Soybean Rice Feijão	24,397 1,230 152	25,866	304
State of Mato Grosso	Ana Terra (COOPERCANA)	40	17,862	Soybean Corn Rice	7,500 250 300	8,950	224
	Piuva (COOPERLUCAS)	39	16,214	Soybean Corn Rice	6,800 750 90	8,420	216
	Total	79	34,076	Soybean Corn Rice	14,300 1,000 390	17,370	220
Total		144 (20)	60,428	Soybean Corn Rice Feijão	38,697 1,000 1,620 152	43,236	264

Note: The number of participating farmers who own land is given in parentheses. They are not included in the total.

1.2 Project Promotion System

The Governments of the both countries provided the funds and all the necessary consultations concerning the investigation, the examination of the basic framework and the conclusion of R/D etc. The Department of Agriculture of Brazil conducted the overall coordination with the Federal Government, the state governments and the other organizations and supported CPA's activities. In addition, Empresa Brasileira de Pesquisa Agropecuria (EMBRAPA) and the agricultural research corporations of the related states cooperated with the research on the agricultural technology in the Cerrado region. The state governments were to construct the community infrastructure, such as roads.

Among others, CPA and agricultural cooperatives assumed a broad and direct responsibility in promoting the project, which accordingly contributed to the success of the project.

(1) CPA

1) Role and accomplishments

The pivotal role for the promotion of the Second Pilot Project was assigned to CPA, which was established by the

investment companies of the two countries (Japan: JADECO, 49%, Brazil: BRASAGRO, 51%) in November, 1978. In other words, the main assignments given to CPA were to plan and coordinate the development project, to evaluate project sites, to select participators of the project, the prepare a basic construction plan for the project sites, to plan the farm management for immigrant farmers, to give them technological guidance, to advise and supervise their financing and to operate directly-operated farms etc.

a) Planning and coordination of development project

CPA prepared the comprehensive development plan, the project execution plan and the financing plan of the initial year in 1985 immediately after the commencement of the project. Since then, CPA has yearly reported the accomplishments of the project, prepared the above plans for the following year and promoted and coordinated the project on the basis of these plans. They have also concluded the business agreements and technological agreements with the participating agricultural cooperatives, made the procedural stipulations with the financing agencies and concluded the cooperation agreements with the related states for the cooperation and coordination with these related organizations.

b) Selection of adequate sites for project

CPA investigated and collected information of the regions which were preliminarily selected by the Government. They provided the participating agricultural cooperatives with these results to support and guide their selection of project sites.

c) Selection of participant

CPA selected participating agricultural cooperatives according to their selection criteria from the prospectives released by the Government. CPA also selected some immigrant farmers from the prospective immigrants who were preliminarily selected by the participating agricultural cooperatives.

d) Preparation of basic construction plan for project sites

After the determination of the project sites, CPA surveyed the land, analyzed aerial photographs and other land information, divided the land into lots and investigated the undulations of each lot. On the basis of these results, CPA prepared a land utilization plan which suits the regional conditions, a facility construction plan and a settlement plan.

e) Preparation of farm management plan and technological guidance

With the cooperation of the Federal Government and state experiment stations and research institutes, CPA prepared the technologies to be introduced to each region and summarized them in five manuals to be used as a guide for farm management planning and technological guidance.

f) Advice and supervision of financing

In compliance with the procedural stipulations with the financing agencies, CPA gave guidance and advising connected with the application for loans and supervised the financing operations. In this way, CPA promoted smooth financing and optimized the uses of loans.

g) Operation of demonstration farms

CPA continued to operate demonstration farms and supplied high quality seeds of soybeans and corn.

As described above, CPA has made large accomplishments in a wide range of fields. They were able to exceed various targets within the scheduled project period especially by

comprehensively and consistently planning the development project, by coordinating the operations with related organizations, and by planning the farm management for the smooth promotion of the project.

2) Administration and organization

CPA is administered by the board of directors, which consists of four directors. An advisory committee is organized as an advisory organ for the board of directors.

CPA has the head office, demonstration farms and local offices and local stations where agricultural engineers are available for various operations. They make constant efforts to upgrade agricultural engineers' ability and to accumulate technologies by holding courses and study meetings.

It may be said that CPA's 10-year efforts for system improvements and their accumulation of technologies and experiences brought about their accomplishments in the Pilot Project.

3) Business Operation and Finance

CPA is requested to secure profits and maintain business operation through the planning and the coordination of development projects etc. Under the Pilot Project, the R/D stipulated the payment to CPA of commissions for supervising the financing (equivalent to 1% of the loan balance), commissions for planning the farm management for immigrant farmers (equivalent to 2% of the loan) and commissions for giving technological guidance to immigrant farmers (equivalent to 2% of the loan balance). They were to be the financial resources for the promotion of the project.

CPA had a difficulty in the fund management during the initial period of the Pilot Project because they were unable to obtain sufficient commissions due to the delay of the development project. Fortunately, however, they were able to secure the income from the directly-operated farms owing to the increase in the production of soybean and corn seed, the production of coffee, etc. Subsequently, they have been able to balance the income and the expenditure, and various commissions account for a large part of their income.

CPA must continue to secure profits and to establish a long-term management foundation. Since they must continue to cover the necessary expenses with commissions, some measures which are necessary for it must be taken in the future.

(2) Agricultural cooperatives

1) Selection of cooperatives

The selection of the participating agricultural cooperatives was started by the Ministry of Agriculture from the early stage on the basis of the criteria which cover their management foundation, technological ability, experience in handling cereals, financial conditions, etc. The Ministry handed over it to CPA and the final decision was made by CPA.

The Japanese-affiliated COTIA Agricultural Cooperative and COCERAL Agricultural Cooperative were selected in the State of Bahia. COOPERCANA Agricultural Cooperative located in Barra do Garca and local COOPERLUCAS Agricultural Cooperative were selected in the State of Mato Grosso. Among these cooperatives, COTIA and COOPERCANA had a solid management foundation and an outstanding technological

ability. On the other hand, COACERAL and COOPERLUCAS were only recently established and their management was not always satisfactory. However, COACERAL belonged to Paraná Central Association of Agricultural Cooperatives and received its guidance. COOPERLUCAS was organized by the members of Holanbra Cooperative in the State of São Paulo and received its guidance.

2) Roles of cooperatives

a) Selection of farmers

In principle, 80% of the settlers were to be immigrants from other areas in every project site. The participating agricultural cooperatives made preliminary selections and CPA made final decisions. The remaining 20% were selected from local farmers. The criteria for the selection comprised Brazilian citizen, the holder of technological and management knowledge and experience of cereals production, the resident in a farm or a province and the availability of considerable own funds.

b) Acquisition and distribution of land

The project sites of PRODECER II had to be at least large enough for securing effective production and

distribution. From this viewpoint, it was decided that the scale of one proejct site must be 10,000 ha or more.

For the selection of project sites, the agricultural cooperatives made preliminary selections on the basis of the natural and social conditions. CPA investigated them and judged their suitability.

Brazilian agricultural cooperatives have original knowhow for selecting settlement places, settling farmers and expanding projects. The unique organizations and experience of Brazilian agricultural cooperatives were instrumental in the progress of the present project.

It is not necessarily easy to obtain a complex exceeding 10,000 ha. Especially, there has been an obvious trend of rising prices of farmland during the recent years. Fortunately, however, sufficient land for farming could be obtained from one land owner in Coaceral, from a small number of land owners in COTIA, from two land owners in COOPERLUCAS and a small number of land owners in COOPERCANA. Since it is difficult to acquire a tract of land of a considerable size in highly populated regions, lands which are far away from trunk roads were obtained in many cases. For this reason, there were even fears over the possibility of securing settlers in COACERAL.

c) Supply of materials for agricultural production and marketing

All of the project sites are in isolated places which are far away from trunk roads. Therefore, it is essential to supply the materials for agricultural production to settlement farmers, to market and process their products for maintaining their farm management. Therefore, silos, warehouses and drying facilities were constructed with the funds of PRODECER II at the main stations and branch stations of agricultural cooperatives located in the project sites. They are available to farmers.

Since COTIA and COACERAL have an ability to collect market information, they obtain the information from Chicago and Barreiras (a trading center of soybeans in the State of Bahia) send it to their offices in isolated places by wireless communications.

d) Other Services

One of the cooperatives is engaged in the construction of roads leading to the outside at its own expense though this was expected to be done by the state government. This is because the current conditions interfere with the

transportation of products and production materials. (Coaceral)

The instructors of the cooperatives provide farmers with technological and farm management guidance at the expenses of CPA. Their guidance has produced large effects. In addition, COTIA Agricultural Cooperative has an experimental station in the project site and is engaged in technological development.

3) Management Situation of Cooperatives

The agricultural cooperatives which participated in PRODECER II have cost factors, such as the construction of offices and facilities and the increase of managers and employees. However, PRODECER II provides large economic advantages to them as described below. Therefore, it may be thought that the invitation of PRODECER II is economically attractive enough for the agricultural cooperatives.

First, the amount of investments per household is estimated to be 550,000 dollars. Among these expenses, the machines, tools, soil improvement materials and the other materials were mostly purchased through the local agricultural

cooperatives. Sales of agricultural product were all entrusted to them, too. Thus, the settlers under PRODECER II became the largest customers of the cooperatives' sales business. This does not mean that the growth of their sales is accounted for only by the settlers. It may be evaluated that the extended effect of the cooperatives' sales business to the farmers in the surrounding area was also large.

Secondly, the settlers produced a large amount of agricultural products from the 1st year and formed new production centers. The facilities for storing and processing them were installed with the funds of PRODECER II. Since these facilities are available not only to the members, but also to the farmers in the surrounding areas, they are contributing to the development of the cooperatives. For example, COOPERCANA Agricultural Cooperative used to be a small association having only 140 member households. However, they now operate gigantic silos, warehouses and various facilities. Their annual sales of products is approaching 700,000 new cruzados. Most of their growth is attributable to the forty farm households which settled under PRODECER II.

1.3 Agricultural Financing System

(1) Flow of Funds

Japan began to disburse the loans to Banco Central do Brasil (abbreviated as BACEN hereinafter) for the Second Pilot Project in November, 1985, on the basis of various agreements between Japan and Brazil.

The required expenses were estimated to be 20.589 billion yen, and Japan and Brazil were to share them equally. It was decided that JICA and the group of 16 private banks are to finance Japan's share of 10.295 billion yen at the ratio of 80% and 20%, respectively. As a result, the loan from JICA were to amount to 8.236 billion yen and the loan from private banks group were to amount to 2.059 billion yen. The loans were disbursed to BACEN.

The loans are deposited in cruzado currency to the additional account of FUNAGRI which is opened at BACEN for the special program according to the demands from BACEN. The L/A (Loan Agreement) clearly states that BACEN provides loans to farm households and agricultural cooperatives only when the cruzado currency of the same amount is deposited from the Central Government in order to assure the equal shares between the two governments.

The additional account of FUNAGRI was transferred from BACEN to the Ministry of Finance in January, 1988. A considerable time was spent for taking necessary procedures for it and making coordination with Japan. This interrupted the disbursement of loans by Japan and hence delayed the project somewhat.

It can be valued highly that, although the flow of funds failed to be smooth in some respects, the scheduled loans have been almost completely executed in terms of dollars, and consequently, the loans to farm households and agricultural cooperatives contributed to this agricultural development.

The Brazilian Government agreed to bear exchange losses and guaranteed the repayment of principals and the payment of interests.

(2) Characteristics of Financing

The land purchase fund, land reclamation fund, agricultural machine and tool purchase fund and the farm management fund of the initial two years are supplied to settlement farmers. The financing of the present project had the following two characterisitcs. First, while the Brazilian financial circles customarily do not finance for

land purchase funds, loans were provided for purchasing land exceptionally under the present project. Secondly, farm managements funds were provided as middle-term funds of a maximum of three years. Concerning the settlement farmers, these two characteristics may be evaluated as the key to the success of the present project.

As a part of the present project, the participating agricultural cooperatives were provided with loans for the funds for purchasing project land and the funds for constructing the facilities for business operations, such as farm marketing and supply. In general, it is highly risky and extremely difficult to provide a large amount of long-term loans as equipment funds to agricultural cooperatives located in the remote areas. However, loans were disbursed to them specially under the present project after the confirmation of their possibility on the basis of CPA's investigation etc. It can be evaluated that this enabled the project to be promoted smoothly.

The financing under PRODECER II intially had an extremely concessional nature compared with the general agricultural financing system. However, no large difference in interest rates and loan periods as well as in the items to be financed recently exists due to the Brazilian

Government's policy. In reality, loans under PRODECER II are far more advantageous because Brazilian financial circles are currently faced with the shortage of funds and credit fears. In other words, the fact that loans are assured to the participators in PRODECER II is a great advantage. In addition, general agricultural financing has various restrictions which are not explicitly stated.

(3) Limitation of Loans

The amount of loans to a farm household under PRODECER II has been fixed as 70,000 ORTN since the beginning of this system in August, 1985. It is not often heard that this amount is insufficient. This seems to be attributable to the following reasons. First, the present project is coming to an end and there is no case of new farm management planning. Secondly, the amount of loans exceeds 432 thousand new cruzado in the current price. If a farmer's own funds (20%) are added, they seem to be nearly sufficient for furnishing the standard capital of a participating farm household. Another reason seems to be that farmers are minimizing loans because the high interest rate policy is being adopted at present.

(4) Appropriateness of End Interest Rate

The end interest rate under PRODECER II has been revised several times from the initial rate of "3% + ORTN" to the current rate of "12% + IPC" (consumer price index). Superficially, the concessional nature of the financing conditions under PRODECER II is being lost. However, the availability of PRODECER II funds itself is a large economic advantage in Brazilian financial circles. It will not be adequate to take up the end interest rate alone and argue whether it is high or low.

(5) Financing Agencies

The financing agencies are selected by BACEN and they finance the project participators in place of the Ministry of Finance. The following four banks are designated as financing agents.

- BNCC (Banco Nacional de Credito Cooperativo)
- BEMAT (Banco do Estado de Mato Grosso)
- B.B. (Banco do Brasil)
- DESENBANCO (Banco de Desenvolvimento de Bahia)

The financing procedures are performed under close communications and cooperations between each financing agent and CPA. This is a desirable state.

However, some of the financing agents failed to circulate funds smoothly in some cases because of unfamiliarity with clerical procedures or the incomplete transmission of information. The balance of loans is not reported to CPA in every occasion. The financing agents are asked to grasp the project participators' financial transaction state and supply the latest information to CPA.

The profit margin which is given to the financing agencies is 4% at present. It is the same as other funds of the same type. Though, there may be various arguments about this also, there is no way but to consider it as an indication of the Brazilian Government's demand-suppressing policy.

(6) Comprehensive Evaluation

The supply of loans to settlement farmers and cooperatives has been one of the principal means for the promotion of the present project. The supply of funds was an essential measure for promoting the present project because it is not easy to obtain long-term funds for land acquisition

and equipment and middle-term funds for farm management in Brazilian financial circles.

The limit of loans to the settlers has been stipulated as 70,000 ORTN from the beginning. The previous records lead one to judge that loans below this limit were enough to cover the investment demand.

As to the appropriateness of the end interest rate, the rates ranging from "3% + ORTN" (initial period) to "12% + IPC" (current) are judged to be financially attractive to the farmers and cooperatives under PRODECER II in the light of the extreme credit limitations in Brazil.

The fund transactions were slightly delayed at the beginning of the project because the financing agencies were unfamiliar with the clerical work or because they failed to transmit information thoroughly. However, they fulfilled their duties almost completely. The fact that they contributed to the improvement of the social and economical position of the settlement farmers and agricultural cooperatives and to the development of the region can be highly evaluated.

1.4 Improvement of Infrastructure

(1) Agricultural Infrastructure

For a pilot project, it is extremely important to improve the agricultural infrastructure, including the construction of farms which are planned in consideration of cultivation by large machines and soil conservation, the construction of farm roads which are planned in consideration of the transportation of production materials and agricultural products, the construction of economical irrigation facilities which are planned in consideration of river discharges and crops and the construction of cereal drying and storage facilities for settlers. Such infrastructure becomes a model for the future agricultural development in the surrounding area. On the basis of the experiences of PRODECER I, CPA, which is the primary promotor of the project, made detailed planning procedures for PRODECER II. CPA's technical staffs provided guidances on the basis of the procedures. As a result, the agricultural infrastructure has been improved to an almost satisfactory level.

For the basic settlement plan, CPA prepared contour maps on the basis of the analysis of aerial photographs and the detailed field investigations in order to provide

fundamental data for lot partitioning and soil conservation. They also made land utilization plans for individual lots and evaluated them in order to distribute land among farmers with the maximum possible equality.

Especially, in the State of Mato Grosso and the State of Bahia, settlers are obligated to reserve of 50% and 20%, respectively of their acquired land for the forestry conservation. Consequently, CPA has made considerable efforts in lot partition and land utilization planning.

Farms were constructed with the following measures. On the assumption of mechanized agriculture, the long side of a lot located in an inclined area was drawn along the direction of a contour line in order to raise the efficiency of machines, and terraces were built from the viewpoint of soil conservation.

The following policy was taken for the farm roads in the project sites. The overall width of trunk roads is to be 9 m and that of branch roads is to be 7 m in order to facilitate the transportation of production materials and agricultural products. These roads are to be constructed by the cooperatives and maintained and managed by provincial governments.

The cereals drying and storage facilities were constructed as the cooperatives' infrastructure. They have been constructed at the center of each project site in order to facilitate transportation. (Exceptionally, as the Piuva project site is located near a national road, these facilities were constructed in the town of Lucas do Rio Verde.) These facilities are available also to those farm households which are not participating in the Pilot Project and have been motivating the cereals production and their quality maintenance among the farm households in the surrounding area.

The plans for irrigation facilities have just been made. Each project site is studying whether to construct them within the period of the Pilot Project or to construct them under the Brazilian Government's National Irrigation Program (PRONI).

(2) Social Infrastructure

The loans for the Pilot Project are not applied to trunk roads and branch roads. The trunk roads (national roads) were constructed and improved by the Federal Government, while the branch roads were constructed and improved under the cooperation between the state governments and provincial governments and the participating agricultural

cooperatives. However, their conditions are not satisfactory.

Especially, although the branch roads were initially expected to be constructed and improved with the budgets of the governments of the two states, their financial ability is poor, because the State of Mato Grosso has just separated the State of Mato Grosso do sul and the State of Bahia is on the way of financial reconstruction, as the governmental officials concerned excused. They simply provided machines for road construction and their operators. The fuel expenses, food allowance etc. for road construction were supplied through the cooperation of the province governments and the agricultural cooperatives which participated in the Pilot Project. Their efforts should be sufficiently evaluated.

On the other hand, the state power corporations were expected to cooperate in electrification facilities such as power-transmission lines, but they failed to meet the expectations. Each of the farm households supplies its own electricity by using a Diesel-engine generator because they cannot hope for its supply from the power corporations for the time being. As to the prospect of it, Lucas do Rio Verde district has made a power transmission plan of 40 km and they will put it into

implementation in the near future. The other districts have made plans, but have no prospect of implementation because of financial conditions, etc.

As described above, the road conditions have been improved to some extent by the efforts of the Federal Government, state governments, provincial governments and the participating agricultural cooperatives. However, the electrification of farm villages must depend on the future efforts of the state governments and the state power corporations.

Basically, the construction of basic infrastructure, such as roads and power, is essential for accomplishing the objectives of the Pilot Project. It seems desirable to construct it in advance in order not to interfere with the execution of the Pilot Project.

For this purpose, it is desirable to study a scheme that includes the basic infrastructure within the framework of the Pilot Project, or a scheme that clearly positions the construction of the basic infrastructure as a related project.

2. AGRICULTURAL TECHNOLOGY

2.1 Land Reclamation and Soil Improvement

For clear cutting, the two ends of an iron wire or chain are connected to two bulldozers and the trees between the bulldozers are felled by driving them in parallel in a round trip. It is said that the efficiency was 15 - 40 ha/day.

About 50 days after clearing, small branches are burnt, while large branches and roots are collected and carried out or burnt. After trunks and roots are removed, soil improvement material (lime and fused magnesium phosphate or super phosphate) are applied and plowed in with a plow.

Terraces were constructed on sloping ground for the sake of soil conservation.

It is said that this land reclamation method leaves a large quantity of roots and requires enormous labor to remove them. It also damages plows easily. However, it is relatively efficient and the productivity of crops has been raised to a certain level by rational soil improvement and subsequent fertilization, and no special problem is found with the land reclamation. As the clearing of a vast area may bring about

negative effects to the environment though, it seems necessary to conduct a continuous investigation of atmospheric temperature, rainfall, wind, soil moisture, etc. and to study countermeasures.

2.2 Diffusion of Farming Technology and its Effects

CPA guides and supervises settler farmers for promoting this project. CPA has concluded technical agreements involving farming technology guidance with agricultural cooperatives concerned. Instructors, who belong to each agricultural cooperative at the expense of CPA, provide thorough technological guidance to farmers.

About the contents of instruction, CPA has prepared detailed reference manuals investigated by specialists for each region, which allowed instructors of cooperatives to use them.

A coordinator for the field-instructors is assigned to each regional office of CPA. About 3 instructors and some supplementary instructors stay at each agricultural cooperative. The instructors and some supplementary instructors stay at each agricultural cooperative association. The instructors visit farms and give guidance if requested by

settlers. They give a stronger and more thorough guidance to settlers than EMATER's advisors do, who are assigned mainly to small farms.

As a result, the cultivation of crops has been managed adequately and the average yields have been increasing yearly. For example, the yield of soybean in Piuva in the State of Mato Grosso has reached the target 2.4 tons/ha in the 3rd year. The crop in Ana Terra has also come close to it. (Table 2)

It is said that the high yields in the project district are stimulating the farmers in the surrounding area and accordingly raising their agricultural production.

2.3 Stability and Sustainability of Agricultural Production

The pH of the soil has risen and the content of inorganic nutrients tend to be increasing as the result of the application of soil improvement materials and sufficient fertilization after land reclamation. The organic substance content in the soil did not decrease, rather it has increased in some cases. Therefore, it may be said that the stability of production has been rising steadily in terms of soil.

However, the stability of agricultural production is constrained by an almost complete lack of rain during the dry season (May to September). In the State of Bahia, a short dry season "veranico" during the rainy season inhibits the production stability of crops, especially annual crops. Some farmers could harvest no rice in the 1st year after the reclamation. The yield of soybean is also kept low for this reason. Irrigation is possible in the State of Mato Grosso, but not in the project district of State of Bahia because of the long distance from water source and the small quantity of water.

It is relatively rare that the meteorological conditions present problems for stabilizing the agricultural production under the current planting system in the project district of State of Mato Grosso. However, "veranico" is a serious obstacle to the stabilization of production in the project district of State of Bahia. In order to avoid and decrease the damages caused by "veranico", some technological development is necessary.

Since the history of land reclamation in State of Bahia is short, the farmers have not been able to stabilize their economic foundation, they tend to depend on the continuous cropping of soybean for the sake of immediate profitability instead of the

long-range stability of production. It is a problem from the standpoint of the stability and sustainability of agricultural production. For this reason, more efforts must be made to select suitable varieties and improve the cultivation technology for stabilizing the production of soybeans. At the same time, a crop rotation must be selected in order to avoid the continuous cropping of soybean and the introduction of perennial crops should be studied urgently.

2.4 Cooperation with Cerrado Agricultural Research Project

EMBRAPA is a coordinator of Brazil's agriculture and live stock-farming research cooperation system. They coordinate tests and researches with the cooperation of CPAC, which is under EMBRAPA, EMPA-MT and EPABA.

CPAC is developing the resource utilization technology and engaged in the research of the agricultural production system on the basis of the natural and social evaluation of Cerrado, the investigation of plants and the research of soil, water and meteorological conditions. They are also transmitting and spreading the research accomplishments through printed matter, meetings, research groups and visits to farms.

EMBRAPA is cooperating with the Japan-Brazil Agricultural Research Cooperation Project (Project-Type Technical Corporation). Japanese experts are dispatched on short-term as well as long-term basis and are engaged in the fundamental research in the fields of cultivation, pests, diseases, soil moisture, etc. They are also engaged in tests for concrete technological developments. They carry out tests jointly with the agricultural experiment stations in the States in the Cerrado region. They visit these agricultural experiment stations periodically to give guidance and provide fund to improve their facilities.

As stated above, the Japan-Brazil Agriculture Research Cooperation Project is fulfilling its responsibility for the Cerrado development by research activities.

EMPA has an experimental farm in Lucas, which is close to the project district, where the soil fertility and the cultivation of annual and perennial crops, etc. are being tested. EPABA of the State of Bahia validates and monitors the developed technology in the project district of Ouro Verde in cooperation with COTIA Agricultural Cooperative. They also have a relation with COACERAL Agricultural Cooperative of Brazil Central.

In order to apply the accomplishments of tests and researches to settlers, they must be fitted to the technological and economic conditions of the field. The rainfall conditions and the other conditions are not the same throughout the vast settlement place. Therefore, selected farmers must test a technology on his farm at the final stage of technological introduction.

State agricultural experiment stations have an especially important role between farmers and research institutes for digesting research accomplishments and for establishing applied technologies in the field. However, the agricultural experiment stations in the States connected with the present project do not always have sufficient facilities and staffs. Their financial conditions and the treatment of researchers and engineers at the state agricultural experiment stations are not always good enough. It is necessary to intensify those state experiment stations.

Table 2 Planted Area and Average Harvest of Principal Crops in Project Districts

Project District	Crop	1986/1987		1987/1988		1988/1989	
		Planted area ha	Average yield t/ha	Planted area ha	Average yield t/ha	Planted area ha	Average yield t/ha
Piuva	Rice	4,494	0.75	1,167	1.80	90	2.10
	Soybean	2,840	1.51	7,930	1.71	6,800	2.40
	Corn	-	-	174	3.74	750	2.40
Ana Terra	Rice	273	1.80	6,500	2.05	300	2.10
	Soybean	-	-	900	1.31	7,500	2.22
	Corn	-	-	50	3.90	250	3.60
Ouro Verde	Rice			1,574	1.34	750	1.50
	Soybean			4,333	0.89	12,810	1.44
	Feijão					35	1.20
Brazil Central	Rice			6,388	0.45	525	1.80
	Soybean			5,306	1.16	11,587	1.50
	Feijão					117	0.90

Source: The data of Piuva and Ana Terra in 1986/1987 and 1987/1988 were obtained from JADECO Co.
The other data were obtained from CPA.

3. FARM HOUSEHOLD ECONOMY

The pilot project is conducted in two districts (Brazil Central and Ouro Verde) in the State of Bahia and two districts (Ana Terra and Piuva) in the State of Mato Grosso. Planting was started in 1986 in the two districts of Mato Grosso where the settlement began earlier. However, planting could not be started until 1987 in Bahia State because of the delay of settlement.

Bahia State is inferior to Mato Grosso State in terms of meteorological conditions. For example, the precipitation is small and "veranico" occurs during the rainy season. The two districts in Bahia State had lower unit yield for both soybean and rice this year compared with the two districts in Mato Grosso. When the two districts in Mato Grosso State are compared, Piuva seems to be slightly superior to Ana Terra, because soybean yield in Piuva is higher and it is closer to a town.

As for the back-up, Brazil Central district greatly owes to Mr. Vicente Okamoto who is the executive director of the cooperative and has a great leadership and financial power. Ouro Verde district is under the guidance of an influencial cooperative called COTIA Agricultural Cooperative.

The financial conditions of some of the settlers who are under these conditions were analyzed. The results are reported herein.

3.1 Economic Conditions of Farm Households

The average distributed area per household in the 4 districts is 390 to 450 ha. When the reservation area is subtracted, the usable area ranges from 210 to 330 ha. This is far larger than the traditional agricultural operation (small-scale farmers) in the region.

The heads of the households are mostly in their 30s and are from southern states. Many of the permanent employees are from southern states, while temporary employees are local residents. With 2 tractors and 1 combine for which loan was provided, they seem to still have some room to expand the planting area. In fact, the number of those who have a 2nd farm other than settled farm is not small.

In 1988/89, a large part of the land was used for planting soybean. The ratio of soybean to the total planted area was as high as 90.7% in Brazil Central district, 94.9% in Ouro Verde district, 81.6% in Ana Terra District and 77.7% in Piuva district. It is found that the ratio is especially high in the

first two districts belonging to Bahia State. Rubber is being planted in the Ana Terra and Piuva districts of Mato Grosso State. Corn is also planted in Piuva district where some farmers have started the 3rd crop and the diversification of crops is relatively in progress.

Concerning the earnings and expenses in the 1st fiscal year (1987/88, but 86/87 in Piuva district only), the following data have been obtained. The unit yields of rice and soybean were lower in Brazil Central and Ouro Verde districts partly because of the influence of "veranico". Slightly less than 30% of the 28 farmers investigated suffered a deficit. (Figure 2)

As an evidence, the average unit yield of soybean was 1.16 t/ha in Brazil Central district and 0.89 t/ha in Ouro Verde district. It was higher in Ana Terra district (1.31 t/ha) and in Piuva district (1.51 t/ha). In any event, the 3-year deferment of the repayment of loans for fixed capital investment and the deferred repayment of a part of short-term farming fund (Custeio) in the 1st fiscal year were necessary measures.

3.2 Prospect of Earnings and Expenses

The planting ratio of soybean rose and its unit yield increased in the 2nd year. We took up a typical farmer in Ouro Verde district and studied the possibility of repaying loans by single cropping of soybean (315 ha). The settlers start the full-scale repayment of loans, including short-term farming funds, from the 3rd year. The peak comes in the 8th to 10th year.

The following results were obtained. (1) If low prices are assumed (1.17 OTN/60 kg on average in May, 1987 - April, 1988), the repayment is impossible in some years at the unit soybean yield of 1.8 t/ha. If the unit yield is increased to 2.1 t/ha, a farmer will have some profit after repayment even in the 8th to 10th year. (2) If high prices are assumed (1.77 OTN/60 kg on average in May, 1988 - February, 1989), a farmer will have a profit even at 1.5 t/ha. (Figure 3).

The unit yield of soybean in 1988/89 was 1.50 t/ha in Brazil Central district, 1.44 t/ha in Ouro Verde district, 2.20 t/ha in Ana Terra district and 2.40 t/ha in Piuva district. The former two districts (Brazil Central and Ouro Verde) will face severe financial conditions unless the unit yield of soybean can be increased. On the other hand, the latter two districts (Ana Terra and Piuva) must increase the unit yield in case of single

cropping of soybeans because the usable area is small (224 ha in Ana Terra and 208 ha in Piuva). In this respect, already achieved unit yields may be evaluated sufficiently. The repayment will be easier if high profits can be obtained stably by diversifying crops in addition to corn and rubber being introduced.

As it goes without saying that the soybean price will possibly fluctuate, there is no need to adhere to the single cropping of soybean. Regarding the profitability of soybean, rice, feijão and corn since 1987 cropping year, excluding feijão which requires intensive farming, it was found that the profitability of corn is unexpectedly high. Therefore, it is highly important to change the composition of crops according to the fluctuations of market prices and to establish a technological foundation for putting them into practice, and it will improve and stabilize the profitability of the farm management as a whole. Furthermore, all of the 4 settled districts must secure sales routes of corn.

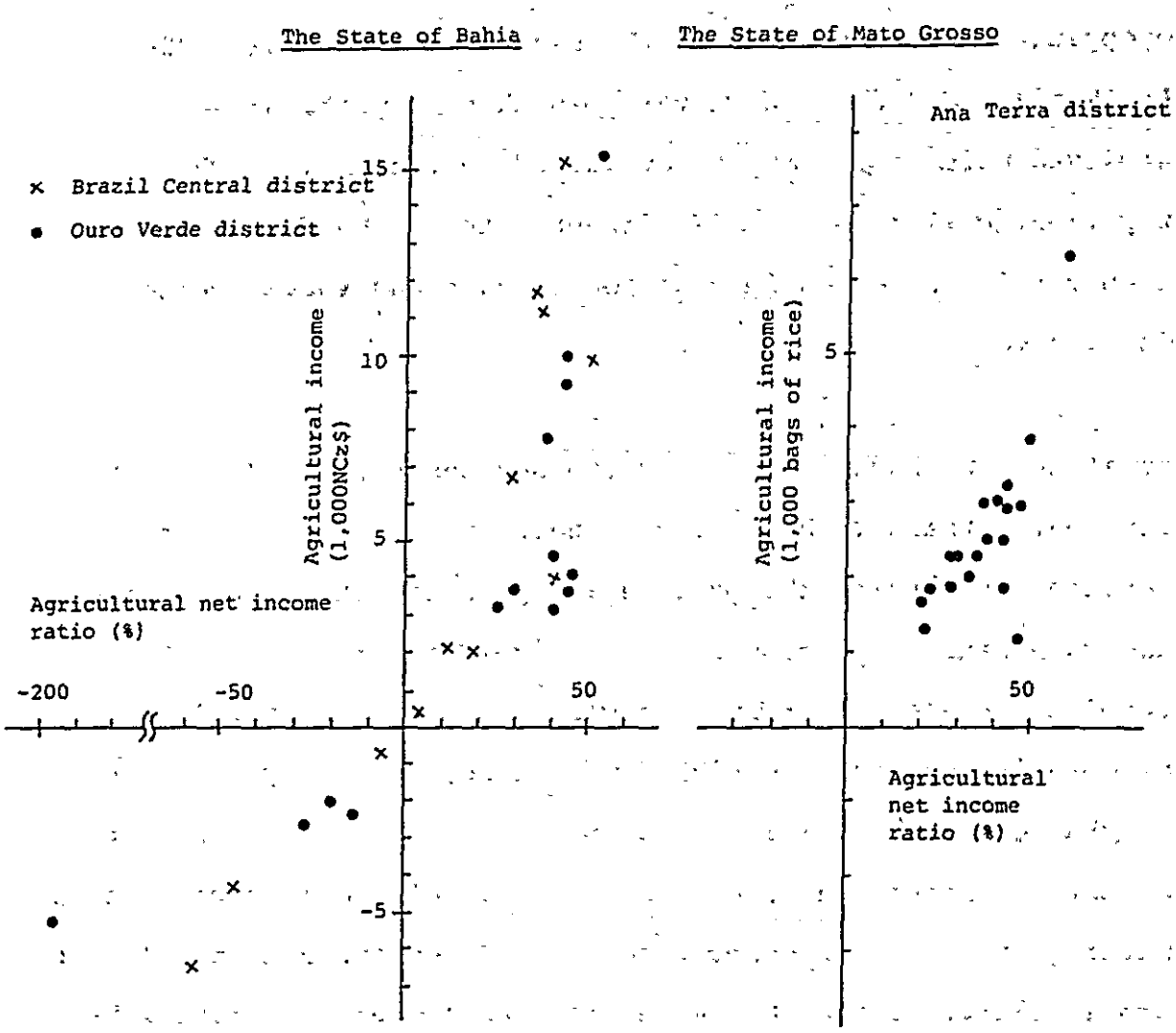

Figure 2 Earnings and Expenses of Settlers (First Year)

Note: 1) Agricultural income (Receita agricola) = Gross income (Receita bruta) - Agricultural expenditure (Custo agricola)

Agricultural net income ratio = Agricultural income ÷ Gross income

2) Piuva district was excluded because the income was given both in the amount and the number of rice bags and the unified evaluation was difficult.

Source: Questionnaire survey

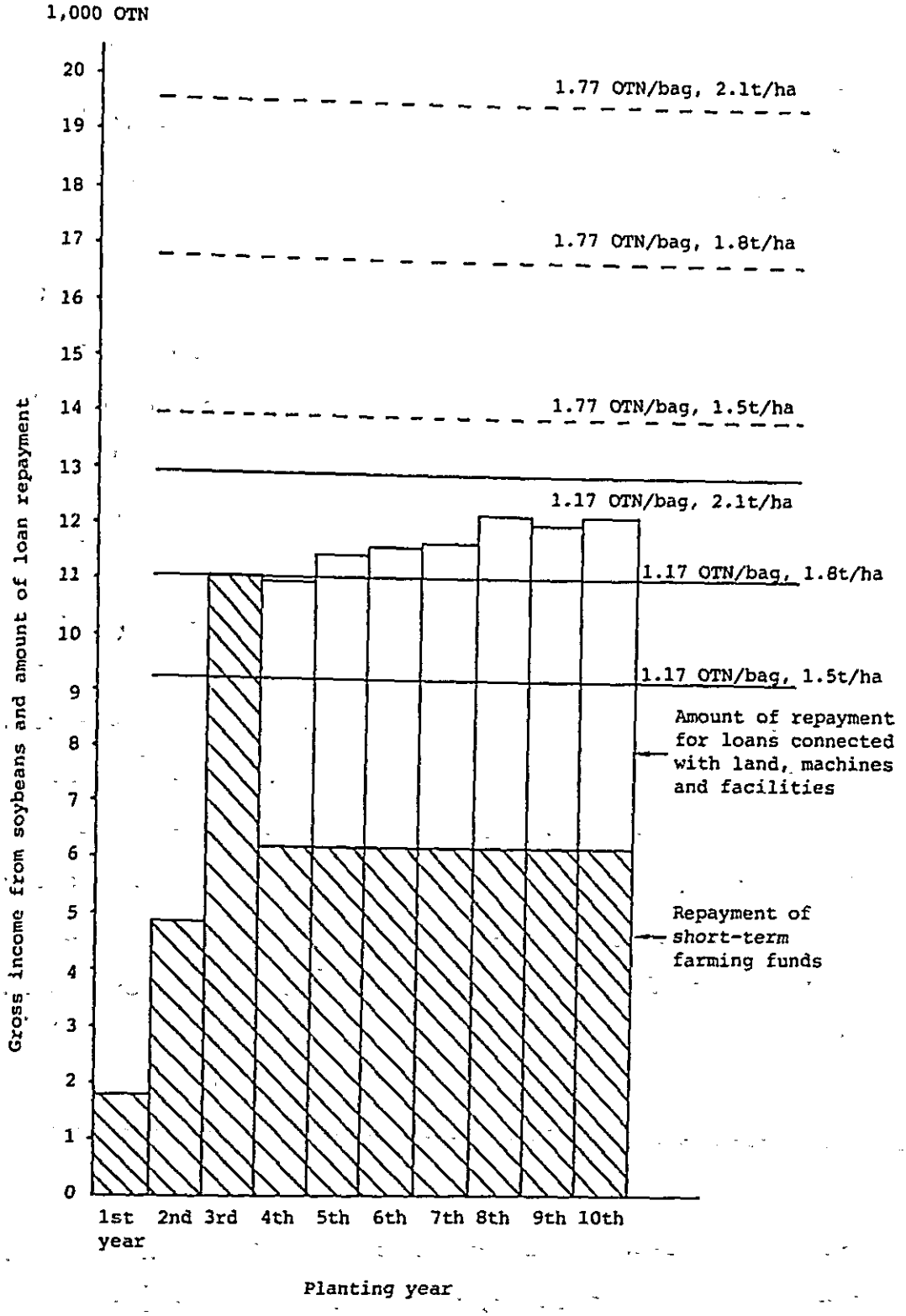

Figure 3 One Farmer's Amount of Repayment and Repayment Possibility

Note: The single cropping of soybean (315 ha) is assumed. It was assumed, however, that the amount of the loan is provided on the basis of the harvest of soybeans (200 ha) and rice (115 ha) in the 1st year.

Source: C.A.C.-C.C., *PROJETO AGRICOLA*, 1987.

4. EFFECTS OF DEVELOPMENT

4.1 Degree of Target Accomplishments

The present pilot project was started in March, 1985, with the planned period of 4 years. It aims at the agricultural development of the scale of 50,000 ha (Number of scheduled settlers = 100, project cost = 20 billion and 589 million yen) in Cerrado region of the states of Mato Grosso and of Bahia.

Since the progress of the project was slightly delayed by the influence of the severe change of the economic environment in Brazil and the problem of FUNAGRI transfer, etc., was agreed upon between Japan and Brazil in March this year to extend the period of the project until February, 1990. The final stage of the project is being executed at present. Therefore, the degree of target accomplishments was evaluated on the basis of the achievements as of May 31st, 1989, and Brazil's prospects during the extended period.

(1) Principal achievements of the project (Table 3)

While the target development area was 50,000 ha, the actual development exceeded 60,000 ha. Since a large number of farmers desired to participate, the number of settlers amounted to 1.4 times as large as the plan. Yet, cropping

area per farm household nearly reached the plan. Actually planted area has already reached 43,000 ha, which exceeds the target (39,000 ha).

However, the progress was not uniform among the districts. For example, the land reclamation work took longer time in the settlement area of COOPERCANA Cooperative of Mato Grosso State because of Cerradon forests. It was not until the cropping year of 1987/88 when all the households could start planting. At the area of COTIA Cooperative in Bahia State, more than half of the farmers gave up the participation because the candidate site was changed three times, because the preparation of purchase contracts took a long time and because an abnormal drought occurred near the area. Therefore, all the settlers were finally determined as late as in January, 1988.

As for the farming management, the productivity has been rising steadily, and hence the prospect of the farming is assured for the time being, except the area of COTIA Cooperative. No district has a firm prospect for the farming of perennial crops, though.

Concerning the production and social infrastructures, the facilities connected with production (silos, warehouses,

etc.), cooperative's facilities such as offices and primary schools have been all completed. However, the conditions of the roads in the settlement districts and the access roads to there are generally poor. The state governments should quickly improve the trunk roads leading to the outside in view of raising the efficiency of transporting agricultural materials and products.

Table 3 Principal Achievements of Project

Plan	Achievement
1. Agricultural development of 50,000 ha in Cerrado region of State of Mato Grosso and State of Bahia Target area (1) Lucas district in the State of Mato Grosso (2) Barreiras district in the State of Bahia	(1) State of Mato Grosso . COOPERLUCAS Cooperative 16,214 ha . COOPERCANA Cooperative 17,862 ha Sub total 34,076 ha (2) State of Bahia . COTIA Cooperative 13,804 ha . COACERAL Cooperative 12,548 ha Sub total 26,352 ha Total 60,428 ha
2. Number of settled farmers: 100 households	(1) State of Mato Grosso . COOPERLUCAS Cooperative 39 households . COOPERCANA Cooperative 40 households Sub total 79 households (2) State of Bahia . COTIA Cooperative 35 households (12) . COACERAL Cooperative 30 households (8) Sub total 65 households (20) Total 144 households (20) * The figures in the parentheses are participants with land, and are not included in the total.

Plan	Achievement
3. Planted area (1) State of Mato Grosso 19,500 ha (2) State of Bahia 19,500 ha Total 39,000 ha	(1) State of Mato Grosso . COOPERLUCAS Cooperative 8,420 ha . COOPERCANA Cooperative 8,950 ha Sub total 17,370 ha (2) State of Bahia . COTIA Cooperative 13,550 ha . COACERAL Cooperative 12,316 ha Sub total 25,866 ha Total 43,236 ha
4. Production and social facilities The following facilities are to be constructed. (1) Cooperative's facilities (2) Production facilities (3) Social facilities	(1) State of Mato Grosso . COOPERLUCAS Cooperative Silos (storage capacity 24,000 tons) and other principal facilities, except some parts of offices and warehouses, have been completed. . COOPERCANA Cooperative Silos (storage capacity 30,000 tons) and other principal facilities, except radio and telephone facilities, have been completed. (2) State of Bahia . COTIA Cooperative Silos (storage capacity 32,000 tons) and other principal facilities have been completed. The expansion of storage facilities is being studied. . COACERAL Cooperative Silos (storage capacity 25,200 tons) and other principal facilities have been completed. The construction of a lime plant is being planned.

(2) Progress of the expenditure of the project fund (Table 4)

The progress rate as of May 31st is given below.

(Based on U.S. currency)

(Plan)

70,230 thousand dollars ÷ 87,617 thousand dollars = 80.2%

(Based on yen)

(Plan)

9,925 million yen ÷ 20,589 million yen = 48.2%

The progress rate in yen is lower because of the tendency of yen's appreciation against U.S. dollar since the beginning of the present project. Accordingly, the progress ratio based on U.S. currency should be used for making judgements.

Table 4 Progress of the Expenditure of the Project Fund

Project cost (Plan)	(1) Actual expenditure as of May 31st, 1989
. 20,589 million yen (87,617 thousand dollars)	9,925 million yen (70,230 thousand dollars)
* To be halved between Japan and Brazil.	(2) Expenditure planned until February 28th, 1990 (including the agro-industry)
	4,338 million yen (30,985 thousand dollars)
	Total 14,263 million yen (101,215 thousand dollars)

If the expenditure which is planned between June, 1989 and February, 1990 is added, the total will amount to 101,215 thousand US dollars and the progress ratio is 115.5% of the plan. This amount includes the agro-industry which is being proposed by Brazil, but no concrete plan for it has been made. If it is excluded, the total will amount to 81,715 thousand US dollars and the progress ratio will be 93.3%. Anyway, it may be said that the initially planned project fund will be mostly expensed.

(3) Technological guidance connected with present project

In response to CPA's request, JICA dispatched 10 specialists for the technological guidance of crop cultivation and underground water utilization in the development districts. JICA also invited 37 trainees including leaders of the cooperatives concerned and the chief engineers of CPA in order to give the trainings on Japanese agricultural cooperatives system, the financing operations of the cooperatives, the basic technology of agricultural development, etc., so as to contribute to the effective promotion of the project.

4.2 Economic Analysis of the Project

For the economic analysis of the project, we calculated the internal rate of return (IRR) which is frequently used prior to the execution of a project. IRR is used as one of indexes for feasibility evaluation and is a useful criteria for measuring the effectiveness of a project.

IRR was calculated on the basis of the development investments (excluding the cost of land) which were made under the present project, the accumulated production cost and the accumulated

value of products and their future estimates, etc. A case in which both the unit yields and prices of principal crops are high and another case in which both of them are low were taken up. The IRR was 17.8% in the former case and 11.5% in the latter case. Since the IRR of this project will probably fall within this range, it may be judged that a sufficient priority can be given to this project. The IRR of each state was once calculated during the 2nd preliminary study before the start of the project (1984), and the result was 8% in both states, which is lower the IRR which was calculated on the basis of the accomplishments and estimates. Accordingly, it may be said that the comprehensive effects of this project is larger than anticipated.

But, it should be taken into consideration that the calculations are based on the following assumptions, and various risks, such as the drop of yield due to meteorological changes and the decline of prices due to the fluctuation of the international market, could happen. We should refrain from taking a very optimistic view only from the obtained results.

(Assumptions)

1) The value was all converted to U.S. dollar so as to eliminate the inflation influences.

2) For the yield and price forecast of soybean, two cases which were studied in chapter 3 (Farm Household Economy) were used. One is a favorable case (harvest = 2.1 tons, price = 1.77 OTN/bag) and the other is an opposite case (harvest = 1.5 tons, price = 1.17 OTN/bag). But, the targets were used as the yield forecast and the prices in 1989 were used as the price forecast for both corn and rice.

3) Of the anticipated amount of PRDECER II loan in 1989, the agro-industry and the emergency fund were excluded because the corresponding benefits cannot be calculated.

4) It was assumed that the benefit of the project starts from zero. (The benefits of charcoal and pasturage were neglected because unused Cerrado regions were reclaimed in most cases.)

5) Though some farmers in the State of Mato Grosso rent land because the reserved land is rather large and consequently the cultivated land is small, the benefits from it are not included due to the difficulty to calculate.

6) It was assumed that semi-fixed assets, including machines, are renewed every 10 years.

7) The production cost of soybean was assumed as equal to 22 bags of the product, that of corn was assumed same as soybean, and that of rice was assumed as 75% of that of soybean. This method is suitable for adjusting the inflation, but, it tends to underestimate the cost when the prices of products are low.

8) The project life was assumed as 20 years, which is equal to the assumption made for the 2nd phase basic investigation.

9) Project life was assumed 20 years, which is same as the 2nd preliminary study undertaken before the start of the project.

4.3 Contribution to Food Supply

(1) Development of farming land

In view of increasing the food production for achieving the self-support in foods and of enlarging the export of grain, the Brazilian Government paid attention to the development of the Cerrado region in the middle and west Brazil. They started the full-scale development by establishing the Point Development Plan of Cerrado (POLOCENTRO) in 1975, but increased 1,400 thousand ha by 1980, which is only 38% of the target. The Cerrado development was accelerated, however, by the good results of the 1st pilot project started in 1979 and by the execution of the expansion program (2nd pilot project and the full-scale project) in 1985. The total development area became 10.20 million ha in 1985, and 12.95 million ha in 1988. In other words, the annual average development was 900 thousand ha during the 8 years from 1980 to 1988.

The current Sarney Administration attaches a high priority to the socio-economic development of the middle and west Brazil in the New National Development Plan of the Republic. The related governmental agencies (Planning Agency, Ministry of Agriculture, Ministry of

Transportation, etc.) and state governments are making concrete efforts to realize the development by establishing Cerrado development policies respectively. These facts indicate the enthusiasm and the positive attitude toward the Cerrado development in the Federal Government as well as the state governments.

According to the Ministry of Agriculture's "Agricultural Policies and Targets" and PRODECER II's records, the target of development over the 4 years from 1986 through 1989 is 3 million ha. The total development accomplished under the pilot project and the full-scale project of PRODECER II was 180 thousand ha, which is larger than the plan by 30 thousand ha and accounts for 6.5% of the above target. If the settlements to the surrounding area are also included, it has reached 13% of the target. It may be said that the successful execution of PRODECER II has made a large contribution to the promotion of the settlement.

(2) Expansion of food production

The Ministry's plan fixes the target increase of the national cereal production from 1986 through 1989 as 15.50 million tons, and the target production increase in the

Cerrado area as 7.80 million tons. It is projected that at least 245 thousand tons or 3.2% will be produced from 150 thousand ha developed by PRODECER II. In fact, cereal production is expected to reach approximately 615 thousand tons (approximately 7.9%) including the surrounding are as of PRODECER II, by the crop year of 1988/89 practically because of the favorable production in the State of Minas Gerais and other states where the full-scale project is under-way. Therefore, the contribution of the Cerrado area to the total production increase of cereals in Brazil is expanding. Among the cereals which are produced in the Cerrado area, the production of soybean was 8.09 million tons in 1988, which accounts for 45% of the national soybean production (18.05 million tons). The production of corn was 8.78 million tons in the same year, accounting for 36% of the national production (24.30 million tons), and the production of rice was 5.54 million tons, accounting for 47% of the national production (11.76 million tons).

Against the global production of cereals (wheat, feed cereals, rice and soybeans) which was 1,838.2 million tons in 1987/88, Brazil's production was 60.8 million tons, accounting for 3.3%. The global production of soybeans was 101.1 million tons, while Brazil's production was 18.1

3.02 million tons in 1987 and 2.60 million tons in 1988. The total value of the export of soybean, meal and oils combined was 2.324 million dollars in 1987, accounting for 8.9% of the total value of export.

It is difficult to know how much of the soybeans produced in the Cerrado area is exported. The State of Mato Grosso do sul exports some of its soybean directly though. It seems that most of the soybeans produced in the Cerrado area is sold in the domestic market mainly because of the transportation cost, while the soybeans produced in the south and the east south seems to be exported.

Table 5 Transition of Cereals Production in 7 Cerrado States and Distrito Federal

Crop year / State	1985		1986		1987		1988	
	Planted area	Production	Planted area	Production	Planted area	Production	Planted area	Production
Goias	2,328,310	4,162,250	2,619,500	4,950,360	2,884,879	5,599,730	2,984,010	6,039,460
Minas Gerais	2,492,821	4,758,696	2,586,009	5,013,685	2,639,648	5,055,289	2,612,467	5,110,414
Mato Grosso	1,444,940	2,588,315	1,776,435	3,244,307	2,080,397	3,994,751	2,386,375	4,368,225
Mato Grosso do sul	1,693,217	3,210,047	1,589,810	2,561,769	1,722,832	3,399,400	1,651,300	3,444,619
Bahia	607,073	572,186	671,493	561,597	916,109	351,231	1,024,103	861,400
Maranhão	1,009,941	757,030	1,472,210	1,608,094	1,443,021	715,171	1,507,935	1,659,950
Piaui	571,577	525,840	696,926	739,224	586,073	278,764	719,023	789,102
Distrito Federal	55,942	107,469	66,252	112,787	68,642	153,017	68,910	152,997
Total	10,203,821	16,681,831	11,478,635	18,791,823	12,341,501	19,547,353	12,955,123	22,426,167
Total for Brazil	26,714,366	49,317,504	27,236,607	44,280,594	28,324,221	54,082,557	29,031,651	54,107,959
Share (%)	38.20	33.83	42.14	42.44	43.57	36.14	44.62	41.45

LSPA/FIBGE (1985/88)

(Note) 1. Cereals = Soybeans, corn and rice
2. Area (ha), production (tons)

4.4 Impact on Regional Society

(1) Impact on farmers in the surrounding area

Since the present project is "a pilot project", the impact to which the largest importance should be attached is that the technology which was demonstrated and established through this project is spread to the surrounding areas. As yet, it is hard to make an clear evaluation on it, because the period since the start of the project is so short. However, the settlers from southern states who have advanced cereal production technologies and high farming management ability has demonstrated marvelous cereals production technology and farm management technology by the use of large machines. It is recognized that the demonstration stimulates greatly the surrounding farmers who have little experience in such cereal production. Furthermore, this pilot project realized Brazilian farmers' dream, namely "to possess their own farm", hence this spurred the settlers' motivation for agricultural production. It also gave the surrounding farmers a strong impact for the possibility of owing a farm.

(2) Impact on regional development

Approximately 70,000 thousand dollars were invested by the execution of the pilot project. Most of it was spent in the project sites and the surrounding area for purchasing land, soil improvement materials, large agricultural machines, seeds, fertilizers, agricultural chemicals and other production materials, for constructing storage silos, houses for settlers and other facilities and for employing workers for land reclamation, soil improvement, etc. It seems that the invested funds circulated in the states and made a large contribution to the vitalization of the regional economy.

Though it was not possible to obtain the accurate number of workers who were employed for land reclamation, soil improvement and farming work which are directly related to the pilot project, the data in COTIA project site of Ouro Verde State led to estimates that about 770 men were employed in land reclamation work, about 960 men in soil improvement work, about 480 full-time workers and 500 temporary workers in spring and fall farming work. Out of them, about 2,000 men were estimated to be locally employed, while the rest are the tractor operators who were employed from other states.

Thus, the pilot project provided the regional society with many employment opportunities even if only the operations which are directly related to the project are included. If we include the increase of employment opportunities for related businesses which have advanced into the surrounding towns (stores of agricultural machines and tools, of agricultural production materials, of construction materials and of daily supplies, hotels, restaurants and transportation business, etc.), we may say that an extremely large labor market was formed, and accordingly it gave a great impact on the increase in residents' income and the vitalization of the consumption economy.

In this way, besides the increase in the production of foods which is the primary objective of Cerrado development, the implementation of the project has greatly promoted the regional development as well.

For example, the Cooper Cana project site of Anna Terra in Mato Grosso State began "to develop a town" in parallel with the agricultural development. It is developing into a town of 500 residents now. The town of Lucas do Rio Verde, which is the base of Piuva project site, had only 2,000 residents in 1985. It has been promoted to a

district of 12,000 residents because the advancement of related enterprises was promoted by the asphalt pavement of National Highway No. 163 and the progress of the pilot project.

Such phenomena are found also in the 2 project sites of Bahia State. Therefore, it is convinced that the pilot project of PRODECER II, an agricultural development project, also had a considerable impact on the structure of the regional society.

Although the development has made progress and the population has increased in the surrounding areas, the social infrastructure such as education facilities, communication facilities, medical and health care facilities, etc. have not been improved enough. It is required, therefore, to cope with this situation without delay.

4.5 Influence on Environment

It was difficult to make the quantitative evaluation of its influence on the environment, because only 2 to 3 years have passed since the execution of the pilot project. However, the

hearings at all the project districts showed no report of erosion or of any abnormality of meteorological conditions, the level of underground water or the discharge of rivers.

On the other hand, it was found that the pilot project is being executed with a high interest and a great concern for the environmental maintenance. In compliance of the regulations of IBDF, 50% of privately owned land in Mato Grosso State and 20% of privately owned land (in Bahia State) are respectively left as reserved lands, which are located along river basins, at water source preservating forests and in high areas with a higher possibility of soil erosion under CPA's guidance.

Furthermore, Brazilian officials concerned highly evaluate the contribution of this project to the environmental maintenance. They say that the agricultural development of the Cerrado area in the middle and west Brazil promotes the migration and settlement in Cerrado area of farmers from the southern states who have a desire for inland migration. This can possibly stop the deforestation in the Amazon area.

The on-going efforts of officers concerned with PRODECER II for environmental protection should be highly evaluated. However, in view of collecting and accumulating basic data for better environmental managing measures in preparation for the future

agricultural development of the Cerrado area, taking into full consideration that this project is a pilot project, it is desirable to examine to establish, in the long run, a system for continuously investigating and studying the environmental changes (meteorological conditions, underground water, river discharge, plant systems, physiochemical properties of soil, etc.) which may be caused by the agricultural development of the Cerrado area.

5. COMPREHENSIVE EVALUATION AND PENDING PROBLEMS

5.1 Significance of Present Project

The Cerrado agricultural development cooperation project which was started by the joint announcement of the Japanese and Brazilian Governments in September, 1974, aiming to increase the production foods in Brazil, to promote the regional development and to contribute to the increase in production and stabilization of supply of the world food, was to promote the agricultural development in the Cerrado area with the cooperation between the Japanese and Brazilian Governments and the Private Sectors.

The project, through both PRODECER I and PRODECER II, has made smooth progress overcoming various difficulties by the efforts of the Japanese and Brazilian Governments and the private people concerned. Both the agricultural production and productivity have exceeded the targets. These accomplishments prove the fact that governmental funds were used adequately; that the agricultural technology was developed and diffused effectively and that agricultural production is sufficiently possible in the Cerrado area. Consequently, this area acquired a firm position in the agriculture of Brazil. In addition, this project promoted the immigration and the settlement of a

large number of small-scale farmers, and it is making a large contribution to the vitalization and the development of the regional society by improving the infrastructure of the surrounding area, by raising the income of local residents and by increasing employment.

Through our joint study, high-ranked government official such as Mr. Rezende (Minister of Agriculture), Mr. Nobrega (Minister of Finance), Mr. Lampreia (Undersecretary General for Bilateral Political Affairs of the Ministry of External Relations) as well as the governors of the states concerned and the private people concerned all made an extremely high evaluation for this project by saying that this project was a great success, that it made a remarkable contribution to agriculture in Brazil and that it was the most successful cooperation project with Brazil in the field of agriculture. They also expressed a strong desire for Japan's continuation of the cooperation in the future Cerrado development. Once the Cerrado development and Japan's cooperation were criticized by a part of the Brazilian Society when PRODECER I was started. However, no such criticism has been heard after the success of PRODECER II became clear. It may be because that the accomplishments of this cooperation project have become to be widely understood by Brazilian people.

As the relation between Japan and Brazil has recently been becoming closer in all fields, including politics, economy, science, technology and culture, etc., such traditional friendship should be strengthened further in the future. It may be said that the success of the Cerrado agricultural development cooperation has an important significance for strengthening these cooperative relations.

5.2 Direction of Future Development of the Project

(1) New requests from Brazil

In February, 1989, the Brazilian Government made requests to the Japanese Government concerning the new agricultural development in the Cerrado area after the termination of this project. One of them is an additional project in the current project districts, and the other is titled Central Brazil Agricultural Development Plan which is an agricultural development involving new states.

Brazil's requests are worthwhile to study positively, because the two phases of the Cerrado agricultural development project have an important significance, because our evaluation study revealed sufficient

accomplishments of the project and because only a small part of the vast Cerrado area has been developed so far.

(2). Basic development direction of future pilot project

One of Brazil's proposals is the expansion of the pilot project in the current project districts. Although a simple addition is difficult because of its character, the execution of intensive agriculture by a new farming method is possible. But, it should be considered that the development of intensive agriculture requires a considerable period of time from investigation to execution.

The three states (Piaui, Maranhão, Tocantins) of the Central Brazil Agriculture Development Plan differ from the present development districts in natural conditions and socio-economic environment and immediate project effects are expected. Therefore, the possibility of conducting a pilot project seems to be higher in these states. When the project is commenced, development plan should be prepared in consideration of some different aspect from the present development which Brazil's requests include, namely;

1) Development project for small-scale farmers

2) Introduction of new crops or new farming activities (cultivation of vegetables and fruits, cultivation of rubber, breeding of small animals, etc.)

In addition, development plan has to be prepared taking the environmental problems into consideration more than ever, because various efforts for "the harmony of development and environmental maintenance" are being made both in individual countries and in the global scale.

(3) Pending problems

In planning a new pilot project, the following problems must be studied and considerations must be made.

1) CPA, which has played an important role as the nucleus for promoting the project, is highly evaluated and trusted by the people concerned. Therefore, when the next project is implemented, project scheme should follow the existing one where CPA is the main institute for promoting the project.

In relation to this, it will be necessary for them to establish a long-term management foundation and to attain independent and stable management.

2) The prices of agricultural products will fluctuate and their distribution structure is expected to change in the future. In such an environment, the agricultural cooperatives' activities, especially their marketing activities, will have increasing importance. Therefore, they must be improved further. It is also important to give technological guidance to the participating agricultural cooperatives in order to assist their farming experiments and researches.

The agro-industry which will be initiated by agricultural cooperatives etc. is expected to develop the settlers' business. Therefore, some financing criteria should be established between Japan and Brazil from the initial stage of planning so that it may be executed within the overall project period.

3) Since the loans to farmers and agricultural cooperatives are the important key, Brazil should consider some preferential treatment for loans so that the financing criteria may be advantageous in comparison with general agricultural loans. This will be important for the smooth promotion of the project.

4) Under the previous projects, the improvement of the basic infrastructure tended to be delayed in all the development sites. In the future, it will be necessary to state Brazil's responsibility clearly in R/D or to study the possibility of including the improvement of the infrastructure in the total project expenses.

5) The repayment of some of the loans of PRODECER I has been rescheduled in consideration of the Brazilian economic conditions, and another negotiation is being made on the rescheduling of the repayments to be made by March, 1990. However, no agreement has been reached on the repayments to be made after September, 1990 and the repayment of the loans for the present project is due to start in March, 1990. Accordingly, when new project funds are discussed between Japan and Brazil, it seems necessary to make some arrangement concerning the repayment of the above loans.

6) The project sites have already attained high productivity. However, the problem of water is becoming increasingly obvious and the technological problems for compounding crops must be solved for stabilizing the production at a high level. For this

purpose, it will be necessary to improve the research on irrigation agriculture, to develop a cropping system and cultivation technology for implementing crop rotation and to improve the cultivation technology of perennial crops.

7) Concerning the environmental impact, hardly any undesirable influence has been found. However, an environmental assessment should be conducted from a long-range viewpoint in future projects. Special considerations should be made, including continuous observation after a project, and technological guidance for this purpose will be necessary.