Brazil

Brazil Jaiba Irrigation Project (II)

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Field Survey: April 2008

1. Project Profile and Japan's ODA Loan

Map of project site

Tomato field in project site

1.1 Background

The agricultural sector in Brazil has been rapidly growing since the 1970s and is regarded as one of the country's key industries holding the share of 12% of GDP, 30% of employment, and 33% of exports in the 1980s. The northeast area of Brazil, including northern Minas Gerais state, is responsible for 20% of the national agricultural production, producing sugar cane, sisal hemp, and cotton wool in particular. However, issues such as periodic droughts, uncertain precipitation, unbalanced land ownership, and a lack of employment opportunities led to poverty and high unemployment ratio.

Against this background, the government of Brazil prepared a 5-year Northeast Irrigation Program (PROINE) in 1986 with the objective of irrigating approximately 740,000ha in northeast Brazil. From the 1970s to the 1980s, the irrigation plan was prepared for the Jaiba agriculture development district (approx. 230,000ha) located in the northern part of Minas Gerais state, with progress being made in basic infrastructure developments. Under PROINE guidelines, Jaiba irrigation project plan began in earnest for a 100,000ha[1] irrigation project, and Jaiba 1 (28,200ha) being implemented with financing[2] by the World Bank.

[1] Equivalent to approximately half of the area of Tokyo.
[2] Jaiba 1 was implemented as a project of the Federal Government with support from the World Bank. Project site of 28,200ha with an irrigable area of 22,685ha, of which the irrigable area was eligible for World Bank financing (Loan amount equivalent to US$71 million; L/A : May 1989). Project completed June 2000.

This project was developed as the Jaiba Irrigation Project Phase 2, and aimed at further improvement of the socio-economic status of the Jaiba agriculture development district by expanding the irrigated area, by improving agricultural productivity, and increasing agricultural production.

1.2 Objective

The project objective is to construct irrigation infrastructure and provide agricultural financing to individuals and agricultural cooperatives in Jaiba, Minas Gerais State as Phase 2 of the Jaiba Irrigation Project (Jaiba 2), in order to expand the irrigation area and to improve agricultural productivity and production, and thereby contribute to enhance the socio-economic status of Minas Gerais State.

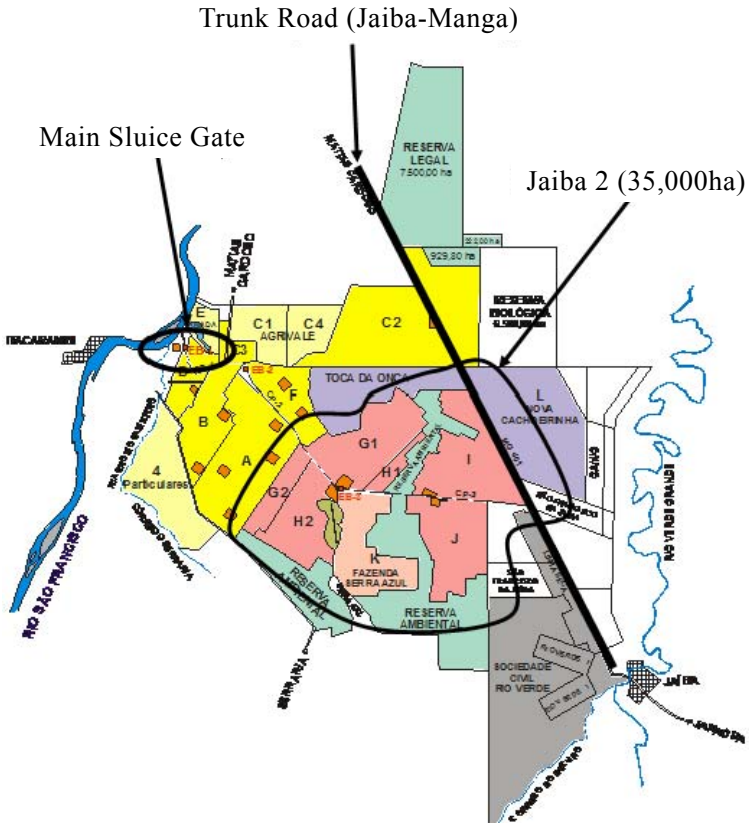

Figure 1: General diagram of Jaiba Irrigation Project

1.3 Borrower/Executing Agency

Borrower: Minas Gerais State Government

Executing Agency: Minas Gerais State Government

Planning and General Coordination State Secretariat (SEPLAG); State Secretariat of Agriculture, Livestock and Supply (SEAPA); Minas Gerais Electricity Center (CEMIG); State Development Bank of Minas Gerais

State(BDMG)

1.4 Outline of Loan Agreement

Loan Amount/Disbursed Amount	14,740 million yen/14,283 million yen
Exchange of Notes/Loan Agreement	November 1989/September 1991
Terms and Conditions - Interest Rate - Repayment Period - Grace Period - Procurement	 4.0% 25 years 7 years General untied
Date of (Disbursement) Completion	September 2005
Main Contractors (over 1 billion yen)	CONSTRUTORA BARBOSA MELLO S.A. (Brazil); CONSTRUTORA OAS LTDA. (Brazil) (JV); CONSTRUTORA QUEIROZ GALVAO S.A. (Brazil); TERCAM - ENGENHARIA E EMPREENDIMENTOS (Brazil) (JV); IVAI ENGENHARIA DE OBRAS S.A. (Brazil); ALSTOM INDUSTRIA S.A. (France), etc.
Consultant Services (over 100 million yen)	ECOPLAN (Brazil); ENGESOLO (Brazil); PCI (JV)
Feasibility Study (F/S), etc.	---

2. Evaluation Results (Overall Rating: B)

2.1 Relevance (Rating: a)

2.1.1 Relevance at the time of appraisal

The irrigation scheme on Northeast Brazil was prioritized after drought during 1978-83, and the 5-year Northeast Irrigation Program (PROINE) was prepared in 1986 (revised in 1987). The plan envisaged development of 744,200ha over a five-year period during 1987 to 1991.

PROINE included the development of 178,500ha as part of the Minas Gerais State Irrigation and Drainage Program (427,000ha). Under the Collor administration (1990-92), consistent priority was given to the development of the Northeast area and to continue the irrigation programs. The subsequent Franco

administration (1992-94) also confirmed the importance of PROINE and the importance of this project was high as a main project.

2.1.2 Relevance at the time of evaluation

(1) Importance of the Jaiba Irrigation Project

With the growing food demand in both global and domestic markets, the importance of agricultural production, which occupy 34% of Brazil's GDP, is increasing more than before. Especially, Northeast areas including north of Minas Gerais State are prioritized under the current administration.

A contribution of R$[3]20 billion (approx. US$12.5 billion) of total investments allocated for the agricultural sector has been clearly specified in the Federal Government's Multi-Year Plan (PPA/Plano Plurianual 2004-07) and US$7 billion out of it is allocated for the government-run PRONAF (federal program to support farmers) to support farmer settlement through the development of rural infrastructure and agricultural credit.

Furthermore, a state-run regional plan for the total development plan of Minas Gerais State (2007-23) places agriculture as the state's core industry and considers implementing third and fourth phases as Jaiba Irrigation Project as one of its priority projects.

(2) Changes of project scope

The structure of beneficiaries changed from the time of appraisal. Originally the project expected migration of approximately 700 small farmers (mainly 10-20ha). However, actual status is that large-scale farmers and enterprises (hundreds-3000ha) occupy the majority of lands. There are 88 farmers (companies) in the Jaiba 2 district including several numbers of large-scale farmers exceeding 1,000ha. On the other hand, there are a significant number of small- and medium-sized farmers (20-50ha) in the Jaiba 1 district.

[3] Exchange rate: US$1 = R$1.6 (April 2008)

Table 1: Number of settled farmers[4]

Size	Jaiba 2 (Plan at appraisal)	Jaiba 2 (April 2004)	Jaiba 1 (C-2 Area)
~20ha	10ha: 243	0	46
~50ha	25ha: 373	42	40
~100ha	64ha: 34 90ha: 34	23	6
~500ha	0	16	7
~1,000ha	0	2	0
1,000ha~	0	5	0
Total	739	88	99

Source: DIJ (Distrito de Irrigacao de Jaiba; the Jaiba Irrigation District Office)

Process leading to change is as follows:

1) Changes of the project environment

Affected by changes of the environment for agricultural productivity in Brazil in recent years, sustainable operations by small-scale farmers[5] which have less productivity and profitability are becoming difficult and tend to aggregate to being a large-scale farmer.

Examining the situation of agricultural productivity during the project implementation (1995-2005), product prices did not rise as much as expected. On the other hand, there was a clear rise in production costs (mainly energy and wage). The table below is a comparison of trends in the production cost of products and market prices. It shows that while production costs have increased many times, the price of produce has grown sluggishly.

[4] Number is an aggregate including farms that have been abandoned and farms lying fallow

[5] Large-scale farmers with high-level farm management skills that can utilize the merits of scale have an agricultural production that is many times greater than small-scale farmers.

Table 2: Price and production cost trends of agricultural products in Brazil

Example Item	Price	Production Cost
Banana		
1995	R$0.49/kg	R$908.45/ha/year
2005	R$0.55/kg	R$4,985.5/ha/year
% 1995 levels	(112.24%)	(550%)
Guava		
1995	R$0.59/kg	R$1,081/ha/year
2005	R$0.50/kg	R$2,465/ha/year
% 1995 levels	(84.75%)	(228%)

Source: Mercador do Productor-Juazeiro/BA

Small-scale farmers with farms of a few hectares were unable to secure sustainability (profitability) under these conditions. In addition, agricultural cooperatives which organize these small-scale farmers malfunctioned. Because of these factors, it was difficult to achieve a sustainable effect from the original project scope that focused on small-scale farmers.

2) Change of the policy by Minas Gerais State Government

Jaiba 1 project implemented by the Federal Government (CODEVASF, the public development corporation for the Sao Francisco river basin) promoted the migration of small- and medium-sized farmers mainly in accordance with the original plan. However, because of the low productivity and epidemic diseases of bananas (Panama disease, Black Sigatoka Disease [6]) during the project implementation, the production in the Jaiba 1 district stagnated. As a result, many small-scale farmers gave up their business. Therefore, in a part of Jaiba 1 project district where the agricultural credit was allocated, only 30% of the benefited area is in production at this stage. (See 2.3.1, Table 7)

In view of such Jaiba 1 conditions, the State Government reconsidered what the migration should be in Jaiba 2 soon after starting the project, and they changed the policy to secure a stable level of production through the participation of large-scale farmers and enterprises. Disposal of land in Jaiba 2 district started from the end of 2003 without any restrictions for size of bids, and made it possible for large-scale investors to procure multiple lots. As a result, 14

[6] Epidemic fungal disease unique to bananas that has spread globally in recent years, causing considerable damage.

large-scale farmers[7] hold 8,200ha, approximately 50% of the irrigable land.

Table 3: Primary large-scale farmers

Farmer	Product(s) Area Owned	Details
SADA (Logistics Company)	Sugar Cane 3,600ha	Refining plant for bio-ethanol fuel. Currently investigating expanding production to 14,000ha.
POMAR BRASIL	Fruits 792ha	Construction of an adjoining concentrated fruit juice production plant (scheduled to begin operations in October 2008). Owns 800ha in Jaiba 2 and 1,200ha in Jaiba 1.
DOSANKO FRUTAS	Bananas 1,207ha	Mainly supplies domestic markets
BEST PULP BRASIL	Tomatoes 1,794ha	Production of industrial tomatoes and tomatoes for processing. Also produces corn for animal feed, with an adjoining refining silo.

3) Development of employment creation and irrigation project by large-scale farmers

It is now possible for medium-sized farmers that possess a few hundred hectares of cropland in the Jaiba 1 district to take part in the project and the improvement of the product situation is expected. In order to increase production, farmers and enterprises involved from Jaiba 2 are making purchases of cropland in the Jaiba 1 district and promoting contract production with landowners. In addition, it effects employment creation because these farmers employ the local residents as tenant farmers[8].

Considering the above conditions and background, changing the scope of this project does not alter its priority objective to achieve social and economic improvements in the region. Furthermore, such changes of the scope can be evaluated to have been an appropriate resolution to accommodate the changes of the socio-economic environment.

As indicated above, the implementation of this project was in accordance with Federal and other plans at the time of appraisal and also at the time of ex-post evaluation, and the project is judged to be extremely highly relevant. However,

[7] Enterprises focused on agricultural production, rather than large-scale farmers, make up the majority of actual settlement.

[8] The interview survey of local farmers yielded a positive opinion of tenant farming, with responses that it is easier to secure a stable living working as a tenant farmer for a large farmer than by working as a small-scale independent farmer.

considering the benefits for small and medium-scale farmers in the original plan, it is important to secure the sustainable system which can expand the development focused on the large-scale farmers to the local residents.

2.2 Efficiency (Rating: c)

The efficiency of this project is evaluated to be low because the project duration was extended considerably from its plan (160%) and also the expenses in terms of output were exceeded the levels planned.

2.2.1 Outputs

Plan and actual outputs are in the table below, and the following items were changed;

(1) Changes of the canal layout and total length due to detailed design
(2) Cancellation of electrical works (Federal Government-funded installation)
(3) Additional trunk road construction (between Jaiba and Manga)
(4) Decreases to agricultural credit

Table 4: Outputs (Comparison of plans at appraisal and actual outputs)

Output	Plans at Appraisal	Actual Outputs
(1) Irrigation Infrastructure		
1) Total Length of Canal	191km	163.8km
Main Canal	2km	16.53km
Secondary Canal	50km	84.3km
Tertiary Canal	89km	39.35km
Quaternary Canal	34km	9.2km
Quinternary Canal	9km	---
Drainage Pipeline	7km	14.43km
2) Pump Station	13 Stations	4 Stations
(2) Electrical Works		**Cancelled**
Out of the Site:	302km of transmission lines/11 substations	(Developed by the State of Minas Gerais funded investment)
Inside of the Site:	1 substation	
(3) Road Works		
1) Farm Roads	136km	139km
2) Connecting Roads	45km	17.2km
		(Additional) Jaiba-Manga Trunk Road 55.7km
(4) Agricultural Credit (for disbursement)		
1) For On-Farm Development	Planned Amount: 14,148 million yen	Disbursed Amount: 2,614 million yen

2) Agricultural Infrastructure etc. (For Agricultural Cooperatives) 3) Agrotechnical Industry	JBIC Portion: 7,117 million yen Local/Beneficiary Portion: 7,031 million yen	JBIC Portion: 2,137 million yen Local/Beneficiary Portion: 477 million yen

(1) Irrigation infrastructure

Changes in the design for canal construction took place mainly during the detailed design stage. As a result, the placement and total length of the irrigation canals were also changed. Installation of small pumps in 13 locations was planned because initially there was a need for the pumping station to send water to higher land. However, as the targeted area became a conservation area, the demand for these pumps is decreased. According to the State Government, this was a necessary change for a functional irrigation infrastructure.

(2) Electrical works

Electrical works were excluded from the project scope and developed by the sole investment of the Minas Gerais Electricity Center (CEMIG). The background for this development was the need to expand the capacity of these electrical works in order to cover the demand expected after the development of the Jaiba 3-4 projects, this expansion being difficult within the Jaiba 2 project scope.

(3) Road works

Construction of 55.7km asphalt-paved trunk road connecting Jaiba to the neighboring city, Manga was added in 2000. This construction was performed using the surplus funds resulting from the cancellation of electrical works. This road runs across the center of the project area vertically. This road is very important to transfer the products efficiently.

(4) Agricultural credit

The actual amount (disbursed amount) of agricultural credit was 18% of the planned amount, a significant reduction. Major changes and contributing factors are as follows:

1) Factors contributing to expansion

Expanded funding to Jaiba 1 district: Part of Jaiba 1 district (C-2), which is not included in initial plans, was selected as a candidate for credit.

2) Factors contributing to reduced amount of credit

● Decreased beneficiaries: Credit for agricultural cooperatives was not executed due to inactivity. In addition, the number of farmers significantly decreased from originally planned 739 (current number of

farmers in Jaiba 2 district is 88).

● Delay of credit demand: Due to the delay of civil works (5 years), disbursements to Jaiba 1 district were delayed until 1999, that of Jaiba 2 to 2005.

Reference: Current Conditions and Future Forecasts for Agricultural Credit

The credit is disbursed from the Jaiba Fund, the consolidated account of BDMG, to control external resources. The Fund limits the disbursement to a single lot (10-25ha) per farmer, based upon the initial agreement in the L/A[9]. Therefore, loans are currently only available for a single farmer with one lot that is no larger than 25ha; medium- and large-sized farmers dominant in the area are not fully able to utilize the fund. This gap hampers the promotion of disbursement.

In addition, approximately 60% of credit implemented during Jaiba 1 was defaulted due to epidemic disease of banana blight (Panama Disease) and other factors (See "Effectiveness" section), currently BDMG take rigid assessment[10] to support restructuring those default farmers. It makes receiving a refund a practical impossibility for farmers who have abandoned a farm. Considering the above, it may be difficult to improve the credit disbursement greatly at a later stage.

Image 1: Secondary Canal

Image 2: Jaiba-Manga Trunk Road

2.2.2 Project period

The project period was actually from September 1991 to June 2006 (176 months), a significant increase of 66 months over the planned project period of September 1991 to October 2000 (110 months). Main causes of delays are as follows:

[9] A continuation of the restrictions of loan agreement that were fixed as a lending condition.
[10] There was not a disclosure of loan disbursement data or information related to assessment standards.

(1) Major factors of delay of commencement (5 years)

1) Delays of contractor/consultant selection process, and legal dispute rose during bidding process (total: 2 years).
Regarding the consultant selection results, a motion of objection was filed from a non-selected firm. Settlement of the process took a certain amount of time.

2) Extended time required for environmental approval (total: 3 years)
Environment-related regulation in Brazil was getting more severe than at the time of appraisal. It added more conditions for approval, such as a public hearing process, originally not required at the time of appraisal.

(2) Major delays during implementation process

1) Additional trunk road development (See "2.2.1 Outputs")
2) Additional works to satisfy EIA requirement
Added vegetated conservation area infrastructure and additional game trails
3) Repair works of canals and ground
4) Suspension of works during heavy rain
5) Delay of procurement of partial electrical equipments[11]

2.2.3 Project cost

The project cost was 18,221 million yen, which was lower than the total estimated cost of 22,920 million yen (actual cost was 79.5% of planned cost). This was influenced by a significant decrease of the agricultural credit portion. There was also an increase in civil works. Judging from the fact that the reduction in output and the project cost of irrigation infrastructure were nearly double the estimates, it is reasonable to consider the total cost per output exceeded its original estimation from the time of appraisal. Major reasons for increase of the project costs are as follows:

(1) Civil works (7,172 million yen at time of appraisal to an actual amount of 13,992 million yen, 195% of planned)
Factors leading to project cost increases:

1) Additional trunk road works (55.7km between Jaiba and Manga)

[11] In addition to the effects of a labor strike at the Taiwanese importer, time was needed to reorder some equipment (pumps, etc.) procured by a subcontractor due to intermittent quality issues.

2) Modified road layout during detailed design
3) Additional measures to comply with environmental and wild animals regulation (construction of conservation roadways, etc.)
4) Increase of development cost per hectare due to a rise in prices and a detailed land assessment (increased from US$3,000/ha to US$5,000/ha)

(2) Agricultural Credit: 2,617 million yen (18.4% of planned amount)
Decrease due to a reduction in eligible farmers and to delayed funding demand, etc. (See "2.2.1 Outputs")

(3) Consulting Service: 1,613 million yen (313% of planned amount)
Amount increased due to a delay in project start, additional road construction, etc.

2.3 Effectiveness (Rating: a)

2.3.1 Irrigated and planted area

(1) Benefited area[12]

The Jaiba Irrigation Project is planned until Jaiba 4 (Phase 4 of the project; currently implemented up to Phase 2) with a total benefited area of 87,000ha. Due to the request of the environmental regulation, 20% of the total area is preserved as a nature conservation area. The Federal Government (CODEVASF) is currently working to increase the number of water pumps at the water intake sluice area to cover the expected demand from Jaiba 3-4.

Table 5: Benefited area (whole Jaiba district)

(Unit: ha)

	Jaiba 1	Jaiba 2	Jaiba 3*	Jaiba 4*	Total
Total Area	41,611	34,773	17,400	13,829	107,613
Benefited Area	32,959	22,606	17,400	13,829	86,795
Irrigable	24,670	19,276	12,200	9,734	65,880

Source: Jaiba Irrigation District Office (DIJ)
*Figures for Jaiba 3 and Jaiba 4 are plan values.

[12] "Benefited area" is the area in the affected region that is expected to derive benefits; in other words, the region that can utilize the irrigation infrastructure. "Irrigable" is the actually cultivated area, while "planted area" is the total area under production. If planting occurs separately during the wet season and the dry season (double cropping), then the number of plantings is the combined annual total number of plantings.

(2) Area planted

The current (as of April 2008) utilization rate of the Jaiba 2 project district is approximately 36%. Since development of Jaiba 2 has just started since 2007, the data such as unit production are estimations based on the actual results of a sample of farmers and also interviews with farmers[13].

As mentioned in "Relevance," development of Jaiba 2 is mainly led by large-scale farmers/enterprises. Although current utilization remains at slightly less than 40% because of the fact that less than two years have passed since the irrigation infrastructure went into operation, all lots are already purchased[14] and in a few years full utilization is expected.

For example, SADA (See Table 3 in "Relevance"), a major Brazilian distribution company built a bio-ethanol plant in the area for bio-ethanol fuel from sugar cane and started operations in April 2008. SADA plans to produce 600,000 liters of bio-ethanol fuel daily at this plant and they calculated that 13,900ha of planted area will be required to cover the production. The plant has established a policy of entering into contracts with neighboring farmers in order to secure production, creating the possibility of region-wide economic benefits.

If SADA continues to expand its production, then it is expected that sugar cane (a raw material to produce bio-ethanol) production will exceed 60% of total production.

[13] The interviews covered 14 farmers working a total of about 5,000ha, approximately 70% of the currently planted land area.

[14] An interview with the State Government revealed the opinion that the Jaiba district is being actively invested in by farmers and enterprises because the area is regarded as being well suited to the production of fruits and it has a developed irrigation infrastructure.

Table 6: Jaiba 2 Project (irrigable area: 19,276.4ha)

(Unit: ha)

	2007	2008	2009	2010	2011
	Actual	Estimated			
Utilization	34.9%	33.6%	54.0%	67.6%	99.1%
Planted Area	6,732	6,475	10,400	13,040	19,100
Sugar Cane	3,584	4,331	6,860	8,000	12,500
Banana	1,327	934	1,140	1,340	1,600
Pineapple	0	0	500	1,200	1,400
Ponkan	68	100	300	500	800
Corn	502	600	800	1,000	1,400
Tomato	231	510	800	1,000	1,400
Other	1,020	0	0	0	0

Source: Farmer interviews at the time of field survey (interviewed farmers covered approximately 74% of planted area.)
Note 1: Utilization = (Planted Area / Irrigable Area)
Note 2: Figures of after 2008 are predictions based on interviews with farmers
Note 3: The "Other" category includes the production of bio-fuel materials that were excluded from future production estimates due to uncertainty regarding commercial viability.

SADA and Japanese venture enterprises in the vicinity conduct research into production of Pinhao Manso as a material of an alternative bio-fuel. Jaiba district has potential to be an important area of the energy businesses[15]. For other important projects underway in Jaiba 2 are the construction of fruit juice plant for concentrated juices and commercial tomatoes, as well as the production of bananas and other fruits for export.

Figure 3: Bio-ethanol refinery

Figure 4: Proposed site for construction of soft drink factory

[15] In Brazil, bio-ethanol fuels are being adopted as a substitute for petroleum fuels, with bio-ethanol fuels already being used in automobiles. High demand is anticipated.

Although the evaluation is based on the anticipated effects calculated from estimates, it is thought that the possibility of a significant variation in production plans is low, considering the current situation where large-scale farmers and enterprises with technology and capital are at the center of development. Therefore, it is expected that the agricultural production of the Jaiba 2 district will grow greatly in the next few years.

On the other hand, for the past five years in Jaiba 1 the planted area has remained steady at about 30% of the usable area. As mentioned in "Relevance", it is mostly affected by the deteriorating farming environment caused by the operation by mainly small farmers and crop blight.

Table 7: Jaiba 1 C-2 (Irrigable Area: 8,042.9ha) (Reference)

	2003	2004	2005	2006	2007
Utilization Note 1	30.4%	35.0%	34.0%	30.5%	28.1%
Planted Area	2,447	2,816	2,739	2,456	2,260
Fruits	2,235	2,490	No Data	2,049	1,931
Horticulture Note 2	69	79	No Data	45	42
Traditional	142	245	No Data	303	249
Forage	2	2	No Data	22	2
Forestry	---	---	No Data	37	37

Source: Jaiba Irrigation District Office (DIJ)
Note 1: Planted Area / Irrigable Area (8,042.9ha)
Note 2: Horticulture: tomatoes, carrots, etc/Traditional: rice, beans, etc.

2.3.2 Improvements of agricultural productivity

1) Unit production: Due to the change of production items from the time of appraisal, the table below compares the data with the national average.

Table 8: Unit Production (Planned/Actual/National Average)

(Unit: tons/ha)

Item	Planned	Jaiba 2	National Average
Sugar Cane	No Data	130	74.7
Banana	25	32	14.1
Pineapple	No Data	60	27.3
Ponkan	No Data	40	20.2
Corn	5.4-5.7	9.6	3.7
Tomato	48	90	58.6

Source: Farmer interviews at the time of field survey (interviewed farmers covered 74% of the currently planted area)

Note 1: Figures for Jaiba 2 include estimated values

Note 2: Source of national averages: IBGE statistics, February 2007

Unit production marks double from those of planned and national average on almost all items. The following can be cited as major factors;

- High technology by large-scale farmers; research into varieties
- Research into varieties and technical support activities supported by government organization
- Improvements of soil condition

The State Government Agricultural Research and Survey Body (EPAMIG[16]) constructed experiment plant in Jaiba. EPAMIG is particularly involved in research on fruit varieties that are appropriate for the area and in promoting the adoption (through seminars, etc.) of cultivation techniques. In addition, effort of large-scale farmers also contributes to high productivity[17].

2) Agricultural production (production by each agricultural product item)

The agricultural production (production by each agricultural product item) and monetary value for Jaiba 2 as calculated based on interviews with farmers is as follows. If the project proceeds according to plans, it is expected that more than

[16] Empresa de Pesquisa Agropecuaria de Minas Gerais

[17] A banana farmer visited Central American countries that had suffered damage from Panama disease in an attempt to prevent the same kind of damage. By researching varieties with resistance, this farmer succeeded in cultivating a high yield, disease resistant variety of banana. Some large farmers are independently hiring outside consultants and accumulating knowledge for productivity improvements through such means as receiving technical guidance. If this knowledge could be shared throughout the entire area it would not only contribute to the self-sustaining development of the project, but also make possible improvements to productivity as a whole.

90% of the irrigable area will be in use in 2011. In the farmer interviews, there was the opinion that the production environment (soil and water resources, etc.) of Jaiba has a high potential, and that stable production can be expected, if the irrigation infrastructure operates appropriately.

Table 9: Production estimation in Jaiba 2

(Unit: ton)

	2008	2009	2010	2011
Sugar cane	563,030	891,800	1,040,000	1,625,000
Banana	29,888	36,480	42,880	51,200
Pineapple	---	30,000	72,000	84,000
Ponkan	4,000	12,000	20,000	32,000
Corn	5,760	7,680	9,600	13,440
Tomato	45,900	72,000	90,000	126,000

Source: Calculated based on interviews with local farmers (interviewed farmers covered 74% of the currently planted area)

Figure 5: Harvesting at a banana plantation

Figure 6: Sugar cane field

Table 10: Production estimation in Jaiba 2 (in monetary value)

(Unit: R$1,000)

	2008	2009	2010	2011
Sugar cane	25,899	41,023	47,840	74,750
Banana	17,933	21,888	25,728	30,720
Pineapple	0	15,600	37,440	43,680
Ponkan	1,320	3,960	6,600	10,560
Corn	1,768	2,358	2,947	4,126
Industrial Tomato	12,623	19,800	24,750	34,650

Source: Based on interviews with primary farmers (interviewed farmers covered 74% of the currently planted area)

If agricultural land use is maximized in accordance with predictions, the value of production is expected to reach around R$198 million (equivalent to US$124 million[18]) in 2011.

2.3.3 Increase of income

Because the project has just started and commencing production in 2007 with a coverage that is currently only about 30% of the whole area and also because the scale of farmers is being altered from the time of appraisal, it is difficult to evaluate the income of individual farmers in the recent survey. For reference, the table below shows the 2008 sales projections of major farmers based on data provided by interviews.

Table 11: Sales projections of primary farmers (2008)

	Main Product	Million R$	Million US$
POMAR BRASIL (792ha)	Fruits	0.00	0.00
BRASNICA (1,207ha)	Banana	23.33	14.58
M PESSOA (1,238ha)	Banana	1.58	0.98
SADA (3,608ha)	Sugar Cane	20.74	12.96
IBÁ AGROINDUSTRIAL (738ha)	Sugar Cane	3.60	2.25
AROEIRA (270ha)	Banana	1.40	0.88

Source: Farmer interviews at time of local survey

Note: Exchange rate: US$1 = R$1.6 (as of April 2008)

[18] Exchange rate: US$1 = R$1.6 (April 2008)

These companies employ local residents as workers or make relationships with tenant farming and contract farming. For instance, SADA (see above) hired 150 people for the refining facility, and POMAR BRASIL plans to hire 100 workers for its facility after operations of the refinery plant are started. Farmers in the table hire on average 50-100 people.

2.3.4 Economic Internal Rate of Return (EIRR)

Although the EIRR was 10.7% at the time of appraisal, result of the re-calculation was 10.91% using the same method as before. The ratio is almost as planned; however, the highly productive agricultural production was expected by large-scale farmers; on the other hand, there were raised production costs and other factors. IRR was not changed much from the plans at the time of appraisal.

Table 12: EIRR recalculation results

	At Appraisal	Actual
EIRR	10.7%	10.91%
● Project life: 30 years ● Cost 1) Investment expenses (total project expenses) 2) Operation and maintenance expenses (facilities maintenance) 3) Production costs ● Benefit: products (calculated based on products in "Table 6")		

Note 1: The calculations for production include future estimates for cultivation based on interviews with farmers.

Note 2: Production costs and product prices were calculated based on interviews with farmers and on SEAPA market prices.

As inferred from the above results, this project was highly effective, producing effects that were mostly as planned.

2.4 Impact

2.4.1 Improvements of socio-economic status

(1) Economic development

Remarkable growth is observed in Brazil's agricultural sector; especially, exports amounted twice from 2002. The amount of Minas Gerais State rises 3 times from 2002. Contribution of this project so far is limited to some extent, since

the production has just started its development. However, stable production from later stage is expected and it will surely contribute to uplift the export volume.

Table 13: Amount of agricultural exports for primary states

(Unit: million US$)

Value of Exports (top)	2002	2005	2006	2007
National	24,840	43,617	49,465	58,420
Sao Paolo	5,994	10,725	13,733	14,432
Rio Grande de Sul	4,307	5,932	6,953	8,828
Parana	3,914	5,954	6,105	7,844
Mato Grosso	1,783	4,136	4,279	5,027
Minas Gerais	**1,666**	**3,736**	**4,307**	**4,984**
% of 2002	2002	2005	2006	2007
National		176%	199%	235%
Sao Paolo		179%	229%	241%
Rio Grande de Sul		138%	161%	205%
Parana		152%	156%	200%
Mato Grosso		232%	240%	282%
Minas Gerais		**224%**	**259%**	**299%**

Source: Ministry of Agriculture (MAPA), Brazil

(2) Improvement of socio-economic status

With the development of irrigation project, recently major macroeconomic indicators such as population, GRDP show steady growth. In 2005, agricultural production and GRDP had grown to 123% and 146%, respectively, compared to 2002. The development of the living environment in conjunction with the irrigation infrastructure has led to an increase in the migrant and resident population of the Jaiba district, that is to say, contributing to urban development as a whole. Furthermore, this project is expected to significantly contribute to an increase in agricultural production following the start of full-scale operations in 2007.

Table 14: Main macroeconomic indicators (Minas Gerais State (MG) / Jaiba)

Indicator		2002	2003	2004	2005
Population	MG	18,508,521	18,751,174	18,993,720	19,237,450
	Jaiba	**29,986**	**31,048**	**32,109**	**33,175**
	Year-to-year	---	3.5%	3.4%	3.3%
Agricultural Production (in R$1,000)	MG	11,166,793	13,487,660	15,422,704	15,568,048
	Jaiba	**31,628**	**28,056**	**33,146**	**38,940**
	Year-to-year	---	-11.3%	18.1%	17.5%
GRDP (in R$1,000)	MG	127,781,907	148,822,788	177,324,816	192,610,905
	Jaiba	**80,471**	**80,965**	**95,162**	**117,218**
	Year-to-year	---	0.6%	17.5%	23.2%
GDP per capita (in R$)	MG	6,903.95	7,936.72	9,335.97	10,012.29
	Jaiba	**2,683.62**	**2,607.74**	**2,963.72**	**3,533.32**
	Year-to-year	---	-2.8%	13.7%	19.2%

Source: IBGE
Note: "MG" is an abbreviation for Minas Gerais State

The project created a nucleus (residential area) for the local residents within the project site and also educational and medical facilities in order to develop the living environment for residents[19].

The 20,000 people residing within the area developed for agricultural production are the direct beneficiaries of this project (population of Jaiba: 33,000 people).

2.4.2 Survey of beneficiaries

An interview survey administered to farmers in the benefited area regarding the current status of the production environment and improvements of income yielded the following results:

[19] Currently 10 residential areas have been created within the project site, with 7 schools and 4 medical facilities having been constructed.

Table 15: Results of beneficiary survey

Question / Region	Jaiba 2	Jaiba 1
1. Production Environment	Satisfied 46% No Change 46% Dissatisfied 7%	Satisfied 50% No Change 28.3% Dissatisfied 21.7%
2. Income, Profitability	Satisfied 50% No Change 43% Dissatisfied 7%	Satisfied 40% No Change 43.5% Dissatisfied 7%
3. Living Environment	Better 35.7% No Change 42.9% Worse 21.4%	Better 34.4% No Change 4% Worse 59%
4. Level of Satisfaction	Satisfied 50% No Change 35.7% Dissatisfied 14.3%	Satisfied 56.5% No Change 16.1% Dissatisfied 27.4%

Note: Respondents: 14 in Jaiba 2, 31 in Jaiba 1 C-2 (in terms of cultivated area, covers 70% of Jaiba 2 district and 25% of Jaiba 1 C-2 area)

1) Since production has just started in Jaiba 2, most of the opinions provided were expectations for future development.

2) Relatively positive opinions were also observed in Jaiba 1, which was surveyed for reference purposes. Although many farmers abandoned farms in Jaiba 1 due to epidemic diseases or declining agricultural environment (see “Relevance” section), new farmers appeared who purchased the former farmers’ land. It is thought that the results of the recent survey reflect the opinions of these new farmers.

3) Trends

This survey was implemented based on a set of questions targeted to small and medium farmers in accordance with the initially planned project scope. However, large farmers currently make up the majority of settled farmers, so the comparisons used in the survey focused on comparisons with former conditions for each farmer and/or company, as well as comparisons with the production environment in other regions.

Consequently, although there were only a few responses that indicated dramatic improvement, responses were generally positive, with more than 50% of responses indicating overall satisfaction. The level of satisfaction is showing a trend for improvement in the areas of living environment and profitability in particular. This is influenced by projections for increased yields due to an increase of production and prices rising in the past 1-2 years.

On the other hand, many complaints on the living environment were raised, such as the lack of public services (educational and sanitation facilities).

Figure 7: Beneficiary interviews

Figure 8: Day nursery for residents

2.4.3 Environmental impact

There were no significant issues. Due to the reinforcement of environmental regulation after L/A, measures for environment were reinforced from original plan. In accordance with the legal requirement, 20% of the area benefiting from irrigation was required to be a preserved area.

A self-funded 234 million yen was applied to construction for ecosystem protection. There are currently no indications of significant issues with regards to the environment.

● Nature conservation areas

22,500ha in the whole Jaiba district was allocated as nature conservation areas, out of which 11,357ha was from Jaiba 2 district.

● Additional measures for protection of ecosystem

Construction of canals for wild animals, and animal (monkeys, squirrels, etc.) trails (Constructed below main canals and agricultural roads.).

2.4.4 Other impact (Acquisition of land, resettlements)

There were no significant issues, despite the fact that land acquisition took longer than planned due to delays caused by price negotiations with the local corporation[20] that owned the land in the project site.

2.5 Sustainability (Rating: a)

2.5.1 Executing agency

2.5.1.1 Operation and maintenance system

(1) Jaiba Irrigation Project (total)

The whole management of the entire Jaiba Irrigation Project is under the

[20] Ometto Group (a major alcohol farmer in Brazil)

responsibility of Jaiba Irrigation District Office (Distrito de Irrigacao de Jaiba) under the supervision of CODEFASF. DIJ is operated by the contributions of beneficiaries and is responsible for the management of the Jaiba 1 district, and common irrigation facilities (on all districts) such as water intake and electrical works.

(2) Minas Gerais State Secretariat of Planning and Management (SEPLAG)/ State Secretariat of Agriculture, Livestock and Supply (SEAPA)

SEPLAG and SEAPA are responsible for the maintenance of the Jaiba 2 district. At the time of appraisal, SEPLAG is the consolidated body of the organization which was called SEPLAN (Planning and General Coordination State Secretariat). However, the fundamental nature of the organization was not significantly altered.

The actual operation and maintenance works of the irrigation infrastructure is subcontracted out to a private enterprise (COPASA) under the supervision of the State Government. COPASA is a private enterprise that comprehensively manages water resources including plumbing. It has a total of 35 employees dedicated to the project and has installed a management office in the district. Electrical works and agricultural credit are handled by the same organizations as at the time of appraisal, the Minas Gerais Electricity Center (CEMIG) and the State Development Bank of Minas Gerais (BDMG), respectively.

The current situation is for the Federal Government to manage main irrigation infrastructure facilities (sluice gates, etc.), while the maintenance of the Jaiba 2 district is performed under the supervision of the State Government. The State Government indicated that this kind of two-tiered structure has possibility to make inequalities such as differing fee systems, and also it is connected to increasing the inter-agency adjustment costs and the amount of time and processing expenses.

2.5.1.2 Technology in operation and maintenance

The staffs at the private enterprise (COPASA) in charge of operation and maintenance are mostly well-experienced in the management of water projects throughout all of Brazil including experience with water supply pipelines. As such, no significant concerns are observed regarding the enterprise's technical capacity. However, COPASA's lack of familiarity in the soft component support of the irrigation project such as negotiations with farmers regarding water rates, etc. is one of the reasons that the negotiations to set prices have not proceeded smoothly.

In interviews, the COPASA staff replied that no concerns are observed, indicating that they had received training from suppliers on the operation of

electrical works and other main infrastructure; furthermore, this infrastructure does not require technically difficult processes.

Figure 9: COPASA office for maintenance

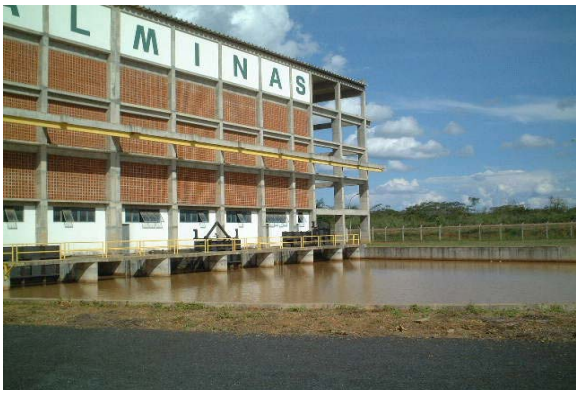

Figure 10: Jaiba 2 sluice gate

2.5.1.3 Finance of operation and maintenance

(1) Budget for maintenance

The annual budget for payments from the State Government to COPASA for maintenance is approximately R$9.36 million (slightly less than US$5.0 million). COPASA indicated that there are no significant issues with the budget size. However, so far all those expenses for covered by the State Government's expenditure, and collection of water charges from beneficiaries, which were intended to be the revenue source for these maintenance expenses, has not started yet. COPASA currently plans to set the amount of water charge, however, the problem arises about how to transfer the initial investment cost. COPASA is still unable to start collecting these fees. At this stage, no exact schedule to start collection is set.

(2) Discussion on the maintenance cost sharing (distribution)

Common problem in the Jaiba district is the problem of water charge. Especially, the extent of users' burden on the initial investment cost (for water intake or electrical works) has been the issue, and many farmers oppose the cost transfer. Therefore, it is impossible to collect it at this time. However, since the collection rate of basic tariff in Jaiba 1 (31.9R$/1,000m^3) marks more than 90%, and since the beneficiaries in Jaiba 2 have agreed to pay the basic tariff, it is expected that the collection rate for basic fees in Jaiba 2 will be stable at a high level.

Although expense collection has not started yet, interviewed farmers and enterprises indicated willingness for the payment of water fees. Furthermore,

significant investments such as the construction of a refining facility have already been made, which is a clear indication of a policy to develop Jaiba as a production center. Considering the current conditions, the evaluation is that the future payment of water usage fees will not create any issues affecting the sustainability of the project.

2.5.2 Status of operations and maintenance

1) Conditions of irrigation infrastructure:

Some building walls cracked and there was some damage to portions of the canal sidewall, but repairs have been performed and currently there are no significant issues affecting the functionality of the irrigation infrastructure. A civil work team of COPASA conducts daily repair work and canal cleaning. The management of water distribution is handled in shifts, with 5 daytime staff and 4 nighttime staff meeting the demand.

2) Contribution of beneficiary

No concrete rule on the participation of beneficiaries to bear the costs for maintenance have been made so far. SEAPA recognizes that it will be primarily responsible for O&M works as they collect water charges from farmers.

Beneficiaries: According to the beneficiary interview, canal cleaning adjoining to their property are done as voluntary works. However, they insist that the DIJ should be primarily responsible for O&M works of the infrastructure as a whole.

As indicated by the above, there are no problems with the capacities of the executing agency, or with the system for maintenance. The project is evaluated to have a high projected sustainability.

3. Feedback

3.1 Conclusion

Considering the above, the evaluation of the project is concluded to be satisfactory.

3.2 Lessons learned

Although the project beneficiaries significantly changed and increased more than anticipated, these changes are a reflection of changes in the agricultural environment (increased large-scale operations, etc.) and environmental changes such as energy conditions on a global scale. Furthermore, a certain amount of time

is needed following the planning of agriculture and agricultural district development projects to become effective. On the other hand, these projects are easily affected by external conditions such as changes of economic and social conditions. Even though projects such as this started with the original objective of providing social benefits, especially providing support to small and medium farmers to secure sustainability like this project, it is necessary to perform reviews of the project design at appropriate intervals along with the change of environment. For instance, the development model that utilizes the participation of large farmers to provide benefits to surrounding small and medium farmers such as this project, which is now achieving balance between the commercial nature of agriculture and its societal impact, is thought to be critical to realizing sustainable development.

3.3 Recommendations

(1) Technical transfer, collaboration between farmers

To enhance the productivity of the entire area including Jaiba 1 district, it is necessary to transfer the technology and experience of large-scale farmers and enterprises in Jaiba 2 area to small and medium farmers in the area. In other words, government organizations like EMATER should play the role of intermediate agency and should host efforts like technical seminars, setups of demonstration farms, and providing technical instructions to small and medium farmers by inviting the consultants from outside of the area.

(2) Consolidation of O&M agency

As was described in “Sustainability,” the double structure of the O&M body is not efficient in terms of administrative burden and cost (for coordination), because the entity responsible for maintenance differs between Jaiba 1 (handled by the Federal Government) and Jaiba 2 (handled locally). That is to say, the rules or the cost burdens for maintenance are different.

It is desirable, therefore, to either consolidate the O&M body or to reinforce the cooperation functionality for unification and adjusting maintenance rules to achieve the reduction of administration costs and a speedy and consistent decision-making process.

(3) Confirmation of the access and provision of public services

Dissatisfaction of the situation of service provision was confirmed in the beneficiary survey. Since this project includes support for the expansion of public services, it is necessary to confirm the needs of residents and to realize the issues for the executing agency and also to examine the remedy.

Comparison of Primary Planned and Actual Results

Item	Planned	Actual
(1) Irrigation Infrastructure		
1) Irrigation Canals	191km	163.8km
2) Main Canal	2km	16.53km
3) Secondary Canal	50km	84.3km
4) Tertiary Canal	89km	39.35km
5) Quaternary Canal	34km	9.2km
6) Quinternary Canal	9km	---
7) Drainage Pipeline	7km	14.43km
8) Pump Station	13 Stations	4 Stations
(2) Electrical Works	Outside Site: 302km of transmission lines; 11 substations Inside Site: 1 substation	Cancelled (Developed by the self-fund of the State of Minas Gerais)
(3) Road Works		
Farm Roads	136km	139km
Connecting Roads	45km	17.2km
		Paved Trunk Road 55.7km
(4) Public Utilities	Water supply and sewerage facilities, schools, police, etc.	As Planned
(5) Agricultural Credit		
Total Amount	14,148 million yen	2,614 million yen
JBIC Portion	7,117 million yen	2,137 million yen
Local/Beneficiary Portion	7,031 million yen	477 million yen
II. Project Period	Sep. 1991 - Oct. 2000 (110 months)	Sep. 1991 - Apr. 2006 (176 months)
III. Project Cost		
Foreign Currency	8,918 million yen	14,283 million yen
Local Currency	13,983 million yen (US$104,356,000)	3,938 million yen (US$33,507,000)
Total	22,902 million yen	18,221 million yen
JBIC Portion	14,740 million yen	14,283 million yen
Exchange Rate	1 USD (US$) = 134 JPY (¥) (as of September 1991)	1 USD (US$) = 117.53 JPY (¥) (avg. Jan. 1991-Apr. 2005)