(On-site evaluation: April - May 2006)

Ex-Post Monitoring for Completed ODA Loan Projects

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Project Name: Federative Republic of Brazil: “Northeast Irrigation Project” (L/A No. BZ-P5)

Loan Outline

Loan Amount/Disbursed Amount:	7,596 million yen / 7,316 million yen
Loan Agreement:	September 1991
Loan Completion:	December 1998
Ex-Post Evaluation:	FY 2000
Executing Agency:	Companhia de Desenvolvimento dos Vales do São Francisco (CODEVASF)

Project Objective

By constructing irrigation facilities and roads, etc., in three districts in the northeastern region of Brazil (Maria Tereza, Estreit IV and Miroros), this project aims to expand irrigation areas and improve agricultural productivity, and thereby contribute to the development of social and economic conditions in that region.

Consultant: Pacific Consultants International

Contractor: Construtora OAS Ltda. (Brazil) and others

Overview of Results

Item	At time of Ex-post Evaluation	At time of Ex-post Monitoring
Effectiveness & Impact		The number of settled farmers has increased in all three districts compared to the time of the ex-post evaluation. At this point in time, however, expansion of the irrigated land and the number of settled farmers in the two districts of Miroros and Estreit IV have remained stagnant (relative to the time of the ex-post evaluation) due to insufficient water, and agricultural profitability (farm income) being low. The effects of the project can be seen to a certain degree in Maria Teresa, but signs of effect in the other two districts appear to be limited.
Effectiveness	(1) Crop yields for farm products At the time of ex-post evaluation planned yield amounts were not reached, partially due to the fact that the irrigation facilities had only just been completed. (Indicators at time of planning are unknown) (i) <Maria Teresa> performance data in 1999	(1) Crop yields for farm products (i) <Maria Teresa> performance data in 2005 Compared to the time of the ex-post evaluation (1999), the cultivated area grew significantly for mango and grape, and with the progress of intensification, the yields for banana, pumpkin, and melon grew. The yield for banana in particular

Farm products	Cultivated area (ha)	Crop (t)	Yield (t/ha)
Banana	991	404	0.4
Coconut	550	N.A.	N.A.
Beans	494	532	1
Guava	459	N.A.	N.A.
Watermelon	237	3,795	16
Tomato	209	3,011	14
Pumpkin	191	2,273	12
Mango	189	N.A.	N.A.
Grape	56	N.A.	N.A.
Passion fruit	53	N.A.	N.A.
Corn	46	81	3
Onion	27	189	7
Acerola	18	N.A.	N.A.
Custard apple	8	N.A.	N.A.
Melon	8	38	5
Carrot	3	45	15
Chili pepper	3	17	6
Total	3,549	-	-

Source: Executing agency materials.

(ii) <Miroros> performance data in 1999

Farm products	Cultivated area (ha)	Crop (t)	Yield (t/ha)
Banana	340	2,138	6

grew significantly, increasing approximately 50-fold. A characteristic of Maria Teresa is the large cultivated area for mango and grape, which are cultivated by agricultural companies.

Farm products	Cultivated area (ha)		Crop (t)		Yield (t/ha)	
		Increase/decrease*		Increase/decrease		Increase/decrease
Banana	885.4	-	20,343.5	++	23	++
Coconut	158.9	-	2,689.3	N.A.	16.9	N.A.
Beans	51	--	88.7	--	1.7	+
Guava	704.6	+	17,018.3	N.A	24.2	N.A
Watermelon	53.7	--	1,043.8	--	19.4	+
Tomato	22	--	687.9	--	31.3	+
Pumpkin	37	--	2,546.3	+	68.8	++
Mango	1,134.9	++	16,781.2	N.A	14.8	N.A.
Grape	629.6	++	16,128.5	N.A	25.6	N.A
Passion fruit	16.4	-	79.7	N.A	4.9	N.A
Corn	32.8	-	156.1	+	4.8	+
Onion	11.7	-	37.7	--	3.2	-
Acerola	61.4	-	461.9	N.A	7.5	N.A
Custard apple	11.5	+	288.7	N.A	25.1	N.A.
Melon	22	+	741.2	++	33.7	++
Tapioca	22	N.A.	836.2	N.A.	38	N.A.
Total	3,854.9	+				

Source: Executing agency response.

*The symbols for “increase/decrease” indicate the following: relative to the time of the 1999 ex-post evaluation, +: increase less than 5-fold; ++: increase 5-fold or greater; - : decrease less

Coconut	45	N.A.	N.A.
Beans	943	559	1
Guava	9	N.A.	N.A.
Watermelon	39	261	6
Tomato	4	N.A.	N.A.
Pumpkin	10	132	13
Mango	20	N.A.	N.A.
Corn	24	48	2
Onion	2	23	12
Custard apple	37	N.A.	N.A.
Melon	2	20	10
Carrot	1	20	20
Sugarcane	3	310	70
Coffee	1	N.A.	N.A.
Total	1,498	-	-

Source: Executing agency materials.

than 5-fold; -- : decrease 5-fold or greater.

(ii) <Miroros> performance data in 2005

From 2003 onward the price of beans—which was a major crop on par with bananas—fell, and its cultivated area has been decreasing. As in Maria Teresa, the intensification of banana production progressed, and both crop and yield have increased significantly. The yields for each of the crops are lower than in Maria Teresa.

Farm products	Cultivated area (ha)		Crop (t)		Yield (t/ha)	
		Increase/decrease		Increase/decrease		Increase/decrease
Banana	682.6	+	12,500.5	++	18.3	+
Coconut	68.5	+	92.2	N.A	1.3	N.A
Beans	52.3	--	69.9	--	1.3	+
Guava	18.2	+	305.8	N.A	16.8	N.A
Watermelon	13	-	119.8	-	9.2	+
Tomato	20.7	++	547.5	N.A	26.4	N.A
Pumpkin	25.2	+	100.3	-	4	-
Mango	39.6	+	44.6	N.A	1.1	N.A
Passion fruit	8.5	N.A	51.5	N.A	6.1	N.A
Corn	178.7	++	334.1	++	1.9	-
Custard apple	202.2	+	201.6	N.A	1	N.A
Tapioca	2.2	N.A	2.4	N.A	1.1	N.A
Castor oil plant	24.4	N.A	14.2	N.A	0.6	N.A
Total	1336.1	-				

Source: Executing agency response.

(iii) Performance figures for Estreit IV are not available.

(iii) <Estreit IV> performance data in 2005

The first period of settlement took place from the end of 2004 through 2005, and planting began. Currently, beans are being cultivated as a crop for self-sufficiency, while there is expanding cultivation of banana as a cash crop. As it takes more than one year before the first harvest for banana, at the time of this monitoring the first banana harvest had not yet been completed.

Farm products	Cultivated area (ha)	Crop (t)	Yield (t/ha)
Banana	143.4	0	0
Beans	423.7	444.9	1.1
Watermelon	18.7	82.7	4.4
Pumpkin	1.5	1.1	0.7
Passion fruit	5	30.3	6.1
Corn	4.8	1.3	0.3
Tapioca	4.9	98	20
Total	601.3	-	-

Source: Executing agency response.

(2) Benefited area and number of settlers (results in 2005)

(i) Area where irrigation is possible and current settled area (developed area)

District	Plan*	1999** (Time of ex-post evaluation)	2005*** (Time of ex-post monitoring)
			Settled area (%)
Maria Teresa	4,938	4,724	3,977 (84%)
Miroros	3,376	2,332	1,958 (83%)
Estreit IV	6,821	5,844	674 (12%)

Source: Executing agency response.

*Planned irrigation area at time of analysis; **area in which irrigation is possible with completion of project; ***area used as irrigated land with settlement.

None of the three districts have yet reached the possible irrigation area which was planned at the time of project completion. Settlement is in progress. In Maria Teresa, settlers are currently being recruited and the number of settled farmers is gradually increasing. The growth, however, is not as swift as was anticipated. In Miroros, the dam water source is also a source of water for municipal water services. There are concerns that an expansion in water service needs and the dry weather in recent years could lead to a water shortage. CODEVASF is thus facing greater settlement recruitment than it is conducting currently. In Estreit IV, the

major reason that settlement has only progressed to around 12% of the irrigation area is that not enough water can be secured to cover the planned irrigation of Estreit overall[1], and as a result CODEVASF has currently stopped recruiting new settlers for Estreit IV. Meanwhile, illegal settlers (approximately 450 families) are illegally taking water for an area of approximately 500ha along the shore of the Estreit dam reservoir. CODEVASF is aware of the issue that the settlement area in Estreit IV cannot be further expanded. As such, it appears that insufficient irrigation water is one of the impediments to the expansion of settlement areas in Miroros and Estreit IV.

With regard to illegal occupation in Estreit IV as mentioned above, approximately 450 families of illegal occupants are cultivating a total of approximately 500ha of farmland along the shore of the dam reservoir. These families are not joining irrigation management cooperatives and are using water from the dam reservoir illegally. In a survey by CODEVASF, it is estimated that this is one of the factors behind the lack of water in the Estreit district. A confrontation with cooperative members has not yet surfaced, but CODEVASF has recognized that this illegal occupation is an issue which must be solved, and is seeking measures to solve it.

(ii) Number of settled farmers (number of settled companies* in parentheses)

District	Plan	1999 (Time of ex-post evaluation)	2005 (Time of ex-post monitoring)
Maria Teresa	823 (N/A)	417 (35)	550 (52)
Miroros	413 (33)	150 (7)	201 (36)
Estreit IV	917 (113)	0 (0)	116 (0)

Source: Executing agency response.

*Agricultural companies with a corporate structure carrying out the cultivation and shipment of agricultural products

In Maria Teresa, settlement has been increasing gradually from the time of the ex-post evaluation, and it is currently still progressing. In Miroros, the current

[1]According to a report on a separate survey (2005), possible reasons for the water shortage in the current 1902ha irrigation area of Estreit overall include: (i) the actual crops are different from the ones initially planned, such as beans and corn, and the central crops have become bananas and mangos which require large amounts of irrigation water; (ii) rather than sprinkler irrigation, which requires farmers to have electricity, there is heavy use of furrow irrigation which results in large losses of water during watering; (iii) the loss of water from the dam reservoir, the cause of which has still not been completely investigated and is unknown (one explanation seems to be that a major cause is the stealing of irrigation water for approximately 450ha by illegal occupants at the upper area of the dam).

number was reached in 2000, and there have not been increases since then. In Estreit IV, settlement has not progressed since the initial settlement of 116 households. The reasons are covered in (i) above.

(3) Farm income per household (family/year)

The average gross profit for farmers in Maria Teresa in 2005 was 179% of the legal minimum wage in Brazil in 2006 (349 Brazilian real per month). Meanwhile, profitability was low in Miroros and Estreit IV, with the figures at 89% and 35%, respectively. The direct cause behind the low profits was the high cost of production relative to income. The average monthly gross profit for agricultural companies, converted into the same area ratio as farmers (5ha/30ha), was 3,192 real (19,156 × 1/6) per company, a profitability level of approximately nine times the legal minimum wage.

Unit: real (1 real = 55.033 yen [May 6, 2006 exchange rate])

District	Annual sales (Average per family)	Annual product cost (Percentage of income)	Annual gross profit	Average monthly gross profit (Percentage of minimum wage)
Maria Teresa	18,031	10,530 (58%)	7,501	625 (179%)
Miroros	12,000	8,250 (69%)	3,750	313 (89%)
Estreit IV	7,006	5,556 (79%)	1,451	121 (35%)
Agricultural companies (Maria Teresa)	775,750	545,875 (70%)	229,875	19,156

Source: Created from answers by irrigation cooperatives.

(4) Percentage of water use fees collected (results in 2005)

The status of collection differs somewhat among the regions. In Maria Teresa, there are some delays in payment, but the collection rate is 100%. In Miroros, only around 65% of the set water use fee amount is collected. The main reason that the fees are not collected is that, according to interviews with executives of irrigation management cooperatives, the farmers cannot pay because they do not have enough money. The shortfall is being covered by CODEVASF funding. With Estreit IV currently in the first year after settlement, CODEVASF for the first fiscal year is set to provide irrigation maintenance costs, so water use fees are still not being collected. As such, in Miroros and Estreit IV the maintenance costs for facilities is being used toward water use fees, and this is currently being covered by CODEVASF funding.

Impact

No data available.

(1) Improvement in social and economic situation

The GRDP in both Pernambuco, where Maria Teresa is located, and Bahia, where Miroros and Estreit IV are located, has increased relative to the time of the analysis in 1991. Nevertheless, in 2005 the values for agricultural production in the target districts of this project were approximately 28 million real in Maria Teresa (approximately 0.7% of the GRDP for the agricultural sector in Pernambuco) and approximately 4.2 million real for Miroros and Estreit IV combined (approximately 0.05% of the GRDP for the agricultural sector in Bahia), and it is estimated that the degree of contribution of this project's districts will be relatively small. The unemployment rates in both states are increasing.

State	GRDP (Unit: real)		GRDP (Agricultural sector) (Unit: real) (Ratio accounted for by this project in parentheses)		Unemployment rate	
	1991	2005	1991	2005	1991	2005
Pernambuco	19.96 billion	42.26 billion	1.56 billion	4.14 billion (0.7%)	7.8%	10.6%
Bahia	30.38 billion	73.17 billion	3.21 billion	8.41 billion (0.05%)	7.7%	9.8%

Source: Created from Brazilian Institute of Geography and Statistics (IBGE) data. (GRDP figures for this project are based on data from the executing agency)

(2) Improvement in quality of life for settlers

In a questionnaire carried out amongst small farmers, the majority in each of the districts answered that their quality of life had improved.

District (Number of people in survey)	Percentage who answered that their living conditions had improved	Reasons
Maria Teresa (87)	67.8%	1) Land was acquired, which could be cultivated by themselves, then, gained a means of livelihood. Satisfied. 2) Income has improved. 3) Productivity is better than before when the land was dry. Etc.
Miroros (89)	87.6%	
Estreit IV (78)	74.4%	

Source: Questionnaire survey carried out in this monitoring

Approximately 13% responded that their quality of life had not improved. The main reason given for this was that the investment they had made was not commensurate with their income. In a group interview in Estreit IV for this survey, the settlers mentioned the following problems related to living conditions: (a) there is no access to funds for agricultural input materials; (b) there is insufficient social infrastructure, including schools, health services, housing, and drinking water; (c) there are no telephone or internet services, and if there are, they are of poor quality; and (d) electricity costs are high.

As such, several issues still remain, including productivity, profitability, and the development of social infrastructure. Nevertheless, it appears that the project has a certain degree of effectiveness with regard to the extremely poor class, including farmers who did not own land and did not have a means of livelihood.

(3) Environmental Impact

CODEVASF has conducted an environmental impact assessment (EIA) of the three districts, and plans to continue carrying out monitoring in the future.

Sustainability	(1) Technical capacity All new settlers received technical support on farm management from CODEVASF at the time of settlement.	There is no major change from the time of the ex-post evaluation. With regard to technical capacity, however, slightly too much emphasis was placed on the spread of production technology, and support for improving the profitability of farmers was somewhat insufficient. Operation and maintenance system for facilities has been established, but in Miroros and Estreit IV, the low profitability of farmers is having a negative effect on the finances of irrigation management cooperatives. (1) Technical capacity (i) Technical support for farmers by CODEVASF Technical support from the government for small farmers has been stipulated in federal laws, and CODEVASF and related government institutions are providing the following services to small farmer members of irrigation cooperatives, using private companies and consultants: • Support related to the organization and operation of irrigation cooperatives. • Consultation services for irrigation cooperatives on technical capacity, laws, and operation. • Technical support related to maintenance and the creation of operational instructions for bidders. • General research on agricultural technologies, distribution, and the marketing of products. (ii) Technical issues recognized by farmers In a questionnaire survey carried out for this monitoring, farmers mentioned the problems listed below. In parentheses are the percentages of the 254 respondents that mentioned each problem (multiple answers). Many farmers are calling specifically for technical support with regard to (I), (II), (III), and (IV), covered below. They are currently not being addressed by CODEVASF's technical support framework, and appear to be future challenges in terms of technical support. (I) The price of crops is low (48%); (II) water use fees and production costs are high (28%); (III) there is no access to funds (26%); (IV) marketing is difficult (20%); (V) access roads are in poor condition (13%); (VI) the problem of

	(2) Structural organization Responsibility for maintenance of the irrigation facilities has been transferred from CODEVASF to the farmers using them. (24 irrigation management cooperatives were set up under CODEVASF direction) In Maria Teresa and Estreit IV, the irrigation facilities are managed by existing management cooperatives. In Miroros, management is being carried out by a new management cooperative which was set up after the completion of the project.	agricultural pests (12%); (VII) insufficient water (10%); (VIII) other (poor quality products, lack of alternative crop operations, insufficient technical support, etc.). (2) Structural organization (i) Management responsibility In principle, for CODEVASF projects, irrigations facilities—with the exception of dams and electrical facilities—are transferred to the irrigation management cooperatives one year after construction. In the three districts targeted in this project, management responsibility for each of the facilities is divided as shown in the following chart. Dams and electrical facilities are managed by each project head and not the irrigation management cooperatives. No problems have occurred that would impact the operation of irrigation facilities.

Facility	Maria Teresa	Miroros	Estreit IV
Dam	Companhia Hidro Elétrica do São Francisco (CHESF)	CODEVASF	CODEVASF
Major waterways, pumps, drainage canals, water distribution canals	Nilo Coelho irrigation management cooperative	Miroros irrigation management cooperative	Estreit irrigation management cooperative (maintenance carried out together with CODEVASF)
Electrical facilities, substations	Companhia de Eletricidade do Estado da Bahia (COELBA) and Pernambuco Companhia Energetica de Pernambuco (CELPE)	Companhia de Eletricidade do Estado da Bahia (COELBA)	Companhia de Eletricidade do Estado da Bahia (COELBA)
Roads within irrigation district	Nilo Coelho irrigation management cooperative	Miroros irrigation management cooperative	Estreit irrigation management cooperative (maintenance carried out together with CODEVASF)
Roads for access from other areas	Petrolina city government	Ibipeba city government	Urandi city government

Source: Executing agency

(ii) Mechanism of irrigation management cooperatives

The following is an overview of the cooperatives in each region. The cooperatives are composed of all recipient farmers and employees of agricultural companies who have settled, and they each have a board of directors made up of chairpersons, auditing members, and members. The members of the board of directors are selected by vote from among the members of the cooperative. The board plays roles such as determining maintenance plans, management policies, and the amount of water fees collected, and carrying out negotiations and adjustments with CODEVASF and other institutions. As such, the irrigation management cooperatives in each district have organizational structures that have been established in a common manner for irrigation districts of CODEVASF projects. Through a local survey, it was confirmed that the management staff of CODEVASF regional offices, promoters, and cooperatives have maintained a smooth cooperative structure.

District	Name of cooperative	Number of members (Number of directors)	Year of establishment
Maria Teresa	Nilo Coelho irrigation management cooperative (including all of Nilo Coelho region)	602 (11)	1999
Miroros	Miroros irrigation management cooperative	237 (13)	1997
Estreit IV	Estreit irrigation management cooperative (including Estreit I through III*)	116 (15)	1995

Source: Responses of irrigation management cooperatives.

*In Estreit, one cooperative has been formed for districts I through IV. Farmers in Estreit IV joined the existing cooperative.

(3) Financial status

(Description not available)

All the irrigation management cooperatives collect water usage charges easily from the farmers and use it for pump electricity charges, improvements to irrigation equipment and other applications. (Description of the financial status of the irrigation management

(3) Financial status

Irrigation collectives are collecting water use fees from collective members, and this is a source of funding for expenses in maintaining the irrigation facilities. CODEVASF shouldered the maintenance costs for one year following the transfer, but the full amounts were shouldered by the cooperatives after that. As was stated in “(4) Percentage of water use fees collected” under “Effectiveness,” since the transfer there are still farmers who are having difficulties in paying water use fees, resulting in

cooperatives themselves is not available)

(4) Operation and maintenance

The irrigation facilities in Maria Teresa and Miroros have been operating smoothly since their completion. In Estreit IV, the irrigation facilities were not provided with enough water for irrigation because the new irrigation dam (covered by an Inter-American non-payment and delayed payment. In Miroros, the farmers have been receiving financial support from CODEVASF continually since 2001. As such, the low profitability of farmers is causing financial problems for cooperatives.

Unit: US$

District	Year	Total water usage amount for irrigation collective	Total expenditure	Amount of support by CODEVASF
Maria Teresa	1999	492,543	548,409	55,866
	2000	732,745	732,745	0
	2001	504,899	504,899	0
	2002	543,307	543,307	0
	2003	693,807	710,200	16,393
	2004	839,863	839,863	0
	2005	1,243,967	1,243,967	0
Miroros	1999	N.A	N.A	N.A
	2000	158,528	158,528	0
	2001	190,065	295,204	85,698
	2002	163,657	254,112	92,780
	2003	205,830	268,815	56,791
	2004	214,166	415,616	82,829
	2005	336,475	684,258	125,715
Estreit IV*	2004	0	54,435	54,435
	2005	0	89,460	89,460

Source: Executing agency materials

*Amount for Estreit IV alone is extracted from overall amount for Estreit cooperative. Settlement in Estreit IV began at the end of 2004 through 2005. The expenditure for the first year of settlement is shouldered by CODEVASF.

(4) Operation and maintenance

The current status of water use facilities in the districts is that functional problems at the facilities are at the level of those that occur in ordinary use. In each district there are not any problems that are too great to be solved by the supervisors.

	Development Bank (IDB) loan) did not contain enough water, so (at the time of the ex-post evaluation) it has yet to begin operation. CODEVASF, in order to bring the water in the dam to an adequate level, is now conducting a detailed survey. New settlers are receiving continued technical support from irrigation cooperatives after settlement, and operation and maintenance of irrigation facilities is autonomously being carried out by irrigation management cooperatives.	
Lessons Learned, Recommendations, Information Resources and Monitoring Methods (1) Follow up on lessons learned and recommendations made in ex-post evaluation report or in later evaluations (2) Proposals for securing sustainability and instructions given at time of follow-up monitoring	(1) Lessons learned N/A (2) Recommendations With regard to the insufficient water level at the new irrigation dam in Estreit IV, prompt attention needs to be given to securing water for irrigation. Indirect support (such as support for the organization of maintenance cooperatives, guidance in farm management, and funding through agricultural financing) from government-related institutions, including the executing agency, can be expected.	In both Miroros and Estreit IV, the stagnant expansion of the settlement areas and the low profitability of farming were obstacles to increasing the effectiveness and impact of the project, and these are serious factors which will also have an effect on sustainability. It is necessary to carry out improvement measures in order to ensure the effectiveness and sustainability of the project. (1) Lessons learned This project is targeted at poor settlers and employees of small and medium agricultural enterprises. A certain degree of effect is starting to be produced for individual settlers, but it is difficult to produce economic benefits as: (a) it is not possible to expand the recipient area due to insufficient water, and (b) the profitability of farmers is low. The factors behind this situation are complex. Possible internal factors include the fact that current crops are greatly different from those planned, and that strategic support for small farmers from the perspective of farmer management and nurturing industries was weak in terms of the CODEVASF project. Possible external factors include the fact that social infrastructure, aside from the irrigation facilities, was not sufficiently developed. Accordingly, it would seem necessary to strengthen “soft” support, including support for the strategic production planning of crops and agricultural technology, and the development of infrastructure related to supporting agricultural activities. (2) Recommendations (i) Measures against water shortage in Estreit IV The water shortage in Estreit IV, which is an impediment to the expansion of the settlement area, appears to have multiple causes, including the problem of illegal occupants. The executing agency should organically cooperate with state governments, other government agencies, and the private sector in order to investigate these problems, and solutions to the water shortage problem should be

		examined in detail. (ii) Measures to improve the income of small farmers Small farmers in Estreit IV and Miroros have fallen into a vicious cycle of poverty due to: (a) a disadvantageous location, (b) low prices for producers, (c) high production costs, and (d) a lack of investment funding. Solutions are elusive. If things remain the way they are, even if the water shortage problem is solved and settlement begins again, the same type of poor farmers will likely increase, and the project cannot be expected to lead to long-term independent development. Hence, the executing agency needs to start the implementation of "soft" improvement measures such as "forming a strategy for realizing higher producer prices and reducing production costs," and "building business models for poor small farms." These measures should be carried out with a view toward cooperation with other government agencies and the private sector in a feasible manner from the perspectives of marketing, shipping, and commercial viability.