Indonesia

Krueng Aceh Irrigation Project

Report Date: March 2001
Field Survey: August 2000

1. Project Profile and Japan's ODA Loan

Location Map of Project Area

Headwork Constructed by this Project

(1) Background

The Fifth Five-Year Plan for Indonesian agricultural sector, which began in 1989, had the following aims: [1] Stronger self-sufficiency in staple foods, [2] improved produce quality, [3] increased incomes of farming, and [4] creation of employment opportunities. The plan aimed to develop 500,000ha of new irrigated land nationwide. The areas covered in Java, other than Jakarta area, were self-sufficient in rice, or could ship surplus rice to other regions. However, the area of land under rice cultivation on Java (approximately 5,000,000ha at the time) was expected to reduce due to conversion to other applications, and it was anticipated that a large increase in unit yields would be very difficult to achieve. Therefore the emphasis was placed on expanding irrigation facilities outside Java.

The area for this project is adjacent to the city of Banda Aceh, in the special province of Aceh at the northern tip of Sumatra, which has natural conditions suitable for rice cultivation. It served as the rice production area for Banda Aceh. At the time, most agriculture in the area was dependent on natural rainfall for water, and agricultural productivity was low and inefficient. Irrigation facilities were needed to enable cultivation of two rice crops a year as a means of providing Banda Aceh with a steady supply of rice and raising the incomes of farmers.

(2) Objectives

This project was to build headworks, water canals, drainage canals and other irrigation facilities in the paddy field area (7,053ha on the right bank of the Aceh River, and 331ha on the left bank) of the river basin adjacent to Banda Aceh in the special province of Aceh. The aim was to enable year-round rice cultivation, thereby increasing rice production and farmers' incomes.

(3) Project Scope

This project consists of the contents as below.

a) Construction of Ache headworks (Gate height: 3.55m, overall width: 122m)
b) Construction of main canal on the left bank (6.7km)
c) Construction of main canal on the right bank (28.2m)
d) Construction of secondary canal (82.1km)
e) Construction of main drainage canal (22.7km)
f) Construction of secondary drainage canal (56.3km)
g) Improvement of tertiary facilities (7,384ha)
h) Procurement of maintenance equipment
i) Consulting service (Assistance in bidding procedures, construction supervision etc. (290M/M))

(4) Borrower/Executing Agency

Republic of Indonesia / Directorate General of Water Resources Development, Ministry of Housing and Infrastructure Development (Former Directorate General of Water Resources Development, Ministry of Public Works)

(5) Outline of Loan Agreement

Loan Amount/Loan Disbursed Amount	¥6,333 million / ¥5,805 million
Exchange of Notes/Loan Agreement	December 1990 / December 1990
Terms and Conditions	Interest rate: 2.5%, Repayment period: 30 years (10 years for grace period), General Untied (Partially untied for consulting services)
Final Disbursement Date	December 1997

2. Results and Evaluation

(1) Relevance

This project, which was based on the Indonesian government's long-term food self-sufficiency plan, aimed to increase agricultural productivity in a belt of land including Banda Aceh, the main city of Northern Sumatra. By extension, it aimed to strengthen the rice self-sufficiency of the country as a whole. The relevance of this plan was still maintained at the time of evaluation. There were no significant changes in the scope of the project at the implementation stage, and the plan for this project can be deemed relevant.

(2) Efficiency

The project was completed largely within the planned period. The total project cost and the ODA loan value remained within the planned amounts (total project cost was reduced by 22% and the ODA loan was reduced by 8%), with no notable problems.

(3) Effectiveness

1) Quantitative Effects

Table 1 shows the planned irrigation areas for this project, and movements in cultivated areas (only for rice, the main crop) for the rainy and dry season crops. Since the project was completed in 1997, the cultivation rates in both seasons have been rising gradually, reaching 83% in the rainy season and 62% in the dry season in 2000, for a total of 145% over the year. The cultivation rate has yet to reach the final average rate indicated at the time of the appraisal, which was 167%, but the irrigation water supplied by this project has clearly increased the efficiency with which the land is used.

Table 1 Cultivation Records

		Plan at the time of appraisal	1996	1997 (Completion year)	1998	1999	2000
① Planned irrigation areas	ha	7,384	7,384	7,384	7,384	7,384	7,384
② Area of rice cultivation (rainy season)	ha	7,384	4,350	4,325	5,060	5,360	6,124
Percentage to the planned value	(%)		(59%)	(59%)	(69%)	(73%)	(83%)
③ Area of rice cultivation (dry season)	ha	4,923	3,750	3,244	3,795	4,020	4,592
Percentage to the planned value	(%)		(76%)	(66%)	(77%)	(82%)	(93%)
④ Cultivation (use of arable land) rate		167%	110%	103%	120%	127%	145%

Source: Executing agency's materials

Productivity, in terms of unit yields, leapt from 2.5t/ha from rainwater farming to 7.0t/ha in rainy season and 6.0t/ha in dry season in 1999 after completion of the project. The increase in productivity increased rice production volume and net income (Table 2).

Table 2 Index for Effectiveness

		Plan at the time of appraisal	1996	1997 (Completion year)	1998	1999
Unit rice yields (rainy season)	ton/ha	5.0	5.0	7.0	7.0	7.0
Unit rice yields (dry season)		5.5	5.0	6.0	6.0	6.0
Annual production volume of rice (rainy season)	ton/ha	-	21,750	30,275	35,420	37,520
Annual production volume of rice (dry season)		-	18,750	19,464	22,770	24,120
Annual production volume of rice (total)		64,015	40,500	49,739	58,190	61,640
Total net income from rice	(Million of Rupiah/ year)	-	13,380	23,750	48,965	66,552

Source: Executing agency's materials

2) Evaluation by beneficiary residents

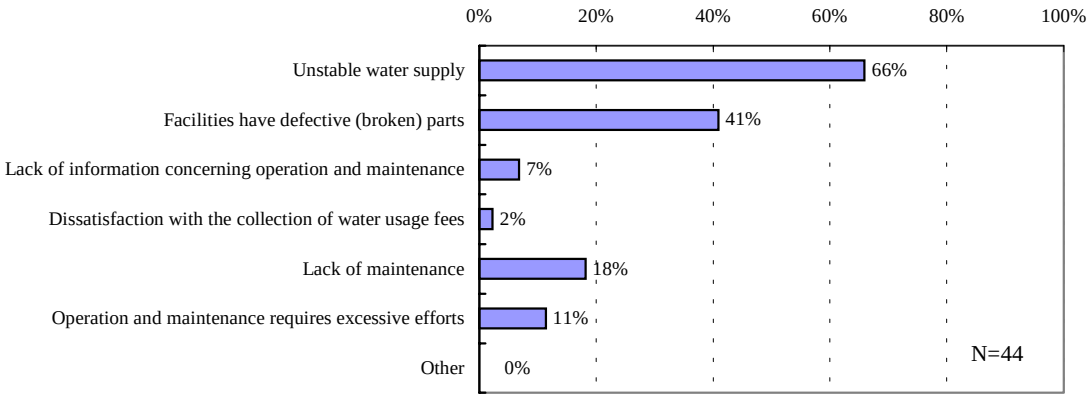
This study conducted a beneficiary interview survey of 100 households farming in the project area with the assistance of the Aceh River Irrigation Project Office[1]. The average land area per household was less than 1ha, and most raised two crops each year. Most households had been farming in the area for ten years or more. This questionnaire survey asked questions on “the state of the irrigation facilities and your evaluation of them“, “improvement in productivity“ and “general evaluation and further requests“. The results are presented below, in order.

<Evaluation and the state of the facilities>

The facilities have been maintained by the local government since the project was completed. When asked about their satisfaction with the current maintenance system of water, 56% said they were satisfied and 44% said they were not, indicating that the majority are satisfied. The main reasons given by those who were dissatisfied were that “water supply is unstable“ and “the facilities have defective (broken) parts“ (Figure 1).

However, this project did not build a dam, and instead draws water directly from the Aceh River, which means the water supply is vulnerable to the influence of the water level in the river. Therefore the reasons of unstable water supply do not necessarily mean that the effects of this project are not being realized.

Figure 1 Reasons for Dissatisfaction with the Current Water Management System (only those who responded that they were dissatisfied)



On the current overall state of the irrigation facilities, the overall evaluation was favorable, but slightly over 60% of respondents admitted “earthworks around the drainage canals are low and prone to overflowing“ (Figure 2). Nearly 70% of respondents said they had suffered damage due to poor drainage (Figure 3).

[1] The interview survey of beneficiaries selected two sub-districts within the project area (which contains approximately 8,000 farmers), both of which were on the larger right bank area. The interviewees were 100 farming households selected at random from the two sub-districts.

Figure 2 Current State of the Irrigation Facilities (multiple responses permitted)

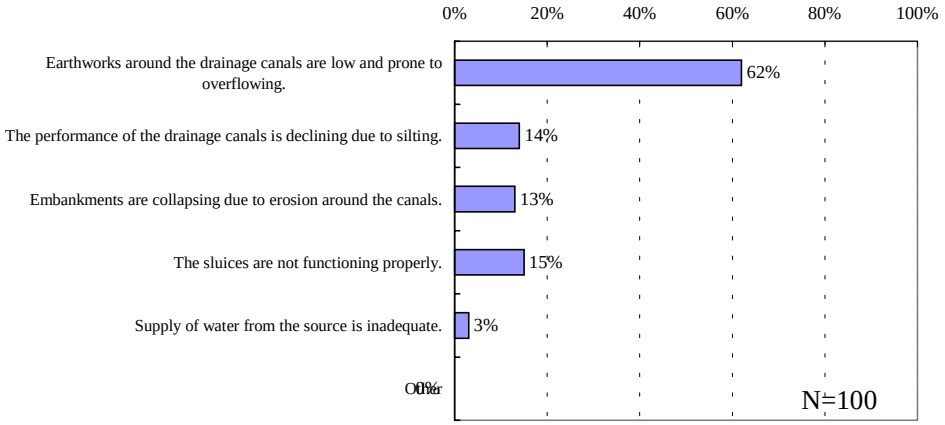
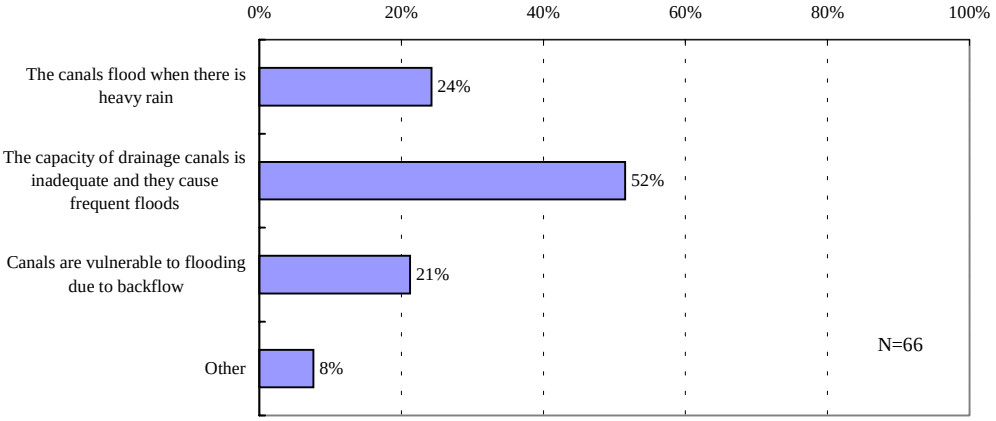
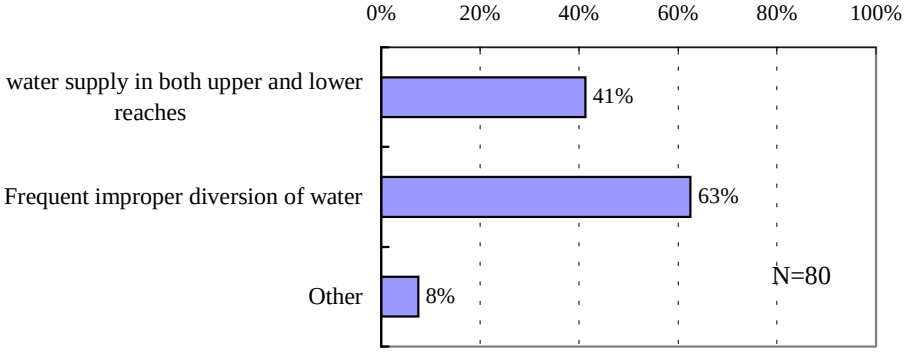


Figure 3 State of Drainage Problems (multiple responses permitted)
(only those who responded that they had suffered damage due to poor drainage)



On the question of water supply, 80% of respondents perceived some problem. “Frequent improper diversion of water“ was particularly pointed out in high percentage.

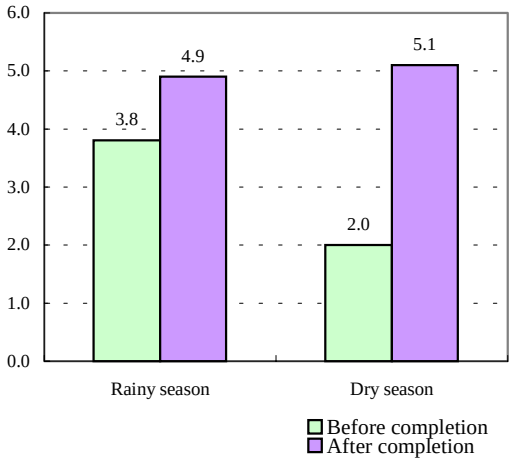
Figure 4 Problems for Water Supply (multiple responses permitted)
(only those who responded that there had been problems for water supply)



<Changes in productivity>

Figure 5 shows the results obtained when interviewees were asked about changes in rice productivity between before and after the completion of the project. Figures are averages of all valid responses received. Production increased by 29% in rainy season and by 155% in the dry season (Figure 5), from which it can be particularly inferred that the increased rate in the dry season is worthy of special mention.

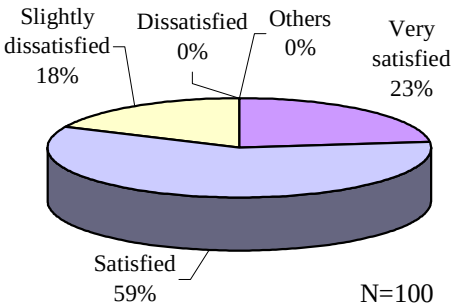
Figure 5 Rice Productivity Before and After Completion of the Project (average of responses: tons/ha)



<Evaluation for this project and further wishes>

When interviewees were asked to rate their satisfaction with the irrigation project as a whole on a four-grade scale, the satisfied group largely exceeded the dissatisfied group, comprising somewhat over 80% who were “very satisfied“ and “satisfied“, and somewhat less than 20% who were “slightly dissatisfied“ and “dissatisfied“ (Figure 6).

Figure 6 Overall Evaluation (graded evaluation)



The opinions and requests listed below were expressed regarding improvements to the facilities. It is considered that the maintenance agency needs to clearly identify the problems and examine appropriate remedial measures.

- The banking of water channels is too low and prone to flooding.
- The drainage canals do not have adequate capacity, and they often overflow.
- The access roads should be improved.
- Damaged parts of the facilities need to be repaired.
- The volume of water drawn from the source is inadequate.

3) Recalculation of Economic Internal Rate of Return (EIRR)

The Economic Internal Rate of Return (EIRR) for this project was recalculated at 10.9%. The calculation of planned EIRR value used the project expenditure figures reported by the executing agency. The benefits of the project were envisaged as the difference between "project implemented" and "project not implemented" cases for net agricultural income, based on the data for yield volumes, crop unit prices and other factors gathered by this study. Compared to the planned value of 167% for cultivated area, the actual value was rather lower, at 145% in 2000, but the unit price for rice more than double from 235,000 Rupiah/t at the time of the appraisal to 496,000 Rupiah/t in 2000 (the price at the time of the appraisal). Also, the planned unit yields were taken as 5t/ha in the rainy season and 5.5t/ha in the dry season, but the actual figures for 1999 were considerably higher, at 7t/ha and 6t/ha, respectively. Therefore the recalculated EIRR was higher than the 8.8% calculated at the planning stage.

(4) Impact

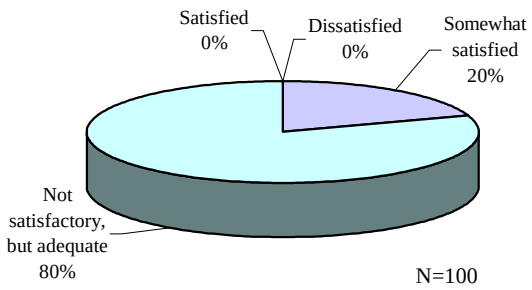
1) Environmental Impact

In the beneficiary interview survey described above, respondents were asked whether this project had caused any adverse environmental impact in the area. No responses indicated specific cases of such impact.

2) Social Impact

The beneficiary interview survey also asked respondents whether the project had produced a beneficial effect on the local economy. Nearly 100% of respondents answered in the affirmative, mainly due to the increase in agricultural incomes and employment opportunities. Also, land for the construction of canals had been bought from 60 of the 100 respondents. According to the executing agency, the land acquisition did not involve large-scale relocation of residents, and there were no relocation-related problems. When asked how satisfied they were with compensation payments, 20% said the payments were somewhat satisfactory and 80% said they were not satisfactory but adequate. None stated that they were dissatisfied (Figure 7).

Figure 7 Compensation for Land Acquisition (graded evaluation)



Although the supply of water has fulfilled the plan overall, there is now antagonism over water issues between some sections of the project area, as described below as a dispute between “Group A“ and “Group B“. Group A is on the left bank of the right-bank main canal, and is supplied with water through tertiary facilities. Group B, on the right bank of the same main canal, has not been provided with tertiary facilities, and therefore they must place pumps into the canal to pump up water for themselves. This situation leads to a clear difference in productivity between the two groups, and there is some social antagonism between them. The Water Resources Office, which is the maintenance body, is aware of the need to resolve the situation, but it has not made any specific solutions for doing so. The situation demonstrates the difficulty of appropriate water distribution management from irrigation facilities.

(5) Sustainability

1) Operation and maintenance scheme and its current status

Maintenance of the facilities is handled by the Aceh Irrigation Project Office (a branch of the Greater Aceh District Water Resources Office), in cooperation with the Water Resources Office of the special province of Aceh. Approximately 40 staffs are involved in the operation and maintenance of this project. Specific operations include water supply from the headworks (sluice operation), removal of soil (embankment operation), and regulation of water levels in the main and secondary canals. The Irrigation Project Office says that a shortage of staff makes it difficult to carry out adequate maintenance over the wide area covered by the project.

The maintenance budget for the above facilities is provided by the provincial government. The maintenance agency prepares the budget needed for the following:

[1] Operating expenses such as personnel, consumption goods, equipment, travels and transport.
[2] Maintenance expenses such as lawn care, minor repairs and silt removal.
[3] Expenses for major repairs.

Budget allocations for [1] and [2] are requested from the provincial government, while budget requests for [3] are channeled through the provincial government to the central government. According to the maintenance agency, the budget that is actually allocated is not sufficient to fund adequate maintenance work.

An Irrigation Service Fee (ISF) system was introduced in 1996 for this project. The fees are collected from farmers by the Water Users’ Associations (WUAs) as maintenance costs for the facilities, and submitted to the provincial government. At present the collection rate for ISFs is low (40% in 2000).

At a point approximately 10km from the headworks, a section of around 50m of the right bank main canal suffers continuous soil slippage from the rear embankment, and silting of the canal is severe. Even in sections of the main canals which are surfaced, the facilities are cracking from the inside because they cannot withstand the pressure, and there are frequent collapses. This situation poses a great risk to the project’s ability to secure an adequate volume of irrigation water and deliver it efficiently. Improvement is needed in the implementation scheme and the technical content of the maintenance operation.

The maintenance of the tertiary facilities is the responsibility of the WUAs established in each water users’ zone. The WUAs were established by a water use management project conducted by the special province of Aceh as an element of the irrigation project. The plan calls for a total of 144 associations to be established, to make one in each water users’ zone. However, by the end of 2000 only 101 associations had been set up, a 70% attainment rate.

The interview survey of beneficiaries described above included questions on “payment of ISFs“ and “participation in operation and maintenance activities“.

<Payment of water use charges>

Approximately 70% of the interviewed farmers held the perception that “water is a natural gift, so it is hard to understand paying for it“, and that perception is reflected in the state of fee payment. Over 70 % stated that they “do not pay fees“, with nearly 33% stating that they “pay part of the fees“. These two groups account for 99% of respondents in total. Only 1% said they “pay the fees in full“.

The most common specific reason for non-payment was “the fee collection system is unclear“ (Figure 8). A high proportion said that the current level of fees was “appropriate“ (Figure 9). Therefore it appears that the failure of farmers in the area to pay their fees is not a problem of money, but rather a lack of understanding of the significance and purpose (application) of the fees, and poor performance of the collection system (the WUAs).

Figure 8 State of Payment of Irrigation Service Fees (choose one of four responses)

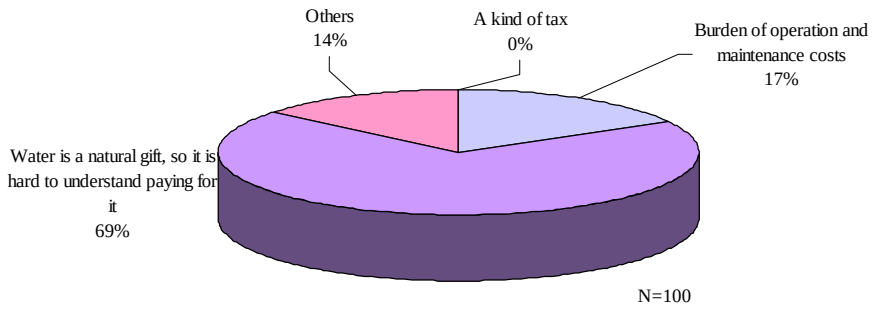
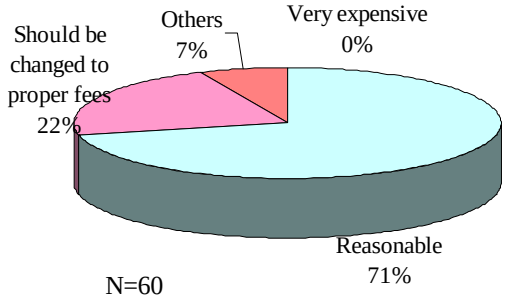


Figure 9 Level of Irrigation Service Fees (graded evaluation)

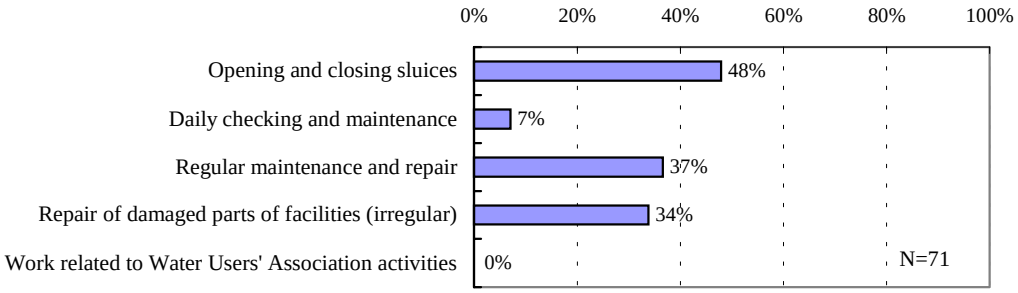


<Participation in operation and maintenance work>

Overall, 70% of farmers stated that they participated in operation and maintenance work. Most of them cooperated as members of the WUAs. Figure 10 shows the specific content of their work. Only 10% of respondents overall said that the operation and maintenance work was “too much work to keep up with“, and over 90% indicated their intention to continue the work.

Figure 10 Content of Operation and Maintenance Work (multiple responses permitted)

(Only those respondents who indicated that they participated in maintenance work)



The local government has provided 40% of interviewees with training in operation and maintenance work, but over 70% of trainees had only received one session of training, and less than 30% received ongoing training. Around 30% of those currently involved in maintenance work say that they do not know what they should be doing, and there is a latent problem with farmers who cannot carry out their tasks because they lack training. All respondents said that training was useful (100%), and there was strong demand for training by experts (90%) and for regular training sessions (57%). The local government and the executing agency should strengthen the training system in future.

2) Sustainability of the effects

At present, the project is realizing its quantitative effects. However, the sustained realization of these effects faces problems in the facilities, organizations and systems. The short term solution is to make a technical survey of silting upstream of the headworks, erosion in the main and secondary canals and collapses in the facilities, followed by consideration of countermeasures. However, the situation which led to the current condition of the facilities includes problems of maintenance budget, organization and systems, besides the technical difficulties. A comprehensive approach, incorporating reconstruction of budgetary, organizational and systemic aspects, is necessary.

This situation has led the Indonesian government to request a further ODA loan from the Japanese government for the purpose of rehabilitating facilities from the previous ODA loan project. Special Assistance for Project Sustainability (SAPS) is to be conducted to examine the technical relevance of the proposed rehabilitation plan and ways to ensure sustainability after rehabilitation.

Comparison of Original and Actual Scope

Item	Plan	Actual
①Project Scope		
1. Civil works		
1) Ache headworks	・Water intake volume: 9.6m^3/s ・Designed discharge capacity: 1,580 m^3/s ・Type of weir: Fixed weir (Gate height: 122m, overall width: 3.55m)	・Same as left ・1,583 m^3/s ・Same as left
2) Irrigation canals	・Main canal on the left bank: 6.7km ・Main canal on the right bank: 28.2km ・Secondary canal: 82.1km ・No. of facilities: 302	・10.35km ・28.41km ・75.44km ・314
3) Drainage canals	・Main drainage canal: 22.7km ・Secondary drainage canal: 56.3km ・No. of facilities: 131	・22.2km ・56.2km ・Same as left
4) Improvement of tertiary facilities	・Improved area: 7,348ha	・7,370ha
5) Maintenance road	・93.8km	・Same as left
6) Control building	・2,200m^2	・Same as left
2. Consulting service Assistance in bidding procedures, construction supervision	・Total: 290M/M Foreign: 112M/M, Local: 178M/M	・Total: 322M/M Foreign: 96M/M Local: 226M/M
②Implementation Schedule		
・Exchange of Notes	-Sep. 1990	-Dec. 1990
・Selection of consultant	-May 1990 ~ May 1991	-May 1990 ~ May 1991
・Consulting service	-May 1991 ~ Mar. 1997	-May 1991 ~ May 1997
・Bidding of construction	-Oct. 1990 ~ Mar. 1996	-Oct. 1990 ~ Aug. 1995
・Civil works	-Feb. 1992 ~ Mar. 1997	-Apr. 1991 ~ Feb. 1997
・Bidding of facilities	-Nov. 1993 ~ Oct. 1994	-Nov. 1994 ~ Feb. 1995
・Installation of facilities	-Nov. 1993 ~ Nov. 1994	-Nov. 1993 ~ Sep. 1995
・Land acquisition	-Apr. 1990 ~ Mar. 1993	-Apr. 1990 ~ Mar. 1993
③Project Cost		
Foreign currency	¥3,342 million	N.A.
Local currency	¥4,552 million	N.A.
Total	¥7,894 million	¥6,130 million
ODA loan portion	¥6,333 million	¥5,805 million
Exchange rate	1Rp. ＝¥0.08	