Indonesia

Way Rarem Irrigation Project (VI)

Report Date: March 2001
Field Survey: September 2000

1. Project Profile and Japan's ODA Loan

Location Map of Project Area

Water Distribution Junction (right)
from Trunk Canal (left)

(1) Background

The Way Rarem Irrigation Project (Phases I~III) is a large scale project which took 12 years to complete. Phase I completed parts of the trunk canals in 1983 and the Rarem Dam (the main water intake dam) in 1984. After that, Phases II and III built irrigation facilities, including the trunk and secondary canals and the tertiary canal network, and were completed in 1987 and 1991, respectively. The irrigation facilities built in the three phases were to be transferred to Lampumg provincial government on completion.

However, due to the factors such as the fall in crude oil prices, former Directorate General of Water Resources Development, Ministry of Public Works could not obtain an adequate budget. The maintenance of the facilities was inadequate as a result, making it almost impossible to complete the transfer to the provincial government because the financial burden on the province would be excessive. It was therefore necessary to reduce the burden of maintenance costs on the provincial government and restore and upgrade the facilities in order toensure long-term realization of project effects.

(2) Objectives

The project was to maintain the functions of the irrigation facilities built under the Way Rarem Irrigation Project (Phases I~III) in order to ensure long-term realization of their effects. To that end, it rehabilitated and upgraded the irrigation facilities and procured equipment for their maintenance.

(3) Project Scope

The scope of this project was as follows.

1) Rehabilitation and upgrading of irrigation facilities
Improvement of dam facilities / Lining of trunk canals (13km) / Improvement of maintenance roads (paving etc., 83km) / Lining of secondary canals (23km) / Lining of tertiary canal networks (20km) / Improvement of soil excavation pit remains (106km) / Addition of ditches alongside maintenance roads

(83km) / Improvement of drainage canals (60km) etc.

2) Training for maintenance

3) Procurement of maintenance equipment

4) Consulting service

Detailed design of facilities, bidding assessment / construction maintenance assistance, training of maintenance staff etc.

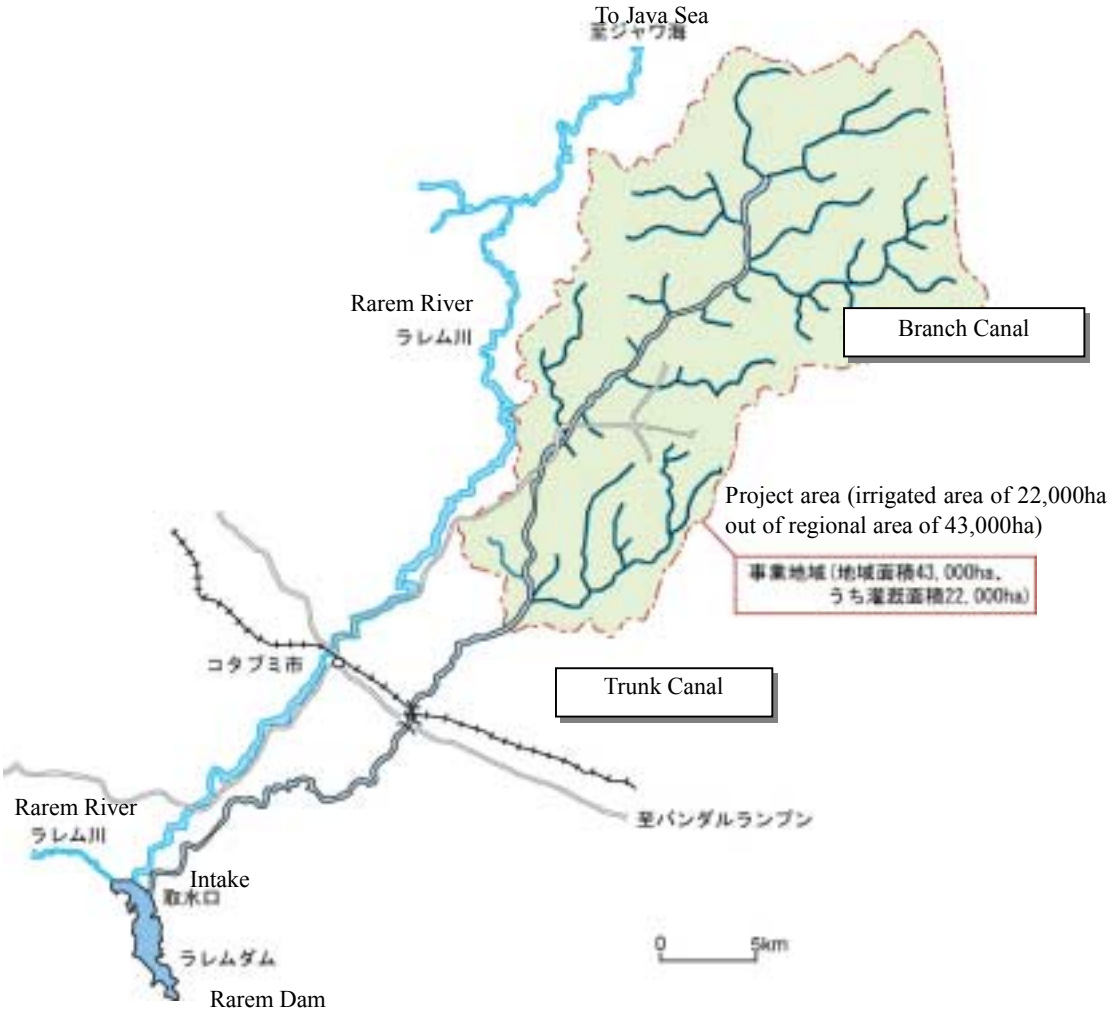


Figure 1　Project Area Map

(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	¥1,623 million / ¥1,558 million
Exchange of Notes/Loan Agreement	September 1991 / September 1991
Terms and Conditions	Interest rate: 2.6%, Repayment period: 30 years (10 years for grace period), General Untied (LDC untied for consulting services)
Final Disbursement Date	October 1997

2. Results and Evaluation

(1) Relevance

This project (Phase IV) is a rehabilitation project, which was assigned a high priority under the Fifth Five-Year Plan. The key targets set by the Plan were maintenance of Indonesia's overall self-sufficiency in rice and higher incomes for farmers. The tasks of efficiently and effectively rehabilitating and upgrading irrigation facilities extending over an irrigated area of 22,000ha was important to maintain and enhance the base of agricultural production. The project's objectives, to maintain the functions and effects of the irrigation facilities completed in the first three phases, remained relevant at the time of the evaluation.

Design changes and additions were made in the course of construction, to accommodate topography and geology, but with those exceptions the project was carried out largely as planned, with no notable changes in its scope.

(2) Efficiency

The executing agency was the Directorate General of Water Resources Development, Ministry of Housing and Infrastructure Development (Former Directorate General of Water Resources Development, Ministry of Public Works). The project was implemented by the Directorate General's Way Rarem Irrigation Project Office, and was completed in 1997 (the construction works were completed at the end of 1996). Completion was nearly a year behind schedule, but the delay was due to the design alterations and additional works mentioned above, which were made to accommodate topography and geology. Total project cost remained within the planned value.

(3) Effectiveness

1) Rice yield per unit area

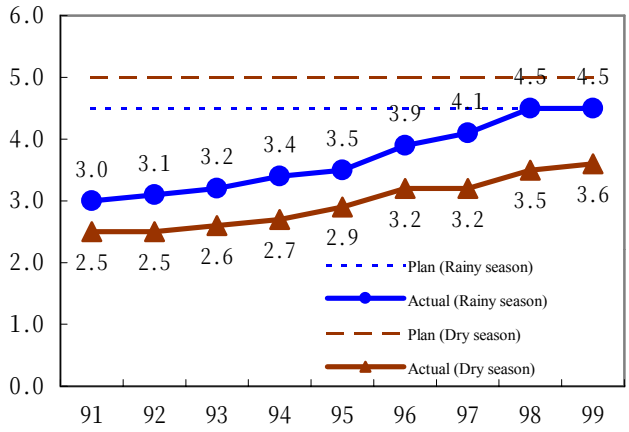
Figure 2 shows unit rice yields in the irrigated area. There is an upward trend in yields from year to year, reaching the target of 4.5 tons/ha in the rainy season of 1998, the year after this project was completed. The

dry season target was set at 5.0 tons/ha, but despite the growth in yield, it did not exceed 3.6 tons/ha in 1999.

The targets for unit yields at the time of the appraisal were 4.5 tons/ha in the rainy season and 5.0 tons/ha in dry season. The data shows that harvest in dry season hasn't achieved the target value within three years after the start of water supply.. The attainment rates for averaged figures over four years show 98% attainment of the target for rainy season, however, 72% for dry season, which falls short. Analysis based on further investigation is required, but it appears that the main cause of the shortfall is instability in the supply of irrigation water (refer to section 5 "Sustainability" for details).

Figure 2 Unit Rice Yields (tons/ha)

* Figures provided by the Way Rarem Irrigation Project Office.



2) Cultivated area

Table 1 shows planned and actual areas under rice cultivation. Phase IV construction works for this project began in 1992. The figures in the table below can be analyzed with reference to the construction period.

Table 1 Planned and Actual Rice Planting

Indicators		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Planned cultivation area (ha)	Dry season	12,103	14,277	15,975	17,705	18,561	19,239	19,346	17,882	18,052	19,099
	Rainy season	7,457	7,167	8,385	7,087	-	8,073	9,351	9,075	8,776	9,873
	Total ①	19,560	21,444	24,360	24,792	18,561	27,312	28,697	26,957	26,828	28,972
Actual cultivation area (ha)	Dry season	12,103	14,277	15,975	17,705	11,783	12,075	11,480	6,455	10,300	11,100
	Rainy season	7,457	7,167	8,385	6,195	2,400	5,200	4,468	6,289	4,925	7,373
	Total ②	19,560	21,444	24,360	23,900	14,183	17,275	15,948	12,744	15,225	18,473
Cultivation attainment rate (%)	②/①	100	100	100	96	76	63	56	47	57	64

Note) Way Rarem Irrigation Project Office

Between 1991, when Phase III was completed, and around 1993, the actual cultivated areas largely matched the plan, but from 1994 to 1997, when water supply from this project began, the cultivation area

figures fell short of the target every year[1]. After the completion of Phase IV, the figures rose slightly in 1998 and 1999, but they remained above 60% of the planned value. The main cause appears to be a shortage of water.

Since the mid-1990s there has been increasing year-round cultivation of palawija (mixed grains) in place of rice in the project area. Among the palawija crops, there has been particularly strong growth in the cultivation of maize and cassava. Table 2 shows annual cultivation figures for those crops in the whole of the administrative zone including the project area. According to the district agriculture office, palawija was largely overlooked in the past, but in recent years there has been a boom in its cultivation.

The area of cassava cultivation, in particular, has grown to the 40,000ha range. This data refers to the whole administrative area around the project area, and it lacks figures up to 1995, which makes a decisive judgement difficult. However, it is reasonable to infer that the same trend is under way in the project area, with large-scale production of maize and cassava replacing rice.

Table 2 Actual Cultivation Areas of Maize and Cassava

Region		Before 1995	1996	1997	1998	1999
Maize (ha)	North Lampung Province	N.A.	24,029	25,699	24,551	26,936
	Tulangbawang Province	N.A.	N.A.	8,281	2,805	5,499
	Total	N.A.	N.A.	33,980	27,356	32,435
Cassava (ha)	North Lampung Province	N.A.	22,378	11,263	32,104	26,621
	Tulangbawang Province	N.A.	N.A.	15,931	11,504	13,870
	Total	N.A.	N.A.	27,184	43,608	40,491

Note) From the agriculture offices of North Lampung and Tulangbawang.

3) Evaluation by local residents

The study conducted a questionnaire survey of 100 households of farmers farming in the project area under the cooperation of Way Rarem Irrigation Project Office[2]. The average agricultural land area per household was 1~1.5ha, and rice was the main crop. A majority had been farming for at least ten years. The questionnaire surveyed on points such as “the state of irrigation and your evaluation of it“ and “your overall evaluation and further requests“. The results of the survey are presented in order to serve as reference material for the directly expressed views of the farmers.

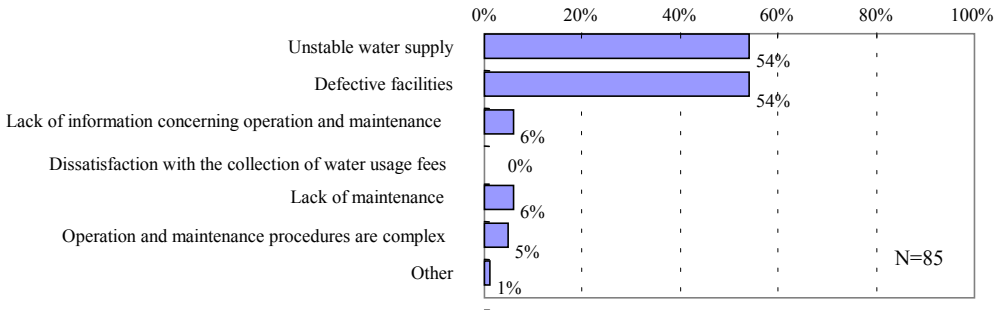
<Condition and evaluation of the facilities>

The large majority of respondents were dissatisfied (85% dissatisfied against 15% satisfied) with the water management system currently operated by the local government. The main reasons were that “unstable water supply“ and “defective facilities“ (Figure 4).

1 The large drop in recorded cultivation for 1997 occurred because the drought continued for longer than in a normal year, due to the El Nino effect.

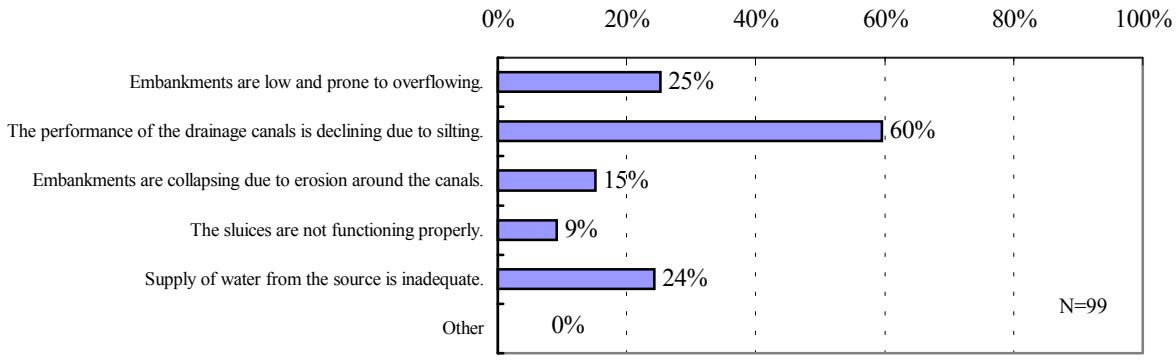
2 The 100 households are a random sample selected on the basis of information provided by the executing agency from within the project area. The questionnaires were conducted in the form of face to face question and answer sessions.

Figure 4　Reasons for Dissatisfaction with the Current Water Management System (multiple responses permitted)



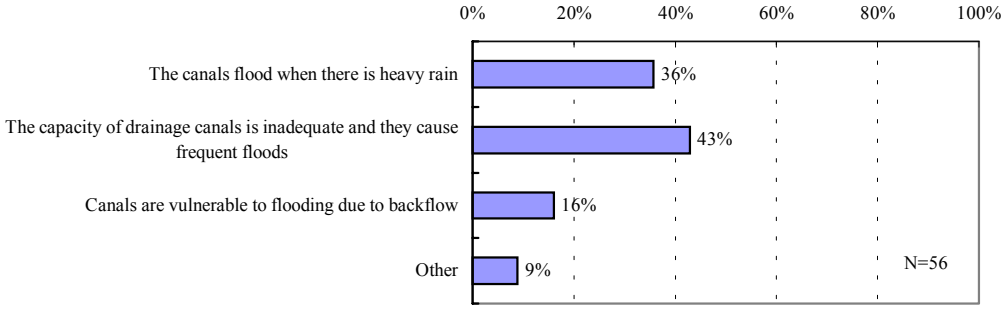
The overall evaluation of the condition of the facilities is good (very good 7%, good 61%, poor 5%, bad 27%), but there were many comments such as “The performance of the drainage canals is declining due to silting“, “Embankments are low and prone to overflowing“, and “Supply of water from the source is inadequate“ (Figure 5).

Figure 5　Current State of the Irrigation Facilities (multiple responses permitted)



Poor drainage had resulted in damage being suffered by 60% of respondents, who indicated problems such as “The capacity of drainage canals is inadequate and they cause frequent floods“ and “The canals flood when there is heavy rain“ (Figure 6).

Figure 6　State of Drainage Problems



Over 60% of respondents perceived problems with the water supply. In particular, 38 out of 58 respondents (66%) complained of “unfair supply of water between the upper reaches and the lower reaches“.

<Overall evaluation and further requests>

When interviewees were asked to rate their satisfaction with the irrigation project as a whole on a four grade scale, 31% were satisfied (either "very satisfied" or "satisfied") and 69%, a majority, were dissatisfied ("somewhat dissatisfied" or "dissatisfied"). Their requests included more functional embankments and drainage canals, repairs to damaged parts of the facilities, and improvements to access roads.

4) Recalculation of economic internal rate of return

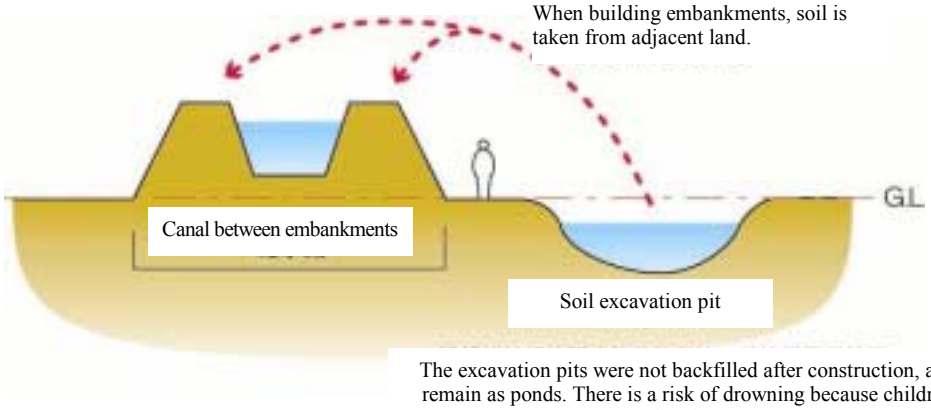
This project (Phase IV) was aimed to increase rice production by rehabilitating and upgrading existing irrigation facilities, but in recent years there has been a shift in cultivation towards crops such as maize and cassava instead of rice. However, this survey was unable to obtain data on these crops that was specific to the project area, making it impossible to recalculate EIRR.

(4) Impact

1) Environmental Impact

At the time of the appraisal there was concern over the risk of water accidents in the pits from which earth was excavated for the embankments (see Figure 7). The executing agency, acting through the local government, advised the farmers to exercise caution, and no major accidents have been reported. Their use in future as breeding pools for freshwater fish is now being considered.

Figure 7 Canal Embankments and Soil Excavation Pits



The excavation pits were not backfilled after construction, and remain as ponds. There is a risk of drowning because children play there.

In the above-mentioned questionnaire survey of beneficiaries, respondents were asked whether the project had caused any adverse impact on the environment, but none reported any such impact.

2) Social Impact

The results of the questionnaire survey found that land for the project had been purchased from 36 of 100 respondents (36%). Less than 20% of them said that they were either "satisfied" or "somewhat satisfied" with the compensation they received. Over 70% stated that the compensation was "unsatisfactory but acceptable" but none described themselves as "dissatisfied". These figures indicate that the land acquisition process for this project was carried out with some level of agreement. When respondents asked

whether the project had exerted a beneficial effect on the local economy, 98% replied in the affirmative, giving reasons such as increased agricultural income and employment opportunities.

(5) Sustainability

1) Operation and Maintenance

Responsibility for the maintenance for this project, including the previous facilities, is divided as shown below, according to the types of facilities.

(i) Rarem Dam

The Way Rarem Irrigation Project Office, an organization under the Directorate General of Regional Development, Ministry of Housing Area Development, operates and maintains the dam, using funding from the national budget (APBN). After completion, it was to be transferred from the central government to the local government, but that transfer has not been made yet. The Office sites the financial difficulties of the local government as the main reason.

(ii) Trunk and branch canals

The Lampumg Provincial Public Works Department uses the provincial government budget (APBD) and the irrigation service fees (ISFs) collected by water users associations to cover maintenance costs. The working units for maintenance are the branch offices, which operate at the rural district level. The large-scale repairs to the facilities are carried out by the Way Rarem Irrigation Project Office.

(iii) Terminal distribution canals

The terminal distribution canals are maintained by the water users associations which were set up for each irrigation block. The associations are farmers' organizations established according to rules set by the local government. They collect irrigation service fees from each household at each harvest, and maintenance work on the facilities, under the associations, is mandatory. The farmers carry out daily maintenance tasks, such as grass cutting around the canals, removal of soil (cleaning of canals) etc., as a service. However, if the water distribution measures and canals are broken and require repair, the association concerned reports the damage to the Way Rarem Irrigation Project Office to call for a repair.

(iv) Drainage facilities

After completion, the drainage facilities were to be transferred from the central government to the local government, in the same way as the dam, but they are still maintained by the Way Rarem Irrigation Project Office under the central government. According to the executing agency, there is no apparent time frame for transferring these facilities to the local government.

2) Operation and Maintenance Status

As mentioned above, the process of transferring the maintenance of this project to the local government was not moving forward at the time of the field survey in September 2000. According to the Way Rarem Irrigation Project Office, the main reason is the poor financial position of the local government, but the Office does not receive an adequate budget from the central government either.

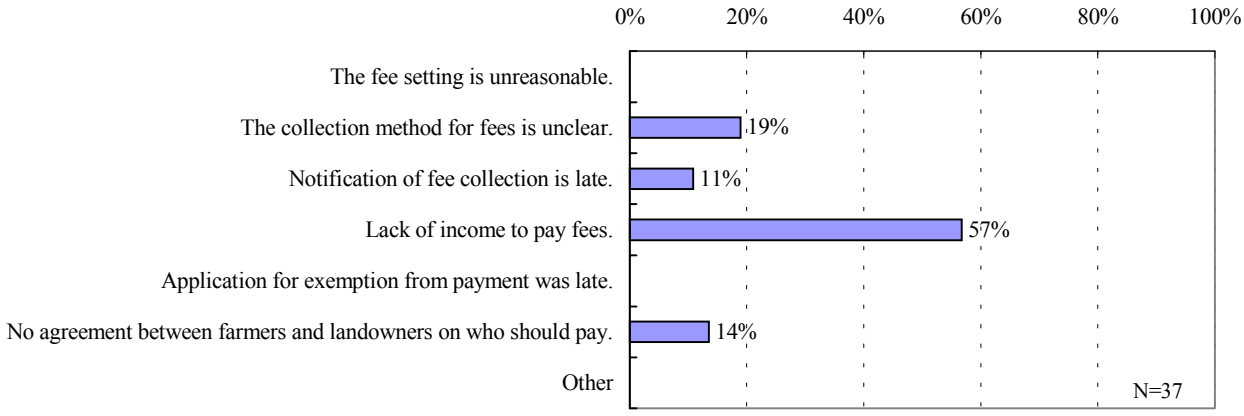
No information was available on the actual budget allocations paid to the provincial government Public Works Department, but its financial difficulties can be inferred from the following situation: There are 80

sluice gate operators posted throughout the irrigation project area, with each one responsible for an average of 250ha, but they do not have motorcycles or cars to move around the areas they must cover. That makes it difficult for them to carry out their maintenance work efficiently.

The water users associations which are central to the maintenance of terminal distribution canals have been set up in every village in the area concerned (in the case of Lampumg province). At the end of 2000, there were 47 associations in 47 villages, and 328 terminal water distribution zones had been transferred to them. Collection of the irrigation service fees (ISFs), which the associations remit to the local government, is mandatory, but the collection rate is less than 50% because collection efforts are inadequate. The organizations and systems of the water users associations should be strengthened for both the collection of irrigation service fees and the maintenance of the facilities.

When the questionnaire survey asked farmers for their opinions of the irrigation service fees, 98% responded that they failed to pay some or all of their fees. Despite the fact that over 80% of farmers answered that the level of fees is reasonable, 21 of the 37 households which said they do not pay the fees since they lack income to pay the fees (Figure 9).

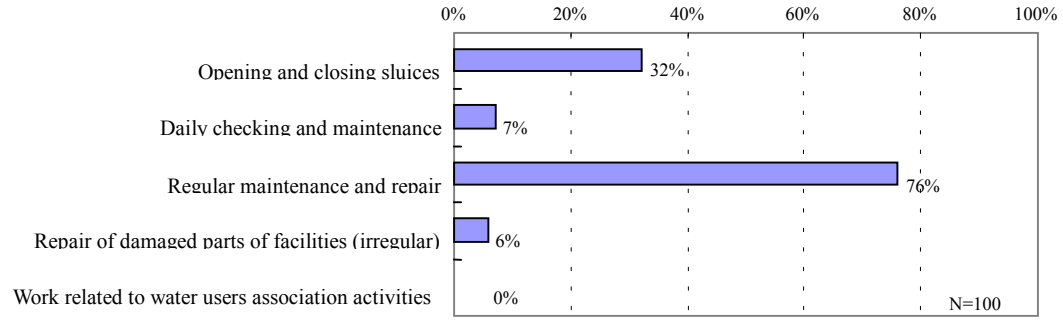
Figure 9 Reasons for Non-payment of Irrigation Services Fees (multiple responses permitted)



The farmers also have an obligation to contribute crops. A contribution of rice is set for each block, and the contributions are allocated to the head of each block, and to the operating funds of the water users association. This system was set up by agreement between the villages and the farmers, and it existed before the irrigation service fee system was introduced. According to the head of the water users association ,in Northern Lampumg Province, the details of collection rates are unclear, but the system is still mostly effective in collecting and using fees.

When questioned about their participation in operation and maintenance work, all respondents (100%) stated that they participated. Most of them cooperated in the work as members of the water users association. Figure 10 shows the specific content of their work.

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



Less than 10% of respondents said that "there is too much work to keep up with", and nearly all indicated their intention to continue with the work in future.

All respondents had received training from the local government in operation and maintenance, and nearly 90% were still receiving regular training. The findings of the questionnaire survey indicate that the training was useful (99%), but many respondents (70%) wanted to be trained by experts.

3) The condition of the facilities

A field study was made in September 2000 to inspect the Rarem Dam, which is the water source, and some of the trunk and branch canals. Their condition can be summarized as follows:

The executing agency says that regional development and slash and burn development of farmland upstream of the dam are causing it to accumulate silt more rapidly than anticipated. Therefore it is more common for water to overflow through the dam spillway in rainy season, which wastes 100~150 million m^3 of water per year that should have been stored. That is the main cause of the chronic water shortage in this irrigation area. The executing agency has submitted proposals to the central government, based on technical studies, for the recovery of the dam's storage capacity in order to solve the water shortage problem[3].

The executing agency also states that the trunk and branch irrigation canals suffer from advancing soil erosion (approximately 40,000m^3) and water leakage, which diminish the efficiency of water supply. Data from the executing agency shows that, in one trunk canal (34km from the dam water outlet to the first distribution sluice) the design leakage rate was 15%, but the actual measured rate was higher, at 17~20%. The canals are now a mixture of concrete surfaced sections and unsurfaced sections, but the executing agency has suggested to the government that the surfaced length should be increased to limit leakage and raise water supply efficiency.

4) Sustainability

This project has not attained its initial objective of increasing rice production, but it has yielded some effect in that direction, and it has also been effective in increasing mixed grains such as maize and cassava.

[3] A feedback survey of all the irrigation projects assisted by Japan's ODA loans has surveyed and analyzed data on the dam's upstream water catchments area and its effective water storage volume, and concluded that the main cause of the water shortage is poor water management. Water is not used fairly, with excessive use in the upper reaches. Therefore the executing agency's requests (such as a higher dam), should be met with quantitative studies and analysis of causes in order to study countermeasures.

The Indonesian government has petitioned the Japanese government for additional aid to rehabilitate trunk and branch canals for the purpose of further sustainability of the project. The aid is now under consideration[4].

However, even if the rehabilitation project was effective, the central and local governments must establish a financial basis for maintenance of the facilities if their effects are to be sustainable. At the same time, the work of the water users associations, which are responsible for the maintenance of terminal distribution canals, must be stepped up, and systems must be established for tasks such as the collection of irrigation service fees. Proper water management by the farmers is also essential for realization of project effects. Farmers must be given guidance and a system must be introduced for appropriate water allocation.

Even if the "internal factors" of the project are solved through further rehabilitation and the functions of the facilities are improved, external factors, in the shape of the environmental changes caused by the development of areas upstream will remain to threaten the functions of all downstream facilities. Therefore the Indonesian government must take a comprehensive approach to the management of the country's water resources.

[4] Rehabilitation work, including a survey of the problems affecting this project, is to be conducted as one of the 19 sub-projects contained in the Water Resources Development Sector Loan II (the exchange of notes was concluded in March 2001).

Comparison of Original and Actual Scope

Item	Plan	Actual
① Project Scope		
1. Civil works	a) Rarem Dam rehabilitation	Same as left
	b) Trunk canals rehabilitation	Same as left
	c) Branch canals rehabilitation	Same as left
	d) Terminal water supply facilities rehabilitation	Same as left
	e) Drainage canals rehabilitation	Same as left
	f) Construction of equipment storage	Same as left
	g) Construction of training house	Same as left
2. Procurement of facility equipment	a) Maintenance equipment	Same as left
	b) Training equipment	Same as left
3. Consulting Service	a) Expert A (Foreign): 44M/M	46M/M
	b) Expert B (Local): 102M/M	114M/M
② Implementation Schedule		
1. L/A	Sept. 1991	Same as left
2. Selection of consultant	Jul. 1991 ~ Jun. 1992	Sep. 1991 ~ Aug. 1992
3. Civil works		
- Package I	Apr. 1994 ~ Jan. 1996	Aug. 1994 ~ Nov. 1996
- Package II	Apr. 1994 ~ Jan. 1996	Jul 1994 ~ Nov. 1996
- Package III	Apr. 1994 ~ Jan. 1996	Aug. 1994 ~ Nov. 1996
- Package IV	Jan. 1991 ~ Mar. 1991	Sep. 1992 ~ Jun. 1993
4. Procurement of facility equipment		
- Maintenance equipment		
- Training equipment	Aug. 1992 ~ Nov. 1993	Dec. 1993 ~ Dec. 1994
	Aug. 1991 ~ May 1992	Jan. 1992 ~ Jan. 1993
5. Consulting service		
	Jul. 1992 ~ Jan. 1996	Aug. 1994 ~ Dec. 1996
6. Training		
- Maintenance staff training		
- Water users association training	Jul. 1992 ~ Feb. 1993	Dec. 1992 ~ Mar. 1993
	Apr. 1992 ~ May 1993	n.a.
7. Land acquisition		
	May 1993 ~ Apr. 1994	Jun. 1993
	To be completed in January 1996	Completed in December 1996
③Project Cost		
Foreign currency	¥1,089 million	n.a.
Local currency	¥844 million	n.a.
Total	¥1,933 million	¥1,663 million
ODA loan portion	¥1,623 million	¥1,558 million
Exchange rate	1Rp. =¥0.068 (Apr. 1991)	n.a.