Indonesia

Small Scale Irrigation Management Project (3)

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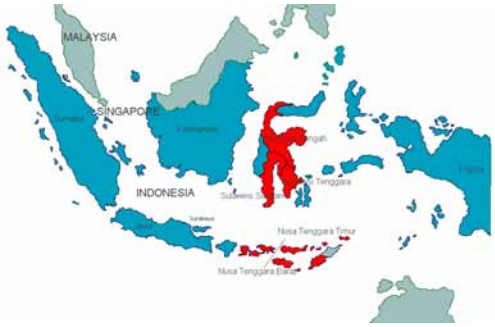
Field Survey：Nov 2006 - Mar 2006

1. Project Profile and Japan's ODA Loan



Map of Project Area

Rehabilitated Lan Lae Secondary Canal
South Sulawesi

1.1 Background

The Indonesian nation lives on rice, and increased yield of rice aiming at its self-sufficiency had been one of the national priorities for a long time. Having achieved the national rice sufficiency once in 1984, that status had been hardly maintained afterwards due to the sharp increase in rice consumption brought by population and income increase. A decrease in arable land especially in Java, due to industrialization and urbanization, and fragile production structure also disenabled self-sufficiency. The Eastern Indonesia including Provinces of East and West Nusa Tenggara, East Timor, South, Central, Southeast, and North Sulawesi and Maluku is a region economically left behind in the national economic development and attracting focused development support by the government. Agriculture is the main industry in the Eastern Indonesia and it absorbs 50 to 80% of the regional total workforce. However, remarkable change in rainfall between wet and dry seasons was hindering planting in the dry season. Therefore the critical issue was to secure necessary amount of water for the region's agricultural yield increase. To improve this vulnerable situation, the Small Scale Irrigation Management Project (SSIMP) Phase I was launched in 1989, and this Project is its third phase.

1.2 Objective

To construct surface water and groundwater irrigation facilities in Eastern Indonesia in order to increase agricultural production, and thereby increasing farmers' income

and contributing to poverty reduction.

1.3 Borrower/Executing Agency：
Government of Indonesia／Directorate General of Water Resources, the Ministry of Public Works

1.4 Outline of Loan Agreement

Loan Amount/Disbursed Amount	16,701million yen/16,008 million yen
Exchange of Notes/Loan Agreement	January 1998/January 1998
Terms and Conditions - Interest Rate - Repayment Period - Grace Period - Procurement	 2.7%（Consultant Portion 2.3%）、 30 years 10 years General Untied
Final Disbursement Date	February 2004
Main Contractors (More than 1 billion yen)	PT. Hutama Karya. (Indonesia)、 PT. Brantas Abipraya (Indonesia)
Consulting Services (More than 100 million yen)	Nippon Koei Co., Ltd. (Japan)
Feasibility Study, etc. (F/S)	Special Study Report on Formulation of SSIMP-III: April 1996 (Nippon Koei Co., Ltd and Associates)

2. Evaluation Result (Rating: A)

2.1 Relevance (Rating: a)

2.1.1 Relevance at the time of appraisal

The 6th Five Year Development Plan (REPELITA VI), 1994~1998, attached importance on the agricultural development of the Eastern Indonesia in terms of (1) introduction of agricultural productivity enhancement programs and new crop varieties, (2) development of frontier arable land areas for rice production outside of densely cultivated Java island and (3) alleviation of poverty in backward regions in Indonesia. In the irrigation development sector, the Village Irrigation Rehabilitation Program (Crush Program) was started in 1994

under presidential instruction in addition to the Irrigation Development and Management Program under REPELITA VI. The Crush Program was to be intensively implemented in three years from 1995.

To put these policies in practice, the Government of Indonesia launched this Project as the third phase of SSIMP which was started in 1985 under the assistance of the USAID (United States Agency for International Development)[1].

2.1.2 Relevance at the time of evaluation

The "Medium-Term National Development Plan (Rencana Pembangunan Jangka Menengah Nasional : RPJM) <2004-2009>" points out weaknesses still prevailing in the Indonesian agriculture, which accounts for 46.3% (labor force), 6.9% (non-oil/gas export value) and 15% (GDP) of the national economy, and stresses continued importance of the agricultural sector revitalization especially, among others, for national food security targeting minimally 90% self-sufficiency for the domestic rice demand. RPJM also puts high priority on assisting strengthened development of relatively backward region of the country including South, Southeast, and Central Sulawesi, West and East Nusa Tenggara Provinces. In order to implement the national policy above, RPJM sets forth the "Food Security Program" and "Increasing Farmers' Welfare Program" as two of the five basic national development programs of Indonesia, and promotes actions for increasing area of cultivation and agricultural production intensification. RPJM also specifies "Development and Management Programs of Irrigation and Drainage Networks and Marsh /Ponds" and "Rehabilitation and Maintenance of Water Resources for Agriculture" to carry out the basic national development programs above. The departmental medium-term strategic plan, "Strategic Plan 2005-2009" of the Directorate General Water Resources, the Ministry of Public Works, indicates the national target of 2.6 million hectare irrigation rehabilitation works within the period.

The importance of this Project has been thus constantly high since planned for the national development since its planning, and it is consecutively followed after its completion by the succeeding "Decentralized Irrigation System Improvement Project (DSIMP)" under the JBIC assistance.

2.2 Efficiency (Rating: b)

2.2.1 Output

The Project consists of facility construction, civil works for rehabilitation, procurement

[1] The Phase I project under USAID was later co-financed by JBIC.

of relevant equipment and consulting services for the implementation. The table below shows the actual outputs in comparison with the original plan.

Table 1: Comparative Outputs between Plan and Performance

Output	Plan (Appraisal)	Performance	
New Dam	3 dams	3 dams	
New Weir	1 weir	7weirs	
Rehabilitated Weir	—	5 weirs	
New Groundwater Well	250 wells	310wells	
Irrigation Canal	The plan did not specify total lengths. The length of canals is almost proportionate to the total irrigation area.	Primary	65 km
		Secondary	147 km
		Tertiary	208 km
Total Irrigation Area	16,059 ha	60,342 ha[2]	
Water Supply System	—	2 systems	
Rural Development (Farm road, Fish drying floor, Market rehabilitation and Farmer training)	—	6 provinces	

The remarkable increase in output volume and types of facility was the result of scope extension utilizing expanded availability of the Yen Loan fund created by the drastic devaluation (more than 80%) of Rupiah currency against Japanese Yen which was caused by the Asian Economic Crisis started in 1997 during the Project implementation. To cope with the expansion of the scope of works, the volume of the consulting services was also increased by 147% up to 3,782 Man-month (MM) against the original plan at 1,531 MM.

In addition to the conventional project supervision and procurement assistance, the consulting services under the Project are comprehensive and dynamic rendering institutional development support including organization and training of water users' associations (WUAs)[3], socioeconomic studies as a base for future irrigation development and feasibility studies for succeeding projects and other elements to maximize the project benefits.

[2] Total number of beneficiaries is estimated at approximately 240,000 farmers.

[3] The training covered total management systems and procedures including O&M practices utilizing manuals prepared in the Project, preparation of bookkeeping and reporting systems, as well as guidance for introducing new agricultural method (SRI) and routine guidance of extension workers.

2.2.2 Period

Under the initial plan, the duration of the Project was from January 1998 to March 2002 (50 months), but the actual period ran from January 1998 to December 2004 (84 months), which turned out 68% longer than planned.

Major reasons of the implementation delay are as follows:

(1) 6-12-month delay due to additional time requirement for the 3-time consultant contract amendments[4].

(2) 4-6 month delay due to the time to arrange payment procedures to 3 dam (Batu Bulan, Pelaparado and Tilong) contractors.

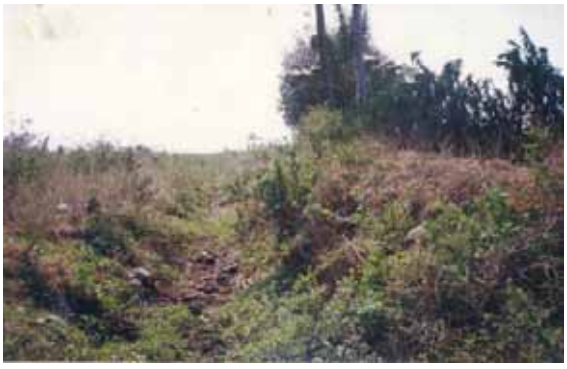
(3) 12-month delay due to redesigning of original technical designs especially for Batu Bulan and Pelaparado dam irrigation systems.

(4) Additional months required for the preparation of the expansion of scope of works and late start of the said portion.

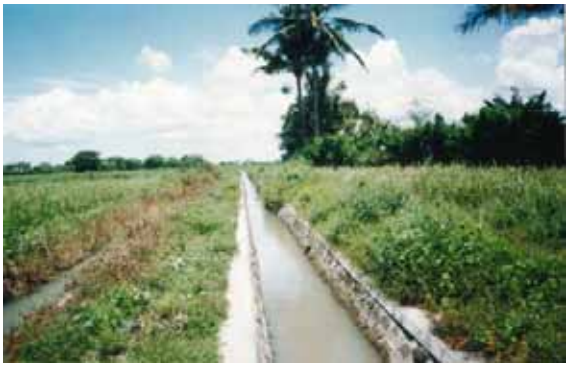
Table 2: Implementation Period (Plan and Result)

	Plan (Appraisal)	Performance
Total Implementation Period	Jan. 1998 ~ Mar. 2002 (50 months)	Jan. 1998 ~ Dec. 2004 (84 months)
Consultant Selection	Dec. 1997 ~ Jun. 1998	Dec. 1997 ~ May. 1998
Consulting Services	Jul. 1998 ~ Mar. 2001	Jun. 1998 ~ Mar. 2002
Civil Works & Equipment Procurement	Jul. 1998 ~ Mar. 2001	Jul. 1998 ~ Dec. 2004

Kelara Karalloe Irrigation Canal in South Sulawesi Province



(Before Project)



(After Rehabilitation by Project)

[4] The contract amendments were required to cover the extended terms of reference to cope with remarkable project scope expansion.

2.2.3 Project Cost

Planned project cost was 22,268 million yen (16,701 million yen covered by ODA loan), and the total project cost at the time of ex-post evaluation was 21,183 million yen (16,008 million covered by ODA loan), 5% smaller than planned. A main reason of the cost saving in spite of the scope extension is the remarkable depreciation of the local currency Rupiah caused by the Asian economic crisis.

2.3 Effectiveness (Rating: a)

2.3.1 Effectiveness Measurement by Effect Indicators

The following table summarizes increase of agricultural production and changes in other indicators after the Project in five provinces[5] where the Project was implemented.

Table 3: Agricultural Production and Other Indictors by Province

Indicators	Increase after Project (%)			
	Sulawesi	NTB	NTT	Total
Cultivated Area				
Wet Season	9	56	65	33
Dry Season	642	102	160	202
Annual Cropping Intensity	44	59	72	57
Unit Yield of Crops				
Wet Season	58	38	58	51
Dry Season	192	39	74	93
Annual Crop Production				
Wet Season	111	92	109	101
Dry Season	640	113	391	210

As the periods required for the fulfillment of the targeted increase of agricultural production are estimated at five years for Sulawesi and West Nusa Tenggara Provinces and

[5] Among six provinces where the Project was implemented, Bali Province carried out only water supply and farm roads development without irrigation.

seven years for East Nusa Tenggara Province[6], it still needs some more years for the full incidence of benefit at the time of this Ex-post evaluation (only after two years from the project completion)[7]. However, the above figures indicate that remarkable increase in "Annual Crop Production" has been achieved after the Project. The increase of dry-season crop has more than tripled while the wet-season crop was doubled. The increase of "Unit Yield of Crops" is significant both for dry as well as wet season; however the contribution of the additional cultivation areas created by the project implementation is much more apparent to the production increase.

Table 4: Share of Project Irrigation Areas among Provincial Paddy Production

(Unit: ton)

Province	Area	2000（Before Project Completion）			2005（After Project）		
		Wet Season	Dry Season	Total	Wet Season	Dry Season	Total
South Sulawesi	Provincial Total (A)			3,658,836			3,390,397
	Project Area (B)	37,727	6,379	44,106	74,327	26,715	101,042
	% (B/A)			1.2%			3.0%
Central Sulawesi	Provincial Total (A)			576,933			716,906
	Project Area (B)	5,713	0	5,713	18,015	20,289	38,304
	% (B/A)			1.0%			5.3%
Southeast Sulawesi	Provincial Total (A)			314,955			339,847
	Project Area (B)	1,796	0	1,796	3,083	242	3,325
	% (B/A)			0.6%			1.0%
West Nusa Tenggara	Provincial Total (A)			1,488,191			1,367,869
	Project Area (B)	62,937	30,996	93,933	128,430	71,759	200,189
	% (B/A)			6.3%			14.6%
East Nusa Tenggara	Provincial Total (A)			461,413			461,007
	Project Area (B)	3,138	871	4,009	6,548	4,281	10,829
	% (B/A)			0.9%			2.3%
Total	Provincial Total (A)			6,500,328			6,276,026
	Project Area (B)	111,311	38,246	149,557	230,403	123,286	353,689
	% (B/A)			2.3%			5.6%

Note: The yield of the Sadang Irrigation System, an enormous system in South Sulawesi Province, is excluded in this table because only minor initial works including studies and

[6] Cf. **2.3.4 Economic Evaluation**

[7] Several parts of the sub-projects have already fulfilled the required periods.

small-scale dredging were implemented in this third phase.

The paddy yield in 2005 (after the Project) increased two to seven times compared with the yield before the Project (2000) in the Project areas. The yields in the Project areas except the West Nusa Tenggara occupy only a few percent in the provincial total, but their remarkable increase obviously play important role for the yield increase in respective provinces.

2.3.2 Beneficiary Survey Result

To supplement the macro-based analysis to measure the Project effect above, beneficiary surveys were conducted at 16 sub-project sites in 5 provinces (South, Southeast and Central Sulawesi, West and East Nusa Tenggara Provinces) in Eastern Indonesia by means of direct farmer interviews from the micro viewpoint.

Sub-project sites in each Province visited and respective numbers of respondents are shown in the table below.

(1) Sub-project Sites Surveyed and Numbers of Respondents

Sub-project Sites	Number of Respondents (Persons)
South Sulawesi Province	
1 Sadang	10
2 Kelara Karalloe	7
3 Lanrae	7
Central Sulawesi Province	
4 Karaopa	10
5 Sinorang	8
6 Kali Polo (Village Irrigation)	8
Southeast Sulawesi Province	
7 Benua Aporo	8
8 Rumbia	8
9 Amonggedo	8
West Nusa Tenggara (NTB) Province	
10 Batu Bulan	9
11 Ijo Balit	7
12 Pelaparado	9
East Nusa Tenggara (NTT) Province	
13 Weliman	12
14 Holeki Halileki	8
15 Tilong	8
16 Oesao	5
Total	132

Farmer Interview
（Oe Sao Groundwater Irrigation, East Nusa Tenggara Province）

The interviews were conducted individually inviting selected interviewees to the village assembly point under a big tree to facilitate participation of as many farmers as possible.

(2) Increase of Rice Production after the Project

The following table shows the provincial average increase of rice production after the Project summarizing the result of the replies of the farmers interviewed about individual change in rice production volume. As the replies were mainly made subjectively on their personal and individual impression, they unevenly varied. However, the summarized average of increase in the five provinces shows 2.3 times after the Project.

Province	Increase after Project (%)
South Sulawesi	126
Central Sulawesi	225
Southeast Sulawesi	74
West Nusa Tenggara (NTB)	125
East Nusa Tenggara (NTT)	121
5 Provinces Total	128

(3) Has the agricultural productivity been increased after the Project?

This question asks about productivity per hectare as a major cause for an increase in the rice production. 87% of the total respondents recognize productivity increase after the Project.

Degree of Increase	%
Yes, very much	52%
Yes, some extent	35%
Almost no change	11%
No, decreased	0%
No answer (Do not know)	2%
Total	100%

(4) Dou you cultivate more profitable crops after the Project?

In addition to the production increase of rice as a major crop, diversification is also an expected benefit from the irrigation improvement under the Project. 71% of the total respondents answered that they enabled to cultivate more profitable crops after the Project. Agricultural statistics of the Project regions indicate that a wide variety of new crops (beans, peanuts, chilli peppers, watermelons, and tomatoes) were started or increased after the Project.

Answers	%
Yes, very much	32%
Yes, some extent	39%
Almost no change	20%
No, decreased	0%
No answer (Do not know)	9%
Total	100%

Vegetable Market in Oe Sao Irrigation Area, East Nusa Tenggara Province

The market is now able to be almost daily open after the Project. It used to be indeterminate before.

2.3.3 Economic Analysis

The feasibility study of the Project was conducted in the “Special Study” included in the SSIMP (2), a preceding project, and it measures economic profitability of the Project by Economic Internal Rate of Return (EIRR). The assumptions and calculation result are summarized in the following table.

Table 5: Major Assumptions and Calculation Result of EIRR

Project Life	Dam, Weir: 30 years Reservoir: 30 years Groundwater Irrigation: 15 years
Cost	1. Investment Cost (Civil Work, Equipment Procurement, O&M Cost, Consulting Service, Physical Contingency) 2. O&M Cost: 1% for Irrigation Facility or 0.5% for other facility of the Investment Costs 3. Replacement Cost Conversion into economic cost applying the conversion rate used in the World Bank projects: 0.71 for Civil Work, 0.9 for Consulting Service, 1.0 for Equipment Procurement.
Benefit	Agricultural Production Increase Applying international market prices estimated by the World Bank's long-term forecast.
Years required to fulfill targeted production volume per hectare	Three Sulawesi and West Nusa Tenggara Provinces: 5 years East Nusa Tenggara Province: 7 years
EIRR	12.1%

The new EIRR was estimated following basically the same but simplified method[8] as the one used in the Special Study Report for SSIMP III on which the project appraisal had been based. The forecasted production increase was partly replaced with the actual figures up to the time of Ex-post evaluation and with updated estimated figures. The new EIRR was 20.9% which is considerably higher than the original estimation. The successful irrigation outcome reinforced by the introduction of the cost saving high yielding SRI (System of Rice Intensification)[9], which had not been supposed in the original plan, is condensed in this significantly higher economic internal return.

2.4 Impact

2.4.1 Increase in Farmers' Real Income

The agricultural production increase after the Project was confirmed in the previous

8 The calculation in the feasibility study is based on the estimation of production increase of individual crops at each sub-project irrigation systems. As for the new EIRR, the benefit flow is estimated on the performance of actual production up to 2005 per crop as a whole.

9 SRI was first developed in Madagascar in 1983 by the French Jesuit Father Henri de Laulanie, an agronomist, and globally disseminated since 1999. In Indonesia, SRI was introduced to 1,849 farm households, 1,364 ha under this Project since 2002. It has achieved averagely 7.2 t/ha paddy yield which is 1.85 times of the yield under conventional method, and it is believed that 25% cost reduction was possible with 40% saving of irrigation water coupled with reduced fertilizer and pesticide inputs. ("Ne no Kenkyu (Reserch of Roots)" by SATO Shuichi, May 2006)

section. The next table tries to present to what extent the Project goals, "Increase in Farmers' Income" and "Poverty Alleviation," has been attained through rates of increase of Annual Gross and Net Farmers Income. The figures show big increase in both types of farmers' income, especially the increase in Sulawesi Provinces where the required time to achieve target is relatively short (5 years) posted a remarkable growth. From another aspect, more increase in the net than gross income indicates financial benefit from the cost reduction greatly affected by the introduction of SRI (System of Rice Intensification) which enables higher yield with less production cost.

Table 6: Increase in Farmers' Real Income

Indicators	Increase after Project (%)			
	Sulawesi	NTB	NTT	Total
Annual Gross Income	199	44	52	91
Annual Net Income	255	50	48	110

(Source: Questionnaire Answer)

Annual Gross Income: Gross Cash Revenue in a Year (1999 constant price)
Annual Net Income: Annual Gross Income – Annual Gross Expenditure of a Household (1999 constant price)

2.4.2 Beneficiary Survey Result

(1) Increase in Monthly Gross Income

The following table shows the provincial average increase of monthly agriculture and non-agriculture income after the Project as the result of the survey on all farmers interviewed. As the replies were mainly made subjectively on their personal and individual impression, they unevenly varied. However, the average of agricultural income increase in the five provinces has almost doubled after the Project, whereas no significant change is found in non-agricultural income.

Province	Income Increase after Project (%)	
	Agriculture	Non-Agriculture
South Sulawesi	87	13
Central Sulawesi	134	2
Southeast Sulawesi	45	4
West Nusa Tenggara (NTB)	77	-4
East Nusa Tenggara (NTT)	138	39
5 Provinces Total	94	9

(2) Has your standard of living been upgraded after the Project?

Degree of Increase	%
Yes, very much	41%
Yes, some extent	48%
Almost no change	6%
No, declined	5%
Total	100%

(3) Has the children's education improved after the Project?

Degree of Increase	%
Yes, very much	31%
Yes, some extent	41%
Almost no change	16%
No, declined	0%
No answer (Answered "Do not know")	12%
Total	100%

Both of above two questions ask subjective impressions of farm households, the fact that almost 90% and over 70% gave positive answers to the inquiries on improvement of living standard and children's education respectively indicates implicitly the farmers' welfare increase through production and income increase brought by the Project.

(4) Economic impact observed in the field survey

Farmers' income has considerably increased in general due to the strengthened agricultural production. The field survey also found a case of remarkable secondary economic impact where further income is being generated by newly created businesses (tourism and mineral water production) by reinvesting the additional funds derived from the increased primary agricultural income. The owner of the business is the leader of the irrigation development in the region. (Ijo Balit <NTB>)

(5) Social impact observed in the field survey

The discussions with the farmers in the field survey revealed their active participation in developing and improving their agricultural production. It was obvious that they were much encouraged by the improvement of their economic wellbeing as a result of both the irrigation improvement and other production enhancement programs including the introduction of SRI in the Project.

The field survey also indicated significant change of the children's education at the

sub-project sites. Investment in education is generally prioritized among the farm households. In some sub-project locations (Oesao, Ijo Balit and others), several cases have been found where some children of the farmers are enjoying even the highest grade of school education (doctoral courses) in Yogyakarta, a well-known education zone in Indonesia and other big cities in Java Island, which the people say had never been financially achievable before the Project.

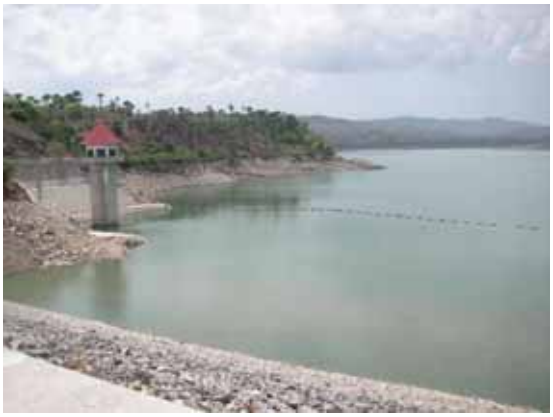
The Ijo Balit case is deriving even tertiary impact beyond the secondary economic impact mentioned above. The owner of the tourism and manufacturing businesses capitalizing on the generated fund from the agricultural income is preparing to establish a hospital for poor people in the region.

2.4.3 Environmental Impact

From the inherent feature of the Project consisting only of small scale irrigation systems except the components with dam construction, there has been little negative impact on environment.

Human resettlement did not occur for the three dam construction components since no houses were located in the farmlands that were acquired.

Land acquisition for the Tilong and Pelaparado dam sites was smoothly carried out with full agreement with respective landowners. During the land acquisition for the Batu Bulan Dam construction, the process was once obstructed by a land broker who willfully purchased the original land for a speculative purpose, but it was eventually settled by providing him with a piece of alternative land in the adjacent area.



Tilong Dam, East Nua Tenggara Province

The dam is also supplying water to the water plant developed under the Project and contributing toward the increased diffusion of potable water among the villages in the area.

2.5 Sustainability (Rating: a)

1. Institutional Structure for O&M

The share of responsibility of O&M in terms of financing and tasks undertakings is set according to the following multiple criteria, but the actual practices do not strictly obey those rules which are flexibly applied in accordance with actual capacity of each agency.

(1) Size of irrigation area
- Over 3,000 ha
- 1,000 ~ 3,000 ha
- Under 1,000 ha

(2) Kinds of canals
- Main canals
- Secondly canals
- Tertiary canals

(3) Kinds and magnitude of maintenance works
- Operation
- Routine and simple maintenance
- Heavy maintenance

The following matrix table shows the share of responsibility under the new Balai system started in January 2007.

Table 7: Structure of Operation & Maintenance of Irrigation Systems under BALAI Irrigation Management

Irrigation Area	Type of O&M Works	Main Canals		Secondary Canals		Tertiary Canals	
		Fund Source	Undertaking Authority	Fund Source	Undertaking Authority	Fund Source	Undertaking Authority
> 3000 ha	O	National Budget	Balai	National Budget	Balai	Water Users Fee	Water Users Association
	R	National Budget	Balai	National Budget	Balai	Water Users Fee	Water Users Association
	H	National Budget	Balai	National Budget	Balai	Water Users Fee (Subsidy from National Budget if Unaffordable)	Water Users Association Balai
1000～3000 ha	O	Provincial Budget	Provincial Irrigation Office	Provincial Budget	Provincial Irrigation Office	Water Users Fee	Water Users Association
	R	Provincial Budget	Provincial Irrigation Office	Provincial Budget	Provincial Irrigation Office	Water Users Fee	Water Users Association
	H	Provincial Budget	Provincial Irrigation Office	Provincial Budget	Provincial Irrigation Office	Water Users Fee (Subsidy from National Budget if Unaffordable)	Water Users Association Provincial Irrigation Office
< 1000 ha	O	Kabupaten Budget	Kabupaten Irrigation Office	Kabupaten Budget	Kabupaten Irrigation Office	Water Users Fee	Water Users Association

	R	Kabupaten Budget	Kabupaten Irrigation Office	Kabupaten Budget	Kabupaten Irrigation Office	Water Users Fee	Water Users Association
	H	Kabupaten Budget	Kabupaten Irrigation Office	Kabupaten Budget	Kabupaten Irrigation Office	Water Users Fee (Subsidy from National Budget if Unaffordable)	Water Users Association Kabupaten Irrigation Office

Note
O: Operation
R: Routine maintenance and light repair works
H: Heavy maintenance works

(The table shows share of responsibility according to the rules and regulation, but are flexibly applied in practice reflecting own conditions in relevant regions)

The routine maintenance works mainly consist of weeding embankments, cleaning and dredging canals, etc. which are technically doable by farmers with simple tools. In case of heavy or complex maintenance which requires physical replacement of equipment and is beyond the farmers' technical and financial capability, relevant regional governments or Balai are involved employing local contractors if necessary.

2. Rates of WUA (Water Users Association) Formulation and Irrigation Fee Collection

The consulting services include in their terms of reference (TOR) assistance to organize WUAs who institutionally undertake operation & maintenance works of downstream irrigation canals. They have successfully attained 100% WUA organization except systems still under preparation. On the other hand, the collection rate of irrigation fee is not satisfactorily enough: 22% for Water fee, 35% for Member fee.

3. Practical Side of O&M in the Field

The institutional structure officially prepared for the O&M system of irrigation is not always followed in practice as it is supposed to work because of its administrative complexity and insufficient and inefficient fund allocation. The Balai system started in January 2007 has revived national participation into regional irrigation management, and it has a back-current feature from the decentralization which had been progressing since the end of the 1990s. The Balai system is basically a tool of the national administration of regional affairs on a river-basin basis. A Balai is organized as a local agency of the central government with extended administrative coverage which covers several Kabupaten and often goes across the provincial boundaries. Though it has not been operationally mature yet, the Balai management is expected to facilitate more efficient administration of thus complex irrigation O&M practices with better coordination among the regional and central

authorities and with smoother fund supply.

WUA fees, as a fund for O&M works to be performed by WUAs, are not stably collected throughout the sub-projects, however, irrigation facilities under the Project are mostly well maintained and effectively operated according to the field observation concurrently conducted with the beneficiary survey. Generally, the irrigation fees have not yet been institutionalized as a source of O&M, instead, the farmers are willing to donate fund and volunteer labor services on an ad hoc basis if need be for necessary operation and maintenance works. As have been discussed in preceding sections, the economic and social effect is so significant that resultant farmers' incentive could drive them to willingly conduct O&M tasks informally to supplement weaknesses of the official systems. Irrigation systems in most developing countries tend to be trapped in a vicious circle: "Poor O&M" → "Physical and Functional Deterioration of Irrigation Facility" → " Unsatisfactory Irrigation Services" → " Discouragement of Farmers Participation in O&M" → "Poor O&M." In contrast, there seems to be a favorable circle prevailing in the irrigation systems developed under the Project in general.

3. Feedback

3.1 Lessons Learned

The Project aimed at contributing to alleviate poverty in the Eastern Indonesia which is one of the poorest areas of the country. The Project is judged successful with substantial benefit to raise the farmers' income through agricultural production increase in the region. The Ex-post evaluation confirmed the statement of PCR that the project benefit has turned out to be more than what had been originally targeted. The considerably higher result in EIRR than the one originally estimated at the appraisal objectively represents this fact. The key factor of success was a holistic approach comprising the following efforts:

1. Comprehensive management embracing the whole project cycle

The Project established and conducted comprehensive whole-cycle project management covering "sub-project finding and formulation," "study for implementation," "designing," "implementation management," "institutional development," "performance monitoring" and "aftercare and feedback." The Project also promoted consensus and active participation of potential beneficiaries in these processes.

2. Comprehensive agricultural development

To support agricultural productivity increase in comprehensive manner, the Project introduced flexibly new method of rice production (SRI: System of Rice Intensification) and other agricultural techniques in order to improve the effectiveness of the irrigation

systems. Rural development sub-projects partly involved in the Project also made the Project effective.

3. Combination of hardware (physical) and software (managerial) development

The combined development efforts involving hardware component (water resource development, rehabilitation of irrigation systems and so forth) and software component (organization and functional strengthening of WUAs, O&M training, extension works, human resource development and so forth) strongly support self-enhancing productivity increase on a sustainable base.

3.2 Recommendations

1. As stated in the section of "Sustainability," the O&M practices are not systematically carried out in terms of that; (1) the official institutional structure of the O&M system is not appropriately followed in practice as it is supposed to work, and (2) the O&M expenditures are not systematically financed by the fund collected as WUA fees. The field survey in this Ex-post evaluation found that the facilities observed in the fields were generally well maintained and operated, but they were maintained not on an institutional but on ad hoc basis in a practical way.

The conditions of the facilities are well maintained mainly due to voluntary support by beneficiary farmers who have an incentive in maintaining project effects. In order to establish a more stable body, however, the O&M practices in the future should be more systemized.

2. To maintain the good practices of the Project performance on a stable and long-run base, the government capacity to effectively and sustainably utilize the institutional and human resources developed under the Project should be enhanced. In particular, the managerial capacity building of the SNVT (Stuan Kerja Non Vertikal: Non-vertical Working Unit)[10] and other key agencies under the Balai system should be conducted in the succeeding projects of DISIMP (Decentralized Irrigation System Improvement Project).

[10] SNVT is a subordinate agency at the provincial level under the Balai System. It carries out improvement and O&M of irrigation facilities under the central budget.

Comparison of Original and Actual Scope

Items	Plan	Performance
1. Output	New Dam: 3 dams New Weir: 1 weirs New Groundwater Well: 250 wells Total Irrigation Area: 16,059 ha	New Dams: 3dams New Weir: 7 weirs Rehabilitated Weir: 5 weirs New Groundwater Well: 310 wells Total Irrigation Area: 60,342 ha Water Supply System: 2 systems Rural Development: 6 provinces
2. Period Loan Agreement Consultant Selection Consulting Service Land Acquisition Civil Work, Equipment Procurement	Jan. 1998 ~ Mar. 2002 (50 months) Nov. 1997 Dec. 1997~Jun. 1998 Jul. 1998~Mar. 2001 Middle of 1997~Dec. 1998 Jul 1998~Mar. 2001	Jan. 1998 ~ Dec. 2004 (84 months) Nov. 1997 Dec. 1997~May 1998 Jun. 1998～Mar. 2002 Beginning of 1998~Dec. 2001 July 1998~Dec. 2004
3. Cost Total (Yen loan amount) Exchange Rate	22,268 million yen (16,701 million yen) Rp. 1 = 0.052 yen (as of 1997)	21,183 million yen (16,008 million yen) Rp. 1 = 0.013 yen (Weighted average during project implementation)