

Ex-Post Evaluation of Japanese ODA Loan Project
“Way Sekampung Irrigation Project (I) (II) (III)”

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1. Project Description



Location of the Project Site



Tertiary Irrigation Canal

1.1 Background

The basin of Way Sekampung River in Lampung Province located in southern Sumatra is a settlement developed by immigrants from mainly from Java and Bali islands, where the irrigation systems were first developed by the then Dutch colonial government in the 1930s. After the construction of Argoguruh Weir in 1935 to supply water to the first immigrants in the Metro area, the irrigation development of the river basin proceeded until 1963 with rather long suspension by World War II in its way. The feasibility study for the water resource development in the river basins of Way Sekampung and adjacent Way Seputih Rivers was completed in 1978 assisted by the U.K., in which the construction of Batutegi Dam upstream Way Sekampung River was proposed to support water scarcity in dry seasons as well as the rehabilitation of the existing irrigation facilities. The rehabilitation and agrarian development was continued afterward in the World Bank’s “Irrigation X Project,” and under the assistance of Asian Development Bank and European Union (EU). In 1981, the “Definite Plan” of the World Bank for the Batutegi Dam construction and extension of the irrigation area was prepared, and then the detailed design of the dam was completed based on that plan. However, the prevailing economic stagnation at the time obliged the government to totally postpone implementation of large-scale irrigation projects. Additionally, partly due to the change of the World Bank’s priority in assistance, this project was virtually suspended. Eventually however, the recognition of the constant needs for new irrigation development revived from the aspect of rice self-sufficiency and regional development and the government came to request Yen-loan assistance from Japanese government in 1991.

1.2 Project Outline

The objective of this project is to respond to the growing rice demand by constructing Batutegi Dam and developing irrigation systems covering 12,000 ha in the Way Sekampung Area in Lampung Province, Sumatra Island, thereby contributing to the farmers' income increase and creation of job opportunities. The project also included an objective to cope with growing power demand by constructing a power station that utilizes water resources of the Batutegi Dam¹.



Batutegi Multipurpose Dam

The second tallest rock-fill dam in Indonesia
constructed under this project



Argoguruh Weir

Constructed in 1935 and rehabilitated under
this project

Approved Amount/ Disbursed Amount	(I)7,653 million yen (II)16,210 million yen (III)9,216 million yen(Total) 33,079 million yen / (I)7,467 million yen (II)11,451 million yen (III)9,148 million yen (Total) 28,067 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	(I) September 1992 (II) November 1994 (III) January 1998 / (I) October 1992 (II) November 1994 (III) January 1998
Terms and Conditions	(I) Interest Rate: 2.6% Repayment Period: 30 years (Grace Period: 10 years) Conditions for Procurement: General Untied (LDC Untied for Consulting Service Portion) (II) Interest Rate: 2.6% Repay-

¹ Batutegi Dam has a multipurpose function including hydraulic power generation. The power generation portion except for the civil works of the plant building was detached from this project to comprise a separate Yen Loan project entitled "Multipurpose Dam Hydroelectric Power Plants Project" with two other hydroelectric power stations attached to respective multipurpose dams under different Yen Loan schemes; namely, Wonorejo in West Java and Bili-Bili in South Sulawesi. The project is implemented by the national power company PLN, and its ex-post evaluation has already been completed. Please refer to the evaluation report on the JICA web-site.

	<p>ment Period: 30 years (Grace Period: 10 years) Conditions for Procurement: General Untied (III) Interest Rate: 2.7 % (2.3% for Consulting Service Portion) Repayment Period: 30 years (Grace Period: 10 years) Conditions for Procurement: General Untied</p>
Borrower / Executing Agency	<p>Republic of Indonesia / Directorate General of Water Resources, Ministry of Public Works</p>
Final Disbursement Date	<p>(I) December 2003 (II) December 2003 (III) February 2007</p>
Main Contractor (Over 1 billion yen)	<p>(I) Taisei Corporation(Japan), Noell Stahl - Und Maschinenbau GMBH (Germany) • PT. Wijaya Karya (Indonesia) (JV), (II) RSEA(Taiwan), (III) PT. Adhi Karya (Indonesia), PT. Pembangunan Prumahan (Indonesia), PT. Waskita Karya (Indonesia)</p>
Main Consultant (Over 100 million yen)	<p>(I) Nippon Koei (Japan)/PT. Barunadri Engineering Consultant (Indonesia)/PT. Gamma Epsilon (Indonesia)/PT. Indah Karya (Indonesia)/PT. Indra Karya (Indonesia) (JV), Nippon Koei (Japan)/Sinotech Engineering Consultant (Taiwan) (JV), (II) None (III) Nippon Koei (Japan)</p>
Feasibility Studies, etc.	<p>“Feasibility Study on Way Seputih and Way Sekampung Basins Development” Department for International Development, 1978</p> <p>“Definite Plan for Construction of Batutege Dam and Expansion of the Existing Irrigation Area” World Bank, 1981</p> <p>“Detailed Design for Batutege Dam and Hydroelectric Power Plant” World Bank, 1983</p> <p>“Feasibility Study for Rumbia Irrigation Project” World Bank, May 1983</p>

	“Special Assistance for Project Formation: Way Sekampung Irrigation Development Project” OECF, December 1991
Related Projects (if any)	JICA “Multipurpose Dam Hydroelectric Power Plants Project”

2. Outline of the Evaluation Study

2.1 External Evaluator

Masami Sugimoto, Representative Director, Certified Public Accountant (C.P.A.), SHINKO Overseas Management Consulting, Inc.

2.2 Duration of Evaluation Study

Duration of the Study: September 15, 2009 – July 30, 2010

Duration of the Field Study: November 25, 2009 – December 10, 2009

February 24, 2010 – March 11, 2010

2.3 Constraints during the Evaluation Study

- (1) Since the Project Completion Reports (PCRs) for the (I) and (II) phases were not submitted to JICA, all the necessary data and information for the evaluation of the said portion had to be collected from scratch in the field, which hindered efficient execution of the ex-post evaluation study. (The ex-post evaluation should be conducted efficiently in such a way that the work starts with an initial analysis of the contents of PCR to grasp basic data and information required for the evaluation, which are to be confirmed and supplemented by additional information collected in the field study conducted in the next stage.)
- (2) The total project cost was unknown because the cost of the non-eligible project expenditures is not available in the project accounting.

3. Results of the Evaluation (Overall Rating: B)

3.1 Relevance (Rating: a)

3.1.1 Relevance with the Development Plans of Indonesia

3.1.1.1 Relevance with the Development Plans at Appraisal

The objectives of the Fifth National Development Plan of Indonesia (REPELITA V, 1989 ~ 1993) were “Stable Food Supply (especially Rice Self-sufficiency)” and “Equalization of Regional Disparity,” and the “Intensification,” “Extension,” “Diversification” and “Rehabilitation” of the agriculture sector are the major strategies to achieve them. Those were inherited in principle to the following sixth National Development Plan (REPELITA VI, 1994 ~ 1998). On the

other hand, the power sector was aiming at improving power supply reliability and power development in line with the policy to get rid of the prevailing oil dependency based on regional resource endowments throughout the country, and it was an urgent issue to develop potential hydropower resources coupled with construction of coal-fired thermal power plants to supply base-load electricity demand. The irrigation and power development by this project was therefore highly expected under those strategies.

The irrigation sub-sector was to tackle the targeted policy issues above by implementing the following programs: (1) irrigation rehabilitation programs mainly in Java island to support agricultural intensification and diversification, (2) development of new irrigation systems to expand irrigated area mainly in outer-Java islands to contribute toward maintaining rice self-sufficiency, production increase of other crops and consequent equalization of the regional disparity, and (3) “marshland development” to contribute to farmland extension and diversification. From the viewpoint of rectifying regional imbalance, the development of Lampung Province where almost 70% of the regional population depend on agriculture should be prioritized. The targeted policy for national rice self-sufficiency also expected many contributions from this project which aims at increased efficiency of the existing irrigation facilities as well as the expansion of total irrigation area.

3.1.1.2 Relevance with the Development Plans at Ex-post Evaluation

Newly started National Medium-term Development Plan (RPJMN, 2010~2014) sets forth “Food Security” as the fifth of the eleven national priorities for execution with sub-goals: (1) competitive power enforcement of agricultural products, (2) farmers’ income increase and (3) 3.7% growth of the agricultural sector during the plan period preserving environment and natural resources. In order to achieve the above targets, RPJMN intends continuing enhancement of the irrigation sector by implementing 129,380ha new development, 1,340,000ha rehabilitation and 2,315,000ha operation and maintenance of the existing systems.

3.1.2 Relevance with the Development Needs of Indonesia

3.1.2.1 Relevance with the Development Needs at Appraisal

The targeted rice production increase in Lampung Province during REPELITA VI was about 300,000 ton occupying about 5.9% of the total national target, in which the volume of rice production in the Way Sekampung area in 1991 was estimated at about 325,000 ton, 20% of the Lampung Province: both were supposed to play important role in attaining the overall targets. In this connection, the targeted irrigation development in Lampung Province was 48,000 ha, 9.6% of the national total. On the other hand, in the power sector, Lampung Province belongs to the Region IV of the national power company PLN, whose electric demand in 1990 consisted of 40% from industry, 43% from domestic and 8% from commercial requirements with total power consumption of 686.6 MVA (contract capacity) and power generation of 967.7 GWh. Under that condition, PLN forecast growth of annual power demand at 3% corresponding with the rate of

regional population growth.

3.1.2.2 Relevance with the Development Needs at Ex-post Evaluation

The long-term provincial development plan of Lampung Province puts continued importance on agriculture as a regional key industry and stresses requirement for improving productivity and quality of its products. Therefore the needs for irrigation development and improvement are constantly high coupled with the water resource development and management. The Way Sekampung river basin area including the sites of this project (Bekri and West Rumbia) is a settlement developed by domestic immigrants from outer islands (mostly from Java) but the water supply gap has been so serious that the water supply from the Batutegi Dam and the irrigation systems of this project are badly needed.

3.1.2 Relevance with Japan's ODA Policy

The Japan's Medium-term Policy on Official Development Assistance (ODA) 1999 enacted based on the ODA Charter in 1992 announces in the section for "Responding to Global Issues (3) Food" standing on the objective to achieve global food security agreed in the World Food Summit 1996 that it is important for poverty alleviation and self-sustained development to support the food-agriculture sector and rural development, and expresses intention to support irrigation development and other agricultural infrastructure improvement.

This project has been highly relevant with the country's development plan, development needs, as well as Japan's ODA policy; therefore its relevance is high.

3.2 Efficiency (Rating: b)

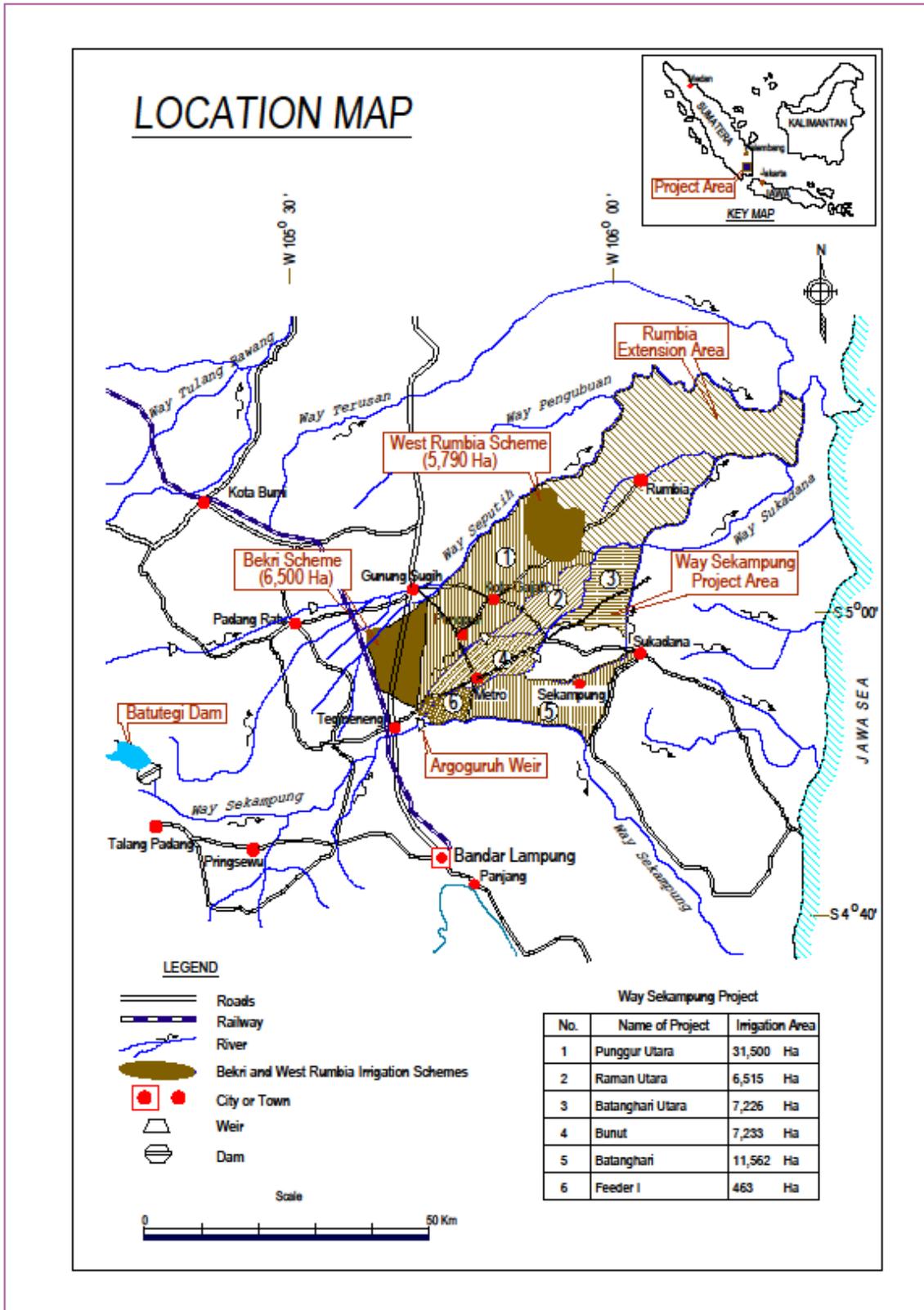
3.2.1 Project Outputs

This project implements civil works, procurement of operation & maintenance equipment and consulting services in order to construct Batutegi Dam (Rock-fill Dam, 120 m high) and to develop irrigation systems and farmland in two areas, Bekri and West Rumbia, in the Way Sekampung river basin. The project is divided into three phases: (I) Preparation works and consulting service for the dam construction, (II) Main construction work of the dam and (III) Civil works for new irrigation systems, procurement of operation & maintenance equipment, farmland development and consulting services for the irrigation portion. Each phase is composed and financed by separate Yen loans.

Actual outputs of the dam and irrigation components have no significant difference from the original plan except the following items.

(Major points of difference)

1. A 0.3MW mini-hydro power generation facility was added to supply electricity to the dam management building and staff residence. (construction cost: 157 million yen)



2. Man-months of the first phase consultancy were significantly increased from 1,599 Man-months to 2,946 Man-months due to the following requirements.

- (1) Additional period for the supervision works due to the extension of the dam construction pe-

riod.

(2) Additional works for the detailed studies on the feasibility of the irrigation water supply to the Rumbia Extension area and on the overall water utilization of the water resources in the river basins of Way Sekampung and Way Seputi².

3. The following works are added to the planned outputs of the phase (III)

(1) Concrete lining of the primary canals in the Rumbia irrigation system (21.8km)

(2) Establishment of the Model Tertiary Facilities (MTF)

For the total enhancement of the Water Users Association (P3A) newly established, ten each, totally twenty pilot P3As were selected as MTF and provided with special assistance in terms of facilities and management training.

(3) Rehabilitation of Argoguruh Weir

Overage Argoguruh Weir established in 1935 was rehabilitated to revive its function.

(4) Man-months of the third phase consultancy were increased due to the following requirements.

a) Additional period for the supervision works due to the extension of the construction duration.

b) Additional work volume for (1) ~ (3) tasks.

3.2.2 Project Inputs

3.2.2.1 Project Period

Under the initial plan, the total project period was from October 1992 to December 2003 (135 months), but the actual project period was from October 1992 to February 2007 (173 months) including the following extension of the loan disbursement periods, which turned out 28% longer than planned.

Table 1 : Extension of Loan Disbursement Periods

Phase (Loan No.)	Original Deadline	Extended Deadline	Extended Months
Phase (I) (IP-387)	November 5, 2001	December 15, 2003	25 Months
Phase (II) (IP-423)	December 15, 2000	December 15, 2003	36 Months
Phase (III) (IP-498)	February 25, 2005	February 25, 2007	24 Months

Main causes of the delay and approximate prolonged months are as follows respectively.

(Batutegi Dam)

² This project area is a settlement accepting immigrants mainly from Java and Bali islands in accordance with the government's transmigration policy. Irrigation development in the Rumbia Extension area under this project was cancelled by the Special Assistance for Project Formation (SAPROF), JBIC. However it is against the government's prior commitment to the immigrants there and the people's desire for the water could not be disregarded. In addition to that, the project lacked comprehensive master plan for water resource and its utilization. Therefore an overall study on water endowment and utilization within the basin of both rivers was requested by the government.

- (1) Delay in contracting with the tunnel works contractor. (4 months)
 - (2) Remarkable delay in tunnel works due to climatic and geological conditions and change of method of construction. (1.5 years)
 - (3) Delay in construction of dam and power house due to the significant delay in river diversion. (10 months)
 - (4) Increased volume of excavation and concrete works because of geological reason, and overall construction delay in dam works due to slowed down procurement process affected by the economic crisis in 1997. (6 months)
 - (5) The compound delay above prolonged the time of gate closure (commencement of impounding) to the wet season, which forced the gate closure to wait until the dry season (May 2001) for safety reasons.
- (Irrigation Facilities)
- (6) Farmers requested changes in canal and drainage construction plans, which took time to reach final agreement.
 - (7) Cassava planting in the project site by some of the farmers prevented the scheduled construction works.
 - (8) Extension of construction period due to the 1,100 ha additional land development.
- (In total an 18-month delay due to the reasons (6) (7) (8))

3.2.2.2 Project Cost

Planned project cost was 40,442 million yen (of which eligible cost portion was 34,371 million yen), and the project cost of the eligible portion at the time of ex-post evaluation was 28,816 million yen (of which Japanese ODA loan was 28,067 million yen), 84% lower than planned. Reliable actual project cost in total was unavailable because the amounts of the non-eligible expenditures (administration cost, tax & duty and land acquisition cost) were not properly recorded in project accounting under the project accounting system of the executing agency. In spite of the implementation delay as well as the actual outputs more than planned, the amount of the eligible project cost was saved within the plan. It is mainly due to the successful reduction of total payment through efficient procurement with reasonable prices through fair price competition under international and local competitive bidding, secondly due to the significant depreciation of Rupiah currency (about 80% depreciation against the rate at Appraisal) brought by the Asian currency crisis in 1997.

Although the project cost of the eligible portion was lower than planned, the project period was longer than planned; therefore efficiency of the project is fair.

3.3 Effectiveness (Rating: a)

3.3.1 Quantitative Effects

3.3.1.1 Results from Operation and Effect Indicators (Increase in Planted Area and Production of Rice)

For effect indicators of irrigation, the Regional Technical Implementation Unit (UPTD) under the Provincial Directorate of Public Works takes statistics of planted area and production of rice in Bekri and West Rumbia irrigation areas³. The following table shows the annual figures from 2006 after the establishment of the irrigation systems under this project.

Table 2 : Planted Area and Production of Rice in the Irrigation Areas Developed under This Project

Irrigation Area	Rice Planted Area (ha)				Annual Rice Production (Ton)			
	2006	2007	2008	2009	2006	2007	2008	2009
Bekri	2,857	3,187	no data	no data	14,285	19,122	no data	no data
West Rumbia	1,288	2,362	3,191	4,956	5,152	10,795	16,274	27,754
Total	4,145	5,549	no data	no data	19,437	29,917	no data	no data

(Source) : Produced from UPTD data

The level of field operation of monitoring systems in respective areas is different. Actual performance of rice production and related statistics is regularly taken and monitored in West Rumbia, while in Bekri, although the figures are being collected also by UPTD, it is not so systematic that the figures of 2008 and 2009 have not been taken yet at the time of the study visit, and the statistics themselves seem to be relatively unreliable. However, the planted area and production of rice have been undoubtedly increasing, at any rate, after this project. Additionally, considering the fact that there used to be little rice production in the two areas before this project, it can be concluded that the advent of rice production in these areas represents the direct effect of this project.

In addition to the agricultural figures directly taken in the benefited areas (double benefit areas) above, the realization of the project effect could be also observed from available BPS (Central Bureau of Statistics) agricultural statistics.

“Bekri” and “West Rumbia” are the names of the irrigation systems which extend to five Kecamatan (sub-districts) of Kabupaten (district) Lampung Tengah in Lampung Province.

The following table compares the increase of planted areas of rice and “parawija” (secondary crops other than rice, like maize, soybeans, peanuts, etc.) and rice production of five benefited Kecamatan to which Bekri and West Rumbia irrigation areas belong (benefited Kecamatan) with other 48 non-benefited other Kecamatan in Kabupaten Lampung Tengah. The figures in

³ Both areas belong to Kabupaten (district) Lampung Tengah (Central Lampung) and include five Kecamatan (sub-districts) and 30 Desa (villages) <double benefit areas, in a sense that they are benefited by both facilities: dam and irrigation system >. On the other hand, seven Kecamatan of Kabupaten Lampung Timur (east Lampung) and City of Metro, outside the irrigation areas under this project, also enjoy water supply from Batutegei Dam <single benefit areas, in a sense that they are benefited only by dam.>.

each column show multiples of the level at 2002 before this project. The rate of increase of the paddy area in the benefited area are double of those of the non-benefited area, and other way around for Parawija, which indicates that conversion from parawija to paddy has been proceeding in the benefited area. The figures of rice production also show a similar but not so conspicuous trend.

The two benefited areas are newly developed irrigation areas under this project and used to cultivate cassava and other kinds of parawija with almost no rice cropping. According to the hearing from the farmers and UPTD officials, they have not yet become accustomed to rice cultivation and still at the stage of practicing trial and error in improvement and technical learning at the moment. Coupled with the factor that it should take five to ten years until the effect of the new irrigation could penetrate newly cultivated fields, the project effect on the rice production has not been fully crystallized.

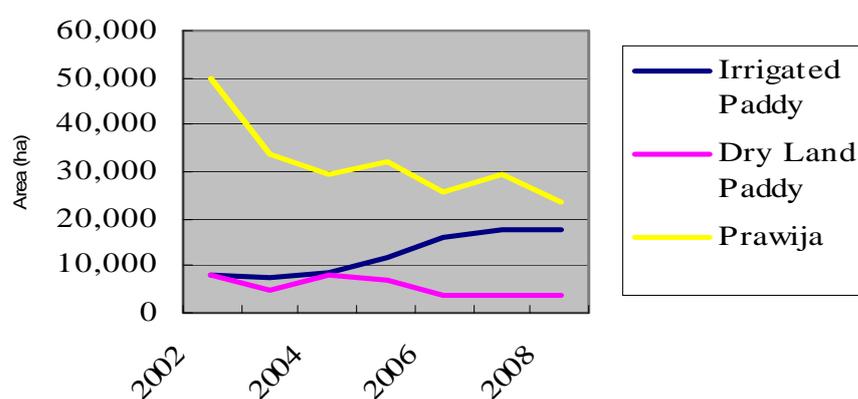
Table 3 : Comparison between Benefited and Non-benefited Areas

	Increase of Planted Area				(3) Increase of Rice Production	
	(1) Paddy		(2) Parawija		Benefited Kecamatan	Non-benefited Kecamatan
Year	Benefited Kecamatan	Non-benefited Kecamatan	Benefited Kecamatan	Non-benefited Kecamatan		
2004	1.07	1.08	0.6	1.04	1.07	0.96
2008	2.24	1.24	0.48	1.12	1.37	1.24

(Source) : Produced from “Kabupaten Lampung Tengah dalam Angka, BPS”

The next figure shows the annual trend of the planted areas in the benefited areas. It illustrates the increasing trend of conversion from the cultivation of parawija to paddy in line with the irrigation development under this project especially from around the year 2005 when the irrigation development and farmland preparation has started.

Figure 1: Trend of Planted Areas



3.3.1.2 Results of Calculations of Internal Rates of Return (IRR)

The analysis at the project appraisal calculated Economic Internal Rate of Return (EIRR) based on the assumptions below including the portion of hydroelectric power station which was detached later as a separate project and concluded that the rate of return is enough to economically justify this project.

Table 4: Assumptions and Result of EIRR Calculation at Appraisal

Project Life	50 years after commencement of project implementation
Economic Cost	<ol style="list-style-type: none"> 1. Construction Cost (Total cost including power station portion) 2. Operation & Maintenance Cost (Rp. 3,951million per annum) 3. Replacement Cost (Rp. 31,564 million after 25 years from commencement of implementation)
Economic Benefit	<ol style="list-style-type: none"> 1. Irrigation Benefit (Incremental revenue from rice production) 2. Hydroelectric Power Generation Benefit (Saved amount of diesel oil consumption) 3. Flood Control Benefit (Improvement in cropping intensity in wet seasons by avoidance of flood damage) 4. Inland Fishery Benefit (Estimated haul) 5. Minus Benefit from Farmland Submergence by Dam Construction)
EIRR (Estimation at Phase (III) Appraisal)	10.3%

Due to the fact that the reliable actual project cost in total was unavailable because the amounts of the non-eligible expenditures are not properly recorded in the project accounting, as mentioned in section 3.2.2.2 above, analysis for the internal rate of return was not possible.

3.3.2 Qualitative Effects

3.3.2.1 Flood Control

Pringsu area, located in the river basin of Way Bulok and one of the tributaries of Way Sekampung River, is irrigated in a 3,200 ha paddy field. The area used to suffer damage from floods almost every year before this project. However, the effect of Batutegi Dam on flood control is so significant that flooding hardly occurs thereafter.

3.3.2.2 Inland Fishery

Though inland fishery in the Batutegi Dan reservoir has not been carried out as a systematic business activity, carp, crucian and other edible carp-family fish are regularly caught by local inhabitants: an average haul of 300kg was recorded in 2004⁴.

3.3.2.3 Raw Water Supply

Though it was unexpected at the time of project appraisal, this project is supplying raw water to PDAM (regional water supply company) to distribute clean water to Bandar Lampung (2,000 l / second), Metro (200 l / second), the airport, Branti and other adjacent areas (50 l / second).

3.3.2.4 Enhancement of P3A through Model Tertiary Facilities

This project provided institutional strengthening services for organizing and training water users associations (P3A) in two newly developed irrigation areas in addition to the construction of trunk as well as end canals there. What is unique in this project is a pilot approach to pick out 10 excellent P3As respectively from two irrigation areas among the total new 58 P3As (Bekri 30, West Rumbia 28), invest them with physical assets consisting of warehouses, drying yards, fishery ponds and cash fruits for income generation as well as provide them with management training to infuse entrepreneurship.



Fishery Pond of MTF



Drying yard of MTF

The result of this attempt successfully took root through running cash businesses among the farmers involved and is stimulating P3As other than the MTF. Represented by the indicator of almost 100% water users fee collection, which is rarely the case in other locations in Indonesia (normally rare to reach 50% in Indonesia according to the various ex-post evaluation study results of other Indonesian irrigation projects), the motivation for production and consequent incentives for maintaining their own irrigation facilities is very high. Earnings from the cash

⁴ Source: "Pelaksanaan Pekerjaan Bendungan Batutegi Provinsi Lampung (Batutegi Dam Works in Lampung Province)" 2004

businesses are kept and invested together with the irrigation fees for the facility maintenance, which enables them to keep the canals in good condition.

3.3.3 Result of Beneficiary Survey

To reinforce the result of the UPTD's indicator monitoring and BPS agricultural statistics shown in 3.3.1.1 above, a beneficiary survey was conducted interviewing farmers and representatives of P3A in Bekri and West Rumbia irrigation areas utilizing uniform questionnaires attempting to probe the project effect for microanalysis.

3.3.3.1 Method

The survey was conducted by directly interviewing a total of 108 farmers equally picked out from the two irrigation areas avoiding biased selection. This project is a new irrigation and paddy farm development. Every farmer used to be only producing cassava, maize and other kinds of parawija with no rice at all except a few who were previously dealing with small-scale rain-fed paddy production in the Bekri area. The result of the survey is summarized as follows.

3.3.3.2 Summary of Survey Result

As for the overall conditions of agricultural production, all the respondents answered that production intensity and productivity has been increased, and among them 20% answered "remarkably increased." On the labor productivity, 89% responded "improved" (6% answered "remarkably increased"). Those responses suggest considerable contribution of this project on the reinforced agricultural production. Project effect on a



Field Interview to Farmers

profitability aspect can be also observed from the proportion of 95%, among which 36% declared "remarkably improved," of the positive answer to the question on the possibility to convert or diversify their production to more profitable crops (cf. 3.4 Impact). For the input aspect, all the respondents affirmed an increase of the kinds and volume of inputs like agricultural machines and implements, fertilizer and pesticide, which suggests the advent of a vigorous cycle in which input increase realized from the profitability improvement enables enhanced production and productivity. For the work load, a fair effect was also observed although the proportion of those who answered "lightened" was relatively smaller at 66% than the positive responses to the questions on productivity and production intensification.

This project has largely achieved its objectives; therefore its effectiveness is high.

3.4 Impact

3.4.1 Intended Impacts

3.4.1.1 Improvement in Farmers' Living Conditions

The beneficiary survey addressed in the former section also deals with the questions regarding the change of living standards of the farmers after the project. Clear answers to the money earnings have not been given by reason of their poor remembrance or unwillingness for disclosure that would lead to a meaningful result. However, the following fact was obtained from qualitative answers to alternative questions asking subjective views and general questions on the economic conditions of the villages.

In the first instance, to the question about changes in the standard of living in general being compared to the situation without the irrigation system before the project, the proportion of 41% answered "remarkably improved" and 57% answered "improved," which means 97% of the beneficiaries feel betterment of their living standard. For more specific questions on the level of children's education and family health, 100% of the respondents answered "improved" among which 40% said "remarkably improved."

Besides the direct inquiry to the farmers, the survey team asked questions on the economic situation to the heads of P3A and villages who have bird's-eye views on the general economic conditions of the region. They told facts that endorse the beneficiary survey result as follows. To begin with, cellphones and motorcycles as a means of communication and transport have come into wide use. Few people possessed cellphones before 2006 when the irrigation systems have not yet been developed under this project (cellphones were generally already popular in Indonesia then), but around three quarters of the villagers use cellphones nowadays. Now almost every household owns at least one motorcycle which used to be owned by very limited number of people before the project. The spread of these communication and transportation tools has further impacts in such away that farmers became able to have easier access to useful agricultural information, family health has improved because of possible access to medical facilities in towns and so forth. In the field of education, maximum level used to be up to a high school level before, but now some children go on to universities, which could be considered the project's positive impact on the general income increase in the region.

3.4.2 Other Impacts

3.4.2.1 Impacts on Natural and Social Environment

(1) Impacts on Natural Environment

Implementation of development projects in Indonesia must clear standards required in the environment impact assessment system (AMDAL) based on the Environment Law. The first impact assessment study was conducted during the detailed design stage by the World Bank in 1982 followed by its update in 1991 and the latest study performed during the project implementation. The project obtained final approval regarding environmental impact assessment by

AMDAL in 1999, and no negative environmental impact was reported in implementing the project.

The Project Completion Report (PCR) of the phase (III) proposes a detailed environmental management plan (only for the irrigation portion) after the project completion; however, no environmental assessment has been conducted up to the time of the Ex-post evaluation. According to the executing agency, it should be carried out though it is not required by official regulation, however, a limited budget could not allow that practice.

(2) Impacts on Social Environment (including land acquisition and resettlement)

The area of approximately 1,600 ha was to be submerged and totally about 3,000 households had to be relocated for the sake of dam construction. The phase (II) appraisal in April 1994 confirmed that the whole processes of the land acquisition, compensation for the relocating residents, and resettlement for the dam was completed without any specific hindrance. Alternative lands to relocate were prepared in areas adjacent to the dam mainly for land owners and in Mesuji F Area (an alternative land space of about 4,000 ha developed for resettlement) mainly for tenants. Most of the relocated people are reported to being satisfied with their new locations whose living conditions are better than the submerged old lands. No resettlement was needed eventually for the implementation of the irrigation part and the land acquisition was smoothly performed.

3.4.2.2 Effect on Hydroelectric Power Generation

The water resource of Batutegi Dam is also utilized as the energy source for the Batutegi Hydroelectric Power Plant which was formulated and implemented as a different yen-loan project. Although the water use of the power plant is not autonomous being subordinate to the irrigation use, the operating conditions are fair with smooth generation within the given framework⁵.

Table 5 : Performance of Batutegi Hydroelectric Power Plant in Operation & Effect Indicators

Indicator	Performance in 2008
Unplanned Outage Hours	168.4hours
Capacity Factor	23.16%
Annual Operating Hours	8,858 hours/year
Planned Outage Hours	409.0 hours/year
Maximum Water Use	364,213 m ³ /second
Net Electric Energy Production	58,016 Mwh/year

⁵ Refer to the Ex-post Evaluation Report of the “Multipurpose Dam Hydroelectric Power Plants Project” (2008) for the detail of the hydropower plant portion.

It can be concluded that the expected project impacts on farmers' income increase and resultant improvement in their living standards are recognized, and the contribution to the power generation which has been detached as a different project is also obvious. On the other side, no significant adverse impacts on the natural or social environment have been found.

3.5 Sustainability (Rating: b)

3.5.1 Structural Aspects of Operation and Maintenance

3.5.1.1 Irrigation Facilities

Operation and maintenance of the irrigation systems were handled by the "Sub Working Unit of Bekri-Rumbia Irrigation Office" for two years after completion, and then handed over to the Provincial Water Resources Service Office. The Office established 58 water users' associations (P3A) which are supposed to autonomously operate and maintain the third and other end canals.



Tertiary Canal and Watergate

Twenty MTFs (Model Tertiary Facilities, refer to section 3.3.2.4 Enhancement of P3A through Model Tertiary Facilities) developed and enhanced in the project have been functioning better than expected, not only in water management but also actively engaging in fish farming, cash cropping as well as voluntary introduction of water saving new agricultural method SRI (System of Rice Intensification) with increasing cash earning. Some farmers following SRI have successfully attained rice productivity high enough at 7.5 ton/ha. Ordinary P3As other than MTF are also judged to be well functioning in the field survey. Sense of belonging and functional reliability is also very high among the P3A member farmers.

3.5.1.2 Batutegi Dam

Operation and maintenance of the dam is performed by Tim Unit Pengelola Bendungan (Tim UPB) <Dam Operation Unit Team> of the local agency of the Ministry of Public Works⁶. Tim UPB has three sections: Upstream Operation & Maintenance, Downstream Operation & Maintenance and General Affairs with 22 permanent and 44 part-time staff under a manager and an assistant manager. Academic background of the permanent staff consists of 8 graduates of higher education (the manager and assistant manager and three other staff members hold

⁶ Balai Besar Wilayah Sungai Mesuji Sekampung (BBWS) <Balai Besar for Mesuji Sekampung River Basin>

post graduate degrees), 7 high school and 6 not-exceeding secondary school graduates.

3.5.2 Technical Aspects of Operation and Maintenance

3.5.2.1 Irrigation Facilities

Operation and maintenance manuals including the one prepared under the project are well prepared and used in practice in the field. The Water Resources Service Office conducted training programs for 58 newly established P3As for three years from 2003. Additionally a comprehensive training scheme entitled PTGA (Pengembangan Tata Guna Air = Water Use Development Program) was provided by BBWS widely to regional government officials and managers of P3As who are involved in water resource management. PTGA is highly effective and significantly contributed to the capacity building of the P3As. The training intends to intensively provide comprehensive learning contents covering wide area including P3A's function, administration & management, financial issues, methods of water distribution, agricultural techniques, operation & maintenance of irrigation facilities and other practical knowledge and methodologies. The actual contents of training shown by one of the P3As visited were found to contain 37 learning items.

3.5.2.2 Batutegi Dam

As stated in the previous section 3.5.1.2, UPB is staffed with personnel having basic technical knowledge of operation & maintenance of dam facilities under the manager. The "Reservoir Operation & Maintenance" (including the portion of power generation) was prepared in the project. Comprehensive training including overseas courses was also conducted under the project, and some of the trainees are still engaged in the Batutegi Dam operation and maintenance. Though the technical background of managing and operating staff corresponds to the requirement, continued education and training for the present staff is not sufficiently provided afterwards. It is hoped that updated training be practiced to sustain the staff's capability for operation & maintenance.

3.5.3 Financial Aspects of Operation and Maintenance

3.5.3.1 Irrigation Facilities

For operation & maintenance of the trunk canals, funds are allocated to the provincial government from the central budget. According to the local agencies for operation and maintenance, the allocated budget was previously short by approximately 30% up to 2006, however a sufficient amount has been available since then. The end canals are operated and maintained basically by the farmers (P3A) themselves. Collection of water users' fee is almost 100%, and most of the maintenance requirement is being carried out by farmers' volunteer work gratis, and extra collection of maintenance fee is practiced as the need arises.

3.5.3.2 Batutegi Dam

Although the budget allocation from the central budget of the Directorate General of Water

Resources, Ministry of Public Works, is generally enough to finance routine operation & maintenance requirement, it hardly covers activities to cope with emerging ad hoc problems such as the replacement of damaged equipment or the removal of waterweeds flourishing on the reservoir's surface (cf. 3.5.4.2 below). Those activities must be limited within the available funds curtailing the routine operation & maintenance activities.

The Indonesian regulations⁷ require all the dams in Indonesia to conduct major inspection (Inspeksi Besar) every 5 years and to report the result to the Dam Safety Commission chaired by the Director General of Water Resources to renew the operational permit. It is almost time for the inspection of Batutegi Dam, however it has not yet been prepared because of the funding constraint. Prompt arrangement of the budget and a start for preparation is highly needed. The overall shortage of funds for the dam maintenance requirement was found, however, it has not been the case that it hinders routine dam operation.

3.5.4 Current Status of Operation and Maintenance

3.5.4.1 Irrigation Facilities

1. The operation & maintenance of the end canals is well performed with P3As' high level of consciousness and willingness; however the trunk canals have been plagued by theft of water gates and other iron parts of the facilities in the secondary canals in Bekri area. Now more than half of the secondary-canal water gates became non-functional. As efforts by the farmers themselves including periodic watch for crime prevention has been ineffective, it is necessary to resort to the police force to expose the crime and arrest the thieves.
2. Elevated ferroconcrete tertiary canals are installed in some parts of both Bekri and West Rumbia irrigation areas to save the area of land acquisition, and some of the facilities have already deteriorated before their duration period (about 30 years). However, they are repaired with the P3A's own budget and an additional maintenance budget has been prepared by the regional government for the future requirement from further deterioration.

3.5.4.2 Batutegi Dam

1. Significant portions of the dam instruments have been out of order. Due to a lack of its own budget, BBWS expects financial assistance from the World Bank dam rehabilitation project "Dam Operational Improvement and Safety Project (DOISP)," however the possibility is not so favourable because of the reduction of the project budget and its situation with lower significance compared to other candidate dams. Taking account of the case of failure, the D.G. Water Resources, Ministry of Public Works should arrange the necessary budget for the replacement.
2. Waterweeds which appeared in 2009 have been growing fast and now cover almost 70% of

⁷ Government Regulation: PP No. 37 2010 regarding "Dam" Article 145 Clause 4, and Ministerial Regulation of the Ministry of Public Works: Permen No. 72, 1997 Regarding "Safeguard of Dam"

the water surface. It has not been proved directly obstructive to the dam operation but can not be ignored. BBWS tries to remove them but it is burdensome. After a two-day attempt in 2009 investing manpower of totally 300 people and 3.1 million rupiah with the 71 ton outcome, it gave up to continue because no significant improvements were attained. BBWS resumed from the beginning of 2010 and made other efforts to exchange information with other reservoirs faced with similar troubles. It also prepared out-sourced research to analyse the cause and seek effective countermeasures.

Some problems in technical and financial aspects have been observed in terms of the budget insufficiency to cope with ad hoc maintenance issues; lack of continuing staff training for Batutege Dam; and obstructed water distribution from control gates lost by theft in Bekri area. Therefore sustainability of the project is fair.



Rice Planting in West Rumbia

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project is highly relevant with the country's development plan and needs, being consistent with the Indonesian national development as well as the regional development plan of Lampung Province that place continued emphasis on agriculture to support food security. The efficiency is fair due to the delay in project implementation, while the effectiveness is high, introducing rice cropping and promoting diversification to more profitable agricultural crops including rice, and thereby contributing improvement in farmers' income and living standards. Some problems have been observed in terms of financial and facility maintenance aspects, therefore sustainability of the project is fair.

In light of the above, this project is evaluated to be satisfactory.

4.2 Recommendations (To Executing Agency)

1. Intensive P3A capacity strengthening training on a pilot approach on MTF was highly effective. The strengthened function, especially the mind for business and management should be actively disseminated to other P3As.
2. It is already the time for Batutege Dam to conduct a statutory major inspection. The preparation for the implementation and arrangement of budget should be promptly started.
3. The allocated budget for Batutege Dam is not sufficient enough to cover ad hoc maintenance re-

quirement like replacement of the unworkable instruments and removal of growing water weeds in the reservoir. The financial assistance of the DOISP of the World Bank is expected for the former, however, the Ministry of Public Works should arrange at least a required minimum budget from a long-term standpoint.

4. An additional budget should be assigned to conduct periodic study for the environmental impact assessment of the project.

4.3 Lessons Learned

1. This project picked out ten entities as MTF (Model Tertiary Facilities) from the newly established P3As and intensively provided training to infuse entrepreneurship as well as physical investment consisting of warehouses, drying yards, fishery ponds and cash fruits. Business knowhow provided in this attempt successfully took root through running cash businesses and is stimulating other ordinary P3As. This kind of active cultivation of business sense could create a vigorous cycle, if it was given in a proper way, with enthusiasm for agricultural production, creation of constructive ideas, willingness for irrigation facilities maintenance. JICA should analyse this process and effects to extract lessons for future irrigation projects.

2. The project is implemented following the appraisal, but additional research to follow situational changes afterward as well as renegotiation to get agreement with the farmers involved delayed the project implementation with additional expenditures. The Directorate General of Water Resources should have taken participatory and other bottom-up approaches for more prudent and precise studies in advance.

3. According to the executing agency and the consultant, while the awarded contractors were technically capable, some of them lacked project management ability and this affected the smooth implementation of the project. Their core weaknesses were an operational hindrance in dealing with JICA procedures because of the poor English proficiency and a lack of knowledge of international projects. To avoid these weaknesses in future, the experience and ability on international operations should be carefully examined in the tender evaluation process.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Project Outputs	<p>(1) Batutegi Dam Rockfill Dam (Height 120m, Crest length 690m, Crest width 12m, Volume of embankment $9 \times 10^6 \text{ m}^3$), Diversion tunnel (440m), Spillway (333m) Irrigation/Power Waterway (404m), Access roads (Betterment 3.0km, Construction 4.5km, Bridges repaired 2 bridges) Project office & camps renovation & construction, Development of communication system, Irrigation outlet and powerhouse <u>(2) Irrigation system, On-farm development</u> Bekri system (6,500ha), West Rumbia system (5,790ha) Construction of main & secondary canals, Construction of on-farm system & land development <u>(3) Procurement of O&M equipment</u> <u>(4) Consulting services</u> (I) International: 1,599MM (III) International: 473MM, Local 364MM</p>	<p>(1) Batutegi Dam Rockfill Dam (Height 122m, Crest length 701m, Crest width 12m, Volume of embankment $9.64 \times 10^6 \text{ m}^3$), Diversion tunnel (440m), Spillway (333m) Irrigation/Power Waterway (404m), Access roads (Betterment 3.0km, Construction 5.5km, Bridges repaired 2 bridges) Project office & camps renovation & construction, Development of communication system, Irrigation outlet and powerhouse <u>(2) Irrigation system, On-farm development</u> Bekri system (6,500ha), West Rumbia system (5,790ha) Construction of main & secondary canals, Construction of on-farm system & land development, MTF <u>(3) Procurement of O&M equipment</u> <u>(4) Consulting services</u> (I) International: 2,946 MM (III) International: 268 MM, Local 1,092 MM</p>
2. Project Period	<p>(Total) October 1992 ~ December 2003 (11 years 4 months, 136 months) (I) July 1992 ~ January 2000 (II) July 1994 ~ February 2000 (III) July 1998 ~ December 2003</p>	<p>(Total) October 1992 ~ February 2007 (14 years 5 months, 173 months) (I) July 1992 ~ December 2003 (II) July 1994 ~ December 2003 (III) July 1998 ~ February 2007</p>
3. Project Cost		(Total cost unknown)
Amount paid in Foreign currency	22,050 million yen	11,259 million yen
Amount paid in Local currency	18,392 million yen (Rp.348,527)	17,557 million yen
Total	40,442 million yen	28,816 million yen
Japanese ODA loan portion	33,079 million yen	28,067 million yen
Exchange rate	(I) Rp.1 = ¥0.064 (as of April 1992) (II) ¥0.050 (as of April 1994) (III) ¥0.052 (as of April 1992)	(I) Rp.1 = ¥0.033 (II) ¥0.021 (III) ¥0.012 (Average during 1993, 2007)