Indonesia

Bili-Bili Irrigation Project

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Field Survey : Sep. 2007 - Mar. 2008

1. Project Profile and Japanese ODA Loan

Map of Project Area

Completed Primary Irrigation Canal of Bissua Irrigation Scheme

1.1 Background

The Indonesian nation lives on rice, and an increased yield of rice aiming at its self-sufficiency was one of the national priorities for a long time. Having achieved the national rice self-sufficiency once in 1984, that status could hardly be stably maintained afterward due to the sharp increase in rice consumption resulting from population and income increase coupled with countering arable land decrease in urbanized and industrialized Java which is the leading rice-growing center of Indonesia. Regionally, Eastern Indonesia to which South Sulawesi Province including the target area of this project belongs is relatively under-developed being left behind in the national economy and attracting focused development support by the government. Meanwhile, the Bili-Bili Multi-purpose Dam was constructed in 2001 with support of the Japanese ODA loan at upper Jeneverang River in the outskirts of the provincial capital Makassar (approximate population of 1.2 million)[1], and it urged the government to develop irrigation facilities to

[1] In March 2004 after the Dam completion, a large-scale landslide on Mt. Bawakaraen 35 km upstream occurred with huge volume of earth carried downstream the river. Since a part of the mud flowed into the Bili-Bili Dam, the government launched on the "Urgent Disaster Prevention and Reduction Measures" to cope with the accident for which Japan is also assisting through the ODA loan "Urgent Disaster Reduction Project." According to the project leader, however, the mud inflow to the dam does not affect the irrigation water supply under the Project in terms of water quantity and quality. Additionally, the final report in August 2005 of Hasanuddin University, which has been carrying

realize stable water supply to the regional agriculture which was one of the main goals of the dam construction project.

1.2 Objective

To increase rice production by constructing and rehabilitating weirs, primary & secondary canals and drainage, and procuring operation & maintenance equipment in South Sulawesi Province, thereby contributing to farmers' income increase in the region.

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	5,472million yen/5,403 million yen
Exchange of Notes/Loan Agreement	December 1996 / December 1996
Terms and Conditions - Interest Rate - Repayment Period - Grace Period - Procurement	 2.7％（Consulting Service 2.3%）、 30 years 10 years General Untied
Final Disbursement Date	December 2005
Main Contractors (over 1 billion yen)	Hazama(Japan) / Pt. Brantas Abipraya(Indonesia) (J/V)
Consulting Services (over 100 million yen)	CTI Engineering, Co. Ltd. (Japan)
Feasibility Study(F/S), etc.	Lower Jeneberang River Flood Control Project in 1981, JICA

2. Evaluation Result (Rating: B)

2.1 Relevance (Rating: a)

2.1.1 Relevance at the Time of Appraisal

The 6th Five Year National Development Plan (REPELITA VI), 1994~1998, attached importance on the agricultural development of Eastern Indonesia in terms of (1) production increase of rice and other agricultural crops, (2) development of

out periodical environmental impact assessment, concludes that the water quality is suitable for irrigation.

frontier arable land instead of already densely cultivated Java Island and (3) alleviation of poverty in underdeveloped regions in Indonesia. As for the irrigation sector development, measures to (1) strengthen irrigation and drainage operation & maintenance (O&M), (2) promote participation of regional governments and farmers in O&M of irrigation facilities, (3) rehabilitate existing irrigation systems and (4) develop new irrigation systems were to be implemented under the "Irrigation Development and Management Program." South Sulawesi Province where the Project site is located occupied 29% of the total population and 55% of the total rice production in Eastern Indonesia, therefore the Project carried high importance being expected to render significant contribution toward increase of rice production and farmers' income in the region.

2.1.2 Relevance at the Time of Evaluation

The "Medium-Term National Development Plan (Rencana Pembangunan Jangka Menengah Nasional : RPJM-N) <2004-2009>," points out unsolved weaknesses still prevailing in the Indonesian agriculture sector which accounts for 46.3% of the labor force, 6.9% of the non-oil/gas export value and 15% of GDP in the national economy, and stresses continued importance of the sector's revitalization. As for rice production, Indonesian staple diet, minimally 90% self-sufficiency is targeted among other objectives. As Eastern Indonesia including South Sulawesi Province is relatively underdeveloped in the national economy, RPJM-N places the region's development as one of the most prioritized issues to be overcome.

In line with the "Food Security" and "Increasing Farmers' Welfare" Programs under RPJM-N, the "Development and Management Programs of Irrigation and Drainage Networks and Marsh/Ponds" and "Rehabilitation and Maintenance of Water Resources for Agriculture Program" are under way in the irrigation sector to promote arable land expansion and agricultural production increase. Under those national development programs, the departmental medium-term Strategic Plan (RENSTRA: Rencana Strategis) 2005-2009 of the Directorate General of Water Resources, Ministry of Public Works, indicates the national target of 26 million ha irrigation rehabilitation within the period, in which this Project plays a part. The share of rice production in South Sulawesi in 2005 accounts for 54% of the total rice production in Eastern Indonesia, therefore the Project is expected to contribute toward the rice production and farmers' income increase in the region.

Thus, the Project corresponds to the national and other relevant development plans of Indonesia both at the times of the appraisal and ex-post evaluation, and

its relevance is thus extremely high.

2.2 Efficiency (Rating: b)

2.2.1 Output

The Project consists of the following civil works, procurement of a set of relating equipment and consulting services for Project implementation. The table below shows the actual output in comparison with the original plan.

Table1：Comparison of Planned and Actual Outputs

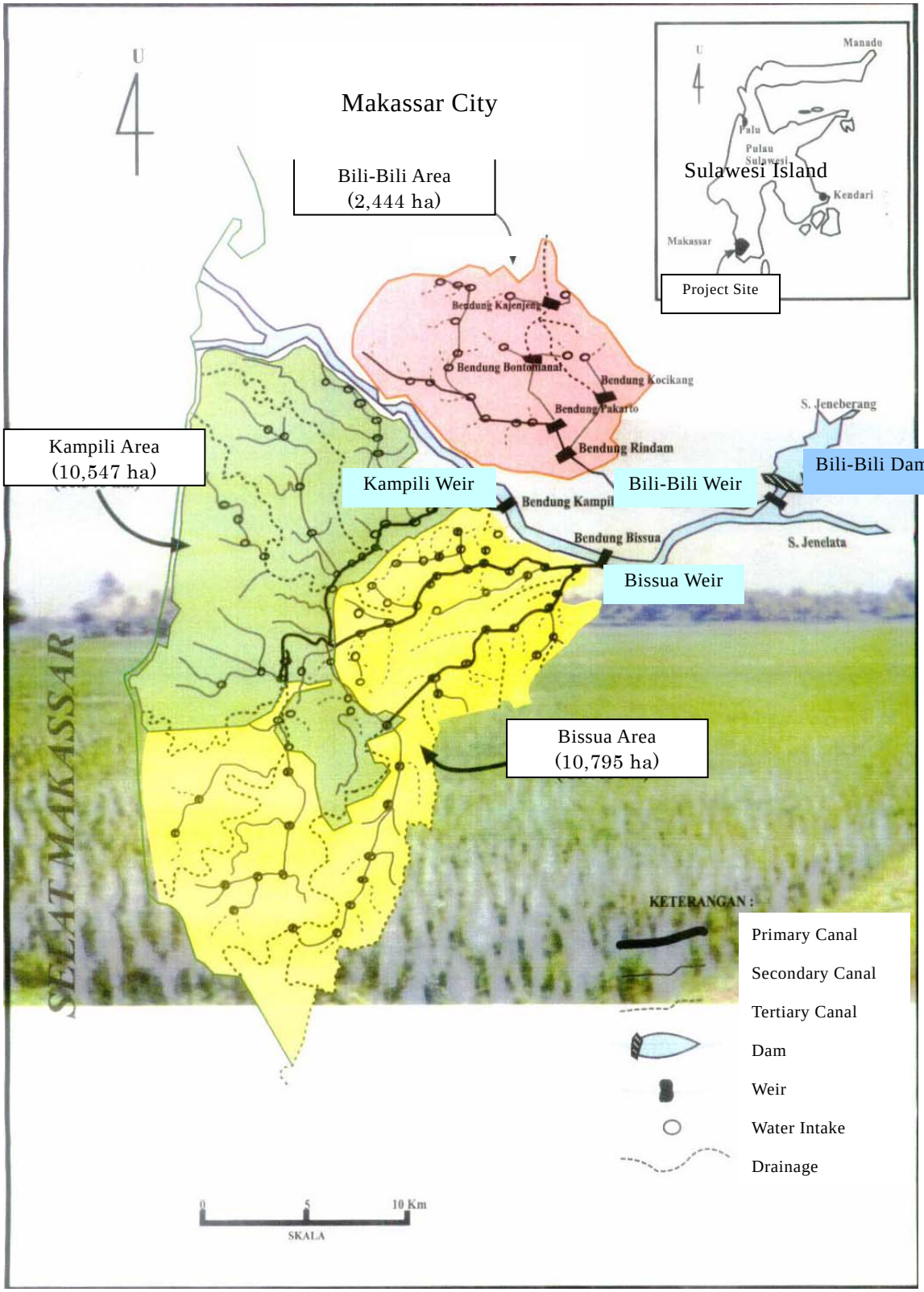
Output	Original Plan	Actual Output
I. Civil Works		
1 Construction and Rehabilitation of Weirs		
(1) Kampili Weir (Rehabilitation)	Concrete Gravity Height 2.0m Length 100.0m	Concrete Gravity Height 2.0m Length 117.0m
(2) Bili-Bili Weir (Construction)	Rubber Dam Height 1.5m Length 86.0m	Concrete Gravity Height 2.3m Length 69.0m
(3) Bissua Weir (Construction)	Concrete Gravity Height 5.0m Length 135.0m	Concrete Gravity Height 12.2m Length 239.3m
2 Irrigation Canals		
(1) Kampili		
Primary Canals	14.5km	13.5km
Secondary Canals	122.0km	184.3km
Tertiary Canals	Originally not planned	Covering the area of 288ha (Length not specified)
(2) Bili-Bili		
Primary Canals	9.9km	19.9km
Secondary Canals	12.6km	18.0km
(Bissua)		
Primary Canals	6.6km	27.8km
Secondary Canals	30.4km	25.8km
Tertiary Canals	Originally not planned	Covering the area of 3,767ha (Length not specified)

(3) Drainage	Length not specified	89.3km
(4) Inspection Road	Gravel pavement (Length not specified)	Asphalt pavement 12km
2. O&M Equipment	1 unit	1 unit
3. Consulting Services	748.00MM	2,043.42MM

The Project consists of three irrigation schemes; namely, Kampili, Bili-Bili and Bissua as shown in the site map of the irrigation area below. The basic designs outlined by the feasibility study (Study on “Lower Jeneberang River Flood Control Project”) were reviewed in the detailed designing in the Project. The consequent major modifications were as follows.

Bili-Bili Weir constructed under the Project

Figure 1 : Irrigation Area



1. Irrigation Area

The Project covers three irrigation schemes; namely, Kampili, Bili-Bili and Bissua. Each area of the irrigation schemes is as follows.

Table 2：Comparison of Planned and Actual Irrigation Areas

Irrigation Scheme	Plan	Actual
Kampili	21,000ha	10,547ha
Bili-Bili		2,444ha
Bissua	3,600ha	10,795ha
Total	24,600ha	23,786ha

(Source: The consultant's "Service Completion Report" December 2005)

The area downstream after the junction of the primary canals of Kampili and Bissua used to be included in the Kampili area, since water was supposed to be supplied from the Kampili weir, however after the Project, the water was supplied from the newly constructed Bissua Weir. Therefore the area concerned was transferred from Kampili to Bissua to get more accurate water flow computation of Bissua Weir, which made Bissua increase and Kampili decrease between the planned and actual irrigation areas developed.

2. Bili-Bili Weir

The weir was originally planned to be located on Jeneberang River downstream the confluence with Jenelata River, but it involved a risk to expose the upstream area to possible floods encroaching upon the riverbanks. Therefore the location was removed to the spot just down the spillway of Bili-Bili Dam under the new design. It consequently withdrew the necessity to apply a movable type (rubber dam) under the original design, and adopted a fixed (concrete gravity) type for the new weir.

3. Bissua Weir

As a result of the review of the location of the Bissua Weir under the detailed design, it turned out to be necessary to fix the water intake at an altitude of 30.2m above sea level in order to supply water to the whole area of Bissua, and the height was added 7m to the original design. At the same time, the Bissua Weir is located

at the V-shaped valley, and since the height was added as explained above (the width increases in proportion to the height elevation) and the location was changed to downstream (the river width increases downstream), the length of the weir was extended 100m longer than the original design.

4. Irrigation Canals

The layout of irrigation canals was also changed to a large extent in the detailed design. The original project scope only covered primary and secondary trunk canals, and it was agreed that tertiary canals improvement was supposed to be conducted by farmers themselves. However in reality, it has long been prevailing that the irrigation water could not sufficiently reach end farms under poor preparation of tertiary canals due to the limited technical and financial capacity of the farmers. It consequently encouraged illegal water off-takes from the trunk canals directly to the fields with pipes and even by holing the canals, which further prevents water flow to the destinations being also caused by leakage from the broken canals upstream. Considering this unfavorable condition and anticipating serious negative influence on the expected Project effect, the Project decided to deal with tertiary canal preparation in a part of Kamplili and Bissua areas[2].

The area covered by the tertiary canals prepared under this Project is given in the next table. Additional improvement was also implemented by the government's own budget and it facilitated water supply to totally 7,133 ha farmfields.

Table 3：Coverage of Tertiary Canals Constructed by Project(Additional Scope)

Irrigation Scheme	Irrigated Area	Coverage of Tertiary Canals Developed under the Project	Ratio
Kampili	10,547 ha	288 ha	2.7%
Bili-Bili	2,444 ha	0 ha	0%
Bissua	10,795 ha	3,767 ha	34.9%
Total	23,786 ha	4,055ha	17.0%

(Source: Aggregate figures on the hydrographic map provided by the Balai Besar Wilayah Sungai Pompengan, Jeneberang: River Basin Water Resource Management Unit of Pompengan, Jeneberang)

2 No works had been attempted with Indonesian Government's budget until this decision in around the year 2001 (precise date is unknown).

Gate control works by P3A (Water Users Association) staff at a tertiary canal

5. Inspection Roads

The inspection roads were constructed along the main canals with gravel pavement. However, the inspection roads along the Bissua main canal were paved with 5 cm ATB (asphalt treatment base) on a gravel roadbed taking into account of its importance as a junction with the Kampili primary canal and as an only road for the people's living.

6. Consulting Services

As shown in the next section, the Project experienced considerable extent of delay and resultant two-year extension of loan disbursement period. The Man-month (MM) of the consulting service regarding construction management took 3.3 times the original plan due to that implementation delay.

2.2.2 Project Period

Under the initial plan, the project period was from December 1996 to January 2003 (74 months), but the actual project period was from January 1997 to December 2005 (108 months) including two-year extension of the loan disbursement period, which turned out 45.9% longer than planned. Major reasons of the implementation delay include (1) interrupted budget execution in economic turbulence with hyperinflation triggered by the Asian monetary crisis in 1997, (2) accompanied administrative confusion originated by the economic crisis with the collapse of Soehato regime and drastic as well as frequent change of institutional apparatus involving central and regional governments and (3) consequent delay in the contractor procurement process.

2.2.3 Project Cost

Planned project cost was 7,296 million yen (of which Japanese ODA loan was

5,472 million yen), and the total project cost at the time of ex-post evaluation was 6,997 million yen (of which Japanese ODA loan was 5,403 million yen), 4.1% smaller than planned. In spite of the expanded output performance compared to the original plan, the total project cost was held within plan on a yen basis. It is mostly due to the significant depreciation of Rupiah currency brought by the economic crisis.

Although the project cost was held within the initial plan, the project period considerably exceeded the plan. Therefore the efficiency of this project is judged to be moderate.

2.3 Effectiveness (Rating: a)

2.3.1 Effectiveness Measurement by Operation and Effect Indicators

The following table summarizes the change in such indicators as the irrigated area, cultivated area and unit rice yield after the Project in comparison with the expected outcome. The actual performance in 2005 almost achieved the planned targets.

Table 4：Change in Irrigated and Cultivated Areas and Unit Rice Yield

Indicator	Unit	Original Plan (1996)	Modified Plan in Detailed Design (1999)	Realization in 2005
Total Irrigated Area	ha	24,600	23,690	23,786
Cultivated Area (Wet Season Paddy)	ha	20,700 (*1)	-	23,040 (*2)
Unit Rice Yield				
Wet Season	t/ha	4.6	5.5	4.83 (*3)
Dry Season	t/ha	4.6	6.0	

(Source: Project Completion Report (PCR), except items below

(*1) Targeted cultivated area for 2003 shown in the consultant's Service Completion Report.

(*2) Actual performance presented in the above report.

(*3) Since reliable performance data were not provided in PCR or questionnaire

answers, the figures were taken from the agricultural statistics of the Central Bureau of Statistics (BPS) on average yields in Gowa and Takalar Kabupatens (Districts) to which the Project sites belong. The area of the Project site occupies 47% of the total arable land in the two kabupatens in 2004.

2.3.2 Beneficiary Survey Result

To supplement the attempt for macro-view project effect measurement, a beneficiary survey was conducted in three irrigation areas, Kampili, Bili-Bili and Bissua by means of interviews to farmers and responsible members of P3A (Water Users' Associations) using a questionnaire prepared in advance.

Table 5：Classified Respondents of Beneficiary Survey

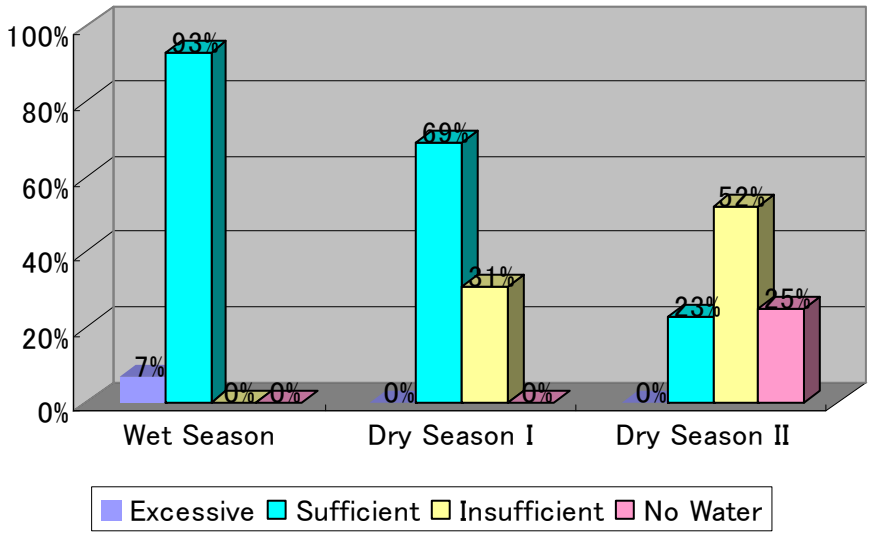
(Unit: household)

Irrigation Scheme	Up-stream	Middle-stream	Down-stream	Total
Kampili	35	35	35	105
Bili-Bili	5	5	5	15
Bissua	25	28	30	83
Total	65	68	70	203

1. Sufficiency of Water for Agriculture

A year in Indonesia comprises (1) a wet season from October to March, (2) the first dry season from April to June and (3) the second dry season, with the least rainfall, from July to September. The following graph illustrates a summary of beneficiary answers on the extent of sufficiency of total agricultural water available, rainfall and irrigation water inclusive.

Figure 2 : Seasonal Sufficiency in Agricultural Water



Although the Project enabled the supply of irrigation water in dry seasons during which almost no water was available previously, the condition of water insufficiency has not completely been removed due to imperfect preparation of tertiary canals according to the farmers. Especially a quarter of respondents complain of absolutely no water available in the second dry season. Around 5% of the total respondents who suffer from insufficient water in dry seasons do not plant any dry season crop (including the Dry Season I and II), and most of the other farmers cope with the water shortage by reducing area of planting and/or by supplementing the water shortage by pumping ground water. Considering the purpose of irrigation which enables farmers to enjoy ample water for production throughout the cropping year without significant seasonal bias, it is hard to say that the Project has fully achieved its potential capacity. Incidentally, a far smaller part of the farmers in Bissua, where tertiary canals were partially developed under the project, complain of water insufficiency in the second dry season. Only 12% of the Bissua farmers told that no water is available, whereas 72% of Bili-Bili and 26% of Kampili farmers said so.

2. Unit Rice Yield

The following table indicates seasonal unit rice yields summarized from the result of farmer interviews which asked them how many sacks of rice they harvested in each season. The figures are average weight converted from the number of sacks per hectare they answered. Rice yields normally tend to be bigger in dry seasons which have longer sunlight hours provided that water is sufficiently supplied.

Table 6：Seasonal Unit Rice Yields

(Unit: ton/ha)

	Wet Season	Dry Season I	Dry Season II	Average
Kampili	4.9	4.9	N/A	4.9
Bili-Bili	4.4	4.5	3.2	4.0
Bissua	4.6	5.2	N/A	4.9

（Source: Compiled from the answers of the beneficiary survey）

3. Change in Agricultural Production and Income

The following table summarizes the answers from the farmers in each irrigation area on change in agricultural production and income per household before and after the project. While slight changes are observed in the cultivated areas, increase in other indicators is conspicuous.

Table 7：Change in Agricultural Production and Income

Irrigation Scheme	Indicator	Unit	Project		Increase
			Before	After	
Kampili	Annual Rice Production Volume	Sack	42	88	110%
	Average Cultivated Area	ha	0.42	0.45	7%
	Monthly Agricultural Reve-nue	1,000 Rp.	3,181	7,577	138%
	Monthly Agricultural Expen-diture	1,000 Rp.	851	2,374	179%
Bili-Bili	Annual Rice Production Volume	Sack	83	155	87%
	Average Cultivated Area	ha	0.86	0.87	1%
	Monthly Agricultural Reve-nue	1,000 Rp.	3,994	11,740	194%
	Monthly Agricultural Expen-diture	1,000 Rp.	1,504	4,576	204%
Bissua	Annual Rice Production Volume	Sack	134	320	139%
	Average Cultivated Area	ha	0.45	0.52	16%

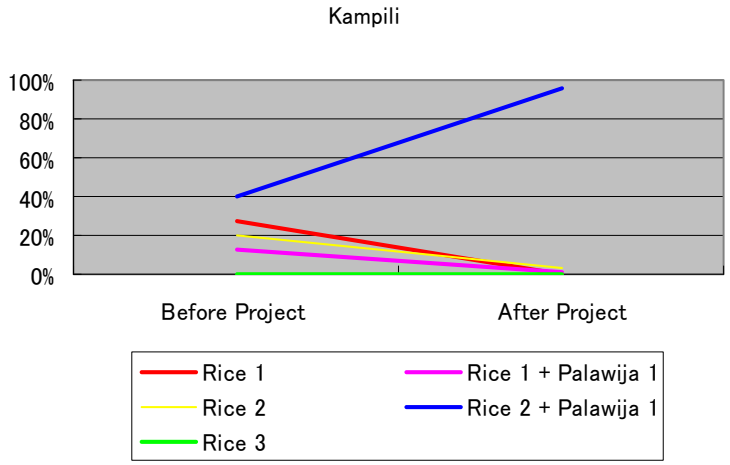
	Monthly Agricultural Revenue	1,000 Rp.	5,750	11,564	101%
	Monthly Agricultural Expen-diture	1,000 Rp.	1,751	2,614	49%

（Source: Compiled from the answers of the beneficiary survey）

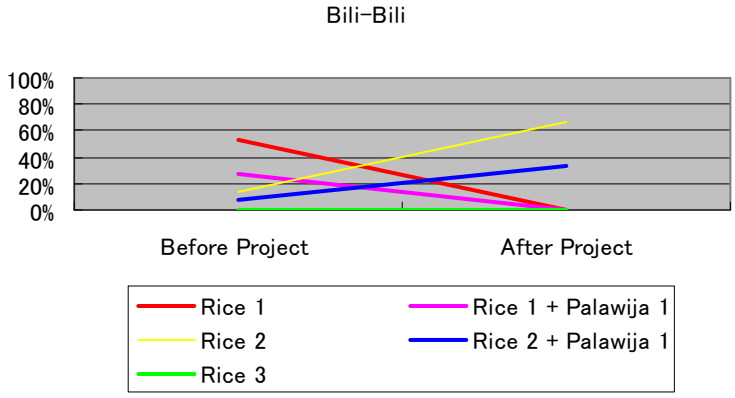
4. Change in Cropping Pattern

Indonesian agriculture is characterized in general by multiple cropping to plant rice and palawija (non-rice crop planted between the rice seasons) on the same farmland. The next table summarizes the answers of beneficiary farmers interviewed in each irrigation area on the change of cropping pattern after the Project in comparison with the previous practice. According to their answers, single cropping (“Rice 1”) and “Rice 1 + Palawija1” patterns have decreased. On the other hand, the multiple cropping of “Rice 2 + Palawija 1” pattern has increased, and the “Rice 3” became possible in more than 20% farms in Bissua.

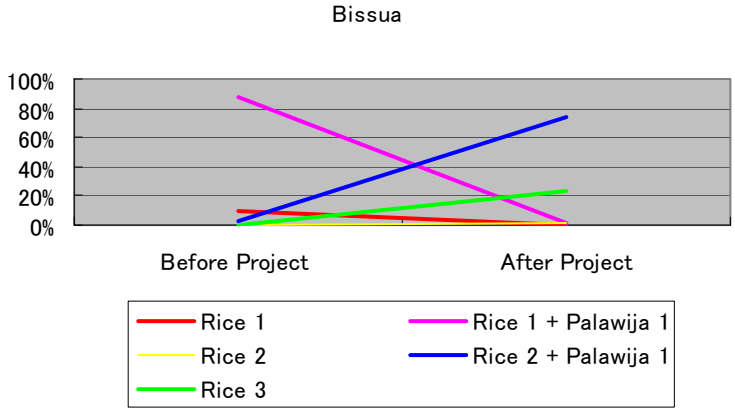
Figure 3：Changes in Cropping Pattern



Most of the farms (96%) transferred to “Rice 2 + Palawija 1” Pattern.



Originally "Rice 1" Pattern dominated compared to other irrigation areas. 67% of those transferred to "Rice 2" Pattern.



Original dominating pattern, "Rice 1 + Palawija 1," was almost replaced by "Rice 2 + Palawija 1" Pattern (74%). "Rice 3" was partly realized (23%).

5. Summary

Although the ultimate purpose as an irrigation project that should enable stable water supply throughout whole cropping seasons has not been fully attained, the rice production increase turned out remarkable. Especially the largest increase was achieved in Bissua where the tertiary canals developed under the Project covers one third of the total irrigated area. From the fact that no significant change is observed in cultivated area and unit rice yields, the production increase is considered to be the result of the increased number of harvest in a year through the change in cropping pattern thanks to the dry-season water supply enabled by the Project.

2.4 Impact

2.4.1 Improvement in Farmers' Living Conditions

As analyzed above, the income of the farmers in the Project area has considerably increased. The following table shows the survey result on the extent of the contribution of income increase to the improvement of the farmers' living conditions in terms of general living standard, children's education and family health.

Table 8：Improvement in Living Standard, Education and Health

Response / Irrigation Scheme	Considerably Improved	Improved	No Change	Worsened
General Living Standard				
Kampili	62%	34%	4%	0%
Blili-Bili	60%	33%	7%	0%
Bissua	31%	62%	7%	0%
Average	51%	43%	6%	0%
Children's Education				
Kampili	55%	25%	20%	0%
Blili-Bili	40%	40%	20%	0%
Bissua	31%	56%	13%	0%
Average	42%	40%	18%	0%
Family's Health Conditions				
Kampili	56%	17%	26%	1%
Blili-Bili	60%	20%	20%	0%
Bissua	17%	78%	5%	0%
Average	45%	38%	17%	0%

（Source: Beneficiary Survey）

The beneficiary survey inquired farmers' subjective impression on their living, however, the fact that 94% gave positive answers for "general living standard" and more than 80% gave positive answers for "children's education" and "family health" indicates that the agricultural production increase brought by the Project promoted the welfare of the people in the region through income increase.

Beneficiary survey interview to a farm household

2.4.2 Environmental and Social Impact

A number of Environmental Impact Assessment (EIA) studies have been conducted mainly by the University of Hasanuddin (UNHAS) since the Project preparation stage, and have not reported negative impact on environment until this ex-post evaluation.

No resettlement of farm household was executed for the Project implementation except some cases in which only few houses moved not farther than 20m.

Works	Components	Note
Development	New Construction	-
	Upgrading of Existing Facility	Enhancement of current function, or betterment which extend the service life of the facilities
Management	Operation	-
	Maintenance	Routine works to maintain function
	Rehabilitation	Recovery works to previous conditions

2.5 Sustainability (Rating: b)

2.5.1 Implementing Agency

2.5.1.1 Institutional Structure for Operation and Maintenance (O&M)

Development and Management of irrigation facilities in Indonesia consists of the following tasks in the current statutory framework.

Table 9：Classification of Works for Irrigation Development & Management

Primarily, development & management of primary and secondary canals are undertaken by the regional or central governments, while tertiary canals are under responsibility of water users association (P3A) of farmers. A detailed share of responsibility is stipulated by the Government Regulation of Republic of Indonesia Number 20, Year 2006 About Irrigation and related Decisions of Minister of Public Works based on the Law Number 7, 2004 About Water Resources. Responsibility sharing varies according to the sort of works, area of irrigation and type of canals. The simplified management structure for operation and maintenance is summarized in the table below. The structure is multi-layered

and P3As and regional governments are entitled to be supported by the upper authorities if a task is beyond their technical and/or financial capability.

Table 10：Responsibilities for Operation & Maintenance of Irrigation Facilities

Irrigated Area	Type of O&M Works	Primary 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 Provincial 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 Kabupaten Budget if Unaffordable)	Water Users Association Kabupaten Irrigation

							Office

(Note)

O: Operation

R: Routine maintenance and light repair

H: Heavy maintenance and rehabilitation

Balai: River Basin Water Resource Management Unit (Regional agency of the Ministry of Public Works)

As already mentioned above, the legal framework for operation and maintenance of irrigation is complexly structured with different sets of responsibility according to the sort of works, area of irrigation and type of canals. That situation with somewhat ambiguous share of responsibility leads to actual practice of operation and maintenance not strictly obeying the official rules. In addition, prevailing delay in preparation of end canals after tertiary canals in the Project area has been discouraging proper organization of P3As. In order to get rid of these weaknesses and to establish strengthened sustainability of the Project, it is essential to further promote preparation of end canals and strengthening of P3As.

2.5.1.2 Technical Capacity

Whether an irrigation project can be operated properly with sustainable benefit largely depends on adequacy of operation and maintenance works of end canals, and it needs strengthening of P3As which are primarily responsible for that task. The government has been attaching importance to P3A strengthening and ever conducted PTGA[3] and BINTER[4] programs for that purpose. Those programs were taken over by Balai Besar (River Basin Water Resource Management Unit) legally established in 2007, which is the regional agency of the Ministry of Public Works, as one of the official duties in its organization. Meanwhile, legal arrangement was made in 2006 to transfer the responsibility for conducting technical guidance regarding management of tertiary canals from the Ministry of Public Works to the Ministry of Agriculture, which was gradually implemented in practice. Following that practice, the official coordination meeting was organized

[3] PTGA: Proyek Tata Guna Air (Project for Water Use) is one of the sub-projects of PIRASS: Proyek Irigasi dan Rawa Andalan Sulawesi Sulatan (Irrigation and Marshland Project in South Sulawesi) organized under the Ministry of Public Works in which the local governments trained P3As for their organization and functional enhancement. It started in 1987 and finished in 2003.

[4] BINTER: Bimbingan Tersier (Tertiary Canals Guidance) succeeded PTGA in the framework of PIRASS from 2004 and provided guidance for P3As regarding O&M of tertiary canals in addition to the O&M monitoring of the irrigation networks in South Sulawesi including drought & flood monitoring with countering activities. The PIRASS was absorbed as an internal function of Balai Besar after its commencement in 2007.

to comprehensively discuss the water management from primary to end canals involving Directorate General of Land and Water Management, Ministry of Agriculture as a leading agency, Agricultural Directorate, National Development Planning Agency (BAPPENAS) and Directorate General of Water Resources, Ministry of Public Works.

JICA also attempted the strengthening of P3As through the local governments conducting “the Empowerment of Water Users Association Project” with focused assistance on a model site of 300ha around the pilot village Tanabangka in Kabupaten (District) Gowa which is located within this Project area. This project included such activities as capacity building for local government officers and related leaders who are charged with proper training for P3A members. A series of those activities was admitted to be effectively implemented. However, considering the insufficient function still widely prevailing among P3As, further effort must be continuously attempted to enhance their operation and maintenance of end canals.

2.5.1.3 Financial Status

The institutional framework of operation and maintenance of irrigation systems is officially provided as mentioned earlier by the government regulation about irrigation in 2006 and other relevant laws and ordinances. However, the field survey also witnessed cases suggesting activities firmly rooted in the people’s traditional principle of mutual help would function more effectively than official undertakings abiding by those institutional rules. Financially, poor organizational functions of P3As fail to operate systems to collect irrigation fees as a fund source for their activities, and consequently the rate of collection is significantly low. The following result of interviews to 22 responsible members of P3As conducted in the field survey reveals this reality. However, as commented above, this fact does not necessarily lead to poor practice of operation and maintenance.

Table 11 : Answers of P3A Representatives

Interview Answers from Representatives of P3As	%
1. Irrigation Fee is collected by Mandoro Je’ne* in kind.	56%
2. Insufficient fund from irrigation fee for P3A activities	82%
3. No bookkeeping for irrigation fee	82%

* Madoro Je’ne is a traditional “water master” in Makassar language who has been existing since the time before the advent of the P3A system and still

working on distribution of water and management of irrigation canals. They are now institutionally absorbed in the organization of P3As with assigned tasks to carry out water distribution, canal cleaning and other key operation and maintenance works. However, local opinions often complain their un-institutionalized selfish acts such as appropriation of “irrigation fees” collected in kind, which hampers systematic activities of P3As.

Thus, the collection of irrigation fees has not been institutionalized, but practical works for operation and maintenance is being effectively carried out in general under traditional principle of mutual help with volunteer labor services and ad hoc fund raising. However, operation and maintenance works should be carried out systematically following the institutional requirements in future for appropriate practice in the long run.

2.5.2 Conditions of Operation and Maintenance

Observation of physical facility conditions and state of operation and maintenance was simultaneously conducted with the beneficiary survey. As a result, the weirs and main canals developed under the Project were judged to be well operated and maintained in general.

Institutional framework for operation and maintenance of the irrigation facilities has not been practically functioning, however the Project involves no serious problem in sustainability.

3. Conclusion, Lessons Learned and Recommendations

3.1 Conclusion

Based on the above analysis, it is concluded that the Project is satisfactory.

3.2 Lessons Learned

A project in which the responsibility for end canal development has not been clearly defined at the preparation stage tends to impede complete achievement of its overall goals. A project is expected to be more effective and have larger impact if it has been formulated with comprehensive coverage involving tertiary canals as an integral part, whether it is covered by the Japanese ODA loan or not.

3.3 Recommendations

1. To JBIC/JICA:

The Project effect and impact are materialized to a considerable degree, however, the Project has not yet perfectly fulfill its potential benefit being prevented by the underdeveloped end canals lagging behind the preparation of main canals and ineffective organization of P3As. To fully realize the Project's potentiality, further development of end canals and strengthening of operation and maintenance including P3A enhancement is essential.

2. To Indonesian government:

The Project Completion Report (PCR) proposes eight items to be periodically monitored; namely, "Water Distribution," "Agricultural Production," "Land Use Plan and Irrigation Area," "Sediment Volume of the Reservoir," "Flood Area," "Water Quality," "Number of Locations of Illegal Off-take" and "Juru Reporting Practice." Since these are a fundamental requirement for measuring emerging project benefit and to keep them sustainable, the proposed monitoring practice should be reinforced and fully implemented.

3. To Indonesian government:

It is necessary to promote defining clear share of legal responsibility for operation and maintenance of irrigation systems and implementing it properly through participatory workshops and other collective discussion devices.

Comparison of Original and Actual Scope

Item	Plan	Actual
Output	・Construction of New Weirs: 2 units ・Rehabilitation of Existing Weirs: 1 unit ・Improvement of Primary Canals: 31.0km ・ Improvement of Secondary Canals: 165.0km ・Construction of Drainage: (Length not specified) ・Construction of Inspection Roads: (Length not specified) ・Procurement of Operation & Maintenance Equipment: 1 set	・Construction of New Weirs: 2 units ・Rehabilitation of Existing Weirs: 1 unit ・Improvement of Primary Canals: 61.2km ・Improvement of Secondary Canals: 228.1km ・Improvement of Tertiary Canals: 4,055ha ・Construction of Drainage: 89.3km ・Construction of Inspection Roads 12km ・Procurement of Operation & Maintenance Equipment: 1 set
Project Period Loan Agreement Consultant Selection Consulting Service Tender・Contract Civil Work・Procurement	December 1996 ～January 2003 (74 months) December 1996 December 1996 ～May 1997 June 1997 ～January 2003 February 1999 ～August 2000 September 1999 ～January 2003	January 1997 ～December 2005 (108 months) December 1996 January 1997 ～March 1998 April 1998 ～December 2005 October 1998 ～October 2003 April 1999 ～December 2005
Project Cost Total (Japanese ODA loan amount) Exchange Rate	7,296 million yen (5,472 million yen) Rp. 1 = 0.046 yen (as of April 1996)	6,997 million yen (5,403 million yen) Rp. 1 = 0.013 yen (Weighted average during project implementation)