No.

EX-POST EVALUATION REPORT

OF

JAPANESE ODA LOAN PROJECTS 2009

(INDONESIA I, CHINA I)

July 2010

JAPAN INTERNATIONAL COOPERATION AGENCY

SHINKO OVERSEAS MANAGEMENT CONSULTING, INC.

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Preface

Ex-post evaluation of ODA projects has been in place since 1975 and since then the coverage of evaluation has expanded. Japan's ODA charter revised in 2003 shows Japan's commitment to ODA evaluation, clearly stating under the section "Enhancement of Evaluation" that in order to measure, analyze and objectively evaluate the outcome of ODA, third-party evaluations conducted by experts will be enhanced.

This volume shows the results of the ex-post evaluation of ODA Loan projects that were mainly completed in fiscal year 2007. The ex-post evaluation was entrusted to external evaluators to ensure objective analysis of the projects' effects and to draw lessons and recommendations to be utilized in similar projects.

The lessons and recommendations drawn from these evaluations will be shared with JICA's stakeholders in order to improve the quality of ODA projects.

Lastly, deep appreciation is given to those who have cooperated and supported the creation of this volume of evaluations.

July 2010

Atsuro KURODA
Vice President
Japan International Cooperation Agency (JICA)

Disclaimer

This volume of evaluations, the English translation of the original Japanese version, shows the result of objective ex-post evaluations made by external evaluators. The views and recommendations herein do not necessarily reflect the official views and opinions of JICA. JICA is not responsible for the accuracy of English translation, and the Japanese version shall prevail in the event of any inconsistency with the English version.

Minor amendments may be made when the contents of this volume is posted on JICA's website.

JICA's comments may be added at the end of each report when the views held by the operations departments do not match those of the external evaluator.

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Ex-Post Evaluation of Japanese ODA Loan Project

"Way Sekampung Irrigation Project (I) (II) (III)"

Masami Sugimoto,

SHINKO Overseas Management Consulting, Inc.

1. Project Description

Location of the Project Site

Tertiary Irrigation Canal

1.1 Background

The basin of Way Sekampung River in Lumpung 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 Dam[1].

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.

	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
Borrower / Executing Agency	Republic of Indonesia / Directorate General of Water Resources, Ministry of Public Works
Final Disbursement Date	(I) December 2003 (II) December 2003 (III) February 2007
Main Contractor (Over 1 billion yen)	(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)
Main Consultant (Over 100 million yen)	(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)
Feasibility Studies, etc.	“Feasibility Study on Way Seputih and Way Sekampung Basins Development” Department for International Development, 1978 “Definite Plan for Construction of Batutegi Dam and Expansion of the Existing Irrigation Area” World Bank, 1981 “Detailed Design for Batutegi Dam and Hydroelectric Power Plant” World Bank, 1983 “Feasibility Study for Rumbia Irrigation Project” World Bank, May 1983

	"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 hat 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)

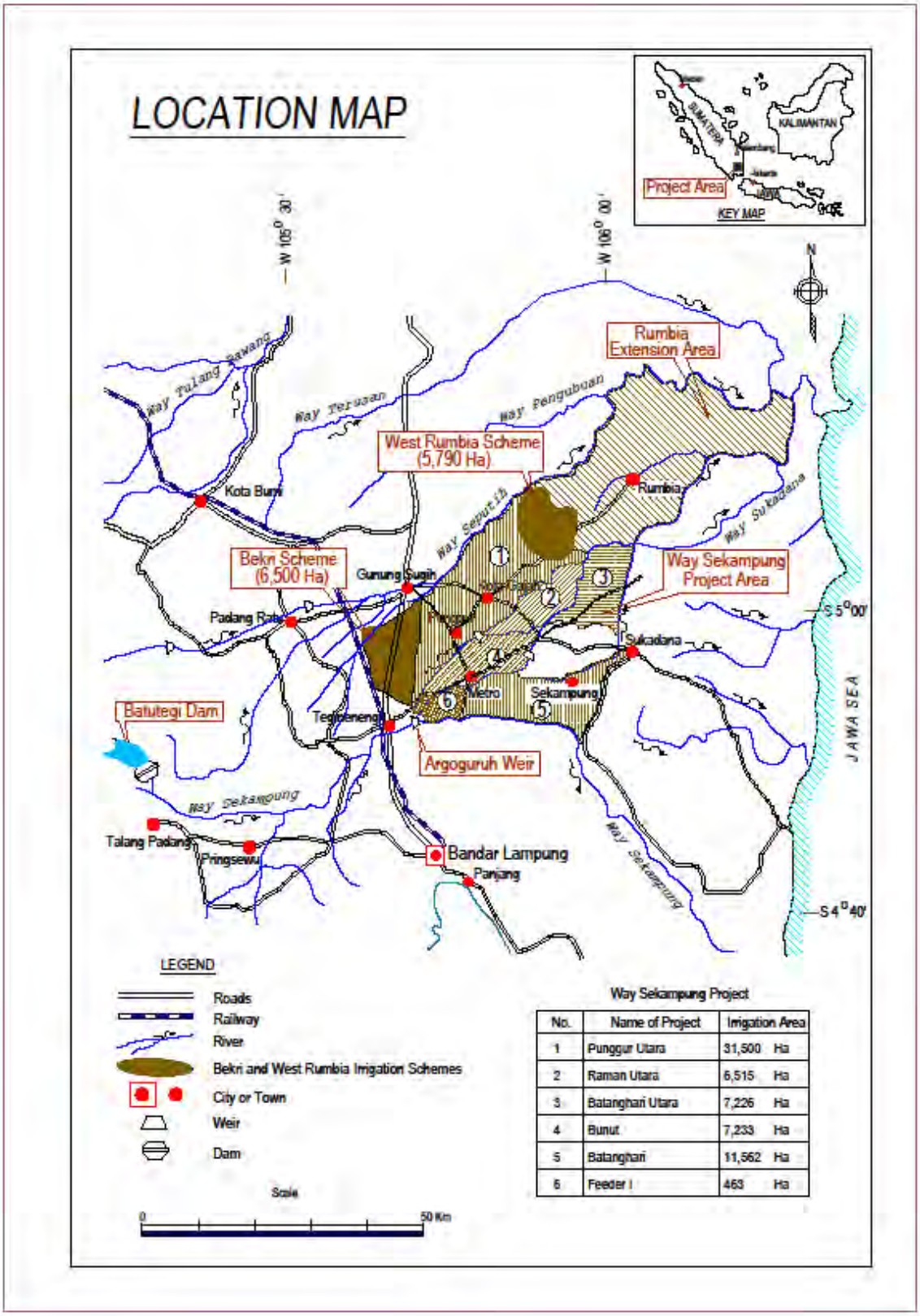
3.2.1 Project Outputs

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 Seputi[2].

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 Argogruh 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 areas[3]. 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 Kabupatan (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 Batutegi 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.

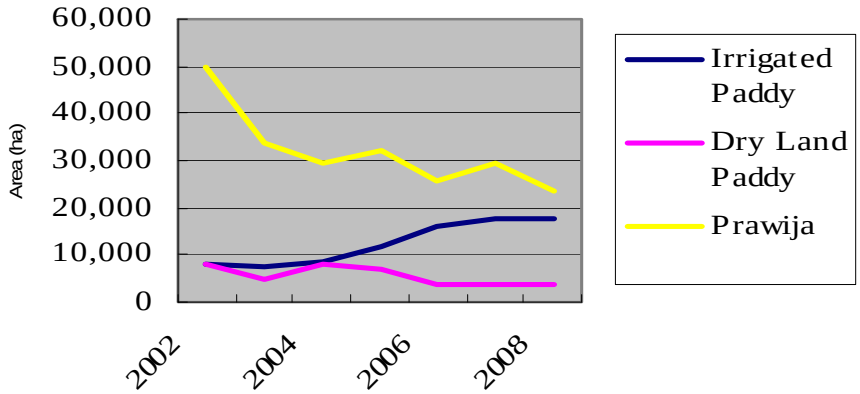
Table 3：Comparison between Benefited and Non-benefited Areas

	Increase of Planted Area				(3) Increase of Rice Production	
	(1) Paddy		(2) Parawija			
Year	Benefited Kecamatan	Non-benefited Kecamatan	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	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	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 2004[4].

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 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.

Field Interview to Farmers

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 framework[5].

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 Works[6]. 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. Additional 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 regulations[7] 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 Batutegi 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 Batutegi 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 Batutegi 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	(1) Batutegi Dam Rockfill Dam (Height 120m, Crest length 690m, Crest width 12m, Volume of embankment 9x10^6 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 (2) Irrigation system, On-farm development Bekri system (6,500ha), West Rumbia system (5,790ha) Construction of main & secondary canals, Construction of on-farm system & land development (3) Procurement of O&M equipment (4) Consulting services (I) International: 1,599MM (III) International: 473MM, Local 364MM	(1) Batutegi Dam Rockfill Dam (Height 122m, Crest length 701m, Crest width 12m, Volume of embankment 9.64x10^6 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 (2) Irrigation system, On-farm development Bekri system (6,500ha), West Rumbia system (5,790ha) Construction of main & secondary canals, Construction of on-farm system & land development ,MTF (3) Procurement of O&M equipment (4) Consulting services (I) International: 2,946 MM (III) International: 268 MM, Local 1,092 MM
2. Project Period	(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	(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
3.Project Cost Amount paid in Foreign currency Amount paid in Local currency Total Japanese ODA loan portion Exchange rate	22,050 million yen 18,392 million yen (Rp.348,527) 40,442 million yen 33,079 million yen (I) Rp.1= ¥0.064 (as of April 1992) (II) ¥0.050 (as of April 1994) (III) ¥0.052 (as of April 1992)	(Total cost unknown) 11,259 million yen 17,557 million yen 28,816 million yen 28,067 million yen (I) Rp.1= ¥0.033 (II) ¥0.021 (III) ¥0.012 (Average during 1993, 2007)

China

Ex-Post Evaluation of Japanese ODA Loan Project

"Gansu Water-saving Irrigation Project"

Masami Sugimoto,

SHINKO Overseas Management Consulting, Inc.

1. Project Description

Location of the Project Site

Sprinkler Irrigation in Operation

1.1 Background

China is one of the world's thirteen countries of the scarcest water endowment where the volume of its total water resources is less than a quarter of the world average. Sixty percent of the country's total cultivated area is located in arid regions under low agricultural productivity due to insufficient water. Among the total water usage, irrigation occupies seventy percent, however, the irrigation sector was faced various obstacles such as low level of facility preparation, deteriorating but un-renewed irrigation facilities, inefficient water use and unreasonably cheep irrigation fees which could hardly cover the cost of operation. Desertification and salt damages in recent years have been decreasing tillable lands as well, but they are considered preventable by appropriate water management to maintain suitable vegetation coverage according to respective topographic conditions by promoting agriculture in flat lands and afforestation on slopes.

Gansu Province is located upstream the Huanghe River basin in the northeast of China continent with its area of 454,000 km^2 (7th largest among 33 province-level divisions[8] in China), 1.2 times as large as the total area of Japan, and population of 26.2 million people (22th among the 33 province-level divisions). The provincial capital is Lanzhou located almost in the center of the whole of China. It has been a spot of strategic importance since the ancient era leading to the Silk Road having Mo Gao Ku at Dunhuang, a World Heritage stone cave, in its western end. As an arid province, sev-

[8] The Province-level Divisions consist of 22 provinces, 5 autonomous regions, 4 direct-controlled municipalities and 2 special administrative regions.

enty percent of the cultivated area is located in the Loess Plateau which is the place of origin where the yellow dust and sand storm rises. With the province's Gross Domestic Regional Products (GRDP) at 317,600 million yuan (about 23,300 million Japanese yen), 27th among the 33 province-level divisions in China, and its low per capita income at 12,000 yuan (about 165,000 Japanese yen), 30th among the 33 province-level divisions, it is classified as one of the poorest provinces of the country. Maximized efficient use of the water resources accompanied by agricultural productivity and people's income increase has been an ancient struggle for the province to overcome those severe conditions.

1.2 Project Outline

The objective of this project is to increase crop yields, expand vegetation coverage and reduce water intake from water sources by developing water-saving irrigation facilities introducing concrete canal lining, sprinkler and other devices for an area of approximately 80,000 ha of the existing six irrigation areas in Gansu Province, thereby contributing to betterment of the farmers' living and improvement of natural environment through preventing desertification, alleviating drying up of the Huanghe River and so forth.

Approved Amount/ Disbursed Amount	6,000 million yen / 5,383 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 2001 / March 2001
Terms and Conditions	Interest Rate: 1.3% Repayment Period: 30 years (Grace Period: 10 years) Conditions for Procurement: General Untied
Borrower / Executing Agency	People's Republic of China / Gansu People's Provincial Government (Finance Department)
Final Disbursement Date	March 2007
Main Contractor (Over 1 billion yen)	None
Main Consultant (Over 100 million yen)	None
Feasibility Studies, etc.	None
Related Projects	JICA "Model Planning Project for Water Saving Measures in Large-scale Irrigation Schemes" (June 2001 ~ May 2006) World Bank "Gansu Hexi Corridor Project" (IDA 90 million US dollars, IBRD 60 million US dollars) 1996 ADB "Optimizing Initiatives to Combat Desertification in Gansu Province" 2000

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: December 10, 2009 – December 24, 2009

March 11, 2010 – March 25, 2010

2.3 Constraints during the Evaluation Study

None

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

3.1 Relevance (Rating: a)

3.1.1 Relevance with the Development Plans of China

3.1.1.1 Relevance with the Development Plans at Appraisal

Placing emphasis on promoting water-saving irrigation as a countermeasure for the water problem that was growing more serious, China set forth the following objectives in the 9th Five Year Plan (1996 ~ 2000).

(1) Designation of 300 prioritized model countries for water-saving and agricultural intensification (targeted water-saving irrigation area: 6,600 ha) and purposed provision of subsidies.

(2) Attainment of 1,867 ha water-saving irrigation by the end of 2000.

(3) Agricultural water saving at 6,000 million m^3 per annum.

Following 10th Five Year Plan (2001 ~ 2005) put further stress especially on maintaining vegetation coverage in desertification-prone dry areas. It is made more of unit yield increases rather than extension of cultivated acreage to cope with the food demand increases and promoted highly efficient water-saving irrigation in dry lands which have much potential room for food production increase with concurrent achievement of prevention of desertification and escape from the poverty-ridden status by boosting agricultural output.

3.1.1.2 Relevance with the Development Plans at Ex-post Evaluation

The 11th Five Year Development Plan declares establishment of the “New Socialistic Rural Communities” as a strategic target and puts first priority on tackling a set of “Agriculture,” “Rural Community” and “Farmer” issues at a time. Water-saving programs including irrigation

hold the status with one of the most prioritized development areas also in the regional plans of Gansu Province; namely, the 9th Five Year Economic Development Plan and the Medium and Long-Term Planned Objectives in 2010 Water-saving Irrigation Development Plan of Gansu Province (2010 ~ 2020). The following policies are addressed by the national government to achieve the target for establishing "New Socialistic Rural Communities" that aims to "develop production, realize an affluent society, promote people's sound mind, beautify communities and carry out democratic management" while maintaining harmony between urban and rural economic and social development.

(1) Increase total productivity of agriculture, promote structural adjustment of the agricultural sector, develop agricultural infrastructure and increase farmers' income.
(2) Carry out prioritized farm and irrigation facility development.
(3) Train farmers to provide knowledge and technology in order to develop their capacity for agricultural management.
(4) Prioritize fund allocation for supporting "agriculture," "rural communities" and "farmers," and extend public services to cover wider agricultural communities and social support for community development.

As one of the prioritized construction investments, the government declares "Conversion to water-saving structure in large-scale irrigation systems."

The 11th Water-saving Irrigation Development Plan of Gansu Province (2006 ~ 2010) as a basic guideline for the development of the agricultural sector aims to expand water-saving irrigation area up to 2,750 thousand mu[9] during the period, with a breakdown into sprinkler irrigation 100 thousand mu, micro irrigation 200 thousand mu, pipe irrigation 600 thousand mu and canal irrigation 1,850 mu with total investment of 1,089.5 million yuan. The investment intends to save 194 million m^3 of water and 40,600 mu of land annually.

3.1.2 Relevance with the Development Needs of China

3.1.2.1 Relevance with the Development Needs at Appraisal

Gansu Province has 70% of its cultivated area in Loess Plateau which could be easily desertified without preventing vegetation. The area of cultivated land and forest is only 15% and 9.4% respectively of the total province. Due to the situation under which most of the irrigation facilities are water-wasting mud canals, and being a remarkable water in-taker in the Huanghe River basin, Gansu Province is obliged to minimize its water consumption to alleviate the water insufficiency downstream. At the same time, the attempt to raise agricultural productivity by introducing water-saving irrigation technology in this inland poor region was expected to play a pivotal role to increase income of poverty-ridden farmers and alleviate income differentials against the coastal regions.

[9] Unit of area in China. 1 mu = 667 m^2 approximately. Japanese unit "tsubo" has a direct link to "mu." 1 mu is exactly equal to 200 tsubo.

3.1.2.2 Relevance with the Development Needs at Ex-post Evaluation

The water resources in Gansu Province are chronically scarce: average annual rainfall is 277 mm, average total volume of water resources is 28,900 million m^3, or 1,100 m^3 per capita which is almost half of the national average. The average water for 1-mu farmland is 378 m^3 which is less than a quarter of the national average. The provincial water supply-demand gap is tremendous with insufficiency of 1,400 million m^3, which has been hindering economic and social development of the province as a significant bottleneck. Therefore a continuous need is attached to this project that develops water-saving irrigation. In addition, it is also much required for Gansu Province to maintain the volume of Huanghe River flow by saving water in order to alleviate desertification in the Inner Mongolia Autonomous Region downstream which is one of the main causes of the yellow sand.

3.1.3 Relevance with Japan's ODA Policy

A slogan "Water is the Source of Life" expressed on a sign placed by the greenhouse equipped with drip irrigation facility under this project.

The prioritized loan assistance policy for China addressed in the Medium-Term Strategy for Overseas Economic Cooperation Operations (December 1999 ~ March 2000) of former JBIC (Japan Bank for International Cooperation) included (1) support for tackling food and poverty issues through improving agricultural productivity, (2) prioritized support for the inland regions to alleviate regional differentials and (3) support for strengthening social and economic infrastructure to facilitate autonomous economic development, coping with (4) environmental conservation including flood control and afforestation. The objectives of this project for water-saving irrigation to increase the productivity of agriculture in Gansu Province, which is a low-income inland province, are consistent with the aforementioned Japan's ODA policy. Additionally, this project contributes to the environmental improvement by providing extra water saved to the region's afforestation.

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 is to make concrete lining of trunk irrigation canals with facility development

of end canals, installation of sprinkler, drip and pipe irrigation facilities for about 80,000 ha in five municipalities in Gansu Province. It consists of civil works, procurement of equipment and installation. A part of the outputs component has shifted from drip and sprinkler facilities to canal lining from the following reasons.

1. The "Short-term Development Plan for Heihe River Basin" which was started in August 2001 following the decision of the State Council replaced the drip and sprinkler irrigation facilities to be installed under this project along the river basin in Zhangye City in large, Jinta County of Jiuquan City.
2. Actual farmers' demand turned out to be stronger for canal irrigation rather than drip and sprinkler facilities which require higher technique and more work for the maintenance.
3. Unsuitable plans were adjusted; such as installation of sprinkler facility in windy Jiuquan City.
4. A number of farmers gave up drip facilities because of unfavorable market trend against targeted crops like greenhouse vegetables, grapes, hops, etc.
5. Market price appreciation of plastic materials for pipe, drip and sprinkler facilities affected by the sharp increase in oil price from 2003 lifted their installation cost.

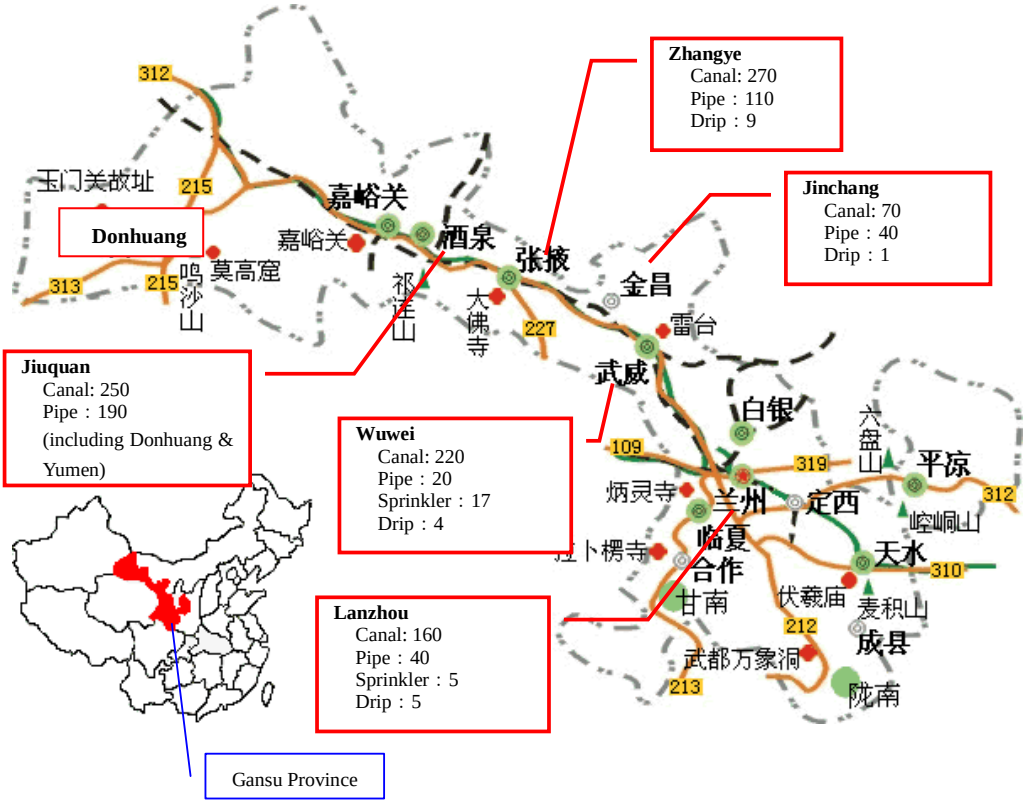
The component of outputs has been thus changed, however the total area covered turned out to be increased 17% from the original plan. The project site extends to five municipalities in Gansu Province (Jiuquan <including Dunhuang and Yumen>, Zhangye, Jinchang, Wuwei and Lanzhou). The following map shows locations of the project sites with outputs by type of irrigation facility installed[10].

For the implementation of this kind of small-scattered type project, it is desirable not to irrationally stick to the predetermined plan but to adjust the contents to the updated needs in the implementation phase. It can be said the way of implementation of this project that puts that principle into practice was appropriate.

Completed canal with concrete lining

[10] Another 20,000-mu drip irrigation facilities out of these outputs are scatteringly installed under the "Gansu Agriculture Cultivation Group Corporation." The Group Corporation is a 100% state-owned company which belongs to the Gansu People's Provincial Government. It is charged with the management of state assets as its main function and also runs agricultural production and marketing.

Figure 1: Project Outputs by Facility Type[11]



3.2.2 Project Inputs

3.2.2.1 Project Period

Under the initial plan, the total project period was from March 2001 to December 2004 (3 years and 10 months, 46 months), but the actual project period was from March 2001 to June 2006 (5 years 4 months, 64 months), which turned out 39% longer than planned. The prolonged project period was mainly caused by the delay in implementation commencement for the reason as follows. However, the process was expedited after the commencement and the implementation period was eventually saved 8 months from the original plan.

(1) The executing agency (Gansu People's Provincial Government) was unaccustomed to the Yen-loan administrative procedures as this was their first experience. Additionally, the project contains multiple components widely scattered throughout the vast area of Gansu Province which is 1.2 times the size of Japan and it claimed significantly longer time for internal coordination. Consequently it was not until October 2001 (14 months delay at that moment) that the final approval of the State Planning Commission on the feasibility study has been ob-

[11] Gansu Province stretching horizontally along the Hexi Corridor has 4 core countries (Donhuang, Jiuquan, Zhangye and Wuwei) established by emperor Wu of Western Han in 110 B.C. Hexi Corridor leading to inland Xinjiang used to be an important international route as a part of Silk Road that enabled political, economic and cultural exchange between ancient China and the Western World.

tained.

(2) Approximately 6-month delay in the tendering process because of the government's ban on public meetings and severe inter-regional traffic control due to the spread of SARDS (Severe Acute Respiratory Syndrome) occurred in 2003.

3.2.2.2 Project Cost

Planned project cost was 9,999 million yen (of which Japanese ODA loan was 6,000 million yen), and the project cost at the time of ex-post evaluation was 8,911 million yen (of which Japanese ODA loan was 5,383 million yen), 10.9% lower than planned. The total project cost includes 27 million yuan (about 383.5 million yen) as the cost of construction materials contributed by farmers and 22 million yuan (about 312.5 million yen) as the farmers contribution labor[12]. In spite of the implementation delay as well as the expanded outputs, the project cost was less than planned. It is mainly due to the successful reduction of total payment through efficient procurement with reasonable prices through fair price competition under competitive bidding.

Although the project cost 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

The Gansu Water Conservancy Agency attaches considerable importance on project effect monitoring and is collecting actual indicative figures before and after the project for 17 countries in 5 municipalities, which they call "sub-projects." The indicators being monitored and their actual figures recorded are as follows.

- Total length of concrete lining and irrigated area by types of irrigation
- Irrigated area by major crops
- Unit yield of major crops
- Volume and rate of water saved
- Water utilization ratio by type of irrigation
- Average annual income of farmers (to be analysed in the impact section later)
- Rate of water fee collection (to be analysed in the sustainability section later)

Since the irrigation facilities developed under this project are relatively small in scale, and they are completed and come into operation individually in the course of project implementation,

[12] Both are booked from the accounting record following the China's internal regulation applying the rate 15 ~ 17 yuan per day for the construction materials contributed by farmers 50 ~ 65 yuan per m^3 as the farmers' contribution labor. It is appreciated as quite a desirable practice for sound project management.

the “before” and “after” project columns of the tables do not indicate specific years before and after the project completion, but conditions before and after installation and operation of individual facilities.

Table 1: Irrigated Area by Major Crops

	Crops	Before Project	After Project	Comparison
Irrigated Area by Major Crops (unit: 10,000 mu)	Wheat	49.07	42.15	86%
	Maize	27.96	34.25	122%
	Vegetable	12.49	16.66	133%
	Cotton	26.00	13.51	52%
	Fruit	8.71	8.43	97%
	Barley	3.22	5.63	175%
	Maize Seed	2.24	2.41	108%
	Broad Bean	0.34	0.42	124%
	Potato	1.33	1.32	99%
	Tomato	1.61	1.49	93%
	Hops	0.47	0.47	100%
	Crude Medicine	0.10	0.10	100%
	Others	45.47	44.62	98%

Table 2：Yield of Major Crops

	Crops	Before Project	After Project	Comparison
Yield of major crops (kg / mu)	Wheat	392	442	113%
	Maize	588	637	108%
	Vegetable	2,309	2,783	121%
	Cotton	259	300	116%
	Fruit	1,864	2,275	122%
	Barley	473	553	117%
	Maize Seed	441	481	109%
	Broad Bean	185	411	222%
	Potato	1,694	2,080	123%
	Tomato	5,755	6,094	106%
	Hops	240	265	110%
	Crude Medicine	700	780	111%
	Others	803	928	116%

Table 3：Volume and Rate of Water Saved

Type of Irrigation Facility	Water Volume Saved (10,000 m^3)	Rate of Water Saved (%)	Average Water Volume Saved per Mu (m^3)
Canal	4,478	12.3	79.73
Pipe	4,300	21.0	118.99
Sprinkler	419	41.5	144.84
Drip	1,703	42.0	231.25
Total (Average)	10,900	17.9	-

Table 4：Water Utilization Ratio
(Rate of Water Volume Used in Fields against Volume of Water Supply)

Type of Irrigation Facility	Before Project	After Project
Canal	54~84%	61~96%
Pipe	55~85%	81~97%
Sprinkler	53~63%	87~94%
Drip	52~62%	87~95

The irrigated area and unit yield have increased after the project; however, the extent of increase is not so significant, except barley for the former and broad beans for the latter. Greenhouse vegetables, fruits and other crops with higher market prices mainly irrigated by sprinklers generally bring larger project effect in value. As stated above in section 3.2.1, 2, there occurred shifts from sprinkler and drip irrigation facilities to canals because of technical reasons for operation & maintenance, and it has resulted in lower effect realized on production increase in value than expected. However that negative factor could have been more or less offset by the 17% increase in irrigated area up to 14,000 ha. As articulated in its title, the primary stress of this project is put on water saving rather than agricultural production increase, and in this context, the project has been highly effective with remarkable water saving endorsed by indicators of volume and rate of water saved and utilized.

Red peppers and tomatoes growing in a greenhouse equipped with drip irrigation facility

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

EIRR (Economic Internal Rate of Return) is calculated; assuming, project life: 50 years, benefit: production increase in value (income increase by incremental production + conversion to more marketable crops), cost: construction cost + operation & maintenance cost). The rate of return calculated at the project appraisal was 22.0%, and the recalculated value at the ex-post evaluation was 17.1%. The calculation at the appraisal compared production in greenhouse cultivation as the "With" case of profitable drip irrigation with outdoor production as the "Without" case[13]. However, it is not realistic and overestimates the EIRR value because greenhouse production was already prevailing even before the introduction of the drip irrigation. EIRR was therefore recalculated comparing greenhouse production with and without the

[13] "With" and "Without" represent estimated operational results in respective cases under the conditions if the project has been and has not been implemented.

project and consequently pushed the EIRR value down. There is also a negative factor of the remarkable shift of more profitable sprinkler and drip facilities to canal irrigation, but it has been offset by the increase in actual irrigated area by the project.

The EIRR recalculated exceeds the "social discount rate" at 10% ~ 12% applied for EIRR analyses by the World Bank and other international aid agencies, and indicates sustained profitability sufficient enough to justify the economic aspect of this project.

3.3.2 Qualitative Effects

3.3.2.1 Synergy with JICA Technical Cooperation Project

JICA implemented a technical cooperation project entitled "Model Planning Project for Water Saving Measures in Large-scale Irrigation Schemes" (2001 ~ 2006) with the Ministry of Water Resources. The synergy with this project is as follows.

(a) The "Water-saving Improvement Manual" prepared in the technical cooperation project is effectively used for the operation and training of water-saving irrigation of small-scale irrigation facilities developed under this project.
(b) The experts dispatched under the technical cooperation project assisted the interim supervision of this project accompanying the mission to the field, disseminated the "Water-saving Manual" and gave technical advices to the beneficiaries of this project. (October 2004)
(c) A joint domestic training involving both projects was implemented. (July 2005)
(d) Four officials from the Department of Water Resources, Gansu Province in charge of this project were invited to the counterpart training of the technical cooperation project (45 days from August to October 2005)

3.3.2.2 Beneficiary Survey

A questionnaire survey to the farmer beneficiaries of this project was conducted during this ex-post evaluation. The survey was carried out following the method described in the next section, and the distribution of the respondents by the irrigation area[14] and type of irrigation facility are summarized in Table 5 and 6 below. Gansu Water Conservancy Agency also conducted a separate questionnaire survey of their own on a large scale (4,000 samples) in the two years after the project's completion. The survey covered 4,000 stakeholders including direct beneficiaries as key respondents. The result of the survey will be discussed later in section 3.4.2.3 for impact analysis.

Table 5 : Distribution of Respondents by Irrigation Area

	Jin-chang	Don-huang	Jiuquan	Yumen	Zhan-gye	Wuwei	Lan-zhou	Total
Sample	15	9	10	1	30	24	23	112

[14] Donhuang and Yumen are included in Jiuquan in the regional distribution map of Figure 1.

Volume								
Ratio	13.4%	8.0%	8.9%	0.9%	26.8%	21.5%	20.5%	100.0%

Table 6：Distribution of Respondents by Type of Irrigation Facility

	Canal	Pipe	Drip	Sprinkler	Others No answer	Total
Sample Volume	56	31	10	3	12	112
Ratio	50.0%	27.7%	8.9%	2.7%	10.7%	100.0%

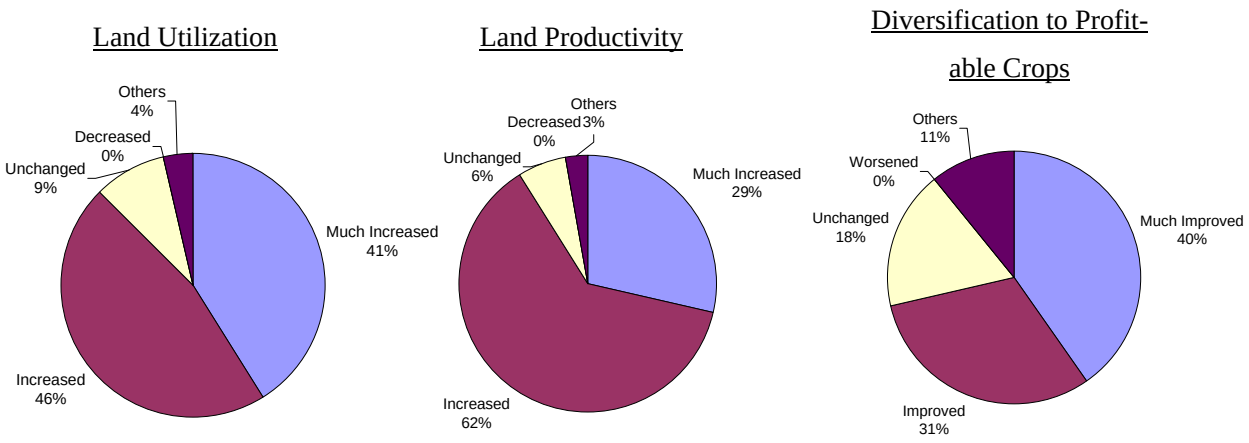
(1) Method of Implementation

Standing on the reliable self-monitoring result of the project effect by the executing agency mentioned above, the survey was conducted with questionnaires and minimum direct interviews during the evaluator's field visits. The survey took unbiased samples based on the weighted proportion among each type and irrigation area with full coverage and used improved questionnaires pre-tested during the first field survey.

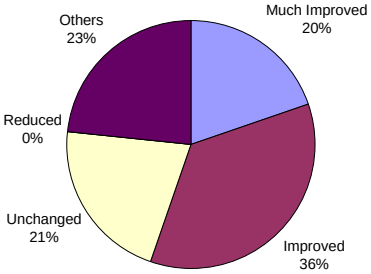
(2) Summary Result

The ratios of responses to the questions asking for a comparison of the present conditions with the situation before the project and the overall evaluation on the project are collectively shown in the following pie charts. They indicate that the project has positively influenced various aspects of the beneficiaries' life, among which the water-saving effect supported by the majority (65%) articulates that the unit water use has been remarkably reduced and corresponds significantly to the result of the periodic effect monitoring by Gansu Water Conservancy Agency.

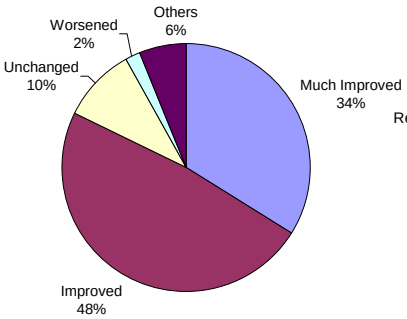
This project has successfully achieved its objectives; therefore its effectiveness is high.



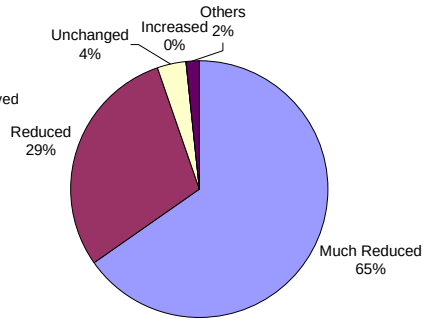
Increase in Inputs



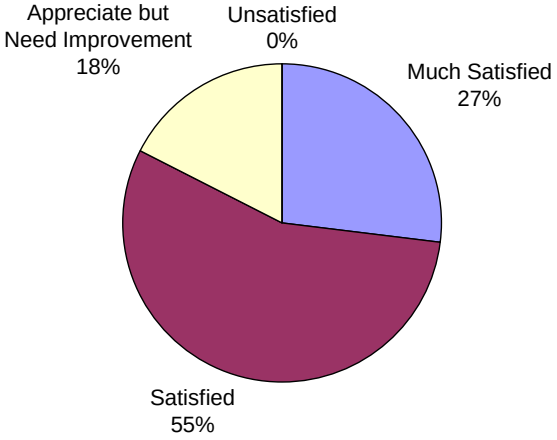
Workload



Unit Water Use (Water-saving)



Overall Evaluation on Project



3.4 Impact

3.4.1 Intended Impacts

3.4.1.1 Increase in Farmers' Income

The size of the project beneficiaries is approximately 905 thousand farmers. According to the effect monitoring by the Gansu Water Conservancy Agency quoted in section 3.3.1.1 above, the average annual income of the farmers in the benefited area was 4,114 yuan before project and turned out 5,191 yuan, 26% increase. As mentioned earlier, most significant project effect has emerged in the aspect of water-saving, however the Production volume of major crops has also increased 15%, especially for fruits (22%), broad beans (122%) and potatoes (23%), which could suggest income increase of the beneficiary farmers.

3.4.1.2 Alleviation of Desertification by Expanded Vegetation Coverage

Of the 11,000 m^3 of water saved with this project, a quantity of 1,815 m^3 has been utilized to expand vegetation of 40,300 mu in the region. The Ministry of Forest conducts comprehensive monitoring research on reduction in desertification and reported an 83,600 ha decrease during

1999 ~ 2004. This project was prepared and implemented under close cooperation between the Water Conservancy and Forestry Departments of Gansu Province. This cooperation is quite desirable, contributing to enhancement of positive project impact by means of systematic collaboration including effort to utilize saved water to tree and grass planting.

3.4.1.3 Prevention of Huanghe River Dry-up[15] and Desertification of the Inner Mongolia Autonomous Region

The Huanghe River Dry-up does not occur any more after starting discharge control at the dams upstream, and the reduction of water intake by the project has been contributing to water flow increase of Huanghe River. The desertification of Inner Mongolia Autonomous Region, which is a source of yellow dust and sand storms, located downstream of the Heihe River (one of the tributaries of Huanghe River) is badly affected by excess water intake by upstream Gansu Province. This project and the concurrent "Short-term Development Plan for Heihe River Basin" extend big preventive effect; for instance, Gansu Water Conservancy Agency told a story on Juyan Lake at the Inner Mongolia which used to often dry up but is now filled with water and greenization in its basin has been proceeding.

3.4.2 Other Impacts

3.4.2.1 Improvement in Indicators on Farmers' Income in Gansu Province

As indicated in section 1.1 Background, Gansu Province belongs to the low income regions in China whose per capita GRDP (Gross Regional Domestic Products) is the 27th among 33 province-level divisions. However, it has been achieving steady increase in income and decrease in ratio of the people under the poverty level.

Table 5: Indicators on Farmers' Income in Gansu Province

	2000	2005	2006	2007
Per Capita Net Income (Yuan)	1,429	1,980	2,134	2,329
Per Capita Agricultural Income (Yuan)	945	1,440	1,554	1,661
Per Capita Expenses for Living Consumption (Yuan)	-	1,820	1,855	2,017
Ratio of People under Poverty Level (%) *	-	2.47	2.08	1.34

Source: Gansu Yearbook 2008

*) The official poverty level revised in 2008 is 1,196 yuan. The figures in this table are percentages under 1,200 yuan.

[15] Dry-up is a phenomenon under which river flow completely stops. Huanghe River which has the second longest length and widest river basin in China following Yangtze River (Chang Jiang) experienced frequent dry-up in 1970s. The most serious case was recorded in 1997, which lasted for 226 days in total.

3.4.2.2 Impacts on Natural and Social Environment (including relocation and land acquisition)

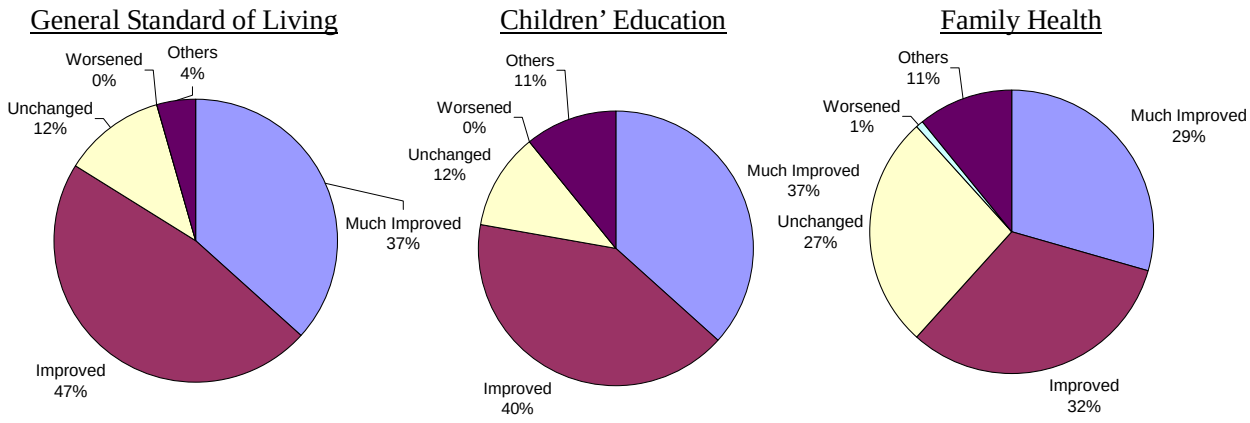
The emphasis of this project is on the aspect of natural environment improvement expecting significant contribution to the prevention of desertification. The environmental impact assessment of the irrigation facilities was conducted by the Environmental Protection Agency of Gansu Province in August 2007 and the project obtained official approval acknowledging that it fulfils the "Three Concurrent Environmental Requirements."[16] Prior studies for environmental assessment were also conducted by the Chinese Research Academy of Environmental Sciences and Gansu University with the conclusions expressing no specific adverse effect on environment.

This project was not accompanied by land acquisition or residents' relocation.

3.4.2.3 Results of Beneficiary Survey

(1) Beneficiary Survey under the Ex-post Evaluation

The beneficiary survey under the ex-post evaluation discussed in the previous section 3.3.2.2 also asked questions regarding improvement in farmers' living standards, and the summarized answers are illustrated in the pie charts below.



The observed improvement of the beneficiaries' standards of living which is much supported by the China's general economic development should not be hastily regarded as a direct impact of this project, however, its positive contribution of a more stable water supply was realized and direct income effect from the drip and sprinkler facilities should also be counted.

(2) Questionnaire Survey by Gansu Water Conservancy Agency

As already stated, Gansu Water Conservancy Agency, the implementing agency of this project, has conducted a large-scale questionnaire survey to the beneficiaries and other project stakeholders over two years, from 2005 until 2007 for their own management purpose[17]. They

[16] China's unique system for environmental management requires execution of "planning," "construction" and "operation" of the main project components and environmental protection facilities concurrently.

[17] It is a fundamental requirement for a project implementing or operating agency to make much of effect monitoring and evaluation and carry them out after project completion. However, it is a practice rarely observed in many development

sent a set of questionnaires to a total of 4,054 stakeholders and collected responses from 3,881 respondents, among which 3,845 answers were accepted as valid. The breakdown of the accepted responses and the results of survey are summarized in Table 6 and 7 respectively.

Table 6: Breakdown of Respondent

Stakeholder	Number of Respondents
Project Beneficiary	2,797
Officials in Charge	425
Other People Concerned	521
Others	102
Total	3,845

Table 7: Questions and Percentages of Answers

Questions	Yes, very much (Excellent)	Yes (Good)	Not so much (Moderate)	No (Bad)
1. Do you appreciate this project?	73%	24%	2%	0.4%
2. Has this project contributed to promote water-saving awareness?	71%	26%	2%	0.2%
3. What is the quality level of this project?	61%	33%	5%	0.9%
4. Has this project deepened recognition for water-saving and production increase?	52%	42%	5%	1%
5. To what extent has this project promoted structural improvement of agricultural sector[18]?	50%	32%	17%	1%
6. How about the impact of this project on environment?	40%	52%	7%	1%
7. How big is the influence of this project as a model program?	56%	39%	4%	0.3%
8. Has this project deepened the perception for project management strengthening and improvement?	63%	35%	3%	0%
9. What is the level of satisfaction at the performance of the regional	50%	47%	3%	0.4%

projects in developing countries.

[18] This question asks whether this project successfully promoted structural adjustment of agriculture by diversifying or converting production to products which are more profitable or fitter for local conditions.

government and project supervision agency?				
10. What is the most suitable irrigation facility?	Canal	Pipe	Sprinkler	Drip
	54%	23%	3%	21%

The survey results above reveal that this project has brought a significant impact including promotion of water-saving and management among the beneficiaries and other stakeholders, and is attracting their appreciation.

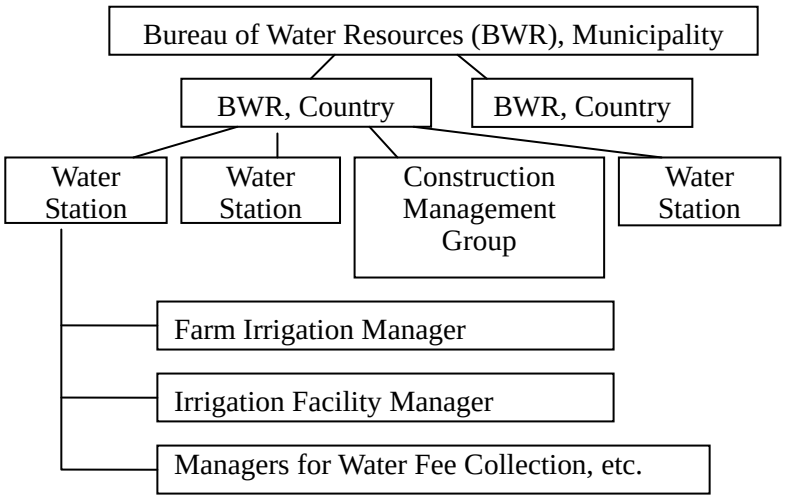
It is therefore recognized that the project has had positive impacts, among them upgrading of the farmers' quality of life, prevention of desertification and other environmental improvement.

3.5 Sustainability (Rating: a)

3.5.1 Structural Aspects of Operation and Maintenance

The operation and maintenance structure of trunk irrigation canals has been organized as follows.

Figure 2: Management Structure of Trunk Canals



Under the supervision of the Bureau of Water Resources at the municipality or country level, the management entities at each irrigation area (Water Stations) carry out such tasks as daily round inspection of primary & secondary canals, facility maintenance by periodic inspection in spring and autumn seasons, preparation of annual water distribution plan, monitoring of water flow and collection of water fees. They also arbitrate water conflict and maintain orderly irrigation operations in close cooperation with the Water Users Associations. On the other hand, the Water Users Associations take charge of end canals, pipe and sprinkler facilities for operation and maintenance: drip facilities are handled under the independent responsibility of indi-

A one-mu farm is irrigated by a set of underground pipe irrigation facility whose concrete holes containing an outlet (left) and control valves (right) are installed on the ground. Farmers are doing land preparation for coming planting season.

vidual users.

Except for the drip irrigation facilities under individual responsibility, the operation and maintenance structure from the Municipality Bureau Water Resources down to the Water Users Association is well organized, and the works are being conducted in an orderly manner.

3.5.2 Technical Aspects of Operation and Maintenance

3.5.2.1 Bureau of Water Resources, Municipality

This is the main municipal administration agency for water management which has technical divisions in charge of water management, construction management and so forth staffed with twenty to forty officials of which half of them are engineers.

3.5.2.2 Bureau of Water Resources, Country

This subordinate agency under the municipal bureau also has technical divisions consisting of construction and water management groups. The number of staff is usually twenty to forty officials of which two thirds are engineers.

3.5.2.3 Water Stations

Water Stations are the subordinate units under the country bureau. The number of staff assigned is not uniform, ranging from ten to two hundred depending on the size of the irrigation area in charge. The officials for farm irrigation management, irrigation facility maintenance and water fee collection take charge of facility management, guidance, water fee collection and so forth in the field.

The municipal bureau conducts water management, financial management and other trainings for the country bureau several times a year, and the country bureau systematically provides technical trainings on irrigation and facility management for the water stations normally in the winter agricultural off-season. The provincial bureau of water resource management is of the opinion that the training for sprinkler and drip irrigation facilities which require higher techniques are not satisfactory enough and need to be further strengthened in the future.

Though the training for sprinkler and drip irrigations which require relatively sophisticated operation and maintenance techniques is an issue of further enhancement, the technical capac-

ity for operating and maintaining other irrigation facilities is judged to be satisfactory.

3.5.2.4 Continuing Project Monitoring

Gansu Water Conservancy Agency attaches special importance on monitoring of operational conditions of the facilities and state of effect realization, and conducted an intensive training for the monitoring tasks in 2004 using the "Monitoring Handbook for Users" prepared by the Gansu Water-saving Irrigation Project Implementation Office established as an executing unit of this project at the Provincial Water Conservancy Agency.

3.5.3 Financial Aspects of Operation and Maintenance

3.5.3.1 Trunk Canals

The financial responsibility for the operation and maintenance of the trunk canals was originally planned to be borne by the farmers, however actual situation of the farmers' financial capacity turned out not to allow for that practice. The plan was therefore modified and the operation and maintenance is now performed by the Municipality and Country Bureaus of Water Resources Management under the finance of the governments' budgets. The amount of budget allocated for maintenance is predetermined by the regulation at 1.5% of the total investment for major maintenance and 40% of the major maintenance budget for routine maintenance requirements. The total amounts of 9,411 thousand yuan for the former and 3,764 thousand yuan for the latter were allocated for this project, which is not more than enough but is basically able to afford ordinary maintenance.

3.5.3.2 End Canals, Pipe and Sprinkler Irrigations

The fund for maintenance is collected from farmers as water fees through Water Users Associations. Collection rates of the water fees are considerably high: averaging 95.3%, 85.2% at the lowest (Liangzhou District, Wuwei Municipality). However the collected fund is not sufficient for the full coverage (50 ~ 75% coverage according to the official evaluation by the Ministry of Finance), which is an issue to be improved.

Though the fund supply for maintaining trunk as well as end canals and other irrigation facilities in the field has not been satisfactory, the minimum funds needed for maintenance are being budgeted so as not to obstruct facilities' operation and maintenance. The end canals and other facilities in the field are actively operated and maintained by the farmers' gratis labor and materials supply as well.

3.5.4 Current Status of Operation and Maintenance

Direct observation in the field study of the ex-post evaluation (Municipalities of Lanzhou, Wuwei, Zhangye and Jiuquan) as well as the official evaluation of the Ministry of Finance found that the installed irrigation facilities were smoothly operating.

No major problems have been observed in the operation and maintenance system, therefore sustainability of the project is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project is highly relevant with the China's Five Year Plan that makes importance of agricultural development and environmental conservation including desertification prevention, and is consistent as well with the water-saving needs of Gansu Province which is suffering from chronic and significant water insufficiency. The efficiency is fair due to the delay in project implementation, while the effectiveness is considerable, contributing to the regional water saving and agricultural production increase as well as income increases and a consequent upgrade of the people's living standard. It is also judged that the project is sustainable with no major problems in the operation and maintenance system.

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

4.2 Recommendations

None.

4.3 Lessons Learned

Project effect and reliability is greatly enhanced if a holistic project management system has been established and operated in such a way that it covers whole process of the project process from the implementation up to the operation & maintenance after the completion and involves aspects of continuing monitoring and evaluation. This project is appreciated in that regard especially from the following merits.

(1) What is desirable for the implementation of this kind of small-scattered type project is not to irrationally stick to the predetermined plan but to adjust it to fit the updated requests (project effect emerges in fragments from the completed portion during the implementation). This project was successfully implemented following that way in practice.

(2) The project has firmly managed keeping a permanent record for financial (revenue and expenditure) transactions and physical progress.

(3) The project clearly identifies directly benefited areas and periodically monitors the effects by means of specified key indicators and feeds the results back to the project operation.

(4) In addition to the above mentioned periodic monitoring, the project has also conducted a social analysis based on a large-scale questionnaire survey to the project beneficiaries and other stakeholders regarding appearance of expected project effects and diffusion of water-saving awareness.

The practice of this project management should be diffused and applied as a case example of good practice to other irrigation projects and other sorts of small-scattered type projects in the future.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1.Project Outputs	(1) Trunk canal concrete lining (2) Development of end canals Canal lining: 153.89km Facility development: 42,466ha (3) Development of sprinkler irrigation: 4,278ha (4) Development of drip irrigation: 8,600ha (5) Development of pipe irrigation: 24,600ha Total: 79,944ha	(1) Trunk canal concrete lining (2) Development of end canals Canal lining: 364.0km Facility development: 63,658ha (954.82 thousand mu) (3) Development of sprinkler irrigation: 1,437ha (21.55 thousand mu) (4) Development of drip irrigation: 2,594ha (38.91 thousand mu) (5) Development of pipe irrigation: 26,110ha (391.6272 thousand mu) Total: 93,799ha (1,406,907 thousand mu)
2. Project Period	March 2001 ~ December 2004 (3 years 10months, 46 months)	March 2001 ~ June 2006 (5 years 4 months, 64 months)
3.Project Cost Amount paid in Foreign currency Amount paid in Local currency Total Japanese ODA loan portion Exchange rate	 0 9,999 million yen (769 million yuan) 9,999 million yen 6,000 million yen US$ 1 = ¥108、 1 yuan = ¥13 (as of July 2000)	 0 8,911 million yen （627 million yuan） 8,911 million yen 5,383 million yen 1 yuan = ¥14.18 (canal), 1 yuan = ¥14.23 (Pipe, Sprinkler, Drip) (Actual record during July 2003 ~ August 2003)

China

Ex-Post Evaluation of Japanese ODA Loan Project

Tongyu River Irrigation Development Project in Jiangsu Province (I) (II)

Masahiro Oseko, Nevka Co. Ltd.

1. Project Description

Project Site

Tongyu River

1.1 Background

In the early 1980s, the Household Responsibility System (HSR)[19] was implemented for agricultural production in China. Due to the introduction of policies such as raising the price at which the government purchased agricultural product, the sector expanded greatly, from producing roughly 300 million tons of food in 1978 to over 400 million tons in 1984. However, productivity of cultivated land thereafter became sluggish and remained stagnated until 1989.

Meanwhile, the population reached 1.25 billion in 2000, requiring the production of 500 million tons of food. However, since it was difficult to reach this goal due to the stagnation mentioned above, the Eighth Five-Year Plan (1991-1995) set a high food production target of 455 million tons by 1995. In order to achieve this, measures were taken such as firmly establishing the HSR, enlarging planted and irrigated areas for major agricultural products and increasing production of chemical fertilizers.

[19] This system first got its start in the early 1980s. Each farming household rents land from the state for farm use and engages in agricultural production. A certain amount of the crop produced is collected by the state, while farmers are free to use any remainder as they please. Compared to collective farming (the People's Commune System), the increase in the discretionary amount cultivated per person increased farmers' incentives to produce and greatly improved agricultural production.

As of 1990, Jiangsu Province boasted the fourth-highest production of grains in the country and was sixth in cotton production. Since the province is located in a river basin including the Huai and Changjiang Rivers, two major rivers, large-scale irrigation is possible. Thus the province was designated an important area for development among the country's irrigated areas in the above policy target and was expected to be a major center for storing grain in China, exporting food to other provinces.

1.2 Project Outline

The objective of this project was to extend and construct the Tongyu River in Subei, Jiangsu Province, thus improving agricultural productivity by improving agricultural water supply and expanding water transport, thereby contributing to the area's economic development.

Approved Amount/ Disbursed Amount	JPY 11,535 million yen (Phase 1: 4,018 million yen, Phase 2: 7,517 million yen) / 11,532 million yen (Phase 1: 4,017 million yen, Phase 2: 7,515 million yen)
Exchange of Notes Date/ Loan Agreement Signing Date	September 1991 (Phase 1), January 1995 (Phase 2) / October 1991 (Phase 1), January 1995 (Phase 2)
Terms and Conditions	Interest Rate: 2.6% Repayment Period: 30 years Grace Period: 10 years Conditions for Procurement: General Untied
Borrower / Executing Agency(ies)	Ministry of Foreign Trade and Economic Cooperation, the People's Republic of China / Ministry of Water Resources of the People's Republic of China
Final Disbursement Date	December 1997 (Phase 1), February 2000 (Phase 2)
Main Contractor	Ranken Enterprises Limited
Main Consultant	None
Feasibility Studies, etc.	Feasibility Study on Tongyu River Project in Jiangsu Province, the People's Republic of China, Water Conservancy Survey and Design Institute of Jiangsu Province, November, 1990
Related Projects	Irrigated Agriculture Intensification Project (1991-1995, World Bank) Taizhou Yangtze River Water Diverting Channel Pro-

	ject (1998-2003, Chinese Government) Taidong River Project (2010- , World Bank)

2. Outline of the Evaluation Study

2.1 External Evaluator

Masahiro Oseko, General Manager, Nevka Co. Ltd.

2.2 Duration of Evaluation Study

Duration of the Study: September 2009 – June 2010

Duration of the Field Study: December 10-24, 2009, March 12-26, 2010

2.3 Constraints during the Evaluation Study

The total time estimated to complete the project at the time of its inception was 6 years and 3 months, but it actually took more than 16 years to be completely inspected and approved. Two years later, this ex-post evaluation study was conducted, which ended up comparing current conditions with those of nearly 20 years ago. During those 20 years, personnel in charge have moved or retired and data has been scattered and lost, posing difficulties for the evaluation. Further, there have been significant changes in social conditions over these 20 years, and it was observed that the plan from 20 years ago was not necessarily appropriate for the present. For example, this project was mainly designed as an agricultural project, but it has become more of a comprehensive project, including industrial and distribution sectors over the 20 years. While the project is now serving a broad role for overall development in the coastal area of Jiangsu Province, this ex-post evaluation study evaluated the project as one for improving agricultural productivity and expanding water transport.

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

3.1 Relevance (Rating: a)

3.1.1 Relevance with the Development Plan of China

From the Eighth Five-Year Plan (1990-1995) until the present Eleventh Five-Year Plan (2006-2010), in order to solve the problems of ensuring a stable food supply and redressing the regional income gap, the Chinese central government has consistently treated the increase of food production, the expansion of land under cultivation, including the irrigated area for major agricultural products, and the promotion of the South-to-North Water Diversion Projects as important policy issues. In addition, the Jiangsu Coastal Development Plan (August 2009) is a comprehensive development plan concerning agriculture, industry and commerce in coastal Jiangsu Province, and the Tongyu River is one of the

key infrastructures for the plan.

Aligning these policies from the central government, in 1990, the Jiangsu Province government settled on the Eighth Five-Year Plan as a provincial-level policy and proceeded with 10 large infrastructure projects. The Tongyu River Irrigation Development Project is one of those projects for the "Comprehensive Agricultural Development of the Huang-Huai-Hai Coast." In addition, as of now, the "Three-Year Implementation Proposal for the Modernized Agricultural Development of the Jiangsu Coast (December 2009)" and the "Yancheng Coastal Development Plan for the Agricultural Sector (2007)" drawn up by the Jiangsu Province government and the Yancheng Municipality. These two plans are designed to further develop the Tongyu River and make the most efficient use of it aligning the central government's Jiangsu Coastal Development Plan.

3.1.2 Relevance with the Development Needs of China

Since 1990s until the present, Jiangsu Province has had high agricultural productivity, ranking among China's top three. However, as of 1990, in the Subei area of the province, one-third of the Togyu river basin's arable land had a middle level yield of 3 to 4.5 tons per hectare, while half of the land had a low level yield of 3 tons or below. In addition, roughly 60,000 hectares of the surrounding land was saline-alkali land, although much of it could be cleansed and made suitable for farming by providing a large amount of water. This was how it became indispensable that water be supplied to the land around the Togyu River with an irrigation project. However, nearby water resources were already close to their limit and the water quality was not good, so a large-scale irrigation canal for farming became necessary to draw water from the Yangtze River, which is relatively close and has an abundant amount of good quality water.

Large and small canals, such as the Beijing-Hangzhou Grand Canal, have been constructed in the Subei area since ancient times to ensure water supplies for farming. With regard to water transport, these canals had also served as primary shipping routes using small boats. Since the freight traffic had heavily relied on water transportation, there were no large main roads or railways developed nearby. Meanwhile, demand for shipping had increased in the central Tongyu River area as the economy had developed, but as there were no large-scale canals that 1,000-ton ships could pass through on the east side of the Grand Canal, water transport posed an impediment to meeting this demand.

3.1.3 Relevance with Japan's ODA Policy

At the time of the project appraisal, the implementation policy set by the Overseas Economic Cooperation Fund (JICA at the present) focused on the following three areas: the environment, food and poverty, and the reduction of regional disparities. Focal points

under the country-specific implementation policy were prevention of desertification, environmentally-friendly agriculture, poverty alleviation through rural development and improvement of agricultural productivity, and irrigation to make efficient use of water resources.

This project has been highly relevant to the country's development plan and its development needs, as well as Japan's ODA policy. Therefore the project's relevance is rated as high.

3.2 Efficiency (Rating: c)

3.2.1 Project Outputs

Outputs planned and achieved are as shown in the table at the end of this report.

There are two subprojects — the Haian and Beiluitang river shiplocks — that were cancelled due to a lack of funds. In addition, since the Haian subproject was cancelled, construction to extend the waterway between Haian and Dongtai was also cancelled (Figure 1). The both of the projects were intended to serve for water transport. But with funds lacking, focus was placed on irrigation as the project's main purpose, and the subprojects for water transport, which were of relatively low priority, were cancelled. It is believed that this decision was appropriate. The cause for the lack of funds was the steep rise in prices of construction materials. Commodity prices in China rose sharply with the rapid economic growth during the 1990s. According to the *Jiangsu Statistical Yearbook 2008*, the raw materials price indicators, which include construction materials, rose about 120% every year during the decade, thus resulting in a lack of funds for the project.

Figure 1 Project Area

Additionally, the completed Subei drainage culvert was demolished after its construction as an effect of the Huai River Sea-Entryway Project (another project budgeted by Jiangsu Province). The Huai River Sea-Entryway Project was a newly devised counter-

measure against flooding initiated as a result of the serious floods that occurred in 1998. The Huai River drains water from western inlands into the eastern Huanghai Sea, so it intersects with the Tongyu River running north-south. After considering various alternatives to minimize the construction's impact on nearby areas and its costs, the Subei drainage culvert was chosen for the intersection. It was impossible to foresee the implementation of the Huai River Sea-Entryway Project when the Tongyu River Project was planned. So the resulting demolition of the Subei drainage culverts was inevitable.

Meanwhile, the plan initially called for 320 small-scale facilities such as sluice gates and bridges, but in the end this number has risen to 420. This increase was the result responding to changes in social conditions nearby such as the construction of railways and roads during the project's long construction phase.

The time for this project has reached a long period of more than 10 years and the expansion and reduction of outputs were caused by changes in society during the time it has been carried out. Each expansion and reduction was an appropriate response to changing conditions and it would not be right to condemn these decisions, but as a result there have been deviations between the plan and outputs made.

3.2.2 Project Inputs

3.2.2.1 Project Period

Under the plan, the period for carrying out the project was 6 years and 3 months (75 months) from October 1991 to December 1997, but it actually took 11 years and 3 months (135 months) from October 1991 to December 2002 (when all construction was completed). The plan has expanded to 180% of its original schedule, significantly longer than planned. The primary reasons for the extensions are: delayed construction due to the serious floods in Jiangsu Province in 1991; surveys, model tests and design changes concerning difficult constructions such as the Xiangshui Shiplock; and time requirements for deliberations, procedures and such concerning the cancellation of subprojects (see 3.2.1). Primary construction of waterways was completed in December 2000. From 1997 until that time, irrigation water was supplied from each section upon its completed construction.

3.2.2.2 Project Cost

The planned cost of the project was JPY 18.782 billion, but it actually became JPY 27.694 billion, 147% higher than planned. The primary causes for going over budget were the steep rise in construction material costs during the period of rapid economic growth in the 1990s and increases in the cost of land acquisitions (RMB 3 per m^2 under the plan, but actually RMB 6 – 7.5 per m^2).

With regards to the amount of the ODA loan, the total amount lent was JPY 11.532 billion, roughly the same as the JPY 11.535 billion under the plan.

The project cost was higher than planned, while the project period was significantly longer than planned. Therefore, the efficiency of the project was low.

3.3 Effectiveness (Rating: b)

3.3.1 Quantitative Effects

3.3.1.1 Results from Operation and Effect Indicators

(1) Effects on Agricultural Development

Agricultural development expected under the plan was in the target area of 219,900 ha by increasing irrigated land area, boosting the rice, wheat and cotton harvests and changing products cultivated. However, neither the Tongyu River's general administrative agencies[20] nor the agency concerned with agriculture[21] could specify the land area that benefited from the project[22]. In addition to this, few data on operation and effect indicators were available. So the evaluation comparing the plan's figures with those for actual results was hardly carried out. Therefore, as an alternative method, the evaluation was made using the agriculture indicators for the entirety of the Yancheng Municipality, the largest area of land directly benefiting from the project. The agricultural indicators in sections 1) through 3) below were all according to the *Yancheng Statistical Yearbook 2009* (China Statistics Press, 2009).

1) Arable Land Area

A regression analysis of arable land area shows that there was a slightly decreasing trend from the time before the project and during the project (1985 − 2002) and that there was a slightly increasing trend after its completion (2003 − 2008), but neither trend is distinguished. As can be seen in Figure 2, they were fairly stable. Accordingly, the expansion of arable land area due to the project is unconfirmed. Note that there was a rapid expansion in year of 2000, but the reason is incomprehensible. Since the trend after 2000 was again constant as before, this expansion is thought to be caused not by a change in

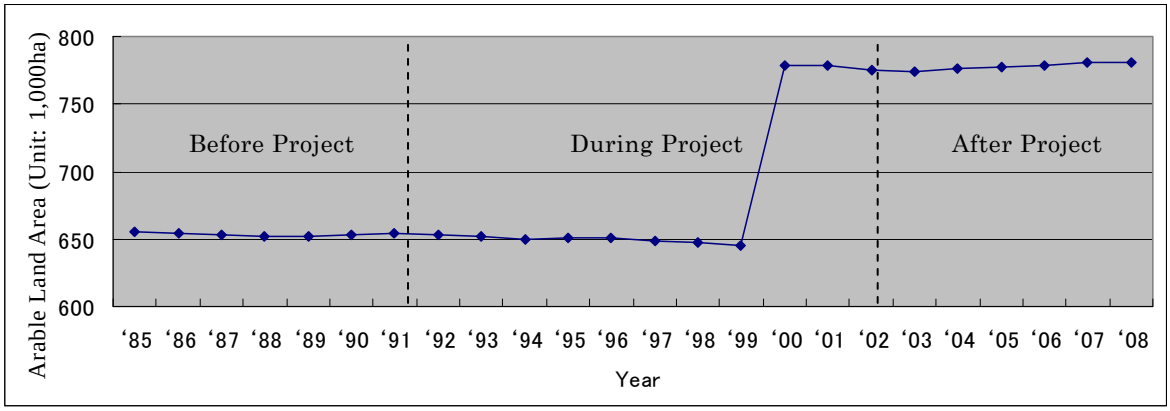
[20] The Jiangsu Province Water Conservancy Department is the general administrative agency for facility construction and the Yancheng Municipal Water Bureau is the general administrative agency for managing facilities.

[21] Agriculture Bureau, Yancheng Municipal Agriculture Committee

[22] Targeted area under the plan was: 192,200 ha (low yield land and saline-alkali land) in the irrigated area North to the Main Irrigation Canal; 19,387 ha (saline-alkali land) in the reclamation area North to Doulonggang River; and 8,313 ha (saline-alkali land) in the reclamation area South to Doulonggang River. But neither the target area planned nor the actual current benefited area could be specified by the agencies concerned. Targeted area planned was not an administrative district and not identical with Yancheng Municipality.

actual arable land area, but rather by a change in the method for statistics.

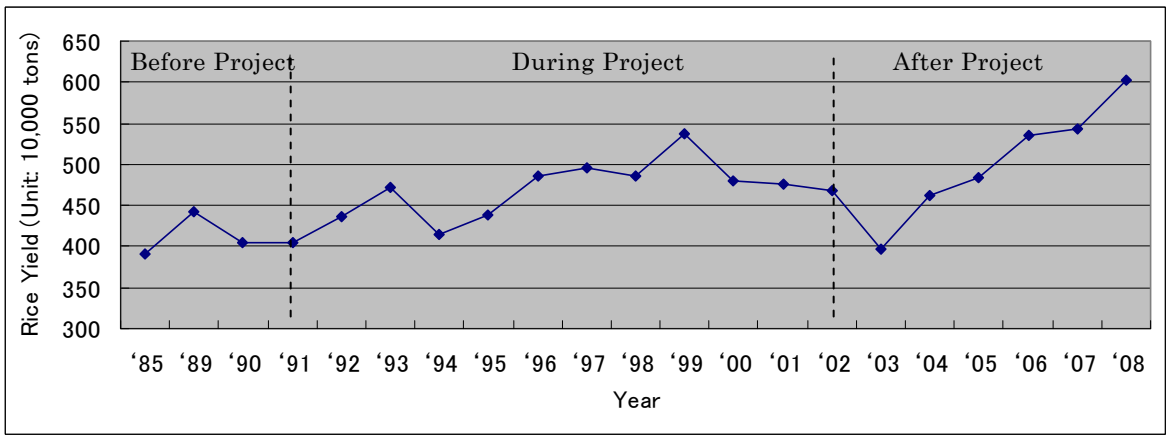
Figure 2 - Arable Land Area



2) Rice Yield

Although there were fluctuations in rice yield both before and during the project (1985 − 2002), the overall trend was an increasing one. The increasing trend is more notable after the project's completion (2003 − 2008). Based on interviews with the Tongyu River's administrative agencies and the agency concerned with agriculture, no other projects that have had a large impact on rice yield have been carried out, so this project can be regarded as one of the major contributors to the increasing trend of rice yield.

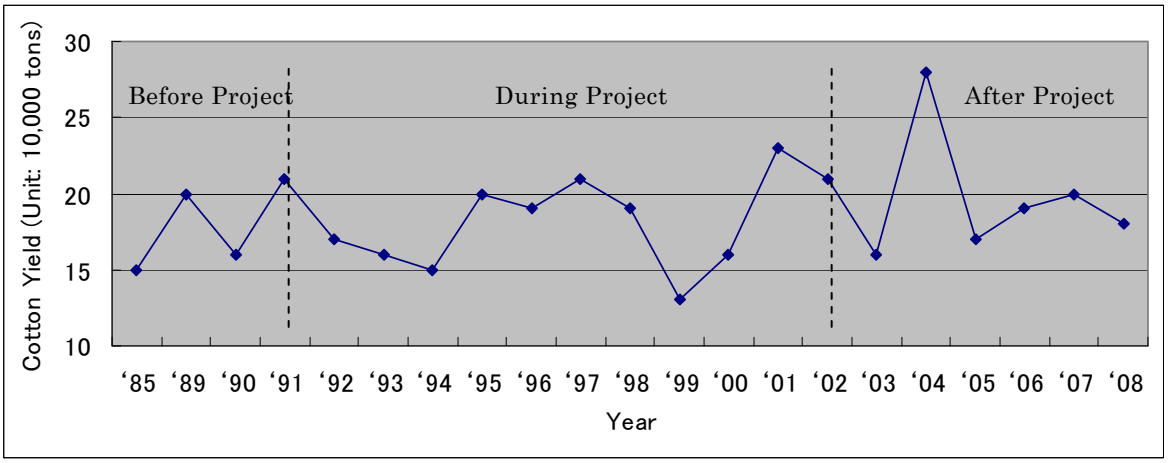
Figure 3 − Rice Yield



3) Cotton Yield

As shown in Figure 4, cotton yield was fairly constant from before the project until after completion (1985 − 2008). No meaningful trends can be read even from a regression analysis. Accordingly, no notable contribution of the project can be seen to cotton yield.

Figure 4 − Cotton Yield



(2) Effects on Water Transport

Regarding effects on water transport development, no specific operation and effect indicators were prepared in the plan. Therefore, this evaluation employed quantitative indicators using traffic through and tolls for the Xiangshui and Datao Shiplocks.

Xiangshui Shiplock

At the Xiangshui Shiplock, traffic tonnage increased an average of roughly 134% annually from 780,000 tons in 2001 to 6.26 million tons in 2009, while tolls collected increased an average of roughly 140% annually from RMB 530,000 to RMB 6.17 million. At the Datao Shiplock, traffic tonnage increased an average of roughly 108% annually from 3.96 million tons in 2004 to 4.86 million tons in 2008, while tolls collected increased an average of roughly 113% annually from RMB 3.08 million to RMB 4.72 million. Before the project, there were no shiplocks for water transport on the Tongyu River and there were no tolls for passage, but the tolls from the project have become a new source of revenue for the Yancheng Municipality.

3.3.1.2 Results of Calculation of Internal Rate of Return (IRR)

When the project was appraised, the economic internal rate of return (EIRR) was calculated as shown in Table 1 and the project was deemed to have sufficient economic profitability.

Table 1 – EIRR Calculation Assumptions and Results from Project Examination

Project Life	40 Years After Project Completion
Costs	1. Construction 2. Operation and maintenance 3. Facility renewal
Benefits	1. Increased agricultural production (farm revenues per ha) 2. Easier and bigger water traffic passage 2.1 Less costs for detours 2.2 Hazard prevention by widening canal 2.3 Less transport expenses by reducing number of shiplocks 2.4 Shortened river distance
EIRR (Phase 2 Assessment)	18.3%

As described above in 3.3.3.1 (1), the target area planned and currently benefiting area from the project cannot be specified. Therefore, due to the fact that data needed for quantitative analysis was not available, analysis for the internal rate of return could not be carried out.

3.3.2 Qualitative Effects

3.3.2.1 Questionnaires and Interviews to Farmers

In order to quantitatively and qualitatively evaluate the agricultural benefits of the project, a questionnaire survey of 104 people and interviews with 2 individuals and 9 groups were conducted among the farmers within the Yancheng Municipality, who are direct beneficiaries of the project. Because the ex-post evaluation compares the situation before and after the project, the questionnaires and interviews had to ask farmers to remember and compare their situation before (1991) and after (2009) the project, spanning a twenty-year period. Therefore, the reliability of the survey is supposed to be low. But looking only at the responses, farming income (rice, wheat, cotton, etc.) after the project rose approximately 7 times over pre-project income, and farming expenses (seeds, seedlings, fertilizer, agrochemicals, farming machinery rentals, etc.) increased 11-fold.

Qualitative answers to questions showed large improvements on mechanization, crop replacement, labor and living standards. This implies that the amount of water for agriculture was increased by this project, which led to the increase of farmers' income. And farmers invested their income in mechanization and crop replacement resulting further increase of income, thus created the virtuous circle.

3.3.2.2 Questionnaires and Interviews to Companies Using Water Transport

In order to quantitatively and qualitatively evaluate the water transport benefits of the project, a questionnaire survey of 27 companies and an interview with 1 company using water transport and 2 water transport shipping companies were conducted among the water transport companies within the Yancheng Municipality, who are direct beneficiaries of the project. According to these, over the past 20 years, the total annual volume of shipping on the water increased roughly 11-fold, while total annual water shipping expenses rose approximately 9 times, indicating high effectiveness for water transport costs. Many companies (20 out of 27) also pointed out low shipping costs in their qualitative responses. Besides economic improvements, many respondents also pointed out improvements in safety, convenience, speed, etc. From these results, the great positive effects extended by the project to companies in the area can be recognized.

3.3.3 Overlaps and Effects of Other Projects

The benefiting area of this project, the Tongyu River Project, partially overlapped with the one of the Irrigated Agriculture Intensification Project (1991-1995, World Bank). However, the Tongyu River Project was for construction on primary waterways, while the World Bank's project was for the construction of facilities on secondary and lesser waterways connected to the Tongyu River, including other activities such as agricultural extension and agricultural mechanization. Therefore, while benefiting areas overlapped, both projects have a mutually complementary relationship, and the two projects should be regarded as one project constructing an irrigation system from primary to the most outlying waterways.

In addition, the Taizhou Yangtze River Water Diverting Channel Project (1998-2003, Jiangsu Province) and the Taidong River Project (since 2010, World Bank) are both waterways supplying water from the Yangtze River to the Tongyu River. These two projects and the Tongyu River Project are treated as the Tongyu Canal Construction Project. The Tongyu River Project is sometimes called in China the "Middle part of" Tongyu Canal Project, which is still continuing to be extended to the upper and lower parts of the canal.

As show in the above, positive results can be seen particularly in rice production and water transportation. However, because the target area planned and the actual current benefiting area could not be verified, and quantitative benefits could not be confirmed regarding the cotton production and irrigated land area in the Yangcheng Municipality, this project has somewhat achieved its objectives. Therefore its effectiveness is fair.

Note that the results of the questionnaires to farmers were less heavily evaluated since their reliability is considered to be low because it was a comparison of the current situa-

tion and the situation 20 years ago relying only on the memories of farmers and there is a concern of some bias in the sampling of farmers.

3.4 Impact

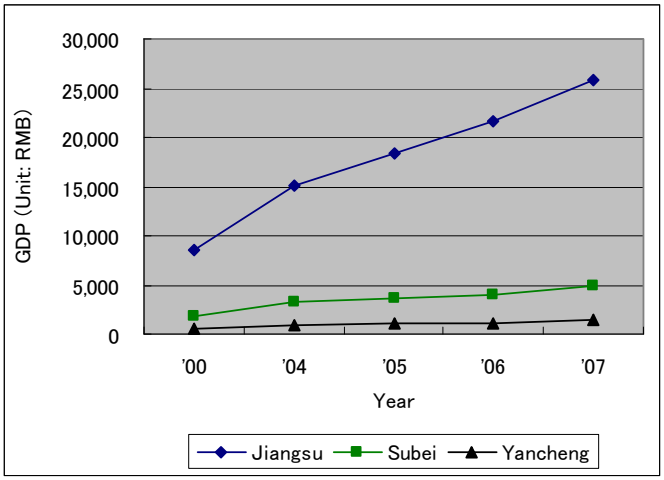
3.4.1 Intended Impacts

3.4.1.1 Impact on the Regional Economy

(1) Gross Domestic Product (GDP) of Yancheng Municipality

As data prior to the year 2000 could not be acquired, an ex-ante and ex-post comparison could not be made, but as far as looking at the economic trends following 2000, as shown in Figure 5, the GDPs of Jiangsu Province, the Subei area of Jiangsu Province and the Yancheng Municipality all showed favorable increases. However, the rate of rise in Yancheng, which was directly impacted by the project, is not particularly great compared to that of Jaingsu Province or Subei area. Accordingly, it cannot be said that the project's impact has stretched to the entire regional economy.

Figure 5 − GDP of Jiangsu Province, Subei and Yancheng

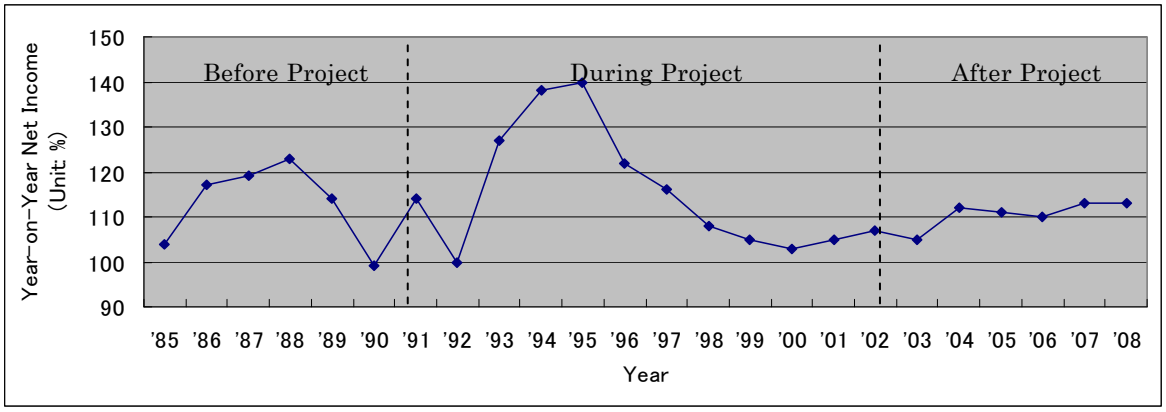


Sources: Jiangsu Statistical Yearbook 2008,
Yancheng Statistical Yearbook 2009

(2) Increase in Per Capita Farmer Income

As shown in Figure 6, year-on-year net per capita farmer income consistently rose around 110% starting in the year 1985. But no particularly large changes can be seen during and after the project. Accordingly, it cannot be read from the statistics that there are positive impacts for farmer income by the project.

Figure 6 − Year-on-Year Net Per Capita Farmer Income



Source: Yancheng Statistical Yearbook 2009.

3.4.2 Other Impacts

3.4.2.1 Impacts on the Natural Environment and Society

(1) Improvements of Water for Daily Use

The Chinese government's environmental standards for water quality are divided into Categories I − III for drinkable water sources, Categories IV and V for agricultural and industrial use, and anything below Category V cannot even be used for agriculture or industry. While the Tongyu River was classified before the project as Category IV and V, it is now classified as Category III, and the River is called the "Clear Water River." This positive effect has been brought about by the design of waterways which increases the volume of filthy water discharge and clean water intake, and by the strengthening of water quality lows and regulations and their enforcement.

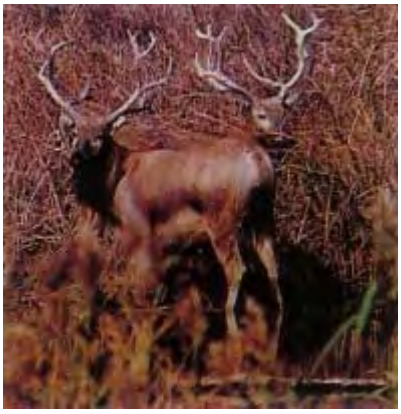
The Tongyu River's water quality is managed as prescribed by both the Tongyu River Management Implementation Law (a municipal regulation) and the Tongyu River Water Quality and Prevention Pollution Order (a provincial regulation). The Yancheng Municipal Water Bureau publishes data on water quality measurements on its website and updates it weekly. Several water companies are located on the banks to supply water from the Tongyu River as a utility. The people living in the river basin use its water in their daily lives. A number of respondents to the questionnaires to farmers also pointed out improved water quality and subsequent reductions in labor.

(2) Impact on the Natural Environment

23.3 km^2 out of 24.7 km^2 of the river basin area was afforestable, and all of the area's tree-planting projects have been completed. The central government has recognized the proactive greening activities and pollution prevention measures taken by the project resulting positive impacts on society, ecology and tourism, and thus designated the project

area as “National Scenic Water Area.”

Regarding conservation of rare wild animals, by connecting over 10 rivers, the project makes a large contribution to adjusting and improving the ecosystem (wetlands) between those rivers, thus creating an appropriate habitat for rare species such as the red-crowned crane and the milu (Père David's deer). This is the largest preservation area for the red-crowned crane in China, and is the largest in the world for the milu.



Milu

(3) Land Acquisition and Resettlement

While the project appraisal expected the resettlement of 29,929 people in 6,995 households, the plan was changed when its detail designs were worked out so as to minimize resettlements to 8,977 people in 3,884 households, which can be highly appreciated. However, on the other hand, this change of plans undeniably caused for the schedule overrun of the project.

According to the questionnaires and interviews to farmers, although there were some cases who complained of problems such as delayed payment for land acquisition compensation and reduced incomes due to the resettlement (1 out of 104 people), the relocations and site acquisition as a whole went well and agricultural production and farming income improved thereafter.

(4) Gender Considerations

According to farmer interviews, labor burdens have been reduced and work hours have been shortened for both men and women. This was due to the fact that the amount of water for agriculture was increased by this project, which led to an increase of farmers’ income, and farmers invested their income in purchases or group lending of agricultural machines, which reduced farmers’ labor burdens and work hours. Shortened work hours are especially welcomed by women, who are allowed to spend more time for housework and child care.

(5) Reduced Flood Damage

The project completion report tells that over 400 million tons of water was drained through the Tongyu River during the flood seasons of 2000, 2003 and 2006, flood damage was greatly reduced.

However, this cannot necessarily be substantiated through the statistical data. As shown in Table 2, while rainfall was 911 mm and flooded land area was 49,000 m^2 during the

1991 floods (before the project), rainfall was 604 mm and flooded land was 54,000 m^2 during the 2003 floods (after the project); more land was flooded even though there was less rainfall. This was affected by the fact that there were 1,000km^2 of wetlands with water retention of 2 billion tons in the western upstream area in 1991, while in 2003 the wetlands had shrunk to 50km^2, leading to a steep drop in water retention. In addition, varying rainfall patterns affect the amount of flooded land. That implies that the land area submerged in floods is largely affected by factors other than the project, i.e. the land's water retention and rainfall patterns. Therefore, from the flood damage data, it is difficult to see a direct contribution to the flood control by the project.

Table 2 Flood Damage in Yancheng since 1991

Year/Month	Rainfall (mm)	Flooded Area (10,000 m^2)	Flood Victims (10,000 people)	Economic Loss (RMB 100 mil.)
1991.6	911	49	508	35
2003.6	604	54	453	55
2006.6	411	41	399	29
2007.6	442	14	137	10

Source: Yangcheng Municipal Water Bureau

As stated above, while it is difficult to verify the project's intended impacts (contribution to the regional economic development of Subei, Jiangsu Province) from the statistics, they could be confirmed to a certain extent through the farmer questionnaires. Otherwise, positive impacts were observed on water for domestic use, the natural environment conservation, post-resettlement farming income, etc. No negative impacts can be recognized.

3.5 Sustainability (Rating: a)

3.5.1 Structural Aspects of Operation and Maintenance

3.5.1.1 Operation and Maintenance Systems for Tongyu River

The Jiangsu Province Water Conservancy Department is the general administrative agency for construction works and the Yancheng Municipal Water Bureau is the general administrative agency for operation and maintenance of facilities. At the Yancheng Municipal Water Bureau, the Yancheng Municipal River Management Offices (11 offices) mainly oversee waterways and the Yancheng Municipal Tongyu River Construction Management Agencies (6 agencies) oversee associated facilities such as shiplocks and pumping stations.

Tasks and procedures of operation and maintenance are standardized at each of the Yancheng Municipal Water Bureau's agencies, and actual operations are appropriately conducted based on these standards. Records and reports regarding operation and maintenance are also appropriately taken according to each agency's procedural guidelines, and they are compiled and bound annually and monthly. For example, the Yandu District

Tongyu Riverbank Management Office monitors waterways and reports on topics such as daily observations, abnormalities and accounting. These reports are compiled monthly and annually and submitted to the Yancheng Municipal River Management Office. Copies are bound and kept in the office of its general manager.

Irrigation stations, which are the government's agencies for managing secondary and lesser waterways, are direct contact points with farmers. The irrigation stations have four duties: collecting water fees; publicizing and instructing the country's agriculture policies; managing the implementation of small-scale projects; and flood control measures. Their personnel, duties, budgets, training and such are established by the provincial government, and they can be regarded as reliable management systems.

3.5.1.2 Operation and Maintenance Systems for Irrigated Land

Operation and maintenance of outlying waterways and farmlands are left to villages. The Jiangsu Province Water Conservancy Department and the Yancheng Municipal Water Bureau are not involved in the management of farmlands. The responsible agency for supervising and directing administration of farmlands is the Agricultural Committee of Jiangsu Province Agriculture Department. But it may be appropriate that the provincial Water Conservancy Department and the municipal Water Bureau should be involved in the administration of farmlands from the view point of water supply.

Farmland and ditches

Water users associations (23 associations) have been introduced in some parts of the Yancheng Municipality for the self-administration by farmers. However, since investments in infrastructure and such are required to introduce these associations, the Yancheng municipal government has no specific plan to introduce them for all farmlands due to the financial constraints. In places where the associations have been introduced, they have come to play coordinators' roles, exercising farmland and water management jointly with several villages. Because of this cooperative way, little conflict between villages has taken places, and farm management in general seems to be going better than other areas where farmland management is conducted separately by each village.

3.5.2 Technical Aspects of Operation and Maintenance

According to information obtained through interviews and observations, the Yancheng Municipal River Management Office and the Yancheng Municipal Tongyu River Construction Management Agencies have sufficiently high technical competencies, and no specific technical problems were found in operation and maintenance of facilities.

Training（Datao Shiplock Office）

Systematic and practical trainings have been conducted on every level of administration aiming at the improvement of technical capabilities. The Jiangsu Province Water Conservancy Department conducts annual training for relevant personnel from a macro perspective including quality control and safety control. Each city and county conducts practical waterway management training. For example, the Yancheng Municipal River Management Offices and Yancheng Municipal Tongyu River Construction Management Agencies conduct a variety of trainings on regular and ad hoc basis such as facility maintenance training and small-scale construction management training for technical personnel and accounting training for clerical work personnel. Participants are given well prepared voluminous texts, from which the agencies' seriousness about training can be observed.

On the irrigation station level as well, regular training for staff such as water administration, water irrigation project management, station manager and assistant manager training and accounting are conducted regularly. There seem to be positive efforts across the entire organization to maintain and improve clerical and technical proficiency.

3.5.3 Financial Aspects of Operation and Maintenance

The budgets for the Yancheng Municipal River Management Office (11 offices) and the Yancheng Municipal Tongyu River Construction Management Agencies (6 agencies) are provided by the Municipality. Adding to this, each agency collects funds on its own through, for example, shiplock tolls, small-scale construction contract fees and such. There is also a stratified financial support system by the municipal, county and national governments. With these, sound finance is systematized and no specific problems observed in general.

Insufficient budget for maintenance was mentioned in interviews regarding dredging (shiplock offices) and lining (river management offices), but they do not pose serious impediment on operation and maintenance. In case of a major problem such as extensive

damage to facilities due to a collision by a ship (which has not actually occurred), financial measures are supposed to be taken by the municipal, provincial or national budget depending on the scale of the incident.

The operation and maintenance of small-scale facilities (pumps, gates, etc.) built by the project is covered by water fees levied from farmers by irrigation stations and subsidies from the county. The water fee collection rate is high about 90% or above. Except a small fraction of very poor farmers, the collection rate among average farmers is nearly 100%.

3.5.4 Current Status of Operation and Maintenance

As stated above in 3.5.1, the Yancheng Municipal Water Bureau standardizes procedures and details regarding operation and maintenance of the river, and offices and agencies in charge appropriately execute their duties based on them. Operation and maintenance of outlying waterways and farmlands is left to the villages and water users associations. Although the Jiangsu Province Water Conservancy Department and the Yancheng Municipal Water Bureau are not involved in it, the operation and maintenance has been conducted without any major problems.

No major problems have been observed in the operation and maintenance system, therefore sustainability of the project is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The relevance of this project is high, as it has been taken as an important policy issue of the Chinese government and was implemented by Jiangsu Province and the Yancheng Municipality as an enforcement of the policy. Efficiency is low due to expansion and reductions in outputs, significant schedule overrun and cost overrun. Alternative indicators were used to evaluate effectiveness due to the inability to specify the target area, but since certain positive effects and impacts have been recognized, the effectiveness is evaluated to be moderate. Sustainability is high, as there are no problematic issues with the operation and maintenance system, technical proficiency or finances of offices and agencies in charge. In light of the above, this project is evaluated to be fairly satisfactory.

Besides the results of the evaluation by five evaluation criteria, it is deserved to specially mention the high relevance of the project at present. This project was planned primarily as an agricultural project nearly 20 years ago. However, thereafter, China enjoyed a rapid economic growth during the 1990s, and the conditions and circumstances have changed greatly also in Subei, Jiangsu Province. Meanwhile, the significance of the project increased as a one to provide water not only for agriculture but for overall develop-

ment including industry, commerce and distribution. The current national strategy, the Jiangsu Coastal Development Plan (2009), and the provincial and municipal policies aim at the comprehensive development of this area. And they are all premised on the water from the Tongyu River. Therefore, it is worthy to give special mention to this point that the project has become more significant and highly relevant from the time it was planned to the present.

4.2 Recommendations

4.2.1 Recommendations to Executing Agencies

(1) While there are certain communication channels between the water departments (Jiangsu Province Water Conservancy Department and Yancheng Municipal Water Bureau) and the agricultural departments (Jiangsu Agriculture Department and Yancheng Municipal Agriculture Committee), the water departments do not comprehend the agricultural benefits made by the project and are not involved in farmland administration. Thus an administrative deviation was observed. In order for the water departments to effectively and efficiently implement projects, they need to track the benefits for the final beneficiaries, i.e. farmers, and feed back the results of the tracking to planning, implementation and evaluation of projects. Therefore, it is recommended that the Water Conservancy Department and the Water Bureau further concern with the business of the agricultural departments and to establish closer communication and cooperation with them.

(2) Compared to other provinces (such as Gansu Province), water users associations in Jiangsu Province seem to have been extended relatively slowly. Looking at an example of their introduction in Yancheng Municipality and comparing to villages without associations, they are very beneficial for farmers. Since associations facilitate self-administered farming by farmers involving and coordinating several villages, the inter-village links are strengthened and the management of facilities and water is conducted more effectively and efficiently. There have also been some local success stories. It is recommended that the water user associations be extended widely in the area.

4.2.2 Recommendation to JICA

As JICA has accumulated knowledge and experiences of water users association and farmers organization through its projects in the past, it could provide efficient and effective assistance for the extension of water user associations mentioned above.

4.3 Lessons Learned

(1) For implementing a large-scale project such as this project, an executing agency should plan, execute, monitor and evaluate the project with a wider perspective not only

focusing on the construction but also viewing the final benefits. In particular, it would be desirable to do the long-term continuous monitoring of the benefits brought about by the project starting from construction period until after the completion of the project. With such monitoring, it would become possible to revise plans including high-level objectives as impacts and outcomes and to change the project strategies and implementation methods. And as a result, the feedback of knowledge and experiences to other projects would be realized.

(2) As stated above in 2.3 and 4.1, this evaluation was conducted comparing the current situation with the one of 20 years ago. Because of the changes in social conditions over 20 years, the relevance of the project has changed and data has been scattered and lost, posing difficulties for the evaluation. Therefore, when a project is expected to span a long period of time, it is recommendable to conduct a mid-term evaluation to review the plan at an appropriate timing.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Project Outputs	1. River extension/construction (1) New: Funing – Xiangshui, 57 km (2) Extension: Haian – Dongtai – Funing, 158 km	1. River extension/construction (1) As planned (2) Haian – Dongtai cancelled, Dongtai – Funing (120 km) as planned, Taidong River connection (7.6 km) added
	2. Subprojects (1) Haian project (1 shiplock) (2) Xiangshui project (1 shiplock) (3) Beiliutang River project (1 shiplock) (4) Subei Irrigation & Drainage project (irrigation culvert: flow of 800 m^3/s, drainage culvert: flow of 110 m^3/s) (5) Abandoned Yellow River project (Abandoned Yellow River culverts: flow of 500 m^3/s, 1 shiplock and pumping station: 50 m^3/s pumped) (6) Construction of 18 bridges	2. Subprojects (1) Cancelled (2) As planned (3) Cancelled (4) Subei Irrigation Culvert: as planned (4) Subei Drainage Culvert: demolished after completion (5) Abandoned Yellow River Culverts: as planned (5) 1 shiplock: as planned plus 5 associated facilities added (5) Pump Station: as planned (6) 27 bridges constructed (23 road bridges and 4 agricultural machinery bridges)
	3. Other related facilities Communication facilities, electric power substations, small-scale sluices, pump stations and others	3. Other related facilities Ferries (27), small facilities (421), Jiangdu West Shiplock Upstream Diversion & Sandbar Severance Project, Tongyu River Flood Prevention Command System Project, Hydrological Facility Construction Project
		4. Extra Projects Datao Electric Pumping Station Project
2. Project Period	October 1991 – December 1997 (75 months)	October 1991 – December 2002 (135 months)
3. Project Cost Amount paid in Foreign currency	11,535 million yen	11,532 million yen

Amount paid in Local currency	7,247 million yen (RMB 690 million)	16,162 million yen (RMB 890 million)
Total	18,782 million yen	27,694 million yen
Japanese ODA loan portion	11,535 million yen	11,532 million yen
Exchange rate	RMB 1 = JPY 11.9 (as of Dec. 1994)	RMB 1 = JPY 18.45 (Calculated from disbursed amount (JPY) and actual construction funds (RMB))