

China

Ex-Post Evaluation of Japanese ODA Loan Project

Yellow River Delta Agricultural Development Project

External Evaluator: Naoko Inada, IC Net Limited

0. Summary

The development of agriculture and rural communities is a priority area in China. Shandong Province occupies a prominent place in this regard with the third largest cultivated area and the second largest production of food in the country. However, the province has only limited water resources. Accordingly, the national and provincial governments are focusing on policies to promote effective utilization of water resources for agriculture and infrastructure development for that purpose. Therefore, this project has been highly relevant. Since all the outputs of this project have been implemented according to the plan in terms of both expenditure and period, the project has been highly efficient. With regard to the effects of this project, the agricultural profits have increased both throughout the project and in terms of household income. This is attributable to factors such as the enlargement of cultivated area, improvement of productivity, and transition to high value-added crops. Meanwhile, it was expected initially that the introduction of double cropping by irrigation would lead to an increase in the production of agricultural produce. However, due to the changes in the cropping pattern such as the expansion of more profitable cotton single cropping, the gross production amount has not reached the planned value. Nevertheless, there have been no problems in the effective utilization of water resources, and thus the project can be regarded as highly effective. From the perspective of structure and technology, the operation and maintenance of the irrigation facilities have been executed properly in coordination and support of the project implementing entities and related organizations. With regard to the financial aspect, on account of the Chinese Government's policy of giving priority to agricultural affairs, the burden on the users of the irrigation facilities has been alleviated, and the financial resources have been secured in the government. In this context, there have been no problems in the operation, maintenance and expansion of the project and its effects. Therefore, the sustainability of the project has been high. Consequently, this project is evaluated to be highly satisfactory.

1. Project Description



Project Location



Cultivated land in the Daluhu area (Moving clockwise from front of the picture, the crops are soybeans, winter wheat after harvest, maize after sowing, cotton, and paddy.)

1.1 Background

In China, nearly 70% of the entire population inhabits rural farming communities, and the development of agriculture and farming villages is still one of the highest priority issues, even as the country is experiencing rapid emergence of the market economy. Amid such circumstances, Shandong, a province blessed with ample water supply of the Yellow River, had come to be regarded as an important production base for agricultural produce, recording the country's second largest harvest in 1998. Since the 1990s, the Xiazhen area of Dongying City and Daluhu area of Zibo City have been proceeding with the modernization of agriculture and the reinforcement of implementing bodies, in response to the policy of the provincial government. Although the province ranked high in the country in terms of cultivated acreage, only a little more than 60% of its land had been irrigated. In addition, there was salt accumulation in the soil of the Xiazhen and Daluhu project areas, leading to low productivity.

1.2 Project Outline

The objective of this project is to cultivate a total of 34,000 hectares of land and improve low- and medium-yield fields in the Xiazhen area of Dongying City and Daluhu area of Zibo City with an eye toward the effective utilization of water resources and the stable production of agricultural produce, by developing agricultural infrastructures such as irrigation facilities and farmlands, thereby contributing to increased income of farmers.

Loan Approved Amount/ Disbursed Amount	8,904 million yen/ 8,882 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March, 2000/ March, 2000
Terms and Conditions	Interest Rate: 2.2%, Repayment Period: 30 years (Grace Period: 10 years), Conditions for Procurement: General Untied
Borrower/ Executing Agency	Government of the People's Republic of China/ Shandong Provincial Government
Final Disbursement Date	July, 2007
Main Contractor	Sinochem International Oil Company
Main Consultant	None
Feasibility Studies, etc.	Shandong Engineering Consulting Institute, 1998
Related Projects	None

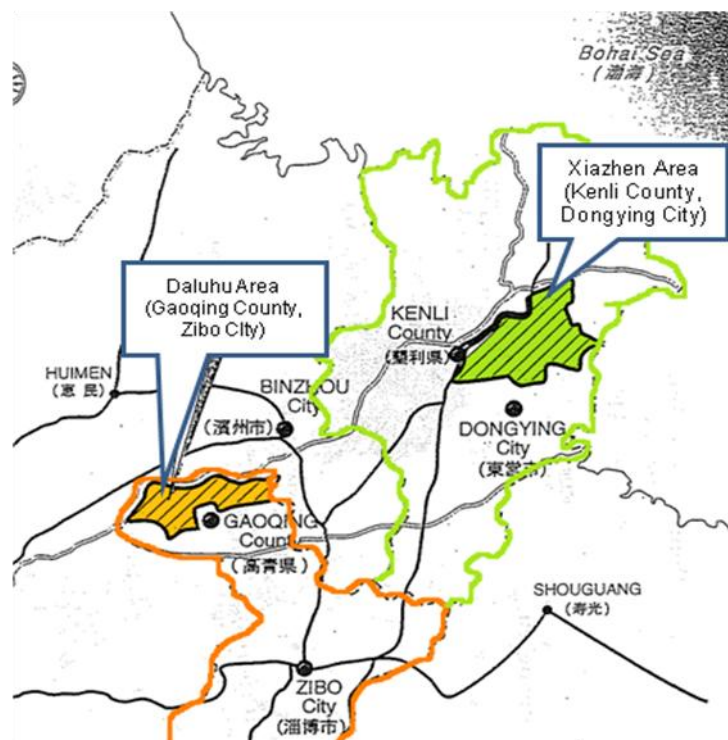


Figure 1 Project Locations

2. Outline of the Evaluation Study

2.1 External Evaluator

Naoko Inada, IC Net Limited

2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted as follows:

Duration of the Study: November, 2010 – October, 2011

Duration of the Field Study: March 3, 2011 – March 17, 2011; June 21, 2011 – June 27, 2011

2.3 Constraints during the Evaluation Study (if any)

None

3. Results of the Evaluation (Overall Rating¹: A)

3.1 Relevance (Rating²: ③)

3.1.1 Relevance with the Development Plan of China

According to the 9th Five-Year Plan (1996 - 2000), which was the development policy of China at the time of project screening, the three main objectives of the development were the increase of food production, improvement of farmers' incomes, and reduction of the indigent population. In addition, the Chinese Government declared in 1998 that as part of a middle- and long-term policy for agriculture and rural development, it would promote the following undertakings: (1) maintenance of food self-sufficiency and increased production of commercial crops; (2) implementation of environmentally - conscious farming practices including the effective utilization of water resources by means of water-saving irrigation; (3) reduction of poverty in rural areas; and (4) reform of the food distribution system.

Meanwhile, in the 12th Five-Year Plan (2011 - 2015), the most important objectives are the development of rural communities³ and safe and stable procurement of food. In the field of rural and agricultural development, the plan places emphasis on the reinforcement of farming and rural infrastructures such as waterworks projects and farmland reclamation, as well as the enhancement of agriculture and the further enforcement of preferential policies for farmers⁴.

¹ A: Highly satisfactory; B: Satisfactory; C: Partially satisfactory; D: Unsatisfactory

² ③: High; ②: Fair; ①: Low

³ "Sannong" (Agriculture, farm villages, farmers) duties

⁴ A financial expenditure of 988 billion 450 million Yuna is scheduled, marking a year-on-year increase of 130 billion 480 million Yuna. (Source: China's Central Committee's decision regarding the development and acceleration of water resources reforms by the State Council)

The cultivated area of Shandong Province is 7,515,300 hectares, which is the third largest in the country (equivalent to 6.17% of the nation's total cultivated land). In 2006, the province produced a total of approximately 40,490,000 tons of food crops, which was the second largest in the country in volume. Accordingly, the province is regarded as one of the most principal bases for agricultural production. The Shandong provincial government declared in its "Shandong Province 12th Five-Year Plan" (2011 - 2015) that the province's two main strategies for agricultural development would consist of improving agricultural productivity through modernization of farming technology and augmenting food production and farmers' income through reinforcement of the competitiveness of agricultural produce. Thereby, the province is committed to focusing on addressing agricultural issues.

Therefore, the objective of this project, which was to aim for increase in food production through the development of agricultural infrastructures, can be evaluated as relevant to the development policies of the Chinese Government at the time of both the screening and the ex-post evaluation.

3.1.2 Relevance with the Development Needs of China

(1) Development Needs of the Agricultural Sector in Shandong

Although the cultivated area in China's northern region, where Shandong Province is situated, accounted for 57% of the total cultivated area in the entire country, the region's reserves of water resources were only 18% of the total amount in the entire country. With the volume of water resources a person can use annually being 350 m³ in Shandong, as opposed to the national average of 2,201 m³ per year⁵ the region was suffering from severe shortages of water.

⁵ World Resources Institute, World Resources 2000-2001

Table 1 Annual water reserves per person in the northern and southern regions of China

Northern Region (m ³)		Southern Region (m ³)	
Province, Autonomous Area, Direct-controlled Municipality	Water Reserves per Person	Province, Autonomous Area, Direct-controlled Municipality	Water Reserves per Person
Ningxia Autonomous Region	149.8	Shanghai City	197.5
Tianjin City	159.8	Jiangsu Province	494.1
Beijing City	205.5	Anhui Province	1,141.4
Hebei Province	231.1	Zhejiang Province	1,680.2
Shanxi Province	256.9	Hubei Province	1,812.3
Shandong Province	350.0	Chongqing City	2,040.3
Henan Province	395.2	Guangdong Province	2,323.8
Liaoning Province	617.7	Hunan Province	2,512.8
Gansu Province	715.0	Fujian Province	2,886.3
Shaanxi Province	809.6	Guizhou Province	3,019.7
Heilongjiang Province	1,208.0	Sichuan Province	3,061.7
Jilin Province	1,215.2	Jiangxi Province	3,093.5
Inner Mongolia Autonomous Region	1,710.3	Guangxi Autonomous Region	4,763.1
Xinjiang Autonomous Region	3,859.9	Hainan Province	4,933.5
Qinghai Province	11,900.5	Yunnan Province	5,111.0
		Tibetan Autonomous Region	159,726.8

Source: "Production Capacity of Chinese Agriculture," Statistical Yearbook of China 2009 Edition, Ministry of Agriculture, Forestry and Fisheries

Furthermore, although the cultivated area in Shandong Province was one of the largest in the country, only a little more than 60% of the area was irrigated⁶, with salts accumulated in the soils of the Xiazhen and Daluhu project areas. For this reason, the province was mired in low productivity. On the other hand, since the soils were relatively low in sodium and pH, many of these lands could be turned arable with proper irrigation and drainage. In the project areas, people called for the effective utilization of precious water resources and the improvement of soils. It was, therefore, prerequisite to construct irrigation facilities and artificial reservoirs in order to secure necessary agricultural water, thereby advancing irrigated agriculture free from the influence of the Yellow River's flow, and improving alkali soil through desalting irrigation.

(2) Additional Implementation of Embankment Maintenance

In September 2005, when the project was underway, additional pavement construction was conducted for the approximately 32 km section of the embankment across the Bohai Sea coast in the Xiazhen area. This construction work was carried out in order to deal with the inundation of the coastal area from the Bohai Sea, a problem that had been anticipated in the risk

⁶ "Production Capacity of Chinese Agriculture," Statistical Yearbook of China 2009 Edition, Ministry of Agriculture, Forestry and Fisheries

assessment at the time of the screening. That said, since the area subject to the risk of inundation had been undeveloped prior to the start of the project, where the inhabitants had been making individual efforts to counter floods by constructing their own embankments, it was excluded from the project plan at the beginning. However, a devastating rainstorm⁷ that occurred in 2003 when the project was in progress inundated the grassland in the project area with seawater, aggravating the alkalization of the soil. Consequently, the necessity of anti-flood measures was confirmed to be greater than initially anticipated, prompting the project contractors to implement pavement construction (Phase 2 Construction), aside from the embankment work (Phase 1 Construction) independently carried out by the city government. Thanks to the effects of the additional construction, typhoons in August 2007 were successfully prevented from causing inundation and associated salt damage.

As above, the additional implementation of embankment construction work was necessary to prevent the inundation of seawater, which could have significantly undermined the effectiveness of the project. Nevertheless, more meticulous risk analysis should have been conducted in the planning stage of the project to determine whether or not the initially conceived measures would be sufficient to avert flooding.

3.1.3 Relevance with Japan's ODA Policy

The Japanese Government in its “Country Assistance Strategy for Economic Cooperation with China” in 1992 placed emphasis on the development of economic infrastructure centering on loan assistance, agricultural/rural development, and development utilizing bountiful resources. Accordingly, agricultural sector support geared to securing food, development of agricultural infrastructure that can serve as a basis for sustainable growth, and development utilizing resources were all relevant to the Japanese Government's aid policy toward China and ODA policy at the time of the screening. Furthermore, the objectives of this project were also relevant to anti-poverty measures, development of economic/social infrastructure, and agricultural/rural development, i.e. the subjects prioritized in the implementation⁸ policy of the yen loan program for China at the time of the screening.

As described above, this project has been fully consistent with the development policies and needs of China and Shandong Province, as well as Japan's ODA policy; therefore, its relevance is high.

3.2 Efficiency (Rating: ③)

3.2.1 Project Outputs

The plans and achievements of this project are listed in the table below. In general, the project

⁷ The volume and level of sea water did not change significantly compared to before the project.

⁸ This signifies the Strategy for Overseas Economic Cooperation created every three years based on the ODA framework and mid-term policy of the Ministry of Foreign Affairs.

proceeded in accordance with the plans with the exception of the following points:

- (1) Changes in the number of reservoirs and the total distance of irrigation canals
- (2) Additional reinforcement work for dykes
- (3) Changes in the specifications and numbers of farming equipment

Table 2 Output : Comparison between the plans at the time of screening and achievements

Items	Plans	Achievements
Xiazhen area		
Reservoirs	2 expansions, 1 new construction	1 repaired
Pump facilities	1 expansions, 14 repairs, 10 new constructions	As planned
Main irrigation canals	5 repairs, 81.93km	5 repaired, 100.53km
Secondary irrigation canals	111.9km	As planned
Transmission facilities	4 facilities, 185 km transmission line	As planned
Main drainage canals	5 canals, 155.3km	As planned
Secondary drainage canals	35 canals, 102.3km	As planned
Farmland consolidation	24,000 ha	As planned
Embankments	-	Second period construction, 30.2km
Other civil engineering works	13,010 ha	As planned
Construction machinery	32 types, 364 machines	As planned
Farming equipment	1,464 self-propelled machines, 1,285 accessories	As planned
Daluhu area		
Main irrigation canals	9 repairs	0 repaired, 1.2km newly constructed
Maintenance of irrigation wells	2,620 wells	As planned
Transmission facilities	6 facilities, 452 km transmission line	5 facilities
Secondary drainage canals	2 canals	As planned
Farmland consolidation	10,000 ha	As planned
Other civil engineering works	2,470 ha	As planned
Construction machinery	8 types, 56 machines	As planned
Farming equipment	95 self-propelled machines, 1,175 accessories	129 self-propelled machines, 2,942 accessories

Sources: Dongyingshi Cooperative Development Limited Liability Company and Yellow River Agriculture Development Corporation, Zibo City

- (1) Changes in the number of reservoirs and the total distance of irrigation canals

The number of reservoirs in the Xiazhen area has decreased due to changing needs. In

particular, flow of the Yellow River was interrupted for 200 days annually at the time of the screening on account of a decrease in the water volume. Accordingly, there was a need to secure a sufficient number of reservoirs to cope with this problem back then. However, the completion of the Xiaolangdi dam after the start of reservoir construction resolved the flow interruptions and thus lessened the demand for reservoirs. Consequently, the funds for reservoirs that had become no longer necessary was reallocated to the expansion of irrigation canals, which was the next highest priority task for more effective irrigation. As a result, the total distance of canal repair became longer than initially planned.

The pavement work for the main irrigation canals in the Daluhu area was implemented at a site 1.2 km from a settling basin for new construction of waterways, down from the nine locations that had been initially planned. This was because the completion of the aforementioned Xiaolangdi dam enabled the adjustment of water flow in the Yellow River, thereby eliminating the need for concrete pavement that could withstand strong water pressure. Therefore, the irrigation canals were maintained as earth canals. Likewise, the irrigation wells in the Daluhu area were determined to be unsuitable for agricultural production, as groundwater testing at the time of detailed designing revealed that the salinity of the soil was too high at locations with high alkalic subterranean water. Accordingly, some of the drilling sites were changed, but the number remained unchanged from the plan.



Fig.4 Main irrigation canal and pump facility in the Xiazhen area



Fig.5 Embankment in the Xiazhen area

(2) Additional reinforcement work for dykes

Reinforcement work for more than 30 km of dyke across the Bohai Sea coast in the Xiazhen area was additionally implemented. (For details, refer to the “3.1 Relevance 3.1.2 Relevance

with the Development Needs of China (2) Additional Implementation of Embankment Maintenance” section.) Since the funds for this additional implementation were secured in the physical contingency funds, the overall project cost and other outputs were unaffected.

(3) Changes in the specifications and numbers of farming equipment

In the Daluhu area, the numbers of farming equipment such as combines⁹ and plows¹⁰ were increased compared to the initial plans. This was in the context of the increase in the production of maize and wheat. Sometime after the start of this project, the profitability of soybeans dropped in relation to other crops owing to the fluctuation of market prices, thus prompting the shift from soybeans to other profitable crops. In particular, the cultivated area for maize and wheat expanded more than initially estimated. In the double cropping of maize and winter wheat, sowing of maize seeds preceded the harvest of wheat, thus necessitating mechanized operations. As a result, the numbers of farming equipment increased.

3.2.2 Project Inputs

3.2.2.1 Project Cost

In contrast with the total project cost of 19.663 billion yen (10.126 billion yen in foreign currency; 635 million yen in domestic currency), the actual project cost was within the plan at 19.197 billion yen (8.882 billion yen in foreign currency; 728 million Yuna in domestic currency) (98% of the planned figure). This total project cost was the sum of the planned value before the start of the project (16.704 billion yen, of which 8.904 billion yen were in foreign currency and 520 million Yuna) and the planned value for the additional implementation (2.959 billion yen, of which 1.222 billion yen were in foreign currency and 115 million Yuna were in domestic currency)¹¹.

The items that were subjected to major changes from the planned values are listed as below.

Table 3 Planned/actual project costs (Item-wise)

(Unit: million yen)

⁹ Agricultural machines for harvesting and threshing crops

¹⁰ Implements of tractors for plowing soil

¹¹ Although the expenses for this additional implementation were not anticipated at the beginning, their necessity was high as part of the project scope. Therefore, they should have been included in the initial plan. Consequently, they were included in the planned values for evaluation when comparing the planned values and achievement values of the total project costs.

Item	Target Value	Achived Value	Target Ratio
Pumping stations, gates, and motors	729.5	186.1	26%
Transmission facilities	625.8	420.0	67%
Materials	3,703.7	5,376.2	145%
Civil engineering works and farmland consoli	5,847.0	9,861.4	169%
Maintenance fees	247.5	330.9	134%
Construction machinery	2,214.9	1,227.7	58%
Farm machinery	874.9	1,392.9	159%
Vehicles and office equipment	266.4	194.8	73%

Source: Created based on the information provided by Dongyingshi Cooperative Development Limited Liability Company and Yellow River Agriculture Development Corporation, Zibo City

The decreases in the items of construction machinery, pump facilities, gates/motors, transmission facilities, vehicles/office equipment were attributable to the reduction of the unit prices vis-à-vis the planned values as a result of competitive bidding, as well as the fluctuation of the exchange rate (from 1 Yuna = 15 yen to 13 yen¹²). Since the decrease in the number of reservoirs was offset by the increase in the maintenance and construction of irrigation canals, the expenses for materials, civil engineering works and upkeep costs were not affected. However, the additional construction of embankments meant that the expenses for this item ended up higher than initially planned. The increase in the expenses for agricultural machinery was due to the increase in the number, changes in the specifications, and rise in prices.

3.2.2.2 Project Period

In comparison with the initially-planned project period between January 2000 and December 2004 (60 months), the project actually lasted from January 2000 to December 2006 (84 months; 140% compared to the plan). This was because it took 13 months to process the paperwork for the additional construction, and another 11 months to implement it. Therefore, the planned construction itself was finished within 60 months in accordance with the initial output, and according to the Shandong Water Resources Department, the additional construction was also completed within the project period. The delay in the construction schedule was derived from the increase in the unplanned output; therefore, the overall schedule for project implementation was reasonably appropriate.

As described above, this project was finished within the planned expenditure and period. This was largely attributable to the establishment of management practice in related organizations and the support system to make it functional. With regard to the procurement operations during the project period, the Shandong Water Resources Department took the initiative in establishing the management practice peculiar to the project. The department then proceeded to publicize the practice by making use of manuals and document formats, thereby significantly contributing to

¹² Rate in 2000.

the project. Although there were numerous standards that needed to be observed such as Chinese laws and JICA's procurement guidelines, they were compiled into one manual so that the related organizations would find them easier to understand. In addition, the project implementing entities responsible for each project area were required to report to the project office of the provincial government every quarter, and an external audit was conducted annually.

As above, while the expenditure for this project was within the planned range, the project period exceeded the plan. This was due to the additional output that had not been planned at the beginning. Considering that the initially-scheduled output, as well as the additional one, was implemented as planned, both project cost and project period were as planned; therefore efficiency of the project is high.

3.3 Effectiveness (Rating:③)

3.3.1 Quantitative Effects

This project was aimed at stable production of agricultural produce and effective utilization of water resources. Although the total production of agricultural produce fell short of the targeted value after the project, it has continued to increase. Furthermore, thanks to the adoption of crops with high added values, the farmers' income has far exceeded the expected level.

3.3.1.1 Results from Operation and Effect Indicators

(1) Status of Agricultural Production

The available arable land area in the project locations reached 34,667 hectares, or 101% of the plan, whereas production amounted to only approximately 60% of the planned level. This is because the production amount of the Xiazhen area was only a little less than 40% of the planned level on account of the changes in the cropping pattern.

At present, the single cropping of cotton¹³ accounts for nearly 70% of total cultivated land in the Xiazhen area. Therefore, simple comparison indicates that the total production is smaller than the planned level. The underlying reason for the prevalence of cotton cultivation in this area is that the market price of cotton has risen since the start of the project, increasing the profitability. In addition, the salinity of the soil in this area is also a factor, as it makes the soil unsuitable for the production of other crops. On the other hand, although cotton requires the most water in spring when its cultivation starts, the water level of the Yellow River is low in the springtime. Therefore, without irrigation from the reservoirs constructed in this project, production expansion of this magnitude could never have been realized. In that sense, the

¹³ Since its cultivation period is from April to November, cotton is unsuitable for double cropping with other crops, thus yielding limited total harvest.

transition to the present cropping pattern has been reasonable, given the current market and soil conditions, and it was this project that enabled this transition. In this area, the achieved value of the planting rate was 61% of the target level (see Table 5). This is because the actual project plan was changed to focus on single cropping of cotton, as opposed to the initial assumption of double cropping. The available arable land area was developed as planned, reaching 100%.

Meanwhile, the total production amount in the Daluhu area exceeded 90% of the planned level; thus the production condition is considered to have been satisfactory. In this area, in response to the decreasing profitability of soybeans, the transition to maize, a more profitable and highly-demanded crop, is in progress.

The trend that is common in both areas is the increase in the production of fruit and fishery products. Although the planted area for vegetables alone has not reached the target level, the overall area including that for fruit and fishery products has expanded. The factor behind this trend is the Government's support program promoting the branding of high-value added crops such as crabs and peaches as local specialties, in which subsidies are being doled out to the producers, and technologies are being transferred (refer to the "3.4.2 Other Positive/Negative Impacts" section).

Table 4 Comparison between planned and achieved levels of planted area, unit crop and production amount

Total	Target value			Achieved value (2009)			Target Ratio
	Planted area	Unit crop	Production	Planted area	Unit crop	Production	
	ha	ton/ha	tons	ha	ton/ha	tons	
Paddy	7,400	7.2	53,300	2,569	7.7	19,719	37%
Wheat	21,400	5.1	109,100	7,311	5.9	43,176	40%
Maize	5,200	5.4	28,100	6,868	7.4	50,822	181%
Soybeans	15,400	2.2	33,900	849	2.1	1,743	5%
Peanuts	800	3.6	2,900	366	2.5	922	32%
Cotton	3,200	0.7	2,200	19,298	1.1	21,674	985%
Vegetables	4,100	74.1	303,800	2,277	45.3	103,187	34%
Fruit				1,178	57.6	67,868	-
Fishery				1,307	4.0	5,262	-
Forestry				2,000	1.1	2,150	-
Total planted area	57,500			44,023			77%
Cropping rate	167%			127%			
Cultivated area	34,380			34,667			101%
Irrigation area				34,467			
Irrigation rate				99%			
Total production			533,300			316,523	59%

Source: Created based on the information provided by Dongyingshi Cooperative Development Limited Liability Company and Yellow River Agriculture Development Corporation, Zibo City

Table 5 Comparison between planned and achieved levels of planted area, unit crop and production amount by area

Xiazhen Area	Target value		Achieved value (2009)		Target Ratio
	Planted area	Production	Planted area	Production	
	ha	tons	ha	tons	
Paddy	5,400	38,880	1,333	10,290	26%
Wheat	15,200	77,520	1,410	6,042	8%
Maize	2,100	11,340	796	4,042	36%
Soybeans	14,400	31,680	676	1,384	4%
Peanuts	800	2,880	226	428	15%
Cotton	1,200	840	18,152	20,367	2425%
Vegetables	2,100	155,610	973	24,532	16%
Fruit	-	-	667	45,023	-
Fishery	-	-	1,064	2,538	-
Forestry	-	-	0	0	-
Total planted area	41,200		25,298		61%
Cropping rate	170%		105%		61%
Cultivated area	24,200		24,200		100%
Irrigation area			24,000		
Irrigation rate			99%		
Total		318,750		114,646	36%

Daluhu Area	Target value		Achieved value (2009)		Target Ratio
	Planted area	Production	Planted area	Production	
	ha	tons	ha	tons	
Paddy	2,000	14,400	1,236	9,429	65%
Wheat	6,200	31,620	5,901	37,134	117%
Maize	3,100	16,740	6,072	46,780	279%
Soybeans	1,000	2,200	173	359	16%
Peanuts	0	0	140	494	-
Cotton	2,000	1,400	1,146	1,307	93%
Vegetables	2,000	148,200	1,304	78,655	53%
Fruit	-	-	511	22,845	-
Fishery	-	-	243	2,724	-
Forestry	-	-	2,000	2,150	-
Total planted area	16,300		18,726		115%
Cropping rate	160%		179%		112%
Cultivated area	10,180		10,467		103%
Irrigation area			10,467		
Irrigation rate			100%		
Total		214,560		201,877	94%

Source: Created based on the information provided by Dongyingshi Cooperative Development Limited Liability Company and Yellow River Agriculture Development Corporation, Zibo City

By contrast, the project has achieved more than expected in the plan in terms of profitability, with the gross profit of the produce in the project areas exceeding the target levels. The table below shows the calculated levels of the profits of the produce in each area (amounts of money after the production costs were subtracted from the sales revenues). Even in the Xiazhen area where the planted area and production volume did not reach the target levels, the profits surpassed the target levels, thus indicating an increase in the overall profitability. This was in context with the increase in the production amount per unit area (unit crop) and the conversion to/expansion of the production of high value-added crops. The reason why the achievement of the planted area fell short of the target is that the plan was changed to focus on single cropping of cotton, as opposed to the initial assumption of double cropping. The available arable land area was developed as planned, reaching 100%.

Table 6 Comparison between planned and achieved levels of production profits by area

	Target value			Achieved value (2009)	
	Land Area (ha)	Profit	Profit (inflation adjusted*)	Land Area (ha)	Profit
		(1000 yuan)	(1000 yuan)		(1000 yuan)
Xiazhen Area					
Low and middle production field development	13,300	145,310	174,372	13,300	211,715
Wasteland development	10,700	111,680	134,016	10,700	160,403
Grassland improvement	8,670	-		8,670	-
Food and fishery development	670	5,670	6,804	667	7,478
Fish breeding pond creation	670	4,390	5,268	667	18,583
Subtotal	34,010	267,050	320,460	34,004	398,179
Daluhu Area					
Low and middle production field development	10,000	138,530	166,236	10,000	137,758
Food and fishery development	470	5,820	6,984	467	9,167
Subtotal	10,470	144,350	173,220	10,467	146,925
Total	44,480	411,400	493,680	44,471	545,104
				Target Ratio	110%

Source: Created based on the information provided by Dongyingshi Cooperative Development Limited Liability Company and Yellow River Agriculture Development Corporation, Zibo City, as well as the results of a beneficiary survey.

* CPIs from 2000 to 2009 were used for inflation adjustment.

Table 7 compares the changes in the production volume and profit per unit area between before and after the implementation of the project. The crop yields have increased by nearly 140% to 230%, and the profits by 210% to 500% compared to before. Although the increase in cotton production has been relatively low, both the profitability and growth rate per unit have become the largest, owing to the stabilization of production as a result of irrigation from the reservoirs, and the rise in the prices accompanied by the increase in the demand in the domestic market.

Table 7 Changes in production and profitability per unit area

Product	Production per Unit Area (ton/hectare)			Profits per Unit Area (yuan/hectare)		
	Before Project	After Project	Growth Rate	Before Project	After Project	Growth Rate
Paddy	4.5	7.7	172%	7,335	19,958	272%
Wheat	3.5	5.3	153%	4,544	9,727	214%
Maize	2.9	6.7	231%	4,516	13,278	294%
Soybeans	1.0	2.1	207%	3,336	10,681	320%
Cotton	0.8	1.1	139%	5,702	28,826	506%

Source: Created based on the information provided by Dongyingshi Cooperative Development Limited Liability Company and Yellow River Agriculture Development Corporation,

Zibo City, as well as the results of a beneficiary survey.



Fig.6 Cotton cultivation in the Xiazhen area



Fig.7 An aquaculture pond and winter wheat cultivation in the Daluhu area

Interviews with the related organizations have confirmed the following factors affecting production:

- There have so far been no particular problems related to natural conditions, disease/insect damage, and other factors, and a stable production environment has been maintained.
- Since reform of the government's agricultural policies in 2004, farmers have been provided with direct subsidies, leading to improvement in the quality of fertilizer and seeds and, consequently, increased productivity. This has been another factor in boosting production.
- In the Daluhu area, the county government's water resources department has taken the initiative in introducing piped irrigation¹⁴ to 8,000 hectares, or about 80%, of the project area since 2010, thereby promoting more effective utilization of water resources.
- Within the project locations, the provincial government has designated model areas, which have been engaged in tasks such as providing information regarding excellent cultivars, imparting production technologies to interested parties, and promulgating the model to other regions.

(2) Indices Regarding Water Demand, Functions and Operation of Irrigation Facilities

With regard to the effective utilization of water resources, which is one of the objectives of this project, interviews with the project implementing entities and beneficiaries have revealed that they have been using only the necessary amount of water in a proper manner, and the annual volume of irrigation water sources, i.e. the Yellow River and subterranean water, has not changed significantly. In particular, with the construction of irrigation facilities in this project, farmers have become able to secure sufficient amount of water for soil preparation even during

¹⁴ Minimize the loss of water by using water supply piping instead of unpaved irrigation canals.

the springtime when the waterlevel of the Yellow River is the lowest. The interviewees explained that this water supply has contributed to the increase in agricultural production.

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

Economic Internal Rate of Return (EIRR)

The economic internal rate of return (EIRR) of this project has been recalculated based on the calculation method at the time of the screening. This has revealed that the EIRR has been improved to 24% from 18.5% at the time of the screening. This may be because the improvement of productivity and the rise in selling prices have been more significant than expected. The present improved productivity and the production pattern focusing on high value-added crops such as cotton have been achieved through the construction of irrigation facilities, thus demonstrating the effectiveness of the project.

Table 8 EIRR Recalculation Results

	At the time of the screening	Achievement
EIRR	18.5%	24%
<ul style="list-style-type: none"> • Project Life: 50 years • Expenses: initial costs (direct construction costs, machinery purchase costs, environmental monitoring costs, project management costs, consulting services), facility maintenance costs, production costs • Benefits: agricultural produce, fishery, forestry and other products 		

Note 1: Based on the beneficiary survey with farmers, prediction of future cultivation plans has been reflected in the calculation of agricultural produce.

Note 2: The production costs and prices have been calculated based on the results of the beneficiary survey and the information provided by the project implementing entities.

3.3.2 Qualitative Effects

With the aim of confirming how the direct beneficiaries, namely the farmers, have interpreted the effects of the project, a beneficiary survey¹⁵ was conducted. According to the survey, the majority of the beneficiaries recognizes the improvement regarding the production status after the project and has expressed a high degree of satisfaction. In particular, they have praised the increased production through the utilization of irrigation facilities and improvement of production technology. With regard to the increase in production, it has been confirmed that not only the construction of irrigation facilities but also other efforts made through the project, specifically the technological transfer, lease of farming equipment, and sale of good seeds for

¹⁵ The beneficiary survey covered randomly-selected 50 farmers in the Xiazhen project area and another 50 in the Daluhu project area.

farmers, have had good impact.

Table 9 Changes in productivity, production technology and services after the project and evaluation by beneficiaries

	Xiazhen area	Daluhu area
1. Status of agricultural production after the project		
Significantly improved	98%	98%
2. Evaluation of current production status		
Very satisfied	88%	56%
Satisfied	12%	44%
3. Changes in production technology/methodology after the project		
	Introduction of advanced production technologies such as water-saving irrigation and excellent cultivars	Realization of water-saving irrigation, fertilizer blending, and mechanization; introduction of advanced production technologies such as excellent cultivars
4. Support services regarding production received after the project		
	Preferential pricing of fertilizers/agrichemicals, lease of farming equipment, guidance on farming, support for excellent cultivars	Preferential pricing of fertilizers/agrichemicals, lease of farming equipment, support for soil measurement/fertilizer blending technology and excellent cultivars

Source: Created based on results of the beneficiary survey



Fig.8 Beneficiary Survey (in Xiazhen)



Fig.9 Harvested Cotton (in Xiazhen)

As described above, the construction of irrigation facilities in this project has enabled the production of high value-added crops. In addition, the increase in productivity has significantly improved agricultural production and, consequently, agricultural profitability in the project areas. Therefore, the effectiveness of the project has been high.

3.4 Impact

3.4.1 Intended Impacts

Most of the farms in the project areas are managed by individual households. The majority of them are small hold farmers, with the cultivated area per household being around 1 hectare. The arable land in a village is shared almost equally by all the households.

(1) Farmers' Income

According to the beneficiary survey, farmers' household income has grown by three to four times as compared with prior to the start of the project. Although both the production costs and sales costs have risen since after the start of the project, the effects of the transition to high value-added crops and the increase in productivity have been great, thus resulting in the achievement of higher incomes to some extent.

Table 10 Changes in Farmers' Household Income (per year)¹⁶

	Before Project	Afrter Project	Growth Rate
Xiazhen Area	7,923.6	35,116.4	443%
Daluhu Area	2,436.3	8,727.7	358%

Source: Created based on the results of the beneficiary survey

¹⁶ The amount of money where the annual production costs are subtracted from the annual earnings from agriculture, aquaculture and other production

In the beneficiary survey, in response to the questions about market and distribution (retailers, sales prices and production costs) that affect incomes, some of the respondents complained about high production costs. Nevertheless, they expressed generally high satisfaction over sales prices and the market and distribution conditions.

The gap of agricultural income between these two project areas stems from the difference in the profitability of the cultivated crops. Due to the difference in alkalinity in the soil between these two areas, the crops suitable for cultivation and the cropping patterns are different. Consequently, highly profitable cotton¹⁷ is cultivated more readily in the Xiazhen area than in the Daluhu area, thus resulting in higher profits in the former. Another factor lies in the difference of the average cultivated area. As shown in Table 11, the average cultivated area in the Xiazhen area is 1.7 times larger than that in the Daluhu area.

Table 11 Average Farmland Area per Household

(Unit: ha/household)

	Target Value	Achieved Value	
		Before Project	After Project
Xiazhen Area	1.26	0.77	1.26
Daluhu Area	0.55	0.61	0.74

Source: Created based on the results of the beneficiary survey

(2) Effects of Higher Incomes

The results of the beneficiary survey have revealed that as a result of the project, some of the beneficiaries have seen a rise in their non-agriculture earnings in addition to the agricultural incomes. The increase in non-agriculture earnings may be because more farmers have become able to work away from home for longer periods as migrant laborers, thanks to the increased efficiency of farmwork as a result of mechanization brought about by higher incomes.

The increased incomes have also contributed to improvement of the living standard of the beneficiaries. According to the survey results, their expenditures for daily living and investments in movable and immovable properties have also increased. The asset investments included refurbishment/extension of houses and purchases of farming machinery, electric appliances, motorbikes, and automobiles. Almost all the households covered by the beneficiary

¹⁷ Alkali soil with high salinity is suitable for cotton cultivation.

survey have responded that their spending has increased. Although fees for compulsory education have become free, education-related spending has increased. This is because more people have started taking lessons outside of schools and more students are going on to higher-level schools.

Table 12 Asset Investment Items that have Increased after the Project

Properties Investment Item	Invested Household Ratio (%)
House Extensions	79
Motorcycles and bicycles	94
Consumer electronics	100
Cars	27
Farm machinery	67
Others	13

Source: Created based on the results of the beneficiary survey

Moreover, almost all the respondents to the beneficiary survey have expressed either a very high or reasonably high degree of satisfaction over their livelihoods after the project. The reasons for this included the increased production amounts, higher unit yields, higher sales prices, increased earnings and better quality of life.

3.4.2 Other Impacts

(1) Benefits to the Project Area and communities

The interviews with the parties concerned have revealed the following positive impacts of the project:

- Producers' associations specializing in particular products such as crabs, shrimps, fish and fruit have been established. They have been engaged in activities such as joint purchasing of feed and chemicals necessary for their production, sharing of equipment, and joint selling of their products. According to the beneficiary survey, 90% of the respondents in the Xiazhen area and all the respondents in the Daluhu area answered that they belong to some sort of newly-established producers' association. This indicates a trend toward the organization of associations related to production and distribution of products, especially those which require new technology and equipment, such as aquaculture and fruit products. For example, the government provides subsidies for the production of aquaculture crabs and peaches in the Xiazhen area so that they can be recognized as local specialties or brands, and this serves as an incentive for further promotion.
- This project has helped to cultivate large-size farmland, construct/repair irrigation facilities, and improve productivity. As a result, the project has had a positive influence on promoting

the government's efforts to construct and improve infrastructures such as roads and irrigation facilities in the surrounding regions. The improved distribution as a result of road construction has contributed to making the transportation of agricultural produce more effective in a synergetic manner.

- Villages in the vicinity of the Daluhu area have taken interest in the effects of this project and have started maintaining irrigation facilities and practicing technologies for aquaculture and agriculture. At present, these technologies are being practiced on only about 200 hectares of cultivated land. In the future, they may further improve the productivity and the farmers' earnings in the regions around the project areas.

(2) Impacts on the Natural Environment

Since one of the project sites (Xiazhen area) adjoins the Yellow River estuary wetland, which is a national nature reserve, many voices raised concerns in the planning stage of the project about environmental impacts on hydrology, water quality and ecology such as the protection of bird habitats and water pollution by insecticides. In the environmental impact survey conducted at the time of the planning, it was confirmed that the implementation of the project would not have significant ramifications. Nevertheless, the project implementing entities have been monitoring water quality¹⁸ and other factors.

For now, the index data for the surface water quality have largely been either improved or stabilized. However, the data in 2007 and 2009 showed that the water quality at certain monitoring locations did not satisfy the government mass standard for surface water environment. The table below shows the results of water quality tests at the main monitoring points of this project.

Table 13 Monitoring Results of Surface Water Quality

(Unit:mg/m³)

Index/Monitoring Points		Classification ¹⁹	Standard Value	1998	2000	2003	2005	2007	2009
pH									
Xiazhen Area	Yihong	III	6.0-9.0	7.9	-	7.3	-	7.4	-
	Yongfeng	III	6.0-9.0	8.1	-	7.8	-	7.6	-
Daluhu Area	Zhimai	III	6.0-9.0	8.3	8.1	-	8.3	8.1	8.1
	Dalu lake	II	6.0-9.0	7.8	7.9	-	7.9	8.0	7.9
COD (Chemical Oxygen Demand)									
Xiazhen Area	Yihong	III	20	34.3	-	46.0	-	26.0	-
	Yongfeng	III	20	322.7	-	39.0	-	22.0	-

¹⁸ Chemical oxygen demand (COD) and biochemical oxygen demand (BOD), indices for water contamination, were confirmed.

¹⁹ The water area functions are classified into five categories in accordance with the purposes of use and protection for surface water areas.

Daluhu Area	Zhimai	III	20	24.7	23.2	-	23.2	22.5	21.8
	Dalu lake	II	<15	25.0	22.6	-	20.6	19.5	19.0
BOD (Biochemical Oxygen Demand)									
Xiazhen Area	Yihong	III	4	4.2	-	14		6	-
	Yongfeng	III	4	9.3	-	10		4	-
Daluhu Area	Zhimai	III	4	2.2	3.7	-	2.8	2.4	2.3
	Dalu lake	II	3	2.8	3.0	-	2.5	2.3	2.2

Sources: Dongyingshi Cooperative Development Limited Liability Company and Yellow River Agriculture Development Corporation, Zibo City

This is probably due to the influence of domestic/industrial wastewater unrelated to the project contained in the drainage at the monitoring points in the Xiazhen area. However, with the construction of a sewage disposal plant in 2009, measures are being taken to some extent at present. In the Daluhu area, domestic wastewater was detected at the monitoring points. Therefore, it is difficult to confirm how much the drainage from agricultural production is influencing the water quality. Nevertheless, there must have been some improvement with the construction of a drainage facility worth 120 million Yuna by the county government in 2009.

According to each project implementing company and corporation, measures taken by them have been effective against the initially-anticipated issues such as the conservation of bird habitats, with no major environmental problems arising.

(3) Land Acquisition and Resettlement

The implementation of the project has not entailed any resettlement of residents or land acquisition.

As above, this project has made many impacts including the increase in farmers' household income, effective production through the organization of farmers, and regional development. Therefore, the project is considered to have been highly effective.

3.5 Sustainability (Rating: ③)

3.5.1 Structural Aspects of Operation and Maintenance

(1) Agencies Responsible for Implementation

Basically, government agencies took charge of the operation and maintenance of this project, and beneficiary farmers were scarcely involved. The implementing agencies were "Dongyingshi Cooperative Development Limited Liability Company (Xiazhen area)" and "Yellow River Agriculture Development Corporation, Zibo City (Daluhu area)," both of which derive from the agricultural development departments of the county governments of the respective areas. Each company and corporation was responsible for supervising the overall project in the project area, as well as managing the main facilities. In addition, the company and corporation took charge of the coordination and supervision of personnel engaged in the operation and maintenance of the

project. There have been no major changes in the organizational structure and role allocation of each company and corporation since the start of the project, nor will there be any likelihood of such changes in the future.

1) Xiazhen Area

During the project period, “Yellow River Delta Xiazhen Agriculture Comprehensive Development Group Corporation, Dongying” was renamed “Dongyingshi Cooperative Development Limited Liability Company.” The company was in charge of the project as an implementing agency during the project and has continued to be in charge even after the end of the project. The operation and maintenance duties of the facilities have been shared as follows:

Table 14 Sharing of Operation and Maintenance Duties of Irrigation Facilities in the Xiazhen Area

Facility, Management Level, Content	Responsible Agencies	Content of Responsible Duties
Water Intake Facilities	County Yellow River Authority	Water resource management
Water Supply, Water Supply Planning	County water resources bureaus and the company	Formulation of water intake plans as necessary
Facility Management: County Level	Water system-based irrigation management offices and the company	Water supply, facilities maintenance, and water fee management
Facility Management: Management of Terminal Facilities at Township and Town Level ²⁰	Town irrigation stations	Water supply, equipment maintenance, and water fee collection
Facility Management: Village Level	Villager committees and unions	Adjustment of water supply for farmers

Source: Created based on the information provided by Dongyingshi Cooperative Development Limited Liability Company, the Kenli County Irrigation Management Office, and villager committees.

2) Daluhu Area

The “Yellow River Agriculture Development Corporation, Zibo City” was in charge during the project period and has continued to take responsibility even after the end of the project. According to the related institutions and organizations, the facility management duties are allocated as follows, and the role of this corporation is to coordinate and monitor the business of these related organizations.

²⁰ In general, Chinese administrative divisions have a three-tiered structure, with provinces, cities/counties, and townships/towns. Townships/towns are the smallest administrative divisions.

Table 15 Sharing of Operation and Maintenance Duties of Irrigation Facilities in the Daluhu Area

Facility, Management Level, Content	Responsible Agencies	Content of Responsible Duties
Water Intake Facilities	County Yellow River Authority	Prevention of flood and thaw damage and supervision by water supply laws, water supply in the Yellow River, management of civil engineering works
Water Supply, Water Supply Planning	County water resources bureaus	Formulation of water supply plans, water supply management, supervision of county-level water resource-related works
Facility Management: County Level	County water system-based irrigation management offices	Operation and maintenance of facilities, management of water fees
Facility Management: Management of Terminal Facilities at Township and Town Level	Township/town irrigation stations	Collection of water fees, operation and management of facilities, cooperation with upper organizations and villages, collection of water fees
Facility Management: Village Level	Villager committees	Coordination among village farmers

Source: Created based on the information provided by the “Yellow River Agriculture Development Corporation, Zibo City” and village committees

(2) Farmers’ participation in operation, maintenance and management

With regard to the organization of farmers for the management of irrigation canals, the existing village committees have been in charge of coordination and management among the users of terminal irrigation canals under their organization structures. Interviews with the members of the village committees and the end users of the facilities have revealed that the facilities are functioning smoothly and without problems. Although it was the county water resources bureau that formulated water supply plans, the village committees were supposed to listen to the villagers’ needs such as the volume and timing of water supply and report to the upper authorities.

In the reforms of agricultural support policies since 2004, measures have been taken to alleviate the burden on farmers through totally abolishing agricultural taxes and so on. This has also influenced the water fees for the irrigation facilities of this project, and the burden on farmers has been minimized.

The participation of the irrigation facility users - the beneficiaries of the project - in the maintenance and management duties of the facilities have been limited to the minimum tasks such as cleaning of the irrigation canals within their own land. This is because the institutional

labor burdens on farmers were abolished after the agricultural reform in 2004, and as a result, the amount of labor assigned to the farmers has been drastically reduced. According to the beneficiary survey, the payment rate of the water resources fees and the participation rate in the sludge disposal operations for the terminal irrigation canals were both 100%. The participation rate in committee meetings was 85% in the Xiazhen area and 60% in the Daluhu area. The users have largely abided by the water supply plans, causing no major problems. In the beneficiary survey, 50% each of the respondents were either “very satisfied” or “satisfied” with the utilization of the irrigation facilities. Therefore, the degree of satisfaction has been considerably high.

3.5.2 Technical Aspects of Operation and Maintenance

In both areas, there have been no incidents of technical problems in operation and maintenance. This is probably due to the effects of the technology transfer since the start of the project and the mechanisms to establish technologies (technical inspection and utilization of manuals and registries).

Each implementing company and corporation boasts years of experience in operation and management of irrigation facilities, having teams of technical experts. Training sessions regarding new technology and knowledge are held once every year for administration staff. Since each company and corporation has had hardly any personnel reshuffles since the project period, the effects of the technical transfers such as the maintenance and management of water resources facilities, inspection regulations, and safety control have become entrenched.

The irrigation stations in townships and towns are engaged in operation and maintenance duties under the tutelage of the county water resources bureau and the governments of their respective townships or town. Their personnel undergo an annual operation training and technical qualification examination in order to maintain the level of expertise necessary for water resources management.

Moreover, there is a compiled list of manuals and registries for the operation, maintenance and management of each facility, which is being used for monitoring the activities.

The farmers utilizing the irrigation facilities have expressed a high degree of satisfaction over the operating status of the irrigation facilities and the services provided by the responsible institutions and organizations. This is because the maintenance of the facilities has been conducted properly, and water supply has been guaranteed when it is necessary. Furthermore, the fact that the county water resources bureau has been formulating water supply plans taking into account the water demand of each village has also contributed to the satisfaction of the users.

The results of the interview survey concerning the degree of satisfaction of the beneficiary farmers over the facility operation are as follows:

Table 16 Evaluation of Facility Operation by Beneficiary Farmers

	Xiazhen Area	Daluhu Area
Evaluation of Operation Status of Irrigation Facilities		
Very Satisfied	80%	20%
Satisfied	20%	80%
Evaluation of Services by Villager Committees (village-level organizations responsible for facility operation)		
Very Satisfied	26%	26%
Satisfied	64%	74%
Evaluation of Services by Company or Corporation		
Very Satisfied	86%	52%
Satisfied	14%	48%

Source: Created based on the results of the beneficiary survey

3.5.3 Financial Aspects of Operation and Maintenance

With regard to the financial resources for the operation and maintenance of the project, the initial assumption at the planning stage was that the project would be managed in an independent manner on the basis of the water fees and the services provided by each company and corporation. However, at the time of the ex-post evaluation, it was the financial assistance by the government that formed the basis of the financial resources, with sufficient revenues guaranteed in the form of the budgets of the county and township/town governments, as well as the water fees collected in the urban areas. The water fee levied on the users of the irrigation facilities was 10 Yuna per person annually, which was significantly smaller than the initially-expected amount (2,410 Yuna/household annually in the Xiazhen area; 1,000 Yuna/household annually in the Daluhu area)²¹. This is attributable to the Central Government's policy since 2004, which was to drastically reduce the burdens on farmers, such as through the abolition of agricultural taxes by means of the reform of agriculture support policy. At the beginning of the project, each company and corporation had been collecting water fees as a responsible entity, but after this reform, the irrigation management office under the jurisdiction

²¹ Prior to the project, it had been 320 Yuan/household annually in the Xiazhen area and 138 Yuan / household annually in the Daluhu area.

of the county government took over the responsibility.

In the case of the Xiazhen area, the county irrigation management office is in charge of collecting the water fees from the users of industrial and industrial and domestic water outside of the project locations. These revenues guarantee the financial resources for maintaining and managing the facilities in the project locations, and the company or corporation as the implementing entities are receiving their operating funds from these resources. The irrigation stations in the townships/town are under the jurisdiction of the township/town governments, and their operating funds are secured in the financial resources of the township/town governments.

In the Daluhu area, the water fees collected by the county irrigation management office and the general budget of the county government have been complementing the operating funds of the project. Meanwhile, the irrigation stations have been operated on the budgets of the township/town governments.

As for the future prospects, since the National People's Congress convened in March 2011 stressed the importance of continuing and reinforcing agriculture-related assistance programs, it is highly likely that the government will subsidize the operation and management of this project.

3.5.4 Current Status of Operation and Maintenance

On conducting a macroscopic observation of the status of the major facilities along with the agriculture experts in this on-site inspection, it has been confirmed that there to be no particular problem with the condition of the facilities.



Fig.10 Water Canal in Xiazhen Area



Fig. 11 Water Reservoir in Daluhu Area

As described above, no major problems have been observed in the operation and maintenance system, therefore sustainability of the project effect is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objective of this project was to make effective use of water resources and stabilize the production of agricultural produce by constructing agricultural infrastructures such as irrigation facilities and cultivated farmlands in the Yellow River Delta Region in Shandong Province, thereby contributing to the improvement of farmers' earnings.

The development of agriculture and rural communities is a priority area in China. Shandong Province occupies a prominent place in this regard with the third largest cultivated area and the second largest production of food in the country. However, the province has only limited water resources. Accordingly, the national and provincial governments are focusing on policies to promote effective utilization of water resources for agriculture and infrastructure development for that purpose. Therefore, this project has been highly relevant. Since all the outputs of this project have been implemented according to the plan in terms of both expenditure and period, the project has been highly efficient. With regard to the effects of this project, the agricultural profits have increased both throughout the project and in terms of household income. This is attributable to factors such as the enlargement of cultivated area, improvement of productivity, and transition to high value-added crops. Meanwhile, it was expected initially that the introduction of double cropping by irrigation would lead to an increase in the production of agricultural produce. However, due to the changes in the cropping pattern such as the expansion of more profitable cotton single cropping, the gross production amount has not reached the planned value. Nevertheless, there have been no problems in the effective utilization of water resources, and thus the project can be regarded as highly effective. From the perspective of structure and technology, the operation and maintenance of the irrigation facilities have been executed properly in coordination and support of the project implementing entities and related organizations. With regard to the financial aspect, on account of the Chinese Government's policy of giving priority to agricultural affairs, the burden on the users of the irrigation facilities has been alleviated, and the financial resources have been secured in the government. In this context, there have been no problems in the operation, maintenance and expansion of the project and its effects. Therefore, the sustainability of the project has been high.

Consequently, this project is evaluated to be highly satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

In the Xiazhen area, it is expected that with the progress of soil improvement, the soil there will eventually become unsuitable for cotton cultivation. Currently, cotton cultivation accounts for 70% of the arable land, and thus it will be necessary to drastically change the cultivated crops in the future. Therefore, it will be important to revise the support policy for farmers as necessary and take measures such as providing excellent seeds of the crops recommended by the county government, so that the interests of the farmers are not compromised significantly.

4.2.2 Recommendations to JICA

None in particular

4.3 Lessons Learned

(1) Establishment of Project Operation and Maintenance Methodology

This project has been completed within the expenditure and period anticipated in the plan. The factors in this smooth implementation of the project are the establishment of management methodology for related organizations and the support system to make it function.

With regard to the project management such as procurement during the project period, the Shandong Water Management Agency has taken the initiative in establishing the management methodology peculiar to the project and notifying the executing agencies of that through the use of manuals and document formats, thereby contributing significantly to making the project operations effective. The reasons for this success lie in not only such thorough implementation of management, but also good communication among the concerned personnel from the JICA office, project offices, and executing agencies in each area. In addition, the establishment of the support and monitoring system to ensure that measures are always taken to prevent problems from occurring or spreading has also come into play. That said, this successful example should serve as a future reference.

(2) Formulation of Water Supply Schedules Based on Accurate Understanding of Needs on the Spot

In the usage management of irrigation facilities, disputes and dissatisfactions can arise among the facility users partly because the water supply is disproportionate to the water demand. In this project, however, the needs of the users are correctly grasped and that understanding is reflected in the water supply schedules, thereby resulting in an extremely high degree of satisfaction among the users. For the effective utilization of water resources, the villager committees and irrigation stations have been holding activities to listen to the demands of farmers in the project

locations, so that the county's irrigation management office can formulate and comply with water supply schedules that accurately reflect needs on the ground. In general, when implementing irrigation projects, coordinating interests of relevant parties is important in securing sustainability. By carrying out such interest adjustment frequently, and through some intervention by government authorities, appropriate management can be realized. Since it takes some time to realize independent operation and management by the users, entities such as government agencies should carry out a moderate level of intervention in securing sustainability. It is important for these agencies to arrange an environment conducive to effective management, while ensuring the continuous manifestation of the project effects.

(3) Clear Division of Operation and Maintenance Responsibilities and Pertinent Monitoring

Different organizations assume different responsibilities ranging from the water intake from the Yellow River to the maintenance of terminal water canals at township/town and village levels. In this project, the responsibilities of each organization have been clarified, and each company and corporation has monitored their performance as an implementing entity. Furthermore, all the relevant organizations have provided training with their staff, and the scarcity of personnel reshuffles has led to the consistency of skill/ability levels. These factors have contributed to the smooth implementation of operation and maintenance. In order to thoroughly maintain this kind of clear division of responsibilities and skill levels, it is important to design the structure and mechanism accordingly from the planning stage of a project, and continue paying attention to implementation during the project.

End

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Project Outputs		
Xiazhen area		
Reservoirs	2 expansions, 1 new construction	1 repaired
Pump facilities	1 expansions, 14 repairs, 10 new constructions	As planned
Main irrigation canals	5 repairs, 81.93km	5 repaired, 100.53km
Secondary irrigation canals	111.9km	As planned
Transmission facilities	4 facilities, 185 km transmission line	As planned
Main drainage canals	5 canals, 155.3km	As planned
Secondary drainage canals	35 canals, 102.3km	As planned
Farmland consolidation	24,000 ha	As planned
Embankments		Second period construction, 30.2km
Other civil engineering works	13,010 ha	As planned
Construction machinery	32 types, 364 machines	As planned
Farming equipment	1,464 self-propelled machines, 1,285 accessories	As planned
Daluhu area		
Main irrigation canals	9 repairs	0 repaired, 1.2km newly constructed
Maintenance of irrigation wells	2,620 wells	As planned
Transmission facilities	6 facilities, 452 km transmission line	5 facilities
Secondary drainage canals	2 canals	As planned
Farmland consolidation	10,000 ha	As planned
Other civil engineering works	2,470 ha	As planned
Construction machinery	8 types, 56 machines	As planned
Farming equipment	95 self-propelled machines, 1,175 accessories	129 elf-propelled machines, 2,942 accessories
2. Period	January 2000 – December 2006 (60 months)	January 2000 – December 2006 (84 months)
3. Project Expenses		
Foreign currency	10,126 million yen	8,882 million yen
Domestic currency	9,536 million yen (635 million Yuna)	10,315 million yen (727.8 million Yuan)
Total	19,663 million yen	19,197 million yen
Yen loan	10,126 million yen	8,882 million yen
Exchange rate	1 Yuan = 15 yen (As of November, 1999)	1 Yuan = 14.1 yen (Average between March 2000 and December 2006)