

Islamic Republic of Pakistan

Ex-Post Evaluation of Japanese ODA Loan  
“National Drainage Program Project”

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## **0. Summary**

The projects’ objectives are to reduce waterlogging and salinity in the Indus Basin and to restore the sustainability of environmentally-sound irrigated agriculture by improving drainage and irrigation facilities and reforming the Operations And Maintenance (hereinafter referred to as “O&M”) system, there by contributing to the reduction of poverty in targeted areas of Pakistan.

Drainage and irrigation facilities are basic infrastructure required for agriculture in Pakistan. The improvement of those facilities is relevant to development policy and development needs in Pakistan, as well as to Japan’s ODA policy. Thus, its relevance is high.

After 2004, the rehabilitation and remodeling of drainage and irrigation facilities have been progressing steadily. Cultivated areas and the production of major crops, such as wheat, rice, and sugarcane, have increased in target areas. Participatory Irrigation Management (hereinafter referred to as “PIM”) also began to progress after 2005. Farmers’ satisfaction rates are relatively high with respect to dispute resolutions, responses to water thefts, O&M of channels, and abiana (water charges) collection, although performance of those functions varies among Farmers’ Organizations (hereinafter referred to as “FOs”), particularly with respect to abiana collection rates. Thus, the project has largely achieved its objectives. Therefore, the project’s effectiveness and impacts are considered to be high.

Project implementation was delayed and not completed until 2002, the original completion period. However, implementation increased rapidly after 2004. The project costs were much lower than planned, but the project period was extended to more than twice the length of the original period. Therefore, the efficiency of the project is fair.

The O&M of water channels rehabilitated and constructed by this project was transferred from the Punjab Irrigation Department (PID)/Punjab Irrigation and Drainage Authority (PIDA) to the Area Water Board (AWB)/FOs based on the concept of PIM. However, reforms must continue. Some challenges continue to affect the technical and financial aspects of O&M, although some positive factors have developed, such as JICA’s technical cooperation project’s efforts to enhance capacity of FOs. Thus, sustainability of the project is fair.

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

## 1. Project Description



Project Map (Punjab Water Channels)



Lining of distributary

### 1.1 Background

Waterlogging and salinity have been significant threats to agriculture and the sustainable irrigation system used in the Indus Basin in Pakistan. To restore the affected land and prevent further waterlogging and salinity, the construction of an effective drainage system was essential. However, under the previous management system, abiana collection rates were low, O&M was ineffective, and some water channels were abandoned. Deterioration of the canal system led to increased waterlogging and salinity, and decreases in agricultural production and cultivable land. Therefore, drastic reforms aimed at the achievement of effective management of the drainage and irrigation system were urgently required.

The Pakistani government designed the National Drainage Program (hereinafter referred to as “NDP”) in 1993. NDP aimed to improve drainage and irrigation facilities and construct an effective drainage management system in the Indus Basin.

In addition, the Pakistani government formulated the “Pakistan Irrigation and Drainage: Issues and Options” report, which emphasized the decentralization of the management system and the establishment of an independent institution in 1994, with the assistance of the World Bank (WB). The report was based on their recognition that institutional reform of the drainage and irrigation sector was essential for the realization of the NDP.

### 1.2 Project Outline

The project’s objectives are to reduce waterlogging and salinity in the Indus Basin and restore the sustainability of environmentally sound irrigated agriculture by improving drainage and irrigation facilities and reforming the Operations and Management system, thereby contributing to the reduction of poverty in targeted areas in Pakistan.

Approved Amount/ Disbursed Amount	10,832 million yen/ 6,238 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 1997/ March 1997
Terms and Conditions	Interest Rate 2.3%, Repayment Period 30 years, (Grace Period 10 years), General Un tied
Borrower/ Execution Agency	The president of Islamic Republic of Pakistan / Water and Power Development Authority (WAPDA)
Final Disbursement Date	December 2006
Main Contractor (Over 1 billion yen)	NA
Main Consultant (Over 100 million yen)	UNDP/UNOPS (training component), National Engineering Services (NESPAK)
Feasibility Study, etc.	The World Bank performed the first survey in 1993, and three additional surveys in 1994. F/S was completed in May 1995.
Related Projects	“Special Assistance for Project Implementation of NDP” (2003) Japanese ODA Loan projects: “Lower Chenab Canal System Rehabilitation Project” (L/A in 2005), “Punjab Irrigation System Improvement Project” (L/A in 2008) Technical Cooperation Projects: “Water Management Advisor for Punjab Province” (2006-2008), “Strengthening Irrigation Management System Including Agriculture Extension Through Farmers’ Participation in the Punjab Province” (2009-2013)

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Juichi INADA, Senshu University/Waseda University

### 2.2 Duration of Evaluation Study

This evaluation study was performed according to the following schedule.

Duration of the Study: October 2012 – August 2013

Duration of the Field Study: January 9 – January 22, 2013; June 13 – June 22, 2013

## 2.3 Constraints during the Evaluation Study

Quantitative indicators and baseline data were not described in detail at the time of the appraisal. Therefore, appropriate indicators and relevant data were collected at the time of the ex-post evaluation.

## 3. Results of the Evaluation (Overall Rating: B<sup>1</sup>)

### 3.1 Relevance (Rating: ③<sup>2</sup>)

#### 3.1.1 Relevance to the Development Plan of Pakistan

Based on the NDP (1993-2018), the Pakistani government formulated “the 8<sup>th</sup> 5-Year National Development Plan (1994-1998),” which designated the agricultural sector as a main pillar of Pakistan’s economic development. It prioritized (1) the comprehensive management of drainage and irrigation, and (2) effective land and water management. The NDP pursued economic development and poverty reduction by attempting to increase agricultural production, increase the surface water supply and decrease waterlogging and salinity by introducing new management methods, organizing FOs to increase effective water use.

The project’s priority was changed from drainage to irrigation because a persistent drought occurred between 2000 and 2004. The Pakistani government prioritized the security of water resources and irrigation by improving its canal system and introducing effective water resource management.<sup>3</sup>

This governmental change in priorities explains the shifts in priorities of JICA’s provision of assistance to NDP from drainage to irrigation. This shift occurred in response to changes made to the above-mentioned policy environment. The JICA project’s objective at the time of the appraisal was to decrease waterlogging and salinity. However, JICA also shifted its priorities, in response to water shortages and a drought that occurred after 2000. JICA changed its assistance scope in early 2003.

At the provincial level, the Provincial Government of Punjab formulated an “Irrigation Sector Reform Program” in 2005. The government announced its involvement with critical irrigation issues such as (1) improved irrigation management, (2) increased transparency in water distribution, (3) the achievement of improved water supply service by transferring irrigation management authority to FOs, and (4) improved on-farm irrigation efficiency and

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<sup>1</sup> A: highly satisfactory; B: satisfactory; C: moderate; D: unsatisfactory.

<sup>2</sup> ③: high; ②: fair; ①: low.

<sup>3</sup> The Pakistani government did not change NDP’s original objectives. No new water sector strategies have been formulated since 1994. Based on an interview conducted with the Department of Water Resources in January 2013, the central government has considered the formulation of a comprehensive strategy for water resource management. However, the draft has not yet authorized a new official strategy.

agricultural productivity.

Therefore, the project was relevant to Pakistan's development policy, including the shift in priorities from drainage to irrigation in response to changes in the policy environment.

### 3.1.2 Relevance to the Development Needs of Pakistan

At the time of the appraisal, the following development needs in the drainage and irrigation sector in Pakistan were mentioned: (1) reduction of water shortages by increasing and preserving water resources, (2) recovery of agricultural production by introducing countermeasures to waterlogging and salinity, (3) introduction of environmentally friendly drainage management, (4) strengthening of sewage management, (5) introduction of integrated flood control programs, (6) increased participation by beneficiaries, (7) development of effective O&M by the capacity enhancement of water management institutions and institutional reforms. These reforms were affected by many challenges, such as further improvements made to governmental policies and strategies, implementations of strategies, and the enhancement of technical and administrative capacity, as well as by financial shortages. The project appropriately reflected Pakistan's development needs.

The drought became one of the major issues that occurred between 2000 and 2004. Because of decreased rain fall, priorities shifted away from measures to prevent waterlogging and shifted towards measures aimed at the resolution of water shortages. (See Figure 1.)

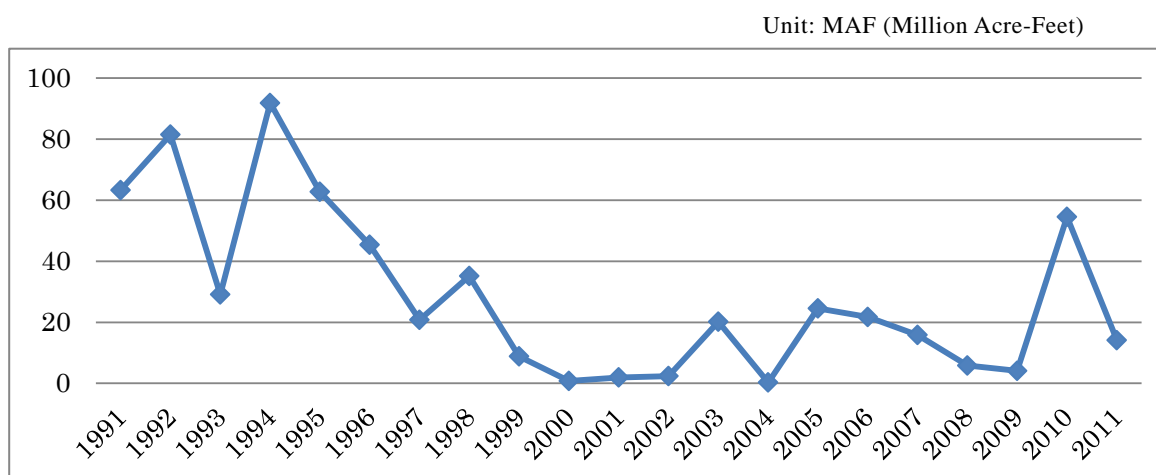


Figure 1. Annual Drainage Discharge in Punjab Province (1991-2011)

Note: Based on data provided by WAPDA.

Figures for fiscal year: From April to March of the following year.

JICA has responded flexibly to changes in Pakistan's development needs. It has shifted its assistance priority from drainage to irrigation and changed its assistance scope by focusing on areas that exhibit higher irrigation needs. These shifts in JICA's project priority and scope are appropriate because JICA has been responding to shifting development needs during the

project period.

### 3.1.3 Relevance to Japan's ODA Policy

In the Medium-Term Strategy for Overseas Economic Cooperation Operations (2002-2005), JICA stated, "Access to social service delivery in Pakistan is still low in comparison with other developing countries. Therefore, improvement of access to socio-economic services in poorer rural areas should be prioritized and significant consideration should be given to the effectiveness of institutions and the participation of local people."

Therefore, the project is consistent with Japan's ODA policy.

The project was highly relevant to Pakistan's development plan and needs, as well as to Japan's ODA policy. Therefore, the project is considered to be highly relevant.

## 3.2 Effectiveness<sup>4</sup> (Rating: ③)

### 3.2.1 Quantitative Effects (Operation and Effect Indicators)

Because no concrete quantitative effect indicators were determined at the time of the appraisal, the following quantitative indicators were examined at the time of the post-evaluation.

#### i. The width of the benefited areas, the number of beneficiaries, and FOs

JICA changed its project scope in January 2003 in response to changes in development needs. It refocused its targets for Components 1 and 2 (rehabilitation of canal system) for sub-projects in area Part A that could be completed by the end of 2006. In Part A, watercourses and minors were included in the list of target sub-projects, in addition to canals and branches. Parts B and C were originally included in the target areas. However, they were excluded when the scope changed in 2003. They became the target areas of later Japanese ODA loan projects.<sup>5</sup>

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<sup>4</sup> Sub-rating for Effectiveness is to be put with consideration of Impact.

<sup>5</sup> Those areas were included as parts of the following Japanese ODA projects: The "Lower Chenab Canal System Rehabilitation Project" (L/A in 2005), and the "Punjab Irrigation System Improvement Project" (L/A in 2008).

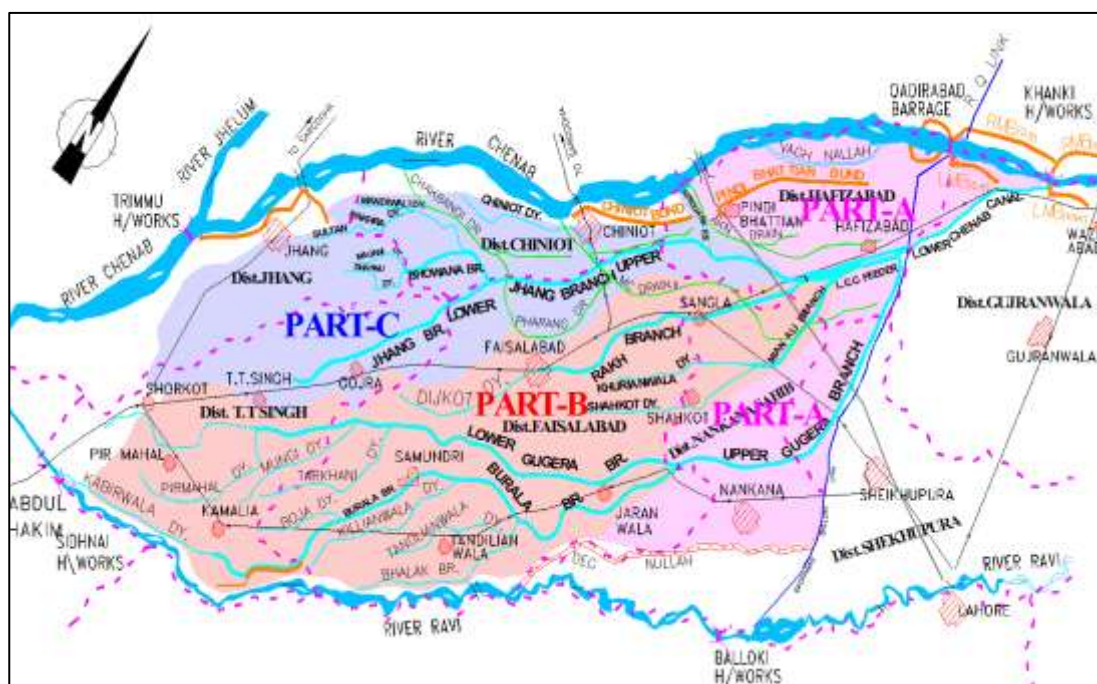


Figure 2. Map of JICA project target areas

Source: PIDA.

Table 1 shows the acres in the benefited areas, the number of beneficiaries, and the FOs. After 2005, 34 FOs were established in area Part A.<sup>6</sup>

Table 1. Estimates of benefited areas and beneficiaries (Part A)

Division	No. of outlets	Gross Canal Area (Acres)	Cultivable Canal Area (Acres)	No. of Beneficiaries	No. of FOs
Khanki	619	272,159	213,737	26,416	12
Upper Gugera	1,166	681,357	550,350	85,312	22
Total	1,785	953,516	764,087	111,728	34

Note: Based on data provided by AWB (LCC-East). The benefited areas described in this table amount to 953,000 acres. However, the figures in this table include all benefited areas in the canal system. They are not limited to areas that directly benefit from JICA's assistance.

## ii. Abiana collection rates

Prior to 2005, when FOs had not yet been established, abiana was collected by PID and used for O&M of the canal system. After 2005, PIM was newly introduced and FOs were established. Irrigation Management Transfer (IMT) continues to progress: FOs are responsible for the collection of abiana and for the O&M of distributaries and minors. The abiana collection rates by FOs in targeted areas are shown in Table 2.

<sup>6</sup> The total number of FOs in Parts A, B, and C is 85. However, one FO has not yet been officially established in law, because some farmers who are members of those FOs have not provided consents (as of the end of 2012). Regardless of whether the target areas are parts of Components 1 and 2, all 85 FOs in Parts A, B, and C are targets of the JICA project as components of its provision of assistance for institutional reforms and capacity building.

Table 2. Abiana collection rates after FOs were established (84 FOs)

Period	Cultivable Canal Area (Acres)	Abiana Assessed (Million Rs.)	Total Collection of Abiana (Million Rs.)	Recovery of Abiana (%)
Rabi 2004-05	1,173,336	48.41	42.38	87.55
Kharif 2005	1,709,482	118.94	93.14	78.31
Rabi 2005-06	1,582,537	64.57	48.65	75.35
Kharif 2006	1,709,482	117.90	80.10	67.93
Rabi 2006-07	1,581,787	65.22	51.77	79.37
Kharif 2007	1,704,522	114.64	73.17	63.83
Rabi 2007-08	1,573,359	61.71	37.21	60.30
Kharif 2008	1,699,204	114.16	68.85	60.31
Rabi 2008-09	1,572,498	59.33	36.72	61.88
Kharif 2009	1,699,204	108.08	55.01	50.90
Rabi 2009-10	1,572,498	58.90	31.05	52.72
Kharif 2010	1,699,228	107.58	78.00	72.51
Rabi 2010-11	1,645,212	63.05	49.39	78.34
Kharif 2011	1,771,918	117.25	86.27	73.57
Rabi 2011-12	1,645,212	73.76	46.50	64.04
Kharif 2012 年	1,771,918	132.76	61.54	46.38

Note: Based on AWB documents. Kharif: May-September; Rabi: October-April of the following year.

The periods after 2005 were divided into the following three stages:<sup>7</sup>

(a) 2005–2007 (Pilot stage): FOs were established and began to engage in PIM under PIDA’s supervision .

(b) 2008 – 2010 (transitional stage): PIDA encouraged FOs that performed well to increase their independent management. It also intervened with FOs that performed poorly to assist with their O&M.

(c) After 2010 (full-scale stage): PIM by FOs was officially introduced by transferring O&M to FOs. Some support was provided by PIDA to strengthen their capacities.

It was reported that abiana collection rates ranged between 35% and 45% prior to 2004 when PID collected abiana. Table 2 shows that abiana collection rates have increased to approximately 70% since 2005 after the new PIM system was introduced, in comparison with low abiana collection rates achieved under the old system. Abiana collection rates were very high (around 80%) during the initial stage that occurred between 2005 and 2007, but the rates decreased to around 50% in 2009. After 2010, when full-scale introduction of PIM was completed, abiana collection rates increased to nearly 80%, but the rates decreased again between 2011 and 2012.

Abiana collection rates improved after 2010 for the following reasons: (1) FOs were very active during the initial stage when PIM was introduced to FOs. (2) Distributaries were improved by JICA’s “Lower Chenab Canal System Rehabilitation Project.” Increases in the number of benefited areas affected farmers’ willingness to pay abiana. In contrast, in recent years, decreases in abiana collection rates reportedly occurred because FOs do not possess the

<sup>7</sup> Based on interviews conducted with staff members of AWB and PIDA.

compulsory power to prevent farmers' failure to pay abiana. Therefore, the number of farmers who fail to pay abiana has increased.

However, based on the "Performance Monitoring & Evaluation of 84FOs (out of 85, see Footnote 6)" report conducted by PIDA, many FOs in Part A area were rated "poor." Most FOs in Part B/C areas were rated "good" or "satisfactory" with respect to the performance of abiana collection rates.<sup>8</sup> It has been reported that these ratings may have occurred because many large landowners who participate in the upper stream of the canal system have easy access to water, and they may be reluctant to pay abiana.

In summary, institutional reforms of the O&M system were conducted as part of the JICA project. A new system based on PIM was established in Punjab province, Irrigation Management Transfer (IMT) was performed with Farmers Organizations (FOs), and PIDA was established. As a result, abiana collection rates improved in the targeted areas of Part A/B/C in general.

### 3.2.2 Qualitative Effects

At the time of the appraisal, it was expected that environmental improvement by decreasing waterlogging and salinity, increased participation by farmers, and poverty reduction would occur if drainage and irrigation facilities and institutional reforms improved, although concrete figures were not proposed as targets. An examination of the project's qualitative effects is outlined below:

#### i. Improvement of FOs' performance

Although FOs were established, their performance varied (with respect to abiana collection rates, dispute resolutions, provision of water supplies to the tail, responses to water thefts, and so on). Performance evaluations were conducted in 2008 by JICA and PIDA, respectively.

Table 3 shows performance evaluation summaries for 84 FOs. Each FO was rated on four categories (i.e., "good," "satisfactory," "adequate," and "poor"). The majority of FOs was rated "satisfactory." Most FOs were rated more than "adequate." However, some FOs rated "poor," continue to operate. This means that FOs' performance varied. The performance rates of large land owners (who tend to avoid obeying FO rules), the educational levels of FO committee members (members' higher education levels resulted in more effective FO management), and the characteristics of each FO's location (e.g., crime rates) were suggested as reasons for differences in each FO's performance.

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<sup>8</sup> PIDA, *Performance Monitoring & Evaluation of Farmers Organizations*, October 2008. The number of FOs included in each performance category for abiana collection rates (three-year totals) were: more than 90% (good): 29; 80-90% (satisfactory): 11; 60-80% (adequate): 25; less than 60% (poor): 19.

Table 3. Performance evaluations of FOs

Unit: Number of FOs (%: Share of the total)

Performance rating	Internal M&E: (PIDA Evaluation)			External M&E (JICA & Third Party Evaluation)	
	PIDA M&E (2006) 84 FOs	PIDA M&E (2007) 84 FOs	PIDA M&E 3Years (2005-08) 84 FOs	JICA Survey (March 2007) 84 FOs	Third-Party Case Studies (May 2008) 10 FOs
<b>Good</b>	13 (16%)	25 (30%)	19 (23%)	19 (23%)	2 (20%)
<b>Satisfactory</b>	34 (40%)	19 (22%)	28 (33%)	47 (56%)	2 (20%)
<b>Adequate</b>	26 (31%)	25 (30%)	23 (27%)	13 (15%)	4 (40%)
<b>Poor</b>	11 (13%)	15 (18%)	14 (17%)	5 (6%)	2 (20%)

Source: PIDA, *Performance Monitoring & Evaluation of Farmers Organizations*, October 2008.

Note: Performance Standards for the JICA survey: Good: More than 86; Satisfactory: 65-85; Adequate: 50-65; Poor: less than 50. Performance Standards for the PIDA Evaluation (2007, 2005-2008): Good: More than 86; Satisfactory: 70-85; Adequate: 55-70; Poor: Less than 55.

Table 4 shows farmers' satisfaction rates with the performance of FOs, based on the location of farmers' land.

(a) Farmers' satisfaction rates were relatively high with respect to dispute resolutions, responses to water thefts, O&M of channels, and abiana collection.

(b) The farmers located at the head of the channel were more satisfied; the farmers located at the tail of the channel were less satisfied. This discrepancy appears to have been caused by differences in accessibility to the water supply between farmers located at the head or tail of the channel.

Based on interviews conducted with FOs, water thefts increased after 2008 because FOs do not possess effective legal authority to prevent water thefts. FOs' legal authority must be strengthened so they can provide effective management.

Table 4. Farmers' satisfaction with FOs' performance based on farmers' locations

FOs' Functioning	Satisfied				Unsatisfied			
	Head	Middle	Tail	Total	Head	Middle	Tail	Total
Dispute Resolutions	494 (87%)	507 (89%)	580 (83%)	1,581 (86%)	75 (13%)	61 (11%)	118 (17%)	254 (14%)
Irrigation Service Delivery	476 (84%)	468 (82%)	473 (68%)	1,417 (77%)	93 (16%)	100 (18%)	225 (32%)	418 (23%)
Feeding Tails	436 (77%)	434 (76%)	462 (66%)	1,332 (73%)	133 (23%)	134 (24%)	236 (34%)	503 (27%)
Control over Water Theft	459 (81%)	458 (81%)	533 (76%)	1,450 (79%)	110 (19%)	110 (19%)	165 (24%)	385 (21%)
Maintenance of Channels	498 (88%)	500 (88%)	587 (84%)	1,585 (87%)	71 (12%)	68 (12%)	111 (16%)	250 (13%)
Assessment & Billing of Water Charges	499 (88%)	498 (88%)	592 (85%)	1,589 (87%)	70 (12%)	70 (12%)	106 (15%)	246 (13%)

Source: PIDA, *Performance Monitoring & Evaluation of Farmers Organizations*, October 2008.

After 2009, through JICA's technical cooperation project, "Strengthening Irrigation Management System including Agriculture Extension through Farmers' Participation in Punjab Province," JICA offered training materials to FOs. These materials were used by PIDA at seminars provided for FO members (committee members, accounting and technical staff members). FOs were also offered manuals and casebooks focused on dispute resolution to increase FOs' capacity. It was believed that these efforts contributed to FOs' performance.

Thus, more than 80% of FOs began functioning after the introduction of PIM, although some variations occurred among FOs. The majority of farmers appeared to be satisfied with the FOs' functions. However, some challenges remain (e.g., strengthening FOs' legal authority).

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**BOX – The Results of a Beneficiary Survey Conducted in Two FOs in the Target Area.**

For the project's beneficiary survey, two FOs were selected from Part A area and interviews and questionnaire surveys were conducted with 100 farmers in each FO between February and March 2013. The first FO interviewed was Qabarwala ("Q" FO, below); the second FO interviewed was Nahra ("N" FO, below). The two FOs are located close to one another. However, "Q" was rated "satisfactory" and "N" was rated "poor" in the PIDA's "Performance Monitoring & Evaluation of FOs" report. As shown in Table 5, the differences in abiana collection rates between the two FOs are notable.

Table 5. Shifts in two FOs' abiana collection rates

Period	Qabarwala			Nahra		
	Abiana Assessment	Abiana Collection	Collection Rate (%)	Abiana Assessment	Abiana Collection	Collection Rate (%)
Kharif 2010	494	384	78	1,887	603	32
Rabi 2010-11	293	293	100	1,114	474	43
Kharif 2011	498	498	100	1,908	1,145	60
Rabi 2011-12	321	321	100	1,888	455	24
Kharif 2012	538	538	100	3,189	777	24
Total	2,143	2,033	95	9,985	3,448	39

Source: Data provided by AWB.

Note: Abiana Unit: One thousand rupees

Kharif: May-September; Rabi: October-April of the following year.

Table 6 shows the differences that occurred in basic attribute data and provides answers to key questions that highlight the differences in both FOs.

Table 6. Comparisons of basic data and farmers' responses to questionnaires conducted with two FOs

		Qabarwala	Nahra
Basic data	Cultivable Areas (Acres)	8,072	42,480
	Number of Farmers	about 2,000	about 5,500
	Lengths of Distributaries (miles)	4.02	36.86
	Number of Outlets	14	87
Farmers' responses to questions	Cultivable Area per Household (Acres)	6.69	10.29
	Main Water Source	Canal: 57.3%/ Tubewell: 42.8%	Canal: 18.7%/ Tubewell: 81.3%
	Have you been paying abiana on a regular basis since FO began collecting abianas?	Yes: 98.5%/ No: 1.5%	Yes: 76.4%/ No: 20.8%
	Do you attend FO meetings?	Yes: 45.9%/ No: 54.1%	Yes: 35.3%/ No: 64.7%
	Do you believe the FO's abiana collection has been transparent and fair?	Yes: 89.9%/ No: 7.3%	Yes: 77.5%/ No: 21.1%
	Do you think the FO's dispute resolution is more effective than before?	Better: 58.8%/ Worse: 13.2%	Better: 35.3%/ Worse: 16.2%
	Do you think the FO takes proper actions against water thefts?	Yes: 80.9%/ No: 14.7%	Yes: 64.3%/ No: 22.9%
	Does FO/PIDA use funds for O&M properly?	Yes: 58.2%/ No: 40.3%	Yes: 45.8%/ No: 51.4%
	Do you think FO elections are transparent and fair?	Yes: 87.3%/ No: 7.0%	Yes: 77.5%/ No: 21.1%

Based on comparisons between the two FOs, the following conclusions and presumptions were reached.

- A) In "Q" FO, farmers participated more frequently in FO meetings, abiana collection rates were higher, and FO elections were considered more transparent. Farmers believed "Q" FO was more effective in taking actions against water thefts and dispute resolutions than "N" FO was.
- B) "Q" FO was smaller than "N" FO. "Q" FO had a smaller number of farmers and the area of land per farmer was smaller. Its compact size and smaller number of small land owners might have made management of "Q" FO more effective.
- C) Based on on-site interviews conducted with FOs, "N" FO displayed sectionalism among some factions. Its FO committee was politicized and some farmers were uncooperative with FO committee members. Those factors may have contributed to "N" FO's poor performance.
- D) Many farmers who belonged to "N" FO stated that PIDA was unhelpful. They believed the former PID management system was better than the PIM management system. In contrast, many farmers who belonged to "Q" FO stated that they have been cooperative with PIDA and that PIDA's assistance with "Q" FO's capacity enhancement was important. Those farmers were confident in the new system

## ii. Decreases in salinity

To reduce salinity, rehabilitation and/or new construction of drainage and irrigation

facilities or the reclamation of soil in saline ground water areas are required. At the time of the appraisal, the project included investment components of the rehabilitation of saline ground water tubewells and watercourse linings in saline ground water areas. However, in reality, the rehabilitation of tubewells was cancelled and the lengths of watercourse linings in the saline ground water areas were decreased.

In addition, the project's targeted area (Part A) is a less saline area. A more saline area (Part B/C, located in the western part of LCC) was targeted in the next Japanese ODA Loan projects. However, salinity situations differ based on weather conditions (e.g., rainfall volume, and so on), as well as on the exact locations of land areas (e.g., heads or tails of watercourses, and so on). Hence, it is difficult to assess the project's exact impact on decreasing salinity in the targeted area.

Therefore, it is difficult to grasp the project's direct effects (Components 1 and 2) on the reduction of saline ground water areas. However, it can be assumed that the rehabilitation and remodeling of drainage and irrigation facilities have led to an indirect increase in cultivable areas in Part A in Punjab province because the deterioration of facilities has caused increases in the number of saline ground water areas and decreases in cultivable areas.

### **3.3 Impact**

#### **3.3.1 Increases in cultivable areas, agricultural production and changes in crops**

At the time of the appraisal, it was assumed that the project had contributed to farmers' increased agricultural production and poverty reduction. However, no quantitative baseline data was proposed. Increases in the water supply by the improvement of water courses might have been a major factor that contributed to increased agricultural production. However, other factors also contributed to these increases. Therefore, increased agricultural production was analyzed as an "impact," rather than a "quantitative indicator" for the project.

The major agricultural products in the target area include wheat, rice, sugarcane, maize, cotton, and so on. The cultivation of double crops or the cultivation of two crops in one year are popular in the area (e.g., rice is cultivated in Kharif and wheat is cultivated in Rabi). Punjab province is a major producer of wheat and rice.

Based on a survey conducted by the International Water Management Institute (IWMI) in Punjab in 2007, agricultural productivity in the target area increased around 10% beginning in 2004-2005. In addition, based on agricultural production statistics provided by the Pakistani Statistical Bureau, the number of cultivated areas of wheat, rice, and maize increased about 20% over the last ten years. In contrast, the number of cultivated areas of sugarcane decreased about 10% over the last ten years.

Table 7 shows shifts in the number of cultivated areas and shifts in wheat, rice, and sugarcane production in the target area between 2000 and 2011.

Table 7. Shifts in the number of cultivated areas and major crop production by district

Unit: One thousand hectares (Cultivated Area); One thousand tons (Production)

	Hafizabad (Part A)		Nankana Sahib (Part A • B)		Faisalabad (Part B • C)		Toba Tek Singh (Part B • C)		
	Cultivated Area	Production	Cultivated Area	Production	Cultivated Area	Production	Cultivated Area	Production	
Wheat	2000	129.9	345.8	0.0	0.0	262.2	766.9	144.9	412.9
	2001	132.7	340.8	0.0	0.0	250.1	651.8	142.1	401.7
	2002	133.5	367.1	0.0	0.0	254.1	716.3	146.5	423.2
	2003	138.0	357.9	0.0	0.0	265.1	789.2	151.3	428.8
	2004	134.4	373.2	0.0	0.0	276.8	901.7	154.6	463.5
	2005	139.2	386.9	142.0	414.2	273.6	793.5	158.6	460.7
	2006	140.4	392.3	138.0	411.1	263.5	817.1	157.8	464.2
	2007	148.1	425.2	159.0	451.2	265.9	697.4	157.0	456.0
	2008	161.5	464.8	166.3	493.7	289.3	846.0	163.1	490.4
	2009	161.1	412.3	141.2	373.7	303.1	861.3	164.3	460.2
	2010	153.0	486.8	113.7	340.9	283.7	897.4	156.6	538.8
Rice	2000	110.9	187.2	0.0	0.0	28.7	41.1	25.1	34.2
	2001	108.1	168.8	0.0	0.0	23.9	29.6	19.8	27.7
	2002	112.5	203.0	0.0	0.0	21.4	32.7	22.3	43.4
	2003	113.7	196.0	0.0	0.0	25.1	32.6	16.7	39.0
	2004	119.4	217.4	0.0	0.0	28.3	38.3	29.1	45.6
	2005	121.8	226.8	100.0	172.5	27.1	41.0	29.1	50.1
	2006	120.2	204.1	96.8	164.1	25.9	37.2	28.7	45.7
	2007	123.4	223.3	101.2	179.6	26.7	42.8	23.9	45.8
	2008	130.3	245.9	114.5	210.6	38.9	61.8	35.2	59.5
	2009	133.1	276.9	102.0	184.2	32.8	53.9	36.0	64.4
	2010	127.1	262.7	96.3	172.7	25.9	46.9	33.2	62.2
Sugarcane	2000	6.5	264.4	0.0	0.0	102.9	4,831.2	37.7	1,803.9
	2001	6.9	288.7	0.0	0.0	108.1	5,481.1	41.2	2,112.9
	2002	7.7	428.3	0.0	0.0	117.4	5,412.1	45.7	2,146.8
	2003	7.3	322.5	0.0	0.0	116.1	5,752.4	43.7	2,192.9
	2004	6.5	281.9	0.0	0.0	106.0	6,023.9	35.6	1,983.9
	2005	6.1	286.1	18.2	666.8	108.5	5,451.6	36.0	1,970.9
	2006	6.1	280.5	19.8	850.4	115.3	6,403.8	38.8	2,182.1
	2007	7.3	282.2	21.0	941.3	125.1	5,999.3	46.6	2,292.1
	2008	6.1	230.7	19.0	863.1	104.8	5,123.5	37.6	1,881.4
	2009	5.7	214.2	16.6	762.1	96.3	4,690.4	35.6	1,826.2
	2010	5.3	206.2	19.4	913.7	104.8	5,471.6	41.7	2,422.0

Source: Statistical Bureau of Pakistan.

Table 7 can be summarized as follows:

- (1) Hafizabad (Part A): After 2005, cultivated areas/ production of wheat and rice increased.  
Cultivated areas/ production of sugarcane decreased.
- (2) Nankana Sahib (Part A/B): After 2005, cultivated areas/ production of wheat, rice, and

sugarcane increased significantly.

- (3) Faisalabad & Toba Tek Singh (Part B/C): After 2008, cultivated areas/ production of wheat and rice increased significantly.

In short, cultivated areas/ production of major crop increased in target areas after 2005.<sup>9</sup> The increase of cultivated areas/production of major crop was considered to be caused by stable water supplies, improvement of agricultural technology,<sup>10</sup> weather changes, and so on. Some FO members stated that improvements to water channels contributed to increased agricultural production and the improvement of soil quality. These responses imply that the project's attempts to improve water channels exerted positive impacts on increased crop production, although they might not have been the sole cause of this increase.

On the other hand, because the project rehabilitated only a portion of the whole canal system (i.e., some core parts of the canal system and the linings of some watercourses), it is difficult to determine exact figures that reveal the Japanese ODA Loan's exact contributions to stable water supplies in the canal system.

### 3.3.2 Other Positive or Negative Impacts

#### i. Impacts on the natural environment

The design of the JICA project was based on "The Drainage Sector Environmental Assessment (DSEA)" completed in 1993 by WAPDA. Any construction works that would have exerted negative impacts on the environment were forbidden. In addition, based on a "Performance Review" conducted by PIDA and JICA, farmers responded that two major negative factors that affected the environment were the fact that cattle entered the watercourses and the fact that they excreted feces into the watercourses. No reports were made that stated that rehabilitation and construction of the water channels led to plague outbreaks or soil deterioration in the target area.

#### ii. Land acquisition or resettlement

Because the project primarily focuses on the rehabilitation of existing facilities, no specific problems related to land acquisition or resettlement have developed. In some portions, pooling areas were expanded at branches. However, this occurred on farmland. Compensation for the land was properly provided in accordance with the "Framework for Land Acquisition and Resettlement." Four off-farm construction works were created on government-owned land area.

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<sup>9</sup> Table 7 also shows that cultivated areas/production of rice and sugarcane increased after 2008 in Parts B and C, which is the target area for the next Japanese ODA Loan projects.

<sup>10</sup> In Part B, JICA conducted the "Strengthening Irrigation Management System Including Agriculture Extension Through Farmers' Participation in Punjab Province" between 2009 and 2013. It attempted to expand agricultural productivity by improving agricultural techniques. It has been reported that productivity increased between 10% and 30% in the pilot area.

However, no resettlement of residents was required.

In light of the above, the project has largely achieved its objectives, therefore its effectiveness and impacts are considered high.

### 3.4 Efficiency (Rating: ②)

#### 3.4.1 Project Outputs

Four output components were available at the time of the appraisal. Major deviations in actual output from planned output are summarized in Table 8.

Table 8. Major changes in output (Planned and Actual)

	Planned	Actual
Component 1: Off-farm drainage & irrigation facilities in Punjab	<ul style="list-style-type: none"> <li>– Off-farm surface drains: 4,139km (Rehabilitation/ remodeling: 3,550 km; New construction: 589 km)</li> <li>– Rehabilitation/replacement of tubewells: 530 units;</li> <li>Construction of major cross drainage</li> <li>– Rehabilitation, remodeling and lining of canals (Distributaries and Minors)</li> </ul>	<ul style="list-style-type: none"> <li>– Off-farm surface drains: Rehabilitation/ remodeling: 2,929 km; New construction: 77 km</li> <li>– Rehabilitation/replacement of tubewells, Construction of major cross drainage: Cancelled</li> <li>– Rehabilitation, remodeling, and lining of canals: Lining of Distributaries/Minors: 411 km; Rehabilitation and remodeling: Distributaries/Minors: 343 km; Main/Branch Canal: 113 km; 108 new structures constructed on canal system</li> </ul>
Component 2: On-farm drainage & irrigation facilities in Punjab	<ul style="list-style-type: none"> <li>– On-farm drains: 30,000acres</li> <li>– Tile drains: 3,000 acres</li> <li>– Watercourse linings in saline ground water areas: 750</li> </ul>	<ul style="list-style-type: none"> <li>– Surface drains: 1</li> <li>– Tile drains: Cancelled</li> <li>– Linings: 499 watercourses</li> </ul>
Component 3: RBOD priority works	<ul style="list-style-type: none"> <li>– Remodeling of necessary structures: 110 km</li> </ul>	<ul style="list-style-type: none"> <li>– Cancelled</li> </ul>
Component 4: Training Services	<ul style="list-style-type: none"> <li>– Training, seminars, study tours for WAPDA, Provincial Irrigation &amp; Drainage Authority, Area Water Board, FOs, PAD</li> </ul>	<ul style="list-style-type: none"> <li>– UNOPS awarded training contract. However, it was not fully implemented and was ultimately cancelled. Later, WAPDA implemented the training services.</li> </ul>

The causes of major deviations in actual output from the planned output noted above are listed below:

- (1) Since the project began, time was required to specify sub-projects and coordinate project formation among the many stakeholders. In addition, delays caused bid prices to exceed the original estimates. Contracts were either never awarded or further delayed. Ultimately, the procurement process began after 2004. (In particular, this delay affected Components 1 and 2.
- (2) Delays in the identification and construction of sub-projects led to delays in the initiation of institutional reforms of the PIM of channels. FOs were established after 2005. (This

delay affected Component 4.)

- (3) Sindh Province did not agree with NDP's "Right Bank Outfall Drainage" (RBOD) plan. This component was conclusively cancelled, including the World Bank Project component.<sup>11</sup>

Those initial delays were highlighted as serious problems during the Joint Mid-Term Review by the WB, Asian Development Bank (ADB), and JICA which was conducted in 2001. These delays were also highlighted in the Joint Donor Review which was conducted in 2002. Ultimately, the scope of Japanese ODA Loan was modified in January 2003. Both JICA and ADB decided to extend their assistance periods until the end of 2006. JICA refocused its assistance components in the following ways:

- (1) Project Components 1 and 2 focused on the support, replacement, and/or rehabilitation of canals located in Lower Chenab Canal.
- (2) Finances for Project Components 1 and 2 only apply to Part A, which covers LCC (East).
- (3) Rather than including sub-projects in Parts B and C, the project included the improvement of distributaries and minors in Punjab Province, regardless of whether they were financed by NDP.
- (4) The requirements for and impacts of tubewells in saline ground water areas should be verified, because they might lead to the development of saline water tubewells.
- (5) Timely progress in the institutional reform of irrigation management is the project's touchstone. Therefore, clear visions and strategies for the improved division of roles among PID, PIDA, and FOs should be proposed. JICA supports its survey on institutional reform.

The United Nations Office for Project Services (UNOPS) was selected as a consultant to provide training services (Component 4) in January 2001. UNOPS implemented 1,204 Person/Days of training (43 million Rs.). However, the contract was terminated because of disagreements that developed on the Pakistani side in September 2003.<sup>12</sup>

In April 2004, the Federal Programme Steering Committee (FPSC) decided to restart new training activities based on the Consolidated Training Plan (CTP) under the direct

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<sup>11</sup> The World Bank's NDP has located its investment component in Sindh Province. The World Bank Inspection Panel received a Request for Inspection from local residents and NGOs in September 2004 because "the extension of Left Bank Outfall Drainage (LBOD) to the upper stream of the Indus Basin would risk an increase in LBOD water levels and badly affect the already degraded environment of the Indus Basin." In addition, they claimed that the WB Environmental Assessment underestimated the NDP project's negative impacts on marine resources. The Inspection Panel began its work in November 2004. It presented its report to the World Bank's Executive Board in October 2006. Ultimately, the project component was cancelled.

<sup>12</sup> The contract was terminated because WAPDA complained that UNOPS' performance and delays in institutional reforms caused poor project performance. Termination of the contract led to another issue: Returns of advance payments to UNOPS were also delayed.

supervision of WAPDA.<sup>13</sup>

The contents of training services conducted at the provincial level are shown in Table 9. Most seminars and trainings were conducted in Punjab Province. The largest number of trainings was provided to FOs.

Table 9. Contents of seminars/trainings implemented in provinces

Unit: Person/Days

Activities	Punjab	Sindh	NWFP
National Seminars/Workshops	678	-	924
Off-the-Shelf Courses, and so on	540	709	
FO Trainings	17,389	-	
Short Courses <sup>14</sup>	800	-	
Learning Tours	227	-	924
Subtotal	19,634	709	
Total	21,267		

Source: WAPDA.

### 3.4.2 Project Inputs

#### 3.4.2.1 Project Costs

The project was co-financed by the WB, ADB, and JICA and supported by the Government of Pakistan. The actual project costs as of December 2006 are shown in Table 10 (the right column of the table shows completion rates). Initially, the project was supposed to cost 85 million US dollar (foreign currency: 531 million US dollar, local currency: 254 million US dollar). However, the actual project costs amounted to 310 million US dollar (foreign currency: 203 million US dollar, local currency: 107 million US dollar), which amounted to 39.6% of the planned costs.<sup>15</sup>

Table 10. Project costs covered by the WB, ADB, JICA, & GoP (Planned/Actual)

Unit: million US dollar

	Planned	Actual	Implementation Rate (%)
JICA	106.5	51.3	48.2
WB	284.9	126.6	44.4
ADB	140.0	25.3	18.1
Government of Pakistan	253.6	107.4	42.4
Total	785.0	310.6	39.6

Note: Exchange Rates:

Planned: US\$ 1= Rs.33.69= 101.73 yen (Rs.1= 3.02 yen). Base year: December 1995

Actual: US\$ 1= Rs.60.49= 121.59 yen (Rs.1= 2.01 yen). Base Year: December 2007.

<sup>13</sup> The following is an outline of the contents of training services: Central government level: 818 person/days (foreign seminars: 35 person or 322 person/days; domestic seminars: 62 persons or 496 person/days). Provincial level: 21,267 person/days. Training targets were primarily staff members of PIDA, AWB, and FOs. Seminar equipment: 6.3 million Rs. (A Vehicle, Computers, and so on).

<sup>14</sup> One-to three-week trainings on drainage and irrigation and environmental issues were provided to staff members.

<sup>15</sup> With respect to project costs, the evaluation team solely evaluated Japanese ODA Loan portion, taking into account the progress, implementation situations, and challenges faced by the entire NDP project.

The project was co-financed by the WB, ADB, and JICA. They coordinated policy direction and institutional reforms. However, they divided their geographical targets for the channels in the following ways:

WB: Drainage and irrigation facilities (Sindh Province, Punjab Province)

ADB: Drainage and irrigation facilities (NWFP, Balochistan Province)

Construction of drainage system (RBOD, LBOD)

JICA: Drainage and irrigation facilities (Punjab Province)

Construction of drainage system (RBOD)

With respect to the Japanese ODA Loan portion, Component 3 was cancelled and the costs for Components 1 and 2 were reduced from the costs included in the original plan. Actual costs were 57.6% (6,238 million yen/10,832 million yen) in comparison with planned costs.

Considering the scope changes made in January 2003, actual costs were 64.2% (6,238 million yen/9,720 million yen), based on calculations that excluded Component 3. (Table 11 also shows the extent of project completion as of December 2002, just prior to the scope changes made in January 2003.)

Table11. Comparisons of Planned and Actual Costs

	Planned	Unit: One million yen	
		(Dec. 2002)	Actual (Dec. 2006)
Component 1	5,541	900	5,540
Component 2	1,469	5	248
Component 3	1,112	0	0
Component 4	1,341	246	341
Contingencies	710	0	0
Interest accrued during construction (IDC)	659	13	109
Total	10,832	1,165	6,238

Note: Exchange rates used in this table are the same as the exchange rates used in Table 10 for Planned/Actual costs.

Exchange rate in December 2002: US\$ 1 = 120 yen.

### 3.4.2.2 Project Period

At the time of the appraisal, the project was planned to run from March 1997 to August 2001 (54 months). However, the project actually ran from April 1997 to December 2006 (117 months). This represented a delay of 5 years and 4 months (217% delay).<sup>16</sup> Therefore, the project period exceeded more than twice the length of the project period included in the original plan. Comparisons of original and actual project periods by component are shown in Table 12.

<sup>16</sup> The World Bank's NDP project was terminated in December 2004 as planned, regardless of delays in project progress. Both the ADB and JICA extended the NDP Project completion period until the end of 2006.

Table12. Comparisons of project schedules (Planned and Actual)

Items	Planned	Actual
L/A	March 1997	April 1997
Component 1	April 1997-August 2001	March 2003-November 2006
Component 2	April 1997-August 2001	July 2002-December 2006
Component 3	April 1997-December 2000	Cancelled
Component 4	July 1996-August 2001	UNOPS: January 2001-September 2003 WAPDA: April 2004-December 2006
Project completion	August 2001	December 2006

As shown in Table 12, project progress stagnated from its initiation in 1997 until mid-2002. During the initial stage, irrigation management system reform continued to progress. Substantial executing agencies, such as PID, were not fully involved in the planning process. PIDA had not become effective so soon after the establishment of the organization. Reportedly, those factors hindered effective project implementation.

JICA's responses to the above-mentioned delay factors are summarized in Table 13.

Table 13. Major causes for delays and responses to delays

Major Causes for Delays	Responses to Delay Factors
It took one year for L/A effectuation because of delayed enactment of the PIDA Act, one of the prerequisites for effectuation. Time was required to specify sub-projects and to coordinate plans among many stakeholders in the government of Pakistan.	All sub-projects were contracted by the end of 2004 by refocusing target sub-projects. Rehabilitation and construction works were completed by the end of 2006.
The project includes the structural reform of irrigation management transfer and related organizations. This requires many discussions and the time to coordinate decisions for project direction.	The president initiated the establishment of a special committee in 2002 that promoted institutional reform and reconstitution of the project. A committee that functioned at the federal government and provincial levels periodically monitored the project's progress.
Participatory Irrigation Management was pursued and FOs were newly established. However, time was required to decide methods to be used to transfer management to the FOs and to mobilize, organize, and train the FOs.	JICA conducted its survey on the progress achieved in FO formation and promoted institutional reform in Punjab Province. Later, the establishment of FOs accelerated. It was completed in the pilot area by December 2004.

### 3.4.3 Financial Internal Rate of Return (FIRR) (for reference)

At the time of the appraisal, the Financial Internal Rate of Return (FIRR) had not been calculated. The Economic Internal Rate of Return (EIRR) of Components 1-3 was estimated as 38.0% based on the following assumptions. Component 4 (training) was excluded from the calculation because its benefits were difficult to estimate.

Cost: construction costs, operation and management (O&M) costs

Benefit: increased agricultural production

Project life period: 20 years after completion

In a Project Completion Report (PCR) produced by the Pakistan government, the EIRR for the drainage component in Punjab Province as a whole was estimated as 14.5%, based on figures provided for each NDP sub-project. The WB Implementation Completion Report (ICR) for its NDP project estimated that the EIRR of the WB assisted investment component was 15.0%.

To calculate EIRRs, both completion reports used the estimations of increased agricultural production as project benefits. However, crop production can be affected by many factors other than actual project effects. In addition, exact impact areas can be difficult to identify. Although it can be difficult to make accurate calculations of project benefits, the EIRR for the JICA portion in Punjab Province amounted to 14.5%, based on the same estimations of increased agricultural production used in the PCR produced by the Pakistani government.<sup>17</sup>

Project costs were much lower than planned and the project period was extended more than twice. Therefore, the efficiency of the project is fair.

### **3.5 Sustainability (Rating: ②)**

#### **3.5.1 Structural Aspects of Operations and Maintenance**

The project's official execution agency was WAPDA. It functioned as the coordination body responsible for inter-provincial issues including NDP. Irrigation policies and projects for each province remain under the jurisdiction of each provincial government. O&M of channels located in Punjab Province are jointly managed by PID, PIDA, AWB, and FOs. The substantial execution agencies for Components 1 and 2 are PID/PIDA. They are responsible for implementation, monitoring and evaluation, and O&M in Punjab Province.

WAPDA is a large agency that employs around 10,000 staff members. Its main pillar is a power wing, and its water wing is relatively small.

PIDA was established in 1997, as part of an irrigation management reform conducted by the Punjab Irrigation Department (PID). After PIDA was established, its recurrent costs were covered by the Punjab Provincial Government's project budget. Most staff members were hired on contracts. However, a decision was made that PIDA would become a permanent body supported by the Punjab Government budget since the fiscal year 2013/14.

After 2005, the Area Water Board (AWB) was established to perform O&M of branch canals. Two AWBs were established in the target areas of the JICA project. Farmers' Organizations (FOs) performed O&M of distributaries. Water user associations (Khal Panchayats) performed O&M of minors. Canal systems were managed by a participatory

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<sup>17</sup> This calculation of the IRR was based on data that appeared in the Pakistani government's report. The data was based on rough estimations of future agricultural production. However, our team relied on this data because no other credible data could be found at the time the evaluation was conducted.

framework composed of those organizations. Water User Associations (Khal Panchayats) were introduced by the Punjab Agricultural Department (PAD) as models of participatory management. Their membership overlapped with FOs. As mentioned above, the Punjab government intends to establish PIM based on the FOs. However, PIDA continues to play a significant role, especially with respect to the technical aspects of O&M. Divisions of roles between FOs and PIDA are described below.

Abiana collection and O&M of channels were conducted by PID/PIDA prior to 2004. However, Irrigation Management Transfer (IMT) progressed after 2005. Three stages are included in the process: (1) 2005–2007: Pilot phase in which O&M was transferred to newly established FOs under PIDA's supervision. (2) 2007–2010: Transitional period during which FOs that performed well were encouraged to increase their independent management. PIDA intervened strongly in FOs that performed poorly. (3) After 2010: PIM was officially introduced by FOs by transferring O&M to FOs. PIDA continued to offer support to FOs to strengthen their capacities.

AWB was established to support FOs' PIM in 2005. AWB has functioned since 2007. The chairman of AWB is the representative for FOs. The co-chairs consist of FOs and PIDA. However, AWB has not yet become fully effective because many staff members their expected transfer from PIDA has not yet occurred.

After 2009, JICA provided capacity building seminars to PID/PIDA staff members and assisted in the development of training materials employed by PIDA for FOs, as part of its technical cooperation project, "Strengthening Irrigation Management System Including Agriculture Extension Through Farmers' Participation in Punjab Province."

### 3.5.2 Technical Aspects of Operation and Maintenance

PID has been engaged in the O&M of water channels for many years. It employs technical staff members that possess sufficient experience. PIDA was established in 1997. Plans were made for O&M staff members to be transferred from PID, and staff transfers have been conducted since 2002. PIDA then began its management of water channels. Technical aspects of the O&M of channels continue to be managed by PIDA's technical staff, and their expertise remains as strong as it was prior to the transfer.

PID/PIDA continues to manage main and branch canals. The new PIM system, which is jointly managed by FOs and AWB, was introduced to address the O&M of distributaries and minors.

However, some challenges developed in relation to those institutional reforms.

One major challenge is the shortage of technical capacity that FOs are required to perform O&M of water channels. FOs have very limited capacity and human resources to perform technical O&M. Ultimately, they continue to depend on PIDA and AWB technical staff

members.

PIDA plans to place four or five civil engineering engineers/ technicians in the area covered by AWB. FOs are performing O&M using workers provided in cooperation with PIDA. However, the transfer of staff members from PIDA to AWB has stagnated. Yet, FOs and AWB depend on PIDA technical staff members to perform O&M.<sup>18</sup> PIDA provides seminars for FOs that primarily focus on daily maintenance work (cutting/trimming berms, desilting channels, and so on).

Remaining challenges include ways to utilize PIDA and AWB's technical staff in the FOs' PIM and ways to divide O&M costs among PIDA, AWBs and FOs.

### 3.5.3 Financial Aspects of Operation and Maintenance

Prior to 2005, PID collected abiana and conducted the O&M of channels. The FOs began collecting abiana after 2005. (Abiana rates are assessed based on the number of acres and the types of crops cultivated regardless of water supply volume used.) In cases of abiana collection shortages, the Punjab provincial government supplements those deficits. However, actual spending for O&M has been significantly lower than spending for required O&M costs (e.g., around 15% in 1992).<sup>19</sup> The following factors are suggested as possible causes of O&M budget shortages: (1) Very low abiana rates were set for political reasons. (2) A significant part of the O&M budget was used to cover PID personnel costs. (3) Abiana collected by PID was sent to the provincial treasury by revenue offices. They were not used directly for O&M.

As mentioned above, FOs' establishment of PIM can be divided into three stages: (1) the "pilot stage" (2005–2007), (2) the "transitional stage" (2008–2010), and (3) the "full-scale stage" (after 2010). After 2005, collected abiana was apportioned. A 40% share was given to FOs and a 60% share was given to PIDA. PIM was promoted in a collaborative manner among the FOs and PIDA. After 2008, FOs that performed well were given 50% shares of collected abianas.

As shown in Table 2, abiana collection rates have hovered around 70% since 2005. This is an improvement from 35%-45% levels achieved prior to 2004 when PID collected abiana. After 2010, during the full-scale stage that included the introduction of PIM, abiana collection rates increased. However, these rates have decreased again in recent years. This fact demonstrates that PIM continues to face some challenges.

During interviews conducted with a number of FOs, some FOs stated that the abiana collected was sufficient to cover the required costs of O&M for watercourses. However, other FOs stated that collected abianas were too low to cover the costs of O&M. Most FOs noted that the problem resides in the low abiana rates because O&M costs must be covered by

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<sup>18</sup> As of June 2013, only 34 staff members have come from PIDA. This number differed from the official number of 137 staff members employed by AWB (LCC-East).

<sup>19</sup> Based on an interview conducted with PID (June 2013).

collected abiana. Abiana rates are purposely kept at very low levels by the Punjab provincial government because of political considerations. PID has requested that the Punjab government raise abiana rates. In May 2013, PID proposed a plan that would raise abiana rates from 135 Rs. per acre to 245 Rs. per acre. However, these rates would only cover 15%-20% of required O&M costs. Additional increases in rates will be required to ensure future financial sustainability.

Based on a “Performance Monitoring & Evaluation of FOs” survey conducted in 2008: (1) the number of FOs that increased their incomes from abiana, rather than their expenditures, decreased from 68 to 45. The number of FOs that showed deficits increased from 16 to 39. (2) In general, personnel costs were higher than O&M costs. According to the detailed questionnaire used in the survey, budget surpluses were realized by controlling expenditures. Deficits were caused by FOs’ high personnel costs.

Table 14. O&M expenses and works performed by FOs

Major O&M Works performed by FOs	Expenses (Rs. in millions)				Number of FOs
	2005-06	2006-07	2007-08	3-Year Total	
Desilting Channels	3.46	3.57	3.95	10.98	56
Strengthening Banks	1.25	2.17	1.30	4.73	57
Cutting/Trimming Berms	4.58	6.97	3.02	14.57	47
Repairing Outlets	0.78	1.61	1.49	3.88	61
Road/Path Inspections	0.23	0.10	0.37	0.70	13
Repairing Breaches/Cuts	2.41	3.20	2.32	7.94	60
Bush Removal	0.25	0.27	0.72	1.25	23
Other O&M Works	0.63	0.92	0.33	1.97	n/a
Total O&M Expenses for Works Performed	13.60	18.90	13.51	46.01	84 in Total

Source: PIDA, *Performance Monitoring & Evaluation of Farmers Organizations*, October 2008.

Note: “Number of FOs” means the number of FOs that conducted major O&M Works listed in the left column within three years (the total number of active FOs is 84).

Table 14 shows O&M expenses for FOs and for O&M works implemented by FOs. Major O&M works conducted by FOs are daily tasks, such as “desilting channels” and “cutting/trimming berms.” Expenses for repair work, such as “strengthening banks,” “repairing outlets,” and “repairing breaches/cuts” were not very high. The right column lists the number of FOs that conducted O&M works listed in the left column. The table demonstrates that some FOs did not implement any daily maintenance and repair efforts.

In conclusion, many FOs were able to maintain a financial balance among income provided by collected abiana, expenditures for O&M, and personnel costs. However, in general, the FOs’ financial status must improve. One major challenge is the fact that the number of FOs that enjoyed budgetary surpluses decreased and the number of FOs that suffered deficits increased. This might lead to the deterioration of drainage and irrigation facilities because required repair works might not be performed in the mid-term future. Most AWB staff

members and FO committee members proposed that one improvement measure would be to raise abiana rates to sustainable levels.

#### 3.5.4 Current Status of Operation and Maintenance

PID and PIDA continue to manage main and branch canals. Many facilities are more than 100 years old; they were constructed during the colonial era. Yet, those facilities are maintained in proper condition because O&M work is being performed

On the other hand, FOs began to manage distributaries and minors based on the PIM system. Irrigation Management Transfer (IMT) also continues to progress. However, it has been reported that many FOs continue to depend on O&M works conducted by PID/PIDA. Even FOs that perform well are unable to conduct required water channel repairs. In fact, some distributaries and minors were not improved in the Part A area. Those channels must be rehabilitated in the future by the use of governmental investments. In addition, some channels have deteriorated during the 7-8 years that passed after rehabilitation was performed between 2004 and 2006. Some breaches and cuts were caused by insufficient repair work. Some challenges continue to affect the PIM system's technical and financial sustainability, as mentioned above. In addition, it is expected that required costs for repairs and maintenance of water channels will increase over the long term.



Chart 3. Branch rehabilitation



Chart 4. New construction of cross drainage



Chart 5. Lining of distributary



Chart 6. Lining of minor



Chart 7. Channel tail



Chart 8. Unrepaired distributary



Chart 9. An example of a leaking minor

In light of the above, some problems have been observed in terms of technical and financial aspects of operation and maintenance. Therefore, sustainability of the project is fair.

#### **4. Conclusions, Lessons Learned, and Recommendations**

##### **4.1 Conclusions**

Drainage and irrigation facilities are basic infrastructure required for agriculture in Pakistan. The improvement of those facilities is relevant to development policy and development needs in Pakistan, as well as to Japan's ODA policy. Thus, its relevance is high.

After 2004, the rehabilitation and remodeling of drainage and irrigation facilities has progressed steadily. The number of cultivated areas and the production of major crops, such as wheat, rice, and sugarcane, have increased in target areas. Participatory Irrigation Management (PIM) also began to progress after 2005. Farmers' satisfaction rates are relatively high with respect to dispute resolutions, responses to water thefts, O&M of channels, and abiana collection, although the performance of these functions varies among FOs, particularly with respect to abiana collection rates. Thus, this project has largely achieved its objectives. Therefore, the project's effectiveness and impacts are considered to be high.

Project implementation was delayed. It was not completed until 2002, the original completion period. However, implementation increased rapidly after 2004. The project costs were much lower than planned. However, the project period was extended more than twice. Therefore, the efficiency of the project is fair.

On the other hand, the O&M of water channels rehabilitated and constructed by this project was transferred from PID/PIDA to AWB/FOs based on the concept of PIM. However, reforms must continue. Some challenges continue to affect the technical and financial aspects of O&M, although some positive factors have developed, such as JICA's technical cooperation project's efforts to enhance capacity of FOs. Thus, sustainability of the project is fair.

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

## **4.2 Recommendations**

### **4.2.1. Recommendations to the Executing Agencies (PID/PIDA)<sup>20</sup>**

- i. The O&M mechanism for drainage and irrigation facilities is the key to the project's sustainability. The establishment of FOs and the introduction of Participatory Irrigation Management (PIM) are extremely important. However, the transfer of authority and personnel from PIDA to AWB has not progressed as planned. PIDA and PID with higher authority should take concrete actions to fill AWB's staff vacancies as planned.
- ii. Many stakeholders noted that the abiana rates per acre are too low to maintain financial sustainability of O&M of channels. Abiana rates should be raised to realistic levels to support sustainable irrigation management. In addition, the provision of additional legal support to strengthen FOs' authority is required to ensure abiana collection from defaulters and to provide effective control of water thefts. The Punjab provincial government is responsible for legislation. It should take action to revise relevant laws and regulations.

### **4.2.2 Recommendations to JICA**

Although institutional reforms for PIM began moving in the right direction, the reforms continue to face a number of challenges, such as low abiana collection rates, FOs' limited capacity, the influence of large land owners and political factions on FOs, and so on. JICA should continue to provide assistance with institutional reforms and FOs' capacity enhancement. For example, JICA could offer examples of good practices performed in other countries, suggest ways to address those challenges, and develop methods other than abiana collection that might be used by FOs to obtain additional income.

## **4.3 Lessons Learned**

One prerequisite for a project based on the "program approach," such as NDP, is that the counterpart agency must have sufficient capacity to perform planning, implementation, and monitoring. Use of the program approach concept for the NDP project was unsuccessful because organizations in the drainage and irrigation sector operated under a drastic reform process during the project's initial stage. Substantial executing agencies, such as PID/PIDA, were not involved in the planning process. In addition, many political factors constrained institutional reforms. Therefore, when the program approach is adopted, the voices of relevant

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<sup>20</sup> Because PID/PIDA are substantial counterparts of the project, rather than directing recommendations to WAPDA, recommendations to the executing agencies are directed to PID/PIDA, after consultations with them.

stakeholders (including beneficiaries in target areas) should be included in the program formation process. Clear strategies and sub-components' priorities, as well as concrete implementation schedules, should be formulated to ensure the effective implementation of the program

### Comparisons of the Project's Original and Actual Scope

Items	Planned	Actual
1. Project Outputs		
Component 1: Off-farm drainage & irrigation facilities in Punjab	<ul style="list-style-type: none"> <li>— Off-farm surface drains: 4,139 km (remodeling: 3,550 km; new construction: 589 km)</li> <li>— Rehabilitation/replacement of tubewells: 530 units</li> <li>— Construction of major cross drainage</li> </ul>	<ul style="list-style-type: none"> <li>— Off-farm surface drains: Rehabilitation/remodeling: 2,929 km; New construction: 77 km</li> <li>— Rehabilitation/replacement of tubewells, construction of major cross drainage: cancelled</li> <li>— Lining of Distributaries/Minors: 411 km; rehabilitation and remodeling: 343 km; (Distributaries/Minors): 113 km; (Main/Branch Canal): 108 new structures constructed as part of canal system</li> </ul>
Component 2: On-farm drainage & irrigation facilities in Punjab	<ul style="list-style-type: none"> <li>— Surface drains: 30,000 acres</li> <li>— Tile drains: 3,000 acres</li> <li>— Watercourse lining in saline ground water areas: 750</li> </ul>	<ul style="list-style-type: none"> <li>— Surface drains: 1</li> <li>— Tile drains: cancelled</li> <li>— Watercourse lining: 499</li> </ul>
Component 3: Right Bank Outfall Drain (RBOD) priority works	Remodeling of necessary structures: 110 km	Cancelled
Component 4: Training services	— Training, seminars, study tours for WAPDA, Provincial Irrigation & Drainage Authority, Area Water Boards, FOs, PAD.	— UNOPS received the training contract but training was not implemented. Ultimately, it was cancelled. Later, WAPDA implemented training services.
2. Project Period	March 1997 – August 2001 (54 months)	April 1997 – December 2006 (117 months)
3. Project Costs		
WB/ADB/JICA	582 million dollar	203 million dollar
Pakistan Gov. *	209 million dollar	107 million dollar
Total	791 million dollar	310 million dollar
JICA loan portion	10,832 million yen (106.5 million dollar)	6,238 million yen (51.3 million dollar)
Exchange Rate	US\$ 1 = Rs. 33.69 = 101.73 yen (Rs. 1 = 3.02 yen) (as of December 1995)	US\$ 1 = Rs. 60.49 = 121.59 yen (Rs. 1 = 2.01 yen) (as of December 2007)

\* Note: The project was co-financed by the WB, ADB, JICA, in assisting the Government of Pakistan. The GoP project cost constituted one part of the total project costs.