Philippines

Small Water Impounding Management Project

Report Date: March 2001
Field Survey: November 2000

1. Project Profile and Japan's ODA Loan

Site Map: The whole of the Philippines

Sub-project Site in the Northern Manila

(1) Background

Due to the harsh climate and topography of the Philippines, the country suffers frequent natural calamities, including droughts and floods, which cause enormous losses in the agricultural sector. The development of large-scale irrigation had been emphasized, and the development of small-scale irrigation areas was lagging behind. At that time there was growing concern over disparities in agricultural productivity, the income gap between rural and urban areas, and the excessive concentration of people in urban areas, which was harming public order. This was the background to the beginning of the Small Water Impounding Management (SWIM) Plan, which was based on the Presidential Administrative Decree No.408 in May 1976. The Plan, which covered the whole territory of the Philippines, aimed to reduce flood damage and make effective use of water resources in applications such as irrigation and power generation in order to reduce rural poverty and the economic and social gaps between rural and urban areas.

(2) Objectives

The project aimed to build small-scale reservoirs in all parts of the country for multi-purposed utilization of water resources such as flood control, irrigation, household water supplies, power generation and the prevention of soil erosion, to make diverse and thereby improve the infrastructure for life and production in rural areas.

(3) Project Scope

The plan as a whole called for the construction of small-scale multi-purpose reservoirs at 187 locations between 1982 and 1992, benefiting a total area of 13,000ha. Further construction of facilities for irrigation, power generation and other uses were to be added as required at each site. At the time of the appraisal, the portions of the plan scheduled for implementation in 1988 and beyond were to be covered by Japan's ODA

loan[1]. The project was divided into three portions:

A Civil works (construction of access roads, dam base works, dam wall works, sluice gate installation, drainage outlet installation, construction and installation of irrigation facilities).

B Procurement and installation etc. of generation equipment[2] (generators, transformers, electricity transmission cables, turbines).

C Consulting services (detailed design and construction supervision).

(4) Borrower/Executing Agency

Republic of the Philippines / Department of Public Works and Highways (DPWH)

(5) Outline of Loan Agreement

Loan Amount/Loan Disbursed Amount	¥3,193 million / ¥2,743 million
Exchange of Notes/Loan Agreement	December 1987 / January 1988
Terms and Conditions	Interest rate: 3.0%, Repayment period: 30 years (10 years for grace period), General Untied (consulting services are partial untied.)
Final Disbursement Date	December 1998

2. Results and Evaluation

(1) Relevance

At the time of the appraisal, the targets stated by the Philippine government in its medium-term development plan (1987 – 1992) were the reduction of poverty, the creation of jobs that would raise productivity, the realization of fairness and social justice, and the attainment of sustained economic growth. Through the reduction of flood damage and the efficient direction of water resources to applications such as irrigation, this project was intended to relieve rural poverty and remedy the economic and social disparities between urban and rural areas. Thus this project was relevant as plan at the time of the appraisal.

The current medium-term development plan for the Philippines (1999 – 2004) is concerned with the problems of poverty, particularly in rural areas, and the growing disparities in income, and it addresses the low level of productivity in the agricultural sector, which is the source of income for most of the poor. The plan looks beyond flood damage reduction as the effect of the small reservoirs, citing the use of irrigation for increased rice production and crop diversity, and other water supply functions, as concrete policy tasks. It also mentions the contribution made by Irrigators Associations (IAs) in the maintenance of irrigation facilities. This project remains relevant within the framework of current development planning in the Philippines.

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1 At the time of the appraisal in June 1987, there were 187 sub-projects within the project that began in 1982, of which 30 had been completed, 28 were under construction, 48 were in, or had completed, the detailed design process, and 81 locations had not been started.

2 The plan was to procure and install generation equipment (generators, transformers, transmission cables and turbines) at two sub-project sites (Macagtas SWIP and Caramoan SWIP), but they were excluded from the project at the execution stage. The reason was that at the times of the feasibility study and the detailed design, the surrounding areas had not been electrified, but they were electrified before the execution of the project.

(2) Efficiency

Construction under this project was expected to be completed in 60 months, between January 1989 and December 1994. However, construction started in May 1993, four years and five months behind schedule, and was completed in September 2000, after 89 months. The factors behind the delays included the following:

(a) Deteriorating contractor performance[3].
(b) The issuance of change orders due to design changes and contractor demands[4].
(c) Land acquisition difficulties[5].
(d) Inclement weather.

Project cost was 84% of the initially planned amount (86% for the ODA loan portion). This cost underrun was apparently due to the devaluation of the Peso.

The irrigation facilities and other facilities were built by the DPWH's SWIM Project Management Office (PMO), with limited contributions from and coordination with the National Irrigation Administration (NIA), the Department of Agriculture (DA), the Bureau of Soil and Water Management (BSWM) and local government units (LGUs) (see Figure 1: Project Implementation Scheme). This scheme meant that full use was not made of the extensive experience of the NIA and BSWM in the implementation of irrigation projects and the organization and training of IAs. In short, the project scope was almost entirely limited to the hardware side, which was the water management and irrigation reservoirs and their related facilities. The Philippines side had been expected for the soft elements of the project, in raising agricultural production and productivity, but the execution of these elements was not always adequate. According to the executing agency, there was some participation and contribution from beneficiary farmers in the selection of candidate projects and in the feasibility study and detailed design stages, but the involvement of farmers was not necessarily deep enough. This was one of reasons of difficulties in land acquisition and the collection of water usage charges since project completion has not been proceeding well.

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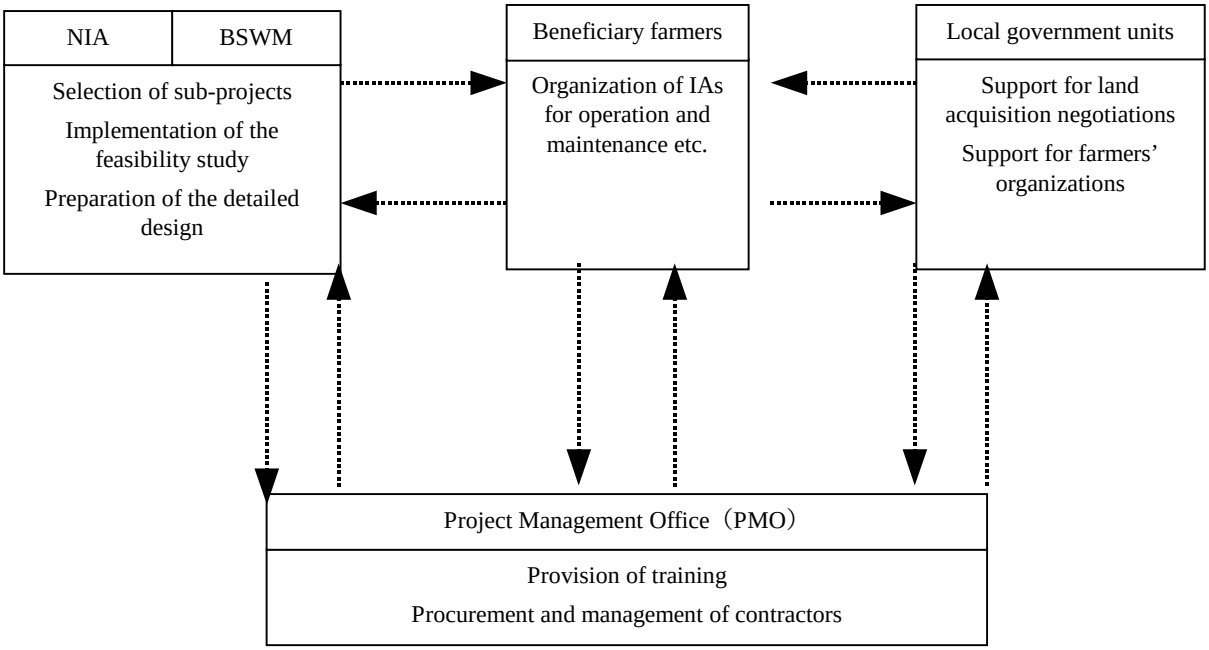
3 The DPWH voided its contracts with six contractors for poor performance. Some cases were reported in which contractors were fired because they were unable to take prompt action to make up for delays despite orders from the DPWH to do so. In other cases, contractors went bankrupt.

4 The change orders had to be issued because adequate topographic surveys were not carried out at the feasibility study and detailed design stages. This indicates that the DPWH was unable to exercise adequate control over the project, because the project was executed 5~10 years after the plans were drawn up, and because the surveyors were employed as sub-contractors of the consultants.

5 Opposition from landowners and sharecroppers affected by the implementation of the project made it impossible for the contractors to work, thus the DPWH, local government authorities and other agencies pursued a series of negotiations with landowners and sharecroppers.

Figure 1: Project Implementation scheme



(3) Effectiveness

1) Effects of irrigation

The project built irrigation facilities for a planned area of over 2,000ha, which are particularly effective in allowing cultivation in the dry season. Table 1 shows the farm land usage rates for 15 sub-projects (Small Water Impounding Projects: SWIP) which were visited in the field survey. The implementation of the project raised the usage rate from 74.2% to 128.3%.

Considering the fact that the project involved the construction of reservoirs as small water impounding projects, and considering the availability of irrigation water, it should be possible to raise the average usage rate to 180%, although there are some differences between the sub-projects (see Table 1). Thus, while the farmland usage rates now are higher than they would have been without the project, the project has yet to yield its full potential, and it is still in the development stage.

Table 1: Farmland Usage Rates for Each Sub-project

SWIP sub-project	After the project (at the time of evaluation)		Before the project	Project beneficiary land area (d)	Farmland usage rates		Area irrigable in dry season (e)	Farmland usage rate when the dry season irrigable land area is planted (d+e)/(d)
	Rainy season	Dry season	Rainy season		At the time of evaluation (a+b)/(d)	Before project (c)/(d)		
	Irrigated fields (a) (ha)	Irrigated fields (b) (ha)	Naturally watered fields (c) (ha)	(ha)	(%)	(%)	(ha)	(%)
1 Sto. Domingo SWIP	25	5	25	32	93.8	78.1	32	200%
2 Maniniog SWIP	80	30	80	80	137.5	100.0	26	133%
3 Masalipit SWIP	80	25	80	80	131.3	100.0	64	180%
4 Bulhao SWIP	33	5	33	33	115.2	100.0	33	200%
5 Gabawan SWIP	39	20	39	39	151.3	100.0	39	200%
6 Macagtas SWIP	270	90	270	270	133.3	100.0	270	200%
7 Inamburakay SWIP	38	20	38	38	152.6	100.0	38	200%
8 Malapong SWIP	60	35	60	60	158.3	100.0	34	157%
9 Balibayon SWIP	67	35	67	67	152.2	100.0	49	173%
10 Florida SWIP	115	70	67	115	160.9	58.3	71	162%
11 Sta. Fe SWIP	39	6	39	39	115.4	100.0	39	200%
12 Nangka SWIP	39	15	39	39	138.5	100.0	19	149%
13 Tugas SWIP	203	150	50	350	100.9	14.3	184	153%
14 Sto. Nino SWIP	70	35	68	70	150.0	97.1	57	181%
15 Campin SWIP	71	4	71	71	105.6	100.0	62	187%
16 San Nicolas SWIP Note 2				54			54	200%
17 Cramoan SWIP Note 2				203			203	200%
18 Polangi SWIP Note 2				31			31	200%
19 Woodland SWIP Note 3				92			59	164%
20 Traciano SWIP Note 3				40			29	173%
21 Lamare 1 SWIP Note 3				21			17	181%
22 Kitao-tao SWIP Note 3				80			44	155%
23 Potot SWIP Note 3				426			426	200%
24 Lagunlong SWIP Note 3				39			31	179%
25 Panlagangan SWIP Note 3				38			14	137%
Total for 15 SWIPs (1-15)	1,229	545	1,026	1,383	128.3	74.2	1,017	174%
Total for 25 SWIPs				2,407			1,925	180%

Source: Field survey results

Notes:

1) These are the results from field surveys of 18 SWIP sub-projects.
2) Not yet in operation.
3) Sub-projects which were not included in the field survey.
4) Farmland usage rate = Actually farmed area/project beneficiary area.

Most sub-projects had been in operation for less than three years, and the irrigation facilities for some of them were still at the development and functional improvement stage, meaning that the planned economic benefits had not yet been fully realized at the time of the field survey. The economic internal rate of return (EIRR) for the site surveyed 15 sub-projects is negative, based on the harvest quantities and unit prices at the time of the survey. However, if one assumes that farmland usage rates reach the planned levels in future and the development effects are fully manifested, the EIRR would reach approximately 10%.

The EIRR only calculates the benefits of irrigation, but the project has been confirmed to yield effects such as flood control, which will be described later in this report. Once such benefits are included in the

calculation, a higher real value of EIRR can be anticipated.

2) Other project effects

Besides irrigation, this project aimed to use water resources for many purposes, including flood control, household water supplies, power generation and soil erosion prevention.

For flood control, an interview survey of beneficiary farmers for each sub-project revealed the results shown in Table 2. Of the 18 evaluated sub-projects, 14 had yielded some degree of flood prevention benefit, and the area benefiting from flood prevention was 15~20ha in seven locations.

The water regulation function of the reservoirs yielded some benefit for soil erosion control in the same way as for flood prevention.

It was unable to obtain any data on household water supply for this evaluation. However, it is only a bi-effect among the overall benefits of the project, and in 25 of the sub-projects no specialized water supply facilities have been built. The use of water for household supplies appears to be far less important than its use for irrigation. Therefore, while there appears to have been some benefit to beneficiary residents, we have not made any quantitative measurement of that benefit.

As the construction of other electrical supply facilities has progressed much further than was anticipated at the time of the project plan, no generation facilities were installed under this project.

There was no data available on the benefits generated by the project through these effects, thus we have not recalculated EIRR.

Table 2: Realization of Flood Control Effects

SWIP sub-project	Effect in reducing the value of flood damage	Beneficiary area (ha)
Sto.Domingo SWIP	Almost 100%	15
Masalipit SWIP	Almost 100%	20
Maniniog SWIP	Almost 100%	20
Bulhao SWIP	Almost 100%	20
Gabawan SWIP	25～ 0%	0
Macagtas SWIP	25～ 0%	0
Inamburakay SWIP	Almost 100%	20
Tugas SWIP	50～25%	15
Sto.Nino SWIP	25～ 0%	0
Nangka SWIP	50～25%	2
Caramoan SWIP	50～25%	n.a.
Balibayon SWIP	Almost 100%	n.a.
Campin SWIP	100～50%	n.a.
Florida SWIP	Almost 100%	n.a.
Malapong SWIP	Almost 100%	n.a.
Polangui SWIP	50～25%	n.a.
San Nicolas	100～50%	n.a.
Sta.Fe	25～ 0%	0

(4) Impact

The main effect of this project has been its contribution to increased food production. It is calculated to have increased the annual rice harvest by 8,140 tons (unhulled weight) by the present[6]. Beneficiary farmers have indicated that there have also been effects on employment. As most of the sub-projects are located in low income areas, the implementation of the irrigation projects and the planting which accompanied some sub-projects was in itself significant in expanding agricultural and social support services. As a result the project can be credited with a positive impact on the forms and techniques of farming and the level and quality of people's lives.

Table 3 calculates average benefit from sub-projects per hectare for cases in which the project was or was not implemented. Compared to the case in which the project was not implemented, the implemented case allowed a dry season crop and approximately quadrupled annual unit crop yield. As a result the project is calculated to have raised average farming household incomes (for approximately 2,000 beneficiary farmers) on about 12,500ha of land. The increased income earned by farmers was used for home repairs, means of transport (jeepneys, motor tricycles etc.), and investment in agricultural equipment etc., which should have ripple effects in improving living standards and productivity. As mentioned above, the project was not yielding its full effects by the time of the field survey, but if the facilities are operated properly, it is estimated that the added value will ultimately rise to approximately 36,000 Pesos/ha.

Table 3: Average Yield from SWIP Sub-project Areas (yield per unit area)

Yield type	Rainy season		Dry season		Increase
	With Project	Without Project	With Project	Without Project	
Farm land （ha）	1.00	1.00	1.00	-	
Cultivated area（ha）	1.00	1.00	0.44	-	
Irrigated area	1.00	-	0.44	-	
Naturally watered area	-	1.00	-	-	
Unit yield (tons/ha) (unhulled)					
Irrigated area	4.00	-	3.70	-	
Naturally watered area	-	2.20	-	-	
Unit price (Pesos/tone)					
Rice price (unhulled)	8,000	8,000	8,000	-	
Yield revenue (Pesos)					
Irrigated area	32,000	-	13,024	-	
Naturally watered area	-	17,600	-	-	
Total revenue (P)	32,000	17,600	13,024	-	
Production costs (Pesos) Note 1)					
Irrigated area	19,980	-	8,152	-	
Naturally watered area	-	13,158	-	-	
Total production costs (Pesos)	19,980	13,158	8,152	-	
Profit (Pesos)	12,020	4,443	4,872	-	
Increased profit (Pesos)	7,578		4,872		12,450

Source: Field survey results.

Note: 1) The cost includes the costs of labor within the family.

[6] The rice yield (tons) based on the 15 sub-projects, as found in this survey, was 13,361 tons for the "with project" case (9,496 in the rainy season and 3,865 in the dry season). In the "without project" case it was 5,223 tons (rainy season crop only).

There were no noteworthy negative environment impacts. According to interviews with beneficiary farmers, the implementation of this project for irrigation and flood control gave them an awareness of the importance of water resource management. That will lead in future to farmers securing adequate water supply in the dry season, and supplying irrigation water more widely in the target irrigation areas.

(5) Sustainability

The operation and maintenance of the facilities built under this project was intended to be transferred to the farmers' organizations which benefit from them[7]. However, by January 2001 only eight of the 25 sub-projects had been transferred out of the management of the DPWH, which is the executing agency. (Seven sub-projects were transferred to IAs and one to the NIA[8].) The reason is that, considering the current status of the irrigation facilities built under this project, the beneficiary farmers are not interested in taking on the responsibility for their operation and maintenance. In particular, the irrigation channels require repairs and improvements due to erosion, construction defects and inadequate management after completion. Furthermore, the low collection rate for irrigation service fees (ISF) and the inadequate supply of irrigation water in the dry season mean that in some sub-projects it is not possible to irrigate the full planned area. Problems[9] such as unfair distribution of irrigation water, inadequate irrigation management, and land acquisition have still not been solved.

Table 4 Comparison of Farmland Usage Rates, Average Unit Yield and Collection Rates of ISF

Sub-Project	Irrigated area		Farmland usage rate	Average unit yield	ISF collection rate
	Rainy season	Dry season			
	(ha)	(ha)	(%)	(ton/ha)	(%)
1. Sto. Domingo SWIP	25.0	5.0	93.8	2.50	-
2. Maniniog SWIP	80.0	30.0	137.5	3.00	100
3. Masalipit SWIP	80.0	25.0	131.3	4.00	100
4. Bulhao SWIP	33.0	5.0	115.2	3.25	-
5. Gabawan SWIP	39.0	20.0	151.3	3.30	70
6. Macagtas SWIP	270.0	90.0	133.3	3.75	17
7. Inamburakay SWIP	38.0	20.0	152.6	3.50	65
8. Malapong SWIP	60.0	35.0	158.3	5.00	100
9. Balibayon SWIP	67.0	35.0	152.2	3.20	30-40
10. Florida SWIP	115.0	70.0	160.9	5.50	90-95
11. Sta. Fe SWIP	39.0	6.0	115.4	3.70	-
12. Nangka SWIP	39.0	15.0	138.5	4.50	15
13. Tugas SWIP	203.0	150.0	100.9	4.50	100
14. Sto. Nino SWIP	68.0	35.0	150.0	2.00	25
15. Campin SWIP	71.0	4.0	105.6	3.70	-
Average	81.8	36.3	128.3	3.45	

Source: Field survey results.

Notes: 1) Based on survey results for the 15 SWIP sub-projects evaluated.
2) Shaded sub-projects have been formally transferred to IAs.

[7] At the time of the appraisal, it was thought that transferring sub-project operation and maintenance to farmers' organizations would be practically difficult, but it could be transferred to Barangay Council (Barangays are equivalent to hamlets) and managed on the Barangay level.

[8] In 1999 the DPWH SWIM-PMO allocated a budget of 20 million Pesos for sub-project maintenance, but the budget was zero for 2000.

[9] The IAs were unable to propose comprehensive civil engineering designs for sub-projects, including resident relocation, thus no agreement has been reached with residents.

Table 4 shows farmland usage rates, average unit yields and ISF collection rates for each of the 15 evaluated sub-projects. Of the 15 sub-projects covered by the field survey, five had been formally transferred to farmers. Compared to those which had not been transferred, the performance of the transferred sub-projects was generally good, as seen in the indicators[10]. It is possible that those projects were transferred to the farmers because they were running well. One problem regarding transfers to IAs is that the beneficiary farmers had little involvement in the planning and design stages, and therefore they had little sense of ownership of the facilities. If they had made a positive contribution from the planning stage onwards, it would have been possible to build facilities based on the accumulated experience of the farmers of each region.

A manual has been prepared for the operation and maintenance of the sub-project facilities, but as there was no continued training of the IAs in the use of the manual, its use is limited, partly because there is not enough sharing of information from the manual within each IA. In 1998, representatives of 25 farmers' organizations received two days of training at Ateneo University in Manila for the operation and maintenance of the facilities, and project effects are expected to be manifested gradually, with feedback to the IA members. The BSWM employed a consultant between July and November 1998 to provide training in the field on matters such as the operation and maintenance of related facilities and the planning and management of farmland and water use. At this stage, the sub-projects have been completed in 23 of 25 locations, and if training had been carried out at an earlier stage, it would have been more effective in encouraging farmers to voluntarily take on the operation of the project.

3. Lessons Learned

In regionally dispersed irrigation and flood control projects, the key to the success of the project is often the participation of beneficiary farmers in planning decisions from the formation and design stages, and the nurturing of the farmers' sense of ownership. A process for reflecting the experience-based ideas of local farmers to the design of each sub-project should have been built in from an early stage of the project cycle.

[10] The IAs which handle the operation and maintenance of these sub-projects allocate 50% or more of the collected ISF to maintenance, and maintenance work on the facilities is carried out as a communal work project (Bayanihan).

Comparison of Original and Actual Scope

Item	Plan	Actual
①Project Scope		
1. Civil Works		
(1) Water dam	25 dams	25 dams
(2) Irrigation	2,510ha	2,374 ha
(3) Irrigation structure	1 Set	1 Set (some changes in the quantity)
(4) Maintenance	25 points	25 points
2.Procurement and installation of power generating equipment	1 Set	Not implemented
3. Consulting Service	Foreign 225 M/M Local 54 M/M Support 27 M/M Additional construction work and supervision costs were accounted separately.	①Engineering/Consultant (Overall supervising work) Foreign 167.9 M/M Local 231.8 M/M Support 686.6 M/M
4. Training for IAs	50 persons	②Intermittent consultant (Local) for each sub-project (a) Revision of F/S-D/E 275.8M/M (b) Construction supervision Senior engineer 875.4 M/M
②Implementation Schedule		
1. L/A concluded	Jan. 1988	Jan. 1988
2. Procurement of consultant	Jan. 1988 ~ Jan. 1989	May 1989 ~ Sep. 1990
3. Consulting Service		
3-1 Review of M/P, D/D	Jan. 1989 ~ Dec. 1993	Sep. 1990 ~ Jun. 1992
3-2 Engineering service for dam construction	Jan. 1989 ~ Dec. 1993	Mar. 1993 ~ Nov. 1998
3-3 Post-evaluation	Jan. 1989 ~ Dec. 1994	Feb. 1998 ~ Nov. 1998
4.Construction work	Jan. 1989 ~ Dec. 1994	May 1993 ~ Sep. 2000
③Project Cost		
Foreign currency	¥2,235 million	¥1,965 million
Local currency	283 million peso	¥1,588 million
Total	¥4,218 million	¥3,552 million
ODA Loan portion	¥3,193 million	¥2,745 million
Exchange rate	1 peso ＝ ¥7 (1987)	N.A.