

PD-ABL-804  
2082

A.I.D. EVALUATION SUMMARY - PART I

1. BEFORE FILLING OUT THIS FORM, READ THE ATTACHED INSTRUCTIONS.
2. USE LETTER QUALITY TYPE, NOT "DOT MATRIX" TYPE.

IDENTIFICATION DATA

<b>A. Reporting A.I.D. Unit:</b> Mission or AID/W Office <u>AEE/USAID/JAKARTA</u> (ES# _____)	<b>B. Was Evaluation Scheduled in Current FY Annual Evaluation Plan?</b> Yes <input type="checkbox"/> Slipped <input checked="" type="checkbox"/> Ad Hoc <input type="checkbox"/> Evaluation Plan Submission Date: FY <u>94</u> Q <u>1st</u>	<b>C. Evaluation Timing</b> Interim <input type="checkbox"/> Final <input checked="" type="checkbox"/> Ad Hoc <input type="checkbox"/> Other <input type="checkbox"/>
---	--	---

**D. Activity or Activities Evaluated** (List the following information for project(s) or program(s) evaluated: if not applicable, list title and date of the evaluation report.)

Project No.	Project/Program Title	First PROAG or Equivalent (FY)	Most Recent PACD (MO/Yr)	Planned LOP Cost (000)	Amount Obligated to Date (000)
497-0347	Small Scale Irrigation Management Project (SSIMP)	85	3/95	\$50,000	\$31,247

ACTIONS

E. Action Decisions Approved By Mission or AID/W Office Director	Name of Officer Responsible for Action	Date Action to be Completed
<b>Action(s) Required</b>  1. De-obligate unused funds (loan & grant) in the amount of \$2,064,657.21.	Widjaja/Yates	Jan. 96

APPROVALS

**F. Date Of Mission Or AID/W Office Review of Evaluation:** \_\_\_\_\_ (Month)  
 \_\_\_\_\_ (Day) \_\_\_\_\_ (Year)

**G. Approvals of Evaluation Summary And Action Decisions:**

	Project/Program Officer	Representative of Borrower/Grantee	Evaluation Officer	Mission or AID/W Office Director
Name (Typed)	Andrea J. Yates	Ir. Djoko Sardjono	Patricia Chaplin	Vivikka Mollidrem
Signature				
Date	26 June 95	17 July 95	26 June 1995	26 June '95

2

**ABSTRACT**

**H. Evaluation Abstract (Do not exceed the space provided)**

The project was designed to assist the Government of Indonesia (GOI) in shifting its agricultural emphasis from Java to the eastern islands, where poverty is more pronounced, by designing and constructing surface and groundwater irrigation systems; establishing effective farmer water user associations (WUAs) by organizers (WUAOs) recruited and trained by non-governmental organizations (NGOs); strengthening local consultants and contractors by using them to design and construct the irrigation systems; and strengthening provincial water resources services (PWRS) staff by giving them responsibility for site selection and overseeing the design and construction work. The purpose of this final evaluation is to evaluate the project achievement; examine the project impacts in terms of changes in agricultural inputs, products, and farmers incomes; and articulate the lessons learned for use in future irrigation development by the GOI and other donors:

**The major findings and conclusions are:**

- The original project design was very ambitious. The original goals had to be scaled back, the funding reduced and the duration extended.
- The project accomplishments include: construction quality was satisfactory to excellent; WUAOs did an effective job of developing and supporting WUAs, and provided valuable input towards design and construction of the systems as well as to the O&M activities; the local consultants and contractors felt their skills had been improved, particularly due to experience gained with dam design and construction management; and the PWRS staff believed their skills were strengthened, particularly in the technical and construction management skills.
- The project shortfalls include: slow implementation; WUAO program was too time and labor intensive to be replicated on a wide scale; questionable sustainability of O&M; and unclear what O&M approach is to be followed.

**The primary recommendations of the evaluation team are:**

- To continue the discussion and exploration of the WUAO Program with Directorate General of Water Resources Development (DGWRD) and Institute for Social and Economic Research Education and Information (LP3ES) to design a project to further test and refine the WUAO approach.
- To develop a standard funding mechanism for O&M of main and tertiary systems with a clear provision for WUA responsibility.

**The primary lessons learned are:**

- The project was ambitious in the terms of project size and number of sites (10 surface and 520 ground water sites).
- The decentralization of authority to the provincial level was in line with DGWRD policy, and was supported by SSIMP through training.
- The WUAO program was accepted for application in future irrigation development in the eastern area.
- The local private contractors were weak in dam design and construction management.

**C O S T S**

**I. Evaluation Costs**

1. Evaluation Team		Contract Number OR	Contract Cost OR	Source of Funds
Name	Affiliation	TDY Person Days	TDY Cost (U.S. \$)	
John Pinney	Tropical Research & Dev.	105 person days	\$101,967	AID/Grant
J.M. Dukesbury	Tropical Research & Dev.			
Vibert Forsythe	Tropical Research & Dev.			
2. Mission/Office Professional Staff		3. Borrower/Grantee Professional		
Person-Days (Estimate) <u>20 person days</u>		Staff Person-Days (Estimate) <u>50 person days</u>		

b

## A.I.D. EVALUATION SUMMARY - PART II

### SUMMARY

**J. Summary of Evaluation Findings, Conclusions and Recommendations (Try not to exceed the three (3) pages provided)**

**Address the following items:**

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>• Purpose of evaluation and methodology used</li> <li>• Purpose of activity(ies) evaluated</li> <li>• Findings and conclusions (relate to questions)</li> </ul> | <ul style="list-style-type: none"> <li>• Principal recommendation</li> <li>• Lessons learned</li> </ul> |
|--|---|

**Mission or Office:**

AEE/USAID/Jakarta

**Date This Summary Prepared:**

05/09/95

**Title and Date of Full Evaluation Report:**

SSIMP Final Evaluation, April 1995

**SUMMARY**

**A. Purpose of the Project**

The Project Goal was:

To expand agricultural production by diversifying production, increasing cropping intensity and improving water reliability.

The Original Project Purpose was:

To design and apply irrigation technology and management systems in support of diversified cropping patterns in selected Eastern Islands.

The Revised Project Purpose was:

To increase the capacity of irrigation agencies and farmers' groups to implement sustainable irrigation systems in selected Eastern Islands of Indonesia.

The physical construction of irrigation systems was not the primary aim of the SSIMP. Rather, the entire process of project design, contract preparation and tendering, led by the Provincial Water Resources Services (PWRS), was the central project objective, including the participation of the beneficiary farmers in the project process. These themes were evident in the breakdown of project components into four major areas in the SSIMP design:

1. Improved irrigation technologies
2. Strengthening Provincial Water Resources Services (PWRS) management
3. Increased beneficiary participation
4. Special studies and pilot activities

**B. Purpose of the Evaluation**

The purpose of this final evaluation was to evaluate the achievements of specified outputs in the Logical Framework in the Project Paper Amendment 1 as well as evaluate the institutional development and policy aspects of the project. This evaluation also examines the project impacts in terms of changes in agricultural inputs and products, and farmers' incomes. Lessons learned are also examined for future irrigation development by GOI and other donors.

The evaluation was conducted from January 18 through February 21, 1995, by a three member team consisting of an irrigation engineer, a rural sociologist, and a management specialist. The team visited all surface water irrigation systems and a number of the groundwater systems constructed under the project in three provinces: West Nusa Tenggara (NTB), East Nusa Tenggara (NTT) and South Sulawesi (SulSel). A thorough review was made of pertinent documents and reports and interviews were held with over 50 individuals and groups involved in the implementation of the project, i.e. the technical assistance team of the SSIMP, the GOI officials at the central and provincial levels, local contractors for design and construction, WUAOs, WUAs and farmers.



**C. Findings and Conclusions:****1. Project Accomplishments:**

SSIMP can be credited with some impressive accomplishments, particularly the universal enthusiasm on the part of the PWRS staff in the field for the increased participation of the WUAs from the very beginning of design, through construction and on to operation and maintenance. The project managers all agreed that their work had been made much easier and more effective as a result of the farmers' input, particularly for the tertiary system development where the designs were better. The farmers were maintaining them better. Because the WUAs had been consulted, the farmers felt that they had an investment in and sense of responsibility for them. The project managers, even the Director of Construction Guidance for Eastern Region, all hope that a new program can be instituted for future irrigation development. One manager was considering making use of project resources to hire the SSIMP WUAs in his location and reassign them to replicate their work in neighboring areas. (Other ex-WUAs in SulSel established a new local NGO to continue a similar program for the coming project, SSIMP II, under OECF). This gives an indication of the value the DGWRD staff place on the WUAO concept.

An impressive approach for the site selection and design of the surface water systems was developed under the project. This included the collection and reporting of considerable engineering, economic, environmental, and social data before a site was selected and design begun. The local private contractors for design and construction works acknowledged that they had been strengthened by being held to stricter standards and receiving the training provided under the TA portion of SSIMP. USAID's policy was for the TA team's input to remain strictly in an advisory capacity allowing the local contractors to perform the actual design and construction. It was an effective means of strengthening the local contractors to perform the actual design and construction. Training was the major contribution in strengthening the PWRS staff. There were 27 staff members who received masters degrees and over 300 staff members who received either formal or on-the-job training under SSIMP.

The same approach was developed for site selection and design of the groundwater systems. Although not as broad in scope as the surface water systems, the engineering, economic, environmental and social aspects were all considered. Several guidance manuals for site selection, design, and well irrigation systems were prepared.

The quality of construction of the irrigation systems (three surface water and approximately ten groundwater sites) that were visited was excellent to satisfactory. In some cases, poor construction had been satisfactorily rectified after withholding payment for unsatisfactory work.

**2. Project Shortfalls:**

Of primary concern, was the viability of the operation and maintenance (O&M) programs for surface water systems. Although the GOI has several programs for funding O&M, there was no clearly defined approach for the project managers to follow. The farmers are now entering the critical phase of operating and maintaining the tertiary and quaternary portions of the systems and it is essential for PWRS to provide good maintenance on the main system in order for the O&M of the farmers to be successful. The PWRS has also to fully introduce the Irrigation Service Fee (ISF) program to the Water Users Associations/farmers in order to prepare the farmers be fully responsible for the tertiary systems.

The other concern is continuing provision of guidance to the WUAs in both O&M and agricultural practices. These surface water systems are new, and the farmers are not familiar with the irrigated crops. PWRS, together with the local government, should continue this program to achieve sustainable O&M of the systems.

**D. Primary Recommendations:**

It is the team's view that the SSIMP approach to developing and supporting WUAs through the use of WUAOs has proven to be extremely effective, **but is probably too time and labor intensive to be replicated on a wide scale.**

Considering the long history of USAID/DGWRD/LP3ES collaboration in the development of this system and the high level of interest displayed by DGWRD, it is recommended that these parties continue discussions and investigations with the intent of developing a follow-on project activity to modify and replicate the WUAO approach to WUA formation and support on a wide scale.

Such follow-on project activity should be small in scope and have an "action research" orientation to design a project to further test and refine the WUAO approach. This would allow greater flexibility and opportunities for experimentation to determine the conditions under which NGO assistance is appropriate. Additionally, it offers advantages over the present approach of full responsibility being borne by DGWRD and local government agencies.

It is also recommended that, in view of the critical importance of a viable O&M program at each system, a standard funding mechanism for O&M be developed for both main and tertiary/quaternary levels - with a clear provision for WUA responsibility at the latter - as quickly as possible. It is also recommended that the full operations SSIMP systems be moved as quickly as possible in the ISF program.

#### **E. Lessons Learned:**

This project was ambitious in the terms of area and number of sites: ten surface water and 520 groundwater systems. The size of surface irrigation systems under SSIMP was medium scale, five to ten times as large as small scale systems, which average is less than 500 Ha. Also, the total number of SSIMP sites - ten surface water systems and 520 groundwater systems - was too much, particularly when the project technologies consisted of surface diversion, lift irrigation, reservoirs and groundwater (and the potential of the latter was not surveyed prior to the SSIMP).

One of the SSIMP goals was to decentralize authority from the central level to the provincial level in design and construction processes through strengthening the provincial staff capabilities. This process was in line with DGWRD policy and supported by SSIMP training program, either in the U.S. or on-the-job training. Training was the key item in supporting the success of this decentralization.

The farmers participatory approach, through the Water User Association Organizers (WUAOs) program, was one of the key components in the SSIMP. Through this approach, farmers were encouraged to participate in project development, from designs and construction phases to the operation and maintenance of the irrigation system. This was successfully implemented during the SSIMP. The project managers are enthusiastic about applying this program for future irrigation development in the eastern region.

In general, the local private contractors were inexperienced in designing dams. The construction contractors were poor in construction management, particularly in managing cash-flow.

u

**ATTACHMENTS**

**K. Attachments** (List attachments submitted with this Evaluation Summary: always attached copy of full evaluation report, even if one was submitted earlier; attach studies, surveys, etc., from "on-going" evaluation. If relevant to the evaluation report.)

**A. Final Evaluation Report of the Small Scale Irrigation Management Project (SSIMP)**

**COMMENTS**

**L. Comments By Mission, AID/W Office and Borrower/Grantee On Full Report**



XD-ABL-804-A  
76311

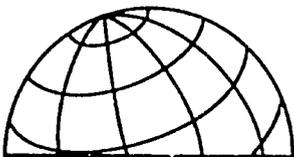
---

**Final Evaluation of the Small Scale Irrigation  
Management Project**  
(August 1985 – March 1995)

Republic of Indonesia—Department of Public Works  
Directorate—General of Water Resources Development  
and  
U.S.A.I.D.

Submitted to  
United States Agency for International Development  
Under contract LAG 4200-I-00-3056-00

Submitted by  
Tropical Research and Development, Inc.  
7001 s.w. 24th Avenue  
Gainesville, Florida 32607



REPUBLIC OF INDONESIA  
DEPARTMENT OF PUBLIC WORKS  
DIRECTORATE-GENERAL OF WATER RESOURCES DEVELOPMENT  
&  
U.S.A.I.D.

FINAL EVALUATION OF THE  
SMALL SCALE IRRIGATION MANAGEMENT PROJECT  
(August 1985 - March 1995)  
INDONESIA

John J. Pinney, Team Leader  
John M. Dukesbury  
Vibert Forsythe

TROPICAL RESEARCH & DEVELOPMENT  
MARCH 1995



## Contents

Acronyms, v

Executive summary, vii

1.	Introduction	1
2.	Methodology	2
3.	Project background	4
3.1.	Prior projects	4
	Sederhana (simple) projects	4
	High-performance Sederhana irrigation systems project (HPSISP)	4
3.2.	Evolution of the Small-Scale Irrigation Management Project	5
	Project paper	5
	Midterm evaluation	6
4.	Revised project concept	8
4.1.	Modifications	8
4.2.	Goal	8
4.3.	Purpose	8
4.4.	Initiatives	8
4.5.	Project outputs	8
4.6.	Inputs	11
5.	Project accomplishments	12
5.1.	Engineering	12
5.1.1.	Surface water irrigation systems	12
5.1.1.1.	South Sulawesi	14
	Survey, investigation, and design	14
	Awo project	15
	Construction	15
	Operation and maintenance	17
5.1.1.2.	Nusa Tenggara Barat	19
	Survey, investigation, and design	19
	Kalimantong II Project	19
	Construction	20
	Operation and maintenance	22
5.1.2.	Groundwater development	22
5.1.2.i.	Nusa Tenggara Barat	25
5.1.2.2.	Sulawesi Selatan	25

5.1.2.3.	Nusa Tenggara Timur . . . . .	27
5.1.2.4.	Conclusions—groundwater program . . . . .	28
5.1.3.	General conclusions . . . . .	30
5.2.	Beneficiary participation . . . . .	33
5.2.1.	The water users association organizer concept and strategy for water users association development . . . . .	34
5.2.2.	Water users associations and water users association organizers in surface water systems of South Sulawesi and Nusa Tenggara Barat . . . . .	37
5.2.3.	Water users associations and water users association organizers in groundwater systems of South Sulawesi, Nusa Tenggara, Barat, and Nusa Tenggara Timur . . . . .	42
5.2.4.	A replicable water users association organizer model, sustainable operations and maintenance, and introduction of irrigation services fee . . . . .	45
5.3.	Overseas Economic Cooperation Fund participation . . . . .	48
5.3.1.	Small-Scale Irrigation Management Project . . . . .	48
5.3.2.	Small-Scale Irrigation Management Project II . . . . .	48
5.4.	Training . . . . .	49
5.5.	Special studies . . . . .	51
5.6.	Role of women un Small-Scale Irrigation Management Project development . . . . .	54
5.7.	Increased agricultural production . . . . .	55
6.	Project management . . . . .	57
6.1.	USAID . . . . .	57
6.2.	The Directorate General of Water Resources Development . . . . .	58
6.3.	Nongovernmental organizations . . . . .	59
6.4.	Technical assistance . . . . .	60
7.	Anticipated future developments . . . . .	64
7.1.	Surface Water Irrigation Development . . . . .	64
7.2.	Groundwater Irrigation Development . . . . .	64
7.3.	Decentralization of authority . . . . .	64
7.4.	Institutional development . . . . .	65
8.	Recommendations . . . . .	68
8.1.	Improving the contracting process . . . . .	68
8.2.	Improving DGWRD project management implementation capabilities . . . . .	69
8.3.	Continued support for water users associations and water users association organizers programs . . . . .	69
	Bibliography . . . . .	71

Appendix A. ....: 79  
Appendix B. .... 81  
Appendix C. .... 85

## **Acronyms and terms**

<b>ADB</b>	Asian Development Bank
<b>AID</b>	Agency for International Development
<b>CO</b>	Community organizer
<b>DGWRD</b>	Directorate General of Water Resources Development
<b>DIP</b>	Annual operating budget
<b>DIR</b>	Director's implementation review (USAID)
<b>DUP</b>	Annual operating budget request
<b>EOM</b>	Efficient operations and management (ADB & World Bank operations and management program)
<b>GOI</b>	Government of Indonesia
<b>ha</b>	Hectare
<b>HPSIS</b>	High-Performance Sederhana Irrigation Systems
<b>IFY</b>	Indonesian fiscal year
<b>ISF</b>	Irrigation service fee
<b>KPP</b>	Farmer participation group
<b>KPPG</b>	Farmer Participation Group Cluster
<b>LP3ES</b>	Institute for Economic and Social Research, Education, and Information
<b>NGO</b>	Nongovernmental organization
<b>NTB</b>	Nusa Tenggara Barat
<b>NTT</b>	Nusa Tenggara Timur
<b>O&amp;M</b>	Operation and Maintenance
<b>OECD</b>	Overseas Economic Cooperation Fund (Japan)
<b>P2AT</b>	Groundwater Development Project
<b>PACD</b>	Project Assistance Completion Date
<b>PSC</b>	Personal Services Contract
<b>palawija</b>	Secondary food crop; food crop other than rice
<b>PIL</b>	Project implementation letter
<b>PJR</b>	Project justification report
<b>PPL</b>	Agricultural Extension Agent
<b>PROM</b>	Preparation for O&M (GOI O&M program)
<b>PSC</b>	Personal Services Contractor
<b>PTGA</b>	Proyek Tata Guna Air (GOI program for water users association development)
<b>PU</b>	Ministry of Public Works or Department of Public Works
<b>PWRS</b>	Provincial water resources services (under the Department of Public Works)
<b>RRIA</b>	Rapid rural irrigation appraisal
<b>SID</b>	Survey, Investigation and Design

<b>SSIMP</b>	<b>Small-Scale Irrigation Management Project</b>
<b>SulSel</b>	<b>South Sulawesi</b>
<b>TA</b>	<b>Technical Assistance</b>
<b>USAID</b>	<b>United States Agency for International Development</b>
<b>WUA</b>	<b>Water Users Association</b>
<b>WUAO</b>	<b>Water Users Association Organizer</b>
<b>WB</b>	<b>World Bank</b>
<b>YIS</b>	<b>Yayasan Indonesia Sejahtera (NGO)</b>

## **Executive summary**

This report presents the findings of the final evaluation of USAID Jakarta's Small-Scale Irrigation Management Project (Small-Scale Irrigation Management Project; Project No. 497-0347). The project agreement was signed on August 30, 1985, and the original completion date (PACD) was September 30, 1993. AID was to provide \$50 million (\$43 million loan and \$7 million grant) and the Government of Indonesia, \$39.7 million in cash and in kind. Following a midterm evaluation in November 1989, the project goals were scaled down, but this was not formally documented until the signing of Amendment No. 1 on January 24, 1994.

The amendment revised AID funding to \$10.0 million loan and \$21.2 million grant for a total reduction of \$18.8 million. The government of Indonesia contribution was reduced to \$13.5 million (a \$26.2 million reduction). In addition, in 1989 the OECF agreed to fund construction and technical assistance activities with funding of \$12.90 million. This made for a total funding for the Small-Scale Irrigation Management Project of \$57.6 million—a \$32.1 million reduction from the original plan. In addition, the amendment extended the PACD from September 30, 1993, to March 31, 1995, which extended the project's duration from eight years to nine and one-half years. USAID's actual expenditures, as of December 31, 1994, were \$8.5 million loan and \$19.8 million grant for a total of \$28.3 million (90.7 percent of the obligated amount).

The goal of the Small-Scale Irrigation Management Project was to expand agricultural production through diversification, increasing cropping intensity and improving water reliability. The original purpose was to design, test and apply irrigation technologies and management systems for the support of diversified food crop production in selected eastern islands of Indonesia. The amended project kept the same goal but broadened the purpose somewhat as follows: "to increase the capacity of irrigation agencies and farmers' groups to implement sustainable irrigation in the three eastern provinces of Sulawesi Selatan, Nusa Tenggara Barat, and Nusa Tenggara Timur."

The original design of the Small-Scale Irrigation Management Project was quite ambitious, particularly its construction goals, and subsequently had to be

scaled down for three reasons. First, the irrigation systems specified for the Small-Scale Irrigation Management Project were medium-scale systems, five to ten times as large as the Sederhana systems, and called for much more design and construction input. Secondly, another major goal of the Small-Scale Irrigation Management Project was to delegate the design and construction functions to the provincial level in order to upgrade the capabilities of the provincial Public Works (PU) staffs. Finally, an additional important goal of the project was to empower and strengthen the farmer organizations (WUAs) by involving them from the beginning in the design, construction, and operations and management of the systems. These goals, although commendable and largely realized, added a considerable expenditure of time and effort to the implementation of the project. Consequently, it is not surprising that the original construction goals of ten surface water irrigation systems covering nearly 20,000 ha and 520 groundwater irrigation systems covering over 5,000 ha fell short.

Other elements cited in the original project paper included the use of nongovernmental organizations to train and field water users association organizers (WUAOs) to develop and support the water users associations; the introduction of improved management systems for site selection and operation and maintenance; the use of local consultants and contractors in order to strengthen their design and construction capabilities; the implementation of an extensive training program; and a policy component, which was to produce a series of technological and policy studies.

Amendment No. 1 reduced the expected construction outputs to the design of seven surface water irrigation systems and the construction of two of them by USAID and one by the Overseas Economic Cooperation Fund. The groundwater irrigation system goal was reduced to 316 systems, of which 50 systems (450 ha) were to be developed by USAID and 266 systems (600 ha) by the Overseas Economic Cooperation Fund.

**Project accomplishments.**—Despite shortfalls on some of the original targets, the Small-Scale Irrigation Management Project can be credited with some impressive accomplishments. Particularly striking to the evaluation team was the universal enthusiasm on the part of the Department of Public Works' staff in the field for the increased participation of the water users associations from the very beginning of design, through construction, and on to operation and maintenance. The project

managers all agreed that their work had been made much easier and more effective because of having had the farmers' input. The project managers felt the designs, particularly for the tertiary canals, were better and the farmers were maintaining them better because the water users associations had been consulted about them, felt they had an investment in them, and had a sense of responsibility for them. When asked about the continuation of development and support for water users associations by water users association organizers after this project ends, the project managers all said they hoped a new program could be instituted; one manager was considering making use of project resources to hire the project's water users association organizers in his location and reassign them to replicate their work in neighboring areas. Whether this will be successful remains to be seen, but it gives an indication of the value they place on the water users associations and association organizers concepts.

An impressive approach for the selection and design of the surface water systems was developed under the project. This included the collection and reporting of considerable engineering, economic, environmental, and social data before a site was selected and design began. We talked to local consultants and contractors from the private sector who had been involved in design and construction of the systems, and they acknowledged that they had been strengthened by being held to stricter standards and through the advice and assistance provided by the technical assistance team. The technical assistance team's input was made more effective by the fact that the team stayed strictly in an advisory role instead of taking over design and construction tasks when difficulties arose.

The quality of construction of the three surface water irrigation and approximately ten groundwater irrigation systems that the team visited was excellent to satisfactory, and the irrigators were receiving adequate supplies of water. In some cases, Department of Public Works' inspectors had allowed shoddy work to slip by, but because of the authority of the technical assistance team (with the concurrence of the USAID engineers) to withhold payment for unsatisfactory work for the surface water systems, and USAID's authority to do likewise for the groundwater systems, the poor construction had been satisfactorily rectified.

**Primary conclusions and recommendations.**—It is the evaluation team's view that the Small-Scale Irrigation Management Project approach to developing

and supporting water users associations through the use of water users association organizers has proven to be extremely effective, but is probably too time and labor intensive to be replicated widely. Considering the long history of collaboration among USAID, the Directorate General of Water Resources Development, and the Institute for Economic and Social Research, Education, and Information in the development of this system and the high levels of importance and interest displayed by the organizer, we recommend that these parties continue the discussions and investigations (which have begun with the National Workshop on the water users association organizers and the Small-Scale Irrigation Management Project program, 21–24 February, in Denpasar) with the intent of developing a follow-on project activity that would be capable of modifying and replicating widely the water users association organizer approach to water users association formation and support. Such a follow-on project activity ought to be small in scope and have an “action research” orientation. This would allow greater flexibility and opportunities for experimentation for determining the conditions under which assistance of nongovernmental organizations is appropriate, and it would offer advantages over the present approach of full responsibility being borne by the Directorate General of Water Resources Development and other responsible agencies of the government of Indonesia.

## **1. Introduction**

This final report presents the findings of the final evaluation of USAID Jakarta's Small-Scale Irrigation Management Project (Small-Scale Irrigation Management Project; Project No. 497-0347). The evaluation was conducted for USAID by a multidisciplinary team from Tropical Research and Development under that firm's Agriculture Indefinite Quantity Contract (Contract No. LAG-4200-I-00-3056-00). All evaluation activities were conducted in Indonesia beginning on January 18, following team mobilization and travel, and ending on February 25, 1995.

An earlier draft of this report was circulated within USAID and the Directorate General of Water Resources Development and discussed at meetings with each of those groups and with the technical assistance team. Comments and suggestions made during those meetings have been incorporated into this final report to the greatest extent possible. However, the evaluation team bears full responsibility for the contents of the report.

Without the full cooperation, gracious assistance, and hospitality shown to us by the many persons in the government of Indonesia, the technical assistance team, and USAID, it would not have been possible to complete this evaluation. We are particularly indebted to those who made additional sacrifices to accompany the evaluation team during the field visits, particularly because these visits extended into the early days of the fasting month.

## **2. Methodology**

The evaluation was conducted by a multidisciplinary team made up of John J. Pinney, irrigation engineer and team leader; John M. Dukesbury, rural sociologist; and Vibert Forsythe, management and irrigation specialist.

Approximately 60 percent of the actual field time was spent visiting a large number of project sites in South Sulawesi, and West and East Nusa Tenggara. A detailed list of activities is included in appendix A. During the field visits, the evaluation team was accompanied by USAID staff, officials from the Directorate General of Water Resources Development's Directorates for Program Support and Implementation Support for the Eastern Region, and (to West and East Nusa Tenggara) a program manager for water users association organizers of the Institute for Economic and Social Research, Education, and Information.

The evaluation methodology consisted of a thorough review of all available project background documents and reports from USAID, the technical assistance team, and the Directorate General of Water Resources Development and provincial water resources services. This review of documents was augmented by interviews with managers and implementation staff from USAID, the Overseas Economic Cooperation Fund, the Asian Development Bank, the Ford Foundation, past and present members of the Harza technical assistance team, USAID personal services contractors, the Directorate General of Water Resources Development, the provincial water resources service, local government and other related government of Indonesia agencies, Institute for Economic and Social Research, Education, and Information contractors, as well as farmer beneficiaries in all sites visited. Appendix B contains a partial list of the persons contacted during the evaluation.

Formal presentations and discussions of a draft of this report were conducted at USAID on February 16 and at the Directorate General of Water Resources Development on February 20; comments received during and after those discussions have been incorporated into this final report. Results of the evaluation were also discussed with members of a visiting team that is assisting the USAID mission in drafting a set of strategic environmental program priorities, which might be capable of incorporating the team's recommendation that USAID consider future support for the water users association organizer strategy of establishing and developing water users associations. Finally, an additional four

days was allotted for the team social scientist to take part in a national workshop, sponsored by the Institute for Economic and Social Research, Education, and Information, on the water users association organizer and the Small-Scale Irrigation Management Project's phase III. Observations from that workshop have also been included in this report.

### **3. Project background**

#### **3.1. Prior projects**

**Sederhana (simple) projects.**—The Small-Scale Irrigation Management Project is the latest in a long series of projects that were designed to help improve the lives of smallholder farmers by developing new or rehabilitating existing small irrigation systems. Sederhana I (1976 to 1979) and the follow-on Sederhana II (1979 to 1984) developed numerous small, simple systems (average 300 ha) in Java and the Outer Islands. The provincial irrigation services were responsible for the design and for overseeing the construction, which was let to local contractors. USAID reimbursed the government of Indonesia after a site inspection by USAID and technical assistance contractor personnel determined that the system was satisfactory. During the eight-year span of these two projects, some 900 systems in twenty-four of the twenty-seven provinces of Indonesia were constructed.

Many of the systems, particularly in Sumatra and Kalimantan, were aimed at providing a livelihood for new settlers brought in, mostly from Java, under the large transmigration effort being pursued by the government of Indonesia at that time. Consequently, many of the systems were placed in extremely remote areas, where it was difficult for contractors to get materials to the sites or to maintain a workforce. The majority of designs consisted of a gabion weir and primary and secondary canals; farmers were expected to construct the tertiary and quaternary canals themselves. For the settlers, many of whom were not experienced irrigators, this was often a large stumbling block, and full development of the systems was sometimes delayed for long periods. However, an assessment done in 1985 showed that 70 percent of the originally designed command area was being irrigated in the wet season and that over 80 percent of the structures and canals were still in good condition.

**High-performance Sederhana irrigation systems project (HPSISP).**—During the last years of Sederhana II and continuing until 1985, another component was added to the project. This was an experiment designed to involve farmers in early phases of irrigation system development, including design and construction. The three-year experiment produced the following findings:

- a. farmer participation can be encouraged in a wide variety of irrigation

- systems regardless of tenancy, farm size, farmers' wealth, and even farmers' access to water;
- b. changes recommended by farmers for both main and tertiary system design and construction were accepted by the Department of Public Works, and the contractors and were incorporated into revisions of the plans; and
  - c. provincial Public Works officials became more receptive to the concept and to farmer participation in irrigation system development during the experiment.

### **3.2. Evolution of the Small-Scale Irrigation Management Project**

**Project Paper.**—In 1985, in response to the Government of Indonesia's desire to put more emphasis on developing the water resources of the eastern areas, where poverty is more pronounced than in the western areas, USAID developed the Small-Scale Irrigation Management Project. The project was authorized August 1985 with a total funding of \$89.7 million. USAID funding was \$43 million loan and \$7 million grant over an eight-year period, and the government of Indonesia's commitment was \$39.7 million.

The project goal was to expand agricultural production by diversifying production, increasing cropping intensity and improving water reliability. The purpose was to design, test, and apply irrigation technologies and management systems for the support of diversified food crop production in selected eastern islands of Indonesia.

Building on the lessons learned from the Sederhana and the High Performance Sederhana Irrigation Systems Projects, the Small-Scale Irrigation Management Project was designed to focus on increased farmer participation in the development, management, and maintenance of small- and medium-scale irrigation systems. The project was also aimed at furthering the trend toward decentralization of decision-making and implementation responsibilities from Jakarta to the provinces, and, in addition, was to seek ways of expanding the private sector's role in the design and construction of surface water systems and in groundwater development.

The target for the development of irrigation systems was 25,000 ha at

fifteen sites in the provinces of South Sulawesi, Nusa Tenggara Barat, and Nusa Tenggara Timur. Four irrigation technologies were to be used: surface diversion (weirs) at three sites, surface lift at two sites, reservoirs at five sites, and groundwater at five sites. Of the \$61.5 million designated for design and construction, 82 percent was for the weirs and reservoirs, 5 percent was for the lift irrigation project, and the balance of 13 percent was for the groundwater systems.

Overall responsibility for implementation and coordination of the project was with the Directorate General of Water Resource Development (DGWRD) in Jakarta. However, in keeping with the deconcentration policy of the government of Indonesia and the goals of the project, the actual site selection, design, construction, and management activities for the surface systems were delegated to the chief of provincial water resources development and the subproject managers, in conjunction with the water users. The groundwater activities were to be handled by Directorate General of Water Resources Development until construction and a period of testing was completed. Following that, management of the wells was to be transferred to the farmer groups.

**Midterm evaluation.**—In November 1989, after the Small-Scale Irrigation Management Project had been under implementation for four years, the progress of the project was analyzed by means of a midterm evaluation. The evaluation found that the project was as much as two years behind schedule, that the design of surface water systems was progressing well, but that no more than three of them could be constructed before the then current project activity completion date, that the groundwater component was just getting started, and that coherent plans for achieving project objectives were lacking. The recommendations included that the project activity completion date be extended by two years to September 1995, that the government of Indonesia and technical assistance management be strengthened, that the detailed management by USAID be reduced, and that water users' association organizers be fielded in all the groundwater programs.

Following the midterm evaluation, the technical assistance chief of party, whose management of the technical assistance had been criticized in the evaluation, was replaced. USAID also responded to the recommendations of the evaluation by instituting annual umbrella project implementation letters to help expedite the groundwater activities.

One month after the evaluation, the USAID director held a director's implementation review (DIR) in Nusa Tenggara Barat, which included a visit to the

Kalimantong II surface water irrigation system in Sumbawa. The director's implementation review resulted in a revision of the project purpose that was more in line with the evolving strategy of the USAID mission. The revised project purpose was:

To increase the capacity of Public Works, local government, private contractors and farmers' groups to design and implement sustainable irrigation systems using new or improved technologies, management systems, and policy guidance.

**Amendment No. 1.** Since the 1989 director's implementation review, subsequent reviews, workshops, strategy statements, and action memos have scaled down the expected actual outputs and costs of the surface water and groundwater irrigation systems, but the stated goal and purpose of the project has remained basically unchanged. The changes in the project were formally documented in the Small-Scale Irrigation Management Project Amendment No. 1, which was signed in January 1994. This evaluation is based upon the project as amended by Amendment No. 1. The revised project is described in the following section.

#### **4. Revised project concept**

##### **4.1. Modifications**

USAID funding for the Small-Scale Irrigation Management Project was changed from \$43 million loan and \$7 million grant to \$10.038 million loan and \$21.211 million grant, for a total of \$31.249 million—a reduction of \$18.75 million. The government of Indonesia's contribution changed from \$39.7 million to \$13.5 million, and an Overseas Economic Cooperation Fund contribution of \$12.897 million was added. The project activity completion date was changed from September 30, 1993, to March 31, 1995, increasing the project's duration from eight years to nine and one-half years.

##### **4.2 Goal**

The goal of the Small-Scale Irrigation Management Project remains unchanged by Amendment No. 1. It is to expand agricultural production by diversifying production, increasing cropping intensity, and improving water reliability as follows:

- Addition of at least one crop per year
- Crop production of 4 tons per ha per season in irrigated areas
- Nonpaddy crops being grown in at least one season

##### **4.3. Purpose**

The revised project purpose, as stated in Amendment No. 1, is to increase the capacity of irrigation agencies and farmers' groups to implement sustainable irrigation in the three eastern provinces of South Sulawesi (SulSel), Nusa Tenggara Barat (NTB), and Nusa Tenggara Timur (NTT).

##### **4.4. Initiatives**

The goal and purpose were to be realized by means of the following initiatives:

- *Construction*—designing and constructing medium-scale surface water and small-scale groundwater irrigation systems in the three target provinces

- *Decentralization*—strengthening of provincial Public Works and transferring authority to them to make decisions concerning site selection, design, and construction of irrigation systems
- *Beneficiary participation*—organizing farmers into water users associations (WUA) through the use of water users association organizers (WUAO) and ensuring the participation of the water users associations in the design, construction, operation, and maintenance of the systems
- *Improving sustainability*—improving the mechanisms for recovering the costs of operation and maintenance of the systems in order to ensure their sustainability
- *Private-sector development*—improving design and construction skills of local consultants and contractors
- *Training*—long-term training in the United States and India for the Department of Public Works' and the regional development planning board's staff; overseas short-term training and study tours for Department of Public Works' staff; in-country short-term training for water users associations, water users association organizers, government of Indonesia personnel, and local contractors
- *Special studies and policy studies*—environmental assessments, lessons learned, groundwater development policies, evaluations, etc.
- *Technical assistance*—U.S. and Indonesian contractors

#### **4.5. Project outputs**

Under the amended project design, at the project's completion there will be three new surface water irrigation systems, covering 7,150 ha, and 316 groundwater irrigation systems, covering 1,050 ha, constructed by USAID and the Overseas Economic Cooperation Fund. Agricultural production will have been diversified and increased by the addition of at least one crop per year, yields of at least four tons per ha and nonpaddy crops being grown in at least one season per year.

The farmer beneficiaries will be organized into water users associations by water users association organizers fielded by two nongovernmental organizations. The water users associations will include women as active participants, and at least some of the water users associations will have been formed into effective federations. Additional nongovernmental organizations (other than the original two) and the operations and maintenance staff of the provincial public works departments will also be developing new water users associations in other systems

as well as giving support and guidance to existing ones.

The provincial water resources services (PWRSSs) will have the authority to make decisions concerning site selection, design, and construction of irrigation systems. The surface water irrigation systems will have been designed by local private contractors under the supervision of the provincial water resources services with guidance from the technical assistance team. The designs will have taken into consideration the environmental analyses, site profiles, and project justification reports done previously for each system. During the design stage, the initial plans will have been explained to the water users associations, and their suggestions for making improvements will have been incorporated to the extent possible. From such experience, private contractors will have learned improved techniques, which they will be using in new projects.

Selection of the groundwater irrigation systems will have been based on assessment reports done for each aquifer. The policies used in developing and implementing each system will have been influenced by the National Irrigation Policy Study. The siting of wells in a system will have been based on established site selection criteria. Private contractors will be doing more and more development of the systems.

The water users associations will have constructed their own tertiary canals, and they will be maintaining them. They will also be paying irrigation service fees (ISF) to help defray the costs of operating and maintaining the main and secondary canals. The combination of operations and maintenance funds from the irrigation service fee and the Ministry of Public Works will be adequate to operate and maintain the systems sustainably. Operations and maintenance activities will be guided by operations and maintenance manuals prepared for each system.

The Directorate General of Water Resources Development will be applying the policies and improved policy implementation procedures described above in other irrigation projects.

Also completed by the end of the project will be designs for four other medium-scale surface water irrigation systems covering an additional 10,542 ha; seven site profiles; five environmental analyses; seven project justification reports; ten special studies and policy studies including the irrigation service fee study;

twenty-seven masters of arts degrees in engineering and related fields; and in-country training for over three hundred members of the government of Indonesia, water users associations, water users association organizers, and contractors.

#### 4.6. Inputs

The amended project called for the following financial inputs:

	USAID	GOI	OECF	TOTAL
Construction (surface water irrigation systems)	9,003	11,113	7,564	27,680
Construction (groundwater irrigations systems)	1,391	1,532	1,619	4,542
Equipment and commodities	648	120	122	890
Training	1,258	67	—	1,325
Special studies and pilot activities	1,906	—	—	1,906
Technical assistance	16,721	—	2,660	19,381
Contingency	322	668	932	1,922
	<hr/>	<hr/>	<hr/>	<hr/>
Project totals	31,249	13,500	12,897	57,646

## **5. Project accomplishments**

### **5.1. Engineering**

This section of the report addresses the engineering aspects of project implementation with specific reference to achieving the project's purpose and objectives. Of the overall project objectives, the ones that will be specifically considered will include, but not be limited to,

- \* farmers' participation, from project inception, in site selection, investigation, survey, design, construction, operation, and maintenance;
- \* more technical activities being supervised at the provincial level;
- \* increased utilization of local consulting and contracting firms at both the national and provincial levels;
- \* the use of nongovernmental organizations in organizing and promoting farmers' participation in project implementation.

The engineering content of the project will be examined under two primary subtopic headings: groundwater and surface water irrigation system development. Even though there were many similarities, implementation of project activities in these areas had some major differences that make it desirable to discuss them separately.

#### **5.1.1. Surface water irrigation systems**

The original project paper identified ten surface water irrigation systems in the SulSel and Nusa Tenggara Barat provinces for review and development. During the first phase of the project, the provincial water resources service and technical assistance teams completed surveys, investigations, and predesign of all ten sites. Rapid rural irrigation appraisals and household surveys for all sites were done by provincial water resources services' staff under the guidance of two personal services contract consultants. These provided additional primary and secondary data for the sites that were worthy of development.

A standard reporting format, the project justification report, was implemented to assess fairly the technical feasibility of each subproject. These project justification reports collected all available site information, including data on hydrology, water resources, water requirements, land resources, agricultural production and marketing, environmental considerations, social considerations, engineering, construction program and costs, irrigation management, project economics, and project implementa-

tion. The project justification report formed the basis for evaluation of each subproject by the concerned parties and was a progressive step toward integrated planning because it recognized that there is more to irrigation system development than engineering methodology.

After the investigation activities were completed, three of the original ten systems identified were considered not feasible for surface water irrigation development. Then the USAID director's implementation review, 1990, determined that it was no longer possible to complete construction of all seven of the other projects. Instead, two of them, Kalimantanong II (K II) in Nusa Tenggara Barat and Awo in South Sulawesi, were to be constructed with USAID funding, and the Tiu Kulit subproject in Nusa Tenggara Barat would be constructed with Overseas Economic Cooperation Fund funding. The remaining four subprojects were to be carried through to final design and preparation of contract documents to enable the Directorate General of Water Resources Development to approach other donors who might be interested in funding construction.

Following this decision, the activities focused on the review of project feasibility and the preparation of final design and tender documents for the projects identified for construction—Awo and K II. The designs and tender documents were completed by local consultants with the technical assistance team's advice and assistance.

The activities during phase II (after March 1992), of the project focused on construction of Awo and K II and initiating sustainable operation and maintenance programs. As construction fell behind schedule, USAID reviewed the project progress and decided that institutionalization of operations and maintenance of the developed systems would not be possible within the time remaining. This prompted a decision to extend the project activity completion date to March 1995, by which time operations and maintenance activities would have been initiated under the technical assistance team's guidance.

Construction tenders were advertised internationally, but construction of the Awo and Kalimantanong II systems were carried out by local contractors—another intended purpose of the project that was successfully implemented. After receiving letters of interest from contractors, tendering eligibility was determined by a team made up of representatives from the Department of Public Works' staff at provincial and central levels. Each contractor's capability was determined with respect to the

scope of each contract package, and a decision made on whether tenders would be requested from the contractor.

All decisions throughout the survey, investigation, design, and construction stages were initiated, and, in most cases, concluded by the provincial project management with central level oversight for administrative purposes. During the course of project implementation, the project manager's authority to sign contracts was significantly increased. This reduced the period required for tendering and awarding contracts and gave the project manager greater administrative control over the flow of activities, hence improving the management process and environment.

#### **5.1.1.1. South Sulawesi**

**Survey, investigation, and design.**—The project paper identified South Sulawesi as a province in which all four irrigation technologies (surface diversion, surface lift, reservoir, and groundwater) could be utilized. Two surface diversion schemes and three reservoir systems were identified for survey, investigation, and design activity. Development of these intermediate-scale surface water projects was to give attention to two components: the design of smaller, more flexible tertiary blocks and the intensive use of water users association organizers.

Activities in surface lift irrigation were to be carried out in an area where farmers already had some experience in river pumping. The project intended to encourage private-sector and commercial involvement in support of expanded lift schemes, but no such activity was initiated. The reason for this was not conclusively determined.

Of the original five surface water projects identified in the province, preliminary designs were completed for four systems, and three of these—Awo (weir), Ponre-Ponre (dam), and Salomekko (dam)—were carried through to final design (to international standards) and contract documents. Little usable design work had been done on these systems prior to the Small-Scale Irrigation Management Project. To carry out the investigation and design work, the technical assistance team had to work with a large number of local consultants. The USAID \$100,000 limit per contract for local consultant work often resulted in as many as four local consultants working on the survey, investigation, and design of each site. This severely affected the logical sequencing and progression of survey, investigation, and design activities. The problem was compounded by provincial water resources services changing the

scope of the local consultants' required work in order to stay within the contract budget. This often resulted in a peculiar combination of seemingly unrelated tasks being completed by individual contractors. These problems could have been mitigated had it been possible to have the local consultants working closely together, but this was seldom accomplished.

**Awo project.**—Initial estimates in the project paper indicated Awo as a project capable of irrigating 1,600 ha, but studies completed under the project found that there was sufficient stream flow to irrigate up to 4,700 ha. The Small-Scale Irrigation Management Project's portion of the Awo project was designed to supply irrigation to 2,500 ha while an additional 2,000 ha will be irrigated later by an extension project funded by the Overseas Economic Cooperation Fund. Review of design, soil investigation, final design, and topographic mapping for the Awo project were all carried out by local consultants, advised and assisted by the technical assistance team. In completing these activities, the consultants, in coordination with the water users association organizers, encouraged full participation by the farmers and the local government. These parties were always kept informed of the project implementation plans and progress, as called for in the Small-Scale Irrigation Management Project's objectives.

A project justification report was completed in September 1990. An environmental assessment report was completed in December 1990. Tender documents were forwarded to the Directorate General of Water Resources Development in January and March 1991. These were reviewed and approved in July 1991. Construction of the system was divided into three contracts packages—Package I, the weir and appurtenances; package II, the left bank canal; and Package III, the right bank canal. Notices to proceed for all three packages were sent out in January 1992.

**Construction.**—The Awo construction contracts included both the main and tertiary systems. The layout and construction of quaternary distribution canals was the responsibility of the farmers. In the construction of the tertiary system, arrangements were made for the contractor to utilize local farmers as the primary source of labor. The contractors provided supervision for construction of the tertiary system with the technical assistance team and provincial water resources services providing technical assistance and advice as needed. The water users association organizers were instrumental in facilitating and negotiating discussions between the contractors and the farmers' groups.

Construction activity began at Awo in January 1992 and progress on all three packages was very slow. After fourteen months, the contractors were all at least 15 percent behind a revised schedule. After receiving advice and recommendations from provincial water resources services, the technical assistance team and Dr. Walter, the USAID special consultant, the contractors and provincial water resources services prepared action plans for improving progress and completing the project within an extended schedule.

Construction activities were rife with problems—primarily management and financial. Among these were the following:

- Lack of proper work programming, scheduling and planning.
- Inexperienced field personnel resulting in inadequate on-site management.
- Lack of adequate management and financial support from the contractor's home office.
- Insufficient equipment support and the use of unreliable equipment.
- Inexperienced inspection staff.
- Difficulty in obtaining an adequate supply of raw material, especially stone and cement.
- Inability to secure an adequate labor force.

The construction progress was also slowed, justifiably, by the technical assistance team's insistence that the contractors comply with the contract specifications, which were sometimes overlooked by both the contractor and the inspection team. Even though a constraint to progress, this was an essential element in ensuring construction of a sustainable system and in improving the technical and monitoring capabilities of the provincial field staff. The technical assistance team's noncompromising stand on product quality, at times, was not appreciated by project management, who felt it an unnecessary hindrance to progress. However, the project manager, in discussions with the evaluation team, admitted that, in retrospect, it served to teach the staff that quality should not be compromised in favor of progress—a lesson he felt was valuable.

In order to introduce improved methods of irrigated cultivation practices to the farmers, several demonstration plots (demplots) were established. The demplots, with an average area of five ha, were sited so as to allow optimum access for farmers in all parts of the system. Free agricultural inputs, including seed, fertilizer, and agri-

cultural tools, were provided for the demplots, and a small, centrally located training center was constructed. The surrounding areas, located on the quaternary as were the demplots, were provided with free seed only and were used as control plots. The agriculture office assigned extension agents for agronomic advice for each demplot, while provincial water resources services had the responsibility for water management and the water users association organizers for farmers' participation. Implementation of the demplot program began in October 1994; even though harvesting had not yet occurred at the time of the evaluation team's visit, the demplots program was obviously influencing the farmers in the surrounding areas. Traditionally, farmers use a seeding rate of 120 to 140 kg per ha; but after observing that, with a rate of 40 kg per ha, the demplots were producing robust crops, many reduced their seeding rates.

In recognition of the fact that construction activities would not be completed in time to effect training of operations and maintenance staff and farmers in operations and maintenance activities, the parallel site concept was developed. A parallel site was developed at Bulucenrana, a nearby existing project, which included rehabilitation of one tertiary system and the development of demonstration areas. Farmers from the Awo demplot area were taken to Bulucenrana for training in water management, operation, maintenance, and irrigated agriculture cultivation methods. This exercise was a complete success in that it was not only effective in training farmers from the Awo project but also had a spin-off effect at Bulucenrana. Farmers in adjoining areas at Bulucenrana saw the benefits realized in the demonstration areas and began to carry out improved maintenance and cultivation practices at their own expense.

During the course of construction, the technical assistance team carried on training of provincial water resources services' and contractors' staffs in basic contracting and construction activities. These sessions were carried out after normal working hours so as not to interfere with the regular work schedule. On-the-job training was also carried on continuously by technical assistance staff members to all parties involved in project implementation. The extent of training varied, depending on the individual specialist and recipient groups, but was always a primary objective of the technical assistance team's activities. From discussions with the recipients, they were successful in transferring improved concepts and methods in irrigation project design and construction.

**Operation and maintenance.**—Full operation of the Awo system began in

October 1994 even though minor construction was still going on. The provincial water resources services organization is now moving from construction to operations and maintenance, but the status of the operations and maintenance organization is somewhat in question. The operations and maintenance staff reports to the project manager, who supplies the budget for operations. Technically, supervision and support come from the Ranting Dinas, the provincial operations and maintenance organization, to whom the system will be turned over for operations and maintenance after a period of two years. In Awo it is anticipated that operations and maintenance of the system will be turned over to the Ranting Dinas staff in 1996. All but one of the positions in the project's operations and maintenance organization has been filled and the personnel trained. However, there have already been problems with staff turnover and absenteeism. Housing and office facilities, transportation, and communication equipment have already been supplied.

The control structures in the system have been calibrated and tables giving the discharge versus gate settings have been prepared. The technical assistance team trained the operations and maintenance staff in operation of the system for normal, low, and flood flow conditions. There have been problems with communication between the operations and maintenance staff and the farmers because the chalk boards set up at each turnout to advise the farmers of system operation were not being used. In addition, meetings between the operations and maintenance staff, project staff, and the water users association organizers were not well attended because the importance of operations and maintenance has somehow not been realized by the persons involved.

Since the system became fully operational in October 1994, water has been delivered to most parts of the service area, although a small portion of the design area remains unirrigable. By mid December 1994, over 80 percent of the service area was being cultivated. However, start-up problems were compounded by low river flows. This kept the inexperienced operations and maintenance staff busy attempting to distribute limited water supplies, but their performance during this period was commendable. The technical assistance team supported the operations and maintenance staff by recommending gate settings and operational strategy. During the period of low flows, the farmers were worried about the possibility of substantial financial losses in their first experience in irrigated agriculture, and some of the farmers decided to wait until the supply of water had increased before starting land preparation.

System maintenance is still the responsibility of the contractors as the system

is still in the contractors' maintenance period. The example set so far by the contractors has not been a good one because scheduled maintenance has been delayed for indeterminate reasons. The main and secondary systems, after six months of operation, already showed signs of heavy siltation in several areas that are not scheduled for maintenance during this fiscal year. Provincial Water Resource Services staff has drawn up a maintenance budget for Indonesian fiscal year 1995-96, but the level of funding is not known at this time.

#### **5.1.1.2. Nusa Tenggara Barat (NTB)**

**Survey, investigation, and design.**—The province of Nusa Tenggara Barat was also identified in the project paper as an area that could support the four irrigation technologies expected to be utilized under the Small-Scale Irrigation Management Project (surface diversion, surface lift, reservoir, and groundwater). Three dams and two weirs were identified for development. Of these, final designs and contract documents were completed for four systems—Kalimantong II (weir), Tiu Kulit (dam), Gapit (dam), and Batujai (dam). As in SulSel, the design work was done by local consultants, advised and assisted by the technical assistance team, and the same problems with having several local consultants working on each project were faced.

A surface lift irrigation system was to be developed in conjunction with the Batujai reservoir at the Surabaya site. However, this was canceled after detailed studies revealed that the water supply at Batujai would be insufficient for the Surabaya project.

**Kalimantong II project.**—The Kalimantan II project (K II) was designed to provide irrigation to 2815 ha of flat land in the alluvial plains of the Tepas river. This includes 479 ha in the existing Kalimantan I system, for which supplementary water will be supplied under K II. Reevaluation of stream flow from the contributing drainage area indicated an adequate water supply to meet water requirements for three cropping seasons annually. River diversion was accomplished by a weir, which was begun by the provincial water resources service in Indonesian fiscal year 1984-85 and abandoned due to lack of funds. There were also a left bank dike, an offtake structure, an irrigation canal system, and a sediment flushing arrangement for both the right and left sides. The right bank main and secondary canal system has a length of 29.5 km serving 1,374 ha and the left bank a length of 21.9 km serving 962 ha.

The contract documents, the project justification report, and the environmental assessment report were completed by the provincial water resources service and the local consultants. Unlike Awo, the design for the system had already been completed by the provincial water resources service, and construction of the weir had been started. However, this existing design was reviewed by the local consultants, with advice and assistance from the technical assistance team, and numerous changes were made in order to meet the required international standards.

**Construction.**—Prequalification was carried out during March and April 1989, with USAID approval of prequalified contractors coming in February 1990. Construction of the system was divided into three packages—the left bank system, right bank system and the weir, and offtake structures. The invitation to tender was issued in September 1990, and tenders were opened in December 1990. Construction activities began late in August 1991. Construction schedules were presented as required under the contract. Unfortunately, all three contractors performed poorly during the first year of construction.

As at Awo, the contractors experienced financial and management problems. The planning and scheduling of activities to utilize personnel and equipment resources efficiently was not a priority with the contractor. The contracts included a considerable amount of rock excavation, which proved to be a major problem for the contractors who were not experienced in dealing with this type of activity on a large scale. The seemingly intractable problem of undersized and old equipment, and the reliance on hand labor to carry out the bulk of the activities, all contributed to the slow progress.

The quality control problem was similar to the experience at Awo and was handled in the same manner by the technical assistance team. The contractors' attempts to have works accepted that were below specifications were invariably rejected by the provincial water resources service staff, reinforced by advice and encouragement from the technical assistance team. In extreme cases the technical assistance team even refused to certify completed works previously accepted by the project's construction inspectors. This aspect of the technical assistance team's activities in construction management was essential to the project being completed satisfactorily and in emphasizing to the project staff that quality construction is rarely to be comprised.

Tertiary development was not given much urgency by the contractors because

of the low profit margin for that portion of the contract and the fact that the tertiaries had more social consequences and required the beneficiaries' input. The formal and informal nature of the process involved in bringing the tertiary blocks to construction was time-consuming because the farmers had to agree to the design. Also, the contractors' lack of survey and drafting staff was a major contributing factor to the delays in the tertiary construction. In response to this, the technical assistance team established a tertiary design unit to assist the contractors in completing the tertiary designs.

The farmers did the construction work on the tertiary canals, but the contractors felt they were not capable of constructing the structures. The technical assistance team encouraged the contractors, with the team's assistance, to train the farmers to carry out this activity. Subsequently, tertiary construction was carried out by the farmers supervised by the contractors' foremen, which greatly improved progress. The work was then inspected by the Tertiary Design Unit, which was responsible for authorizing payment.

In September 1992, the Directorate General of Water Resources Development instructed the contractors to prepare revised action plans for construction completion. The original contract completion date of February 1993 was extended to August 1993 based on the variation orders being processed. Contractors' action plans, using the time extension, were submitted in October 1992.

USAID fielded a consultant, Dr. Walter, in October 1992 to make an independent assessment of construction activities. His report recommended priority construction activities for each contractor to ensure that an operable, if incomplete system, could be constructed by the end of the extension period. The contractors' performance improved after the consultant's visit and the presentation of action plans, despite the wet season. The consultant made a second visit to the project in March 1993 and reported that the contractors' performance had improved, although not enough to allow contract completion within the contract interval. Once again, new priorities were set and approved by the Directorate General of Water Resources Development.

Construction included under the contracts was completed in October 1993. Still there is much drainage construction to be completed before the system can be considered sustainable. This issue should be given immediate attention.

**Operation and maintenance.**—In K II, as construction progressed, many of the areas were brought under cultivation. By October 1993, except for minor deficiencies needing attention, the entire K II system was ready for operation. The area was divided into five delivery areas—two on the right and left banks respectively and one in the existing K I area, which now receives supplemental water from the K II system.

Following the cropping pattern and calendar prepared for the delivery areas, water was delivered according to schedule from October through December 1993 to approximate 2465 ha. In December, heavy flooding caused damage to the irrigation system. Many canals and structures were destroyed, and, as a result, water delivery was disrupted. However, under advisement of the technical assistance team and project management, emergency repairs were prioritized and the disruption of irrigation supplies was minimal. No area under cultivation suffered total crop loss. To enable permanent repair work to the damaged sections of the system, the area to be cultivated for a second crop was reduced to 2069 ha, and for the third crop of palawija, the area was further reduced to 1069 ha.

During the past three cropping seasons the cultivation practices followed traditional patterns. As was done at Awo, in order to introduce farmers to improved irrigated cultivation practices, demonstration plots were developed. In K II, four demplots were sited in the upstream and downstream sections of the left and right banks of the system. The approach at K II was basically the same as that used at Awo—all the inputs provided for the demplots and free seed for the surrounding areas. It was apparent from the healthy looking rice crops that the nearby farmers were benefiting from the training and from observing the demplots.

Operation and maintenance activities are being attended to in a thoughtful manner but are not yet as systematic nor as intensive as desirable. As at Awo, the hand-over and funding mechanism is still somewhat perplexing to the parties involved. This lack of positive direction and guidelines for operations and maintenance activities could prove to be a major constraint to the future sustainability of the systems.

#### **5.1.2. Groundwater development**

Because USAID had had little experience in groundwater development, the groundwater component of the Small-Scale Irrigation Management Project was expected to be exploratory and experimental. The program's stated intent was to explore the

possibilities for increasing the irrigation potential of the participating provinces by developing numerous, small, groundwater systems that are both physically and economically sustainable by the users. More specifically, the program was designed to assist the government of Indonesia in developing and exploiting groundwater resources through the identification and construction of appropriate conveyance, operational and organizational systems. In addition, the project sought to strengthen and expand the private-sector role in this area of irrigation development.

Initial groundwater activity related to the Small-Scale Irrigation Management Project program was through observation of a pilot groundwater site in Nusa Tenggara Timur Province carried out in 1986–87. Reports on this activity served as a history on possible accomplishments and problems. Implementation of the project's groundwater program started slowly, with progress lagging far behind the schedule and targets set forth in the project paper. Factors contributing to this situation included the lack of appropriately trained groundwater development project staff assigned to the Small-Scale Irrigation Management Project subproject area, a weak groundwater development project provincial management structure, a lack of necessary technical equipment, and a lack of incentives to motivate staff performance. Also, the demands of the survey, investigation, and design activities for the surface water programs meant that the technical assistance staff was unable to devote as much time to the groundwater program as would have been desirable.

Compounded delays as a result of staffing deficiencies was one of the many problems encountered in the preparation of the annual operating budget and annual operating budget request for financing the programmed activities. Both the groundwater development project and the technical assistance staff found the required communications and coordination for the issuance of USAID funding difficult. The level of contribution for the USAID portion of the groundwater development project provincial groundwater budgets (approximately 4 percent for Indonesian fiscal year 1991–92 in Nusa Tenggara Barat) was seen as disproportionately low for the effort required for its successful processing. Therefore it was given limited effort and priority. In addition, the government of Indonesia's procedures for implementing groundwater drilling were often not compatible with USAID regulations. For example, the groundwater development project often leased its drilling rigs to drilling contractors for use on contract work that it had funded. This practice was determined by USAID to be unacceptable for the Small-Scale Irrigation Management Project drilling activities, and the USAID legal officer subsequently refused to approve payment for twenty-five wells already drilled under this procedure.

The midterm evaluation of the project in November 1989 identified these problems, among others, as serious constraints to program implementation. At the workshop held in February 1990 to review the midterm evaluation, solutions to the above-mentioned problems were sought. But no decisive plan of action resulted.

The USAID director's implementation review of the Small-Scale Irrigation Management Project, completed in March 1991, presented a number of recommendations for the project's groundwater component, including that

- \* all groundwater activities in the Nusa Tenggara Barat province were to be phased out in Indonesian fiscal year 1991-92;
- \* there was to be no extension for groundwater activities beyond September 1993;
- \* drilling of exploratory wells with USAID funds was to be discontinued after Indonesian fiscal year 1991-92;
- \* all construction of irrigation systems was to be under a fixed percentage reimbursement agreement;
- \* the government of Indonesia was to make every attempt to field a water users association program in Nusa Tenggara Timur in 1991;
- \* USAID would continue to provide technical assistance in Nusa Tenggara Timur and SulSel through the project activity completion date;
- \* the government of Indonesia was to prefinance and contract local consultants to assist in irrigation design, construction supervision and the water users association organizers program;
- \* the National Pump Irrigation Study should continue to receive high priority.

The 1991 director's implementation review resulted in major changes to the Small-Scale Irrigation Management Project groundwater program. Primarily in order to reduce management intensity, groundwater activities in Nusa Tenggara Barat were phased out at the end of Indonesia's fiscal year 1991-92. Project activities continued in Sulsel and Nusa Tenggara Timur with exploratory and production drilling in Indonesian fiscal year 1991-92 and distribution system design and construction carried out during Indonesian fiscal year 1991-93. During the period 1991-92, an intensive effort was made to accelerate the program's implementation. To accomplish this the site selection process was modified. The process in use was a sequence of site selection, based on resource exploration, followed by a development program. The new process was to site exploration wells so that they could be easily converted

to production if the well yield proved adequate. This process was soon incorporated into groundwater activities outside of the Small-Scale Irrigation Management Project area.

#### **5.1.2.1. Nusa Tenggara Barat**

In Nusa Tenggara Barat, groundwater development was programmed in five alluvial plains on Sumbawa. In some of these areas, groundwater was traditionally used for intensive dry season agriculture. As in the other two provinces, exploratory drilling was delayed by the lack of drilling equipment and the lengthy process of contracting for drilling. Additional delays were experienced when the decision to procure drilling rigs under the Small-Scale Irrigation Management Project was reversed in favor of supporting the entry of the private sector into the drilling activities. This meant that instead of the groundwater development project carrying out drilling activities directly, it would lease its equipment for contract drilling. However, because USAID did not agree to fund contract drilling, only six wells had been drilled by Indonesian fiscal year 1991–92, all of which were funded by the government of Indonesia. This lack of agreement on how to proceed contributed to USAID's decision to phase out the Nusa Tenggara Barat groundwater program at the end of Indonesian fiscal year 1991–92.

#### **5.1.2.2 Sulawesi Selatan**

In South Sulawesi, the hydrogeological reconnaissance and surveys by the technical assistance consultants selected 860 ha in five subdistricts for further development. Eighty-one wells were planned for construction over the four-year period from 1990–91 to 1993–94. Implementation of the SuSel program was somewhat more successful than that of Nusa Tenggara Barat. The program focused on developing intermediate wells (10 to 30 meters deep), with accompanying pumping and delivery systems. In addition some dug wells were also attempted.

Site selection in this province was somewhat problematic because difficulties were experienced in matching technical and administratively convenient areas. This was primarily due to the lack of baseline data on aquifers and because there was minimal indigenous groundwater development for irrigation in the areas selected.

The original plan for Phase II of the technical assistance contract was to develop ten sites located in both Regencies. Site selection was carried out jointly by

the technical assistance team, local consultants, and the groundwater development project. The program included site selection, establishing water users associations, and monitoring and evaluation of each system. Of the ten systems programmed for construction, eight groundwater sites were completed, and water users associations were established. The water users association members participated from project design through operations and maintenance activities. Exploratory drilling was carried out under the guidance of the technical assistance team's hydrogeologist.

The process of well exploration to production was first decided upon after the completion of geophysical logging, pumping tests, and water quality determinations. This process was again supervised by the technical assistance team's hydrogeologist. The groundwater development project benefited from this process because technically improved equipment was acquired and used, improved methods were adopted, and staff training was carried out.

Based on the results of these tests, eight wells covering approximately 84 ha were identified for development to production. Distribution systems were designed by a local consultant and contracted for construction during Indonesian fiscal year 1992-93. Well construction was completed by contractors supervised by local consultants. The construction contract included pump houses, distribution systems, fences and access roads.

With reference to operation and maintenance of the developed systems, the water users associations formed for this reason, received training from the groundwater development project until the farmers became reasonably acquainted with all aspects of operation. The groundwater development project retained overall management and operations and maintenance responsibility for a period of two years after construction, during which time it financed the full cost of pump operation. After this period the facilities were handed over to the water users associations for their direct management. The water users associations were provided with an operation and maintenance manual for both the pump and the distribution system to guide them. An hourly pumping fee was determined to finance the operation and maintenance of the pump.

The evaluation team visited two well sites in Bone. The difference between these two sites was a direct indication of how important the farmers' and water users association's response to operations and maintenance is in determining the sustainability of a system. At the first site the pump was running, seemingly unattended,

with the water flowing across a field to an area outside of its designed delivery area. As would be expected, the wastage was great. However, this seemed to bother no one. It could not be determined if the farmer would be paying for this water.

At the second site the situation was quite different. Water was being delivered to a farm through neatly constructed furrows and followed by members of the farmer's family who ensured that the water was delivered to its intended destination, the plants' roots. The marked difference between operation of these systems and water applications and efficiencies was a good indication of the need for effective monitoring of the systems by the water users associations.

### **5.1.2.3. Nusa Tenggara Timur**

In Nusa Tenggara Timur, project activities focused on the island of Timor, on the Oesao and Pariti Plains at the head of Kupang bay in the western part of the Island. In Nusa Tenggara Timur the first wells oriented to irrigation development were installed in 1985–86. Subsequent to identification of the Oesao Pariti Plains in the 1985 USAID project paper, studies under phase I confirmed significant potential and guidelines for site selection and training were given to the Groundwater Development Project staff by the technical assistance team.

During the project implementation period, sixty-three wells were dug, three wells were obtained from the local authorities, thirty-seven wells were placed into production and thirty-six irrigation distribution systems were developed. Five wells were dug by the farmers, on their own initiative, with assistance provided to them in the form of technical advice and cement. Three wells drilled under the Italian Aquafer project earlier were also acquired for irrigation system development.

During Phase 1, the technical assistance team designed seven irrigation systems which were to be used as demonstration and trial areas. Having established a standardized design process, the designs of the remaining systems were handed out to a local consultant. Based on the standardized designs developed by Small-Scale Irrigation Management Project, the Groundwater Development Project staff was able to complete designs for an additional seventeen irrigation systems to be funded by other donors.

In the Small-Scale Irrigation Management Project–USAID systems, buried pipes were selected as the best options for conveying water to the distribution points.

This decision was influential in encouraging a changeover nationally from open surface channels to buried pipe systems.

Construction of the distribution systems was carried out by contractors, using local farmers. The farmers have proven to be adept as laborers in the construction of both wells and distribution systems. A common problem in the irrigation system construction was that of delays in the issuing of project implementation letters by USAID. On some occasions these delays resulted in construction being carried out in the wet season which meant a longer construction period and quality problems.

Under the Small-Scale Irrigation Management Project, the Groundwater Development Project gave operation and maintenance assistance to the farmers for the first two years. Following this, the operation and maintenance of the system becomes the responsibility of the farmers themselves. The Groundwater Development Project has carried out training of the farmers during this period in order to ensure that they have the capability to sustain operations and maintenance of the systems. Farmers in some areas have shown their readiness to enter the irrigated agriculture arena by constructing their own dug wells and purchasing pumps. In this, they are given technical support and encouragement by the Groundwater Development Project, which has recognized the potential and need for coordinated development of groundwater resources.

In the area of improving the capability of the Groundwater Development Project staff, there was agreement that the technical assistance team carried out on-the-job training in all aspects of groundwater and irrigation system design and development. Throughout all the technical and administrative processes, the technical assistance team worked closely with the Groundwater Development Project's project management and staff and assisted in whatever way they could. This included technical advice, equipment sharing and the provision of material items. Even more important was the technical assistance team's influence in emphasizing the importance of farmers input and agronomy training in irrigation development.

#### **5.1.2.4. Conclusions—groundwater program**

Evaluating the groundwater component of the Small-Scale Irrigation Management Project and how its implementation impacted irrigation development is best examined on a site or provincial specific basis. Overall there is little question that the project contributed to the continuing development of groundwater for irrigation uses.

The program's contribution to the improvement in delivery system design and the utilization of buried pipe systems has been favorably recognized and commented on.

In Nusa Tenggara Barat, the inability to come to administrative and procedural agreement did not seriously reduce the development of wells in the province, as groundwater development continued with funding from other sources. USAID's decision to discontinue the Nusa Tenggara Barat program and consolidate activities in the other two provinces seems to have had merit as progress greatly improved subsequently.

In South Sulawesi, the impact of the Small-Scale Irrigation Management Project program was difficult to determine. As discussed earlier, the two sites visited showed such large differences that it was difficult to draw any conclusions. Discussions with the Groundwater Development Project staff indicated that they welcomed the Small-Scale Irrigation Management Project approach to groundwater irrigation development, which included active participation by the farmers at all stages and encouraged continued communication with the farmers even after all construction was completed. However, they indicated that, from a technical standpoint, there was little that the Small-Scale Irrigation Management Project contributed toward improving their technical capabilities.

In Nusa Tenggara Timur the situation was not much different physically, but was markedly different in enthusiasm and support for the concept and approach of the Small-Scale Irrigation Management Project program. The groundwater development project staff was forthright in their praise for the holistic and participatory approach to groundwater irrigation development that was encouraged and supported by the Small-Scale Irrigation Management Project. Groundwater development for municipal and irrigation use was not new to this province. What was new was the idea that the farmers were consulted from the inception of activities and that they were supported in organizing into users groups and given advice and assistance in moving from one rain-fed crop to three irrigated crops annually. This transition was not always successful but there was a definitive feeling of pride when the Groundwater Development Project staff conducted a tour of the Small-Scale Irrigation Management Project area. The managers are intent on making the Small-Scale Irrigation Management Project concept and implementation approach the basis for new groundwater activities in the province.

The private-sector input was encouraged and supported in all phases of this

project component. Almost all groundwater drilling, design, and construction activities were carried out by local consultants and contractors, who benefited from supervision by project personnel and the technical assistance team's assistance throughout project implementation.

### **5.1.3. General conclusions**

Water resources services personnel in the three Small-Scale Irrigation Management Project provinces are well experienced in constructing weirs to divert river flow for irrigation. However, they have limited experience in designing and constructing dams for irrigation during the dry season. The overall project envisaged the transfer of knowledge for designing and constructing dams as well as managing water to permit varied cropping patterns throughout the year. The first of these purposes was eliminated by USAID's decision to construct only two subprojects, both of them weir diversions. Yet the completion of designs for Tiu Kulit and four other subprojects gave the provincial water resources services and the local consultants an opportunity to carry out survey, investigation, and design for dam projects, and the construction of Tiu Kulit by Overseas Economic Cooperation Fund and its subsequent operation by the provincial water resources service give proof of the adequacy of the design.

The extent of knowledge transfer and improved engineering capabilities was then more related to improving the survey, investigation, design, construction management, operation, and maintenance processes. The preparation of site profiles, rapid rural irrigation appraisals, and project justification reports are good examples of the improved survey, investigation, and design process accomplished by the project. Under the Small-Scale Irrigation Management Project's projects in SulSel and Nusa Tenggara Barat, the survey, investigation, and design process has moved from engineering justification to the development of a system for appraising the engineering, social, and economic feasibility and sustainability of a project before construction.

Construction management in these projects improved over the life of the project, and presumably the lessons learned will be carried over to other projects. Both private-sector consultants and contractors and Department of Public Works staff were encouraged to see construction scheduling and system operation in a broader sense. This was especially with reference to staged completion, allowing partial system operation before final completion. The need to plan activities and a corresponding cash flow carefully was also identified as an area in which improvement was required, and improvements were accomplished.

Unfortunately, the late construction of the system did not allow for a proper evaluation of whether improved operations and maintenance procedures and programs are in place. The prepared operations and maintenance manual presents a theoretical base for this; but from initial observations the administrative and financial bases are not in place to support the required activities. This situation must be resolved before the question of whether the system's infrastructure and its operations and maintenance are sustainable can be adequately addressed.

To date, the application to other irrigation projects of improved implementation procedures developed under the Small-Scale Irrigation Management Project by the Directorate General of Water Resources Development has not been fully established. Within the Directorate General of Water Resources Development there appears to be a lack of coordination or consensus as to what, exactly, coming out of the Small-Scale Irrigation Management Project can be viewed as beneficial. The impression is that there has not been any forum for discussion of this subject. Individuals have indicated their opinions and impressions, but not, apparently, for policy or procedural development purposes. From initial discussion with the Construction and Evaluation sections of the Directorate General of Water Resources Development, the sense is that there were procedures and methods utilized on the Small-Scale Irrigation Management Project that merited in-depth evaluation by the concerned suborganizers to determine how these could be adapted or assimilated into other projects implemented by the Directorate General of Water Resources Development. To what extent discussion or evaluation of these will be carried out is not known at this time.

These procedures and methods include:

- \* Farmers' participation from project inception, in site selection, investigation, survey, design, construction, operations, and maintenance.
- \* More technical activities being supervised at the provincial level.
- \* Increased utilization of local consulting and contracting firms at both the national and provincial levels.
- \* The use of nongovernmental organizations in organizing and promoting farmers' participation in project implementation.

The Small-Scale Irrigation Management Project, at the time of project development, included objectives that soon became an integral part of the Directorate General of Water Resources Development decentralization program. It is not clear

what part the project played in promoting these concepts and procedures. This evaluator could not determine whether this process was incubated from the Small-Scale Irrigation Management Project formulation or whether this was natural management restructuring reacting to stress on centralized facilities and personnel.

At the provincial level this issue was somewhat clearer. At both Kalimantan II and Awo, the provincial water resources services managers were quite vocal in their support for and intention to use on future projects many of the planning, management, and technical policies and procedures that they learned from the Small-Scale Irrigation Management Project implementation, especially those relating to decision making at the provincial level and the inclusion of beneficiaries in this process from project investigation through operations and maintenance .

With reference to the objective of sustainable surface and groundwater irrigation systems operating in the three provinces and demonstrating principles underlying this project—again, an unqualified answer to this issue could not be determined at this time. With regard to groundwater development in the three provinces, project implementation met with varied degrees of success in areas identified for development. Groundwater programs in these provinces are ongoing, with an increased awareness that the beneficiaries must be involved in all aspects of project development. This was brought about by the Small-Scale Irrigation Management Project program and will play a significant role in the sustainability of the systems, especially with regard to site selection.

The two surface irrigation systems at Awo and Kalimantan II are a different matter. On completion of construction activities, many of the principles underlying the objectives of the project had been met, though in varying degrees. Decentralization during design and construction and beneficiaries' input into design, construction, operation, and maintenance were instituted to some degree during project implementation. The systems were constructed to design and operational criteria that were determined as feasible and viable. During the first full irrigation season for both of these systems they were operated as designed, although this was fully funded by the project and under the guidance of the technical assistance team. As the systems move from construction to operations and maintenance funding, the question of sustainability will again arise. However, this should not be with regard to the physical system because its operational viability has been proven.

The issue of a sustainable operations and maintenance program, including irrigation service fees (ISF), being established in the project systems was a matter of

great concern for the evaluation team. A sustainable operations and maintenance program must have the financing required for recurring and preventative maintenance. It is a reality that, on a national level, financing for operations and maintenance of irrigation systems is often underfunded. Presumably the government of Indonesia and donor operations and maintenance programs will be available for assistance, but a clearly defined approach did not appear to be in place for either Awo or K II. (A more detailed description of the operations and maintenance situation is given in section 5.2.4.)

The irrigation manuals prepared by the technical assistance team and used for operations and maintenance implementation give in-depth guidance and procedures concerning the maintenance activities and corresponding timings required to sustain the system at its effective capacity. This is not a new activity for the provincial operations and maintenance staff because this process is carried out annually. Throughout the evaluation, the issue of adequate funding for operations and maintenance activities was raised but was never fully resolved to the satisfaction of the evaluation team.

With reference to provincial irrigation departments having the authority to make decisions concerning site selection, design, and construction of irrigation systems—at the present time, the authority for project development is held at the provincial level. The provincial water resources service staff identifies possible development undertakings and initiates discussion with the Directorate General of Water Resources Development for the financing of investigation, feasibility activities, and study. If this is forthcoming, then the provincial water resources service is responsible for implementing the activities leading to survey, design, construction, operations, and maintenance. As the size, complexity, and cost of the system increase, the need for more involved technical input results in increased advisory and supervisory input or responsibility being retained at the central level.

## **5.2. Beneficiary participation**

In the Small-Scale Irrigation Management Project Amendment No. 1, the stated project purpose is “to increase the capacity of irrigation agencies and farmer groups to implement sustainable irrigation systems in selected Eastern Islands.” To this end the project calls for the formulation and refinement of a strategy for the formation and support of water users associations for both surface and groundwater irrigation systems through the agency of water users association organizers provided by non-

governmental organizations, which were contracted for that purpose. Ultimate success in the achievement of this project purpose is to be judged by the formulation of a strategy capable of being replicated by the government of Indonesia in other projects and locations. Achievement of this project purpose is also related to the introduction of an Irrigation Service Fee (ISF) in project locations. The scope of work defining the evaluation addresses these policy issues by requesting the team to

- evaluate the extent to which farmer participation—through water users associations—from the design through operations and maintenance stages has been achieved
- identify the issues which remain to be resolved and the steps being taken to resolve them
- determine the extent to which sustainable operations and maintenance, via implementation by farmers—i.e irrigation service fee is capable of being implemented prior to the project activity completion date, and, if not, to identify what further issues will remain to be resolved.

#### **5.2.1. The water users association organizers concept and strategy for water users association development**

USAID experience with the water users association organizers concept had its origins in the earlier High Performance Sederhana Irrigation System Project (HPSIS) which introduced the use of community organizers (COs) employed by either Public Works or the Agriculture Service to attempt to alleviate irrigation system management problems through a program of creating and strengthening water users associations. This also marked the beginning of the shared experience in this area between USAID and the Institute for Social and Economic Research, Education, and Information (LP3ES) which was to be continued for surface water development under the Small-Scale Irrigation Management Project. (The Ford Foundation was also a partner in this activity and continues to be a supporter and collaborator with both USAID and the Directorate General of Water Resources Development in this area.)

A special study funded by the Small-Scale Irrigation Management Project (see Assiz et al., in the bibliography) reviewed this early experience and concluded that water users associations continued to exist only as long as there was some specific task or function assigned to them. In all but one of the Sederhana or High-Performance Sederhana Irrigation Systems sites included in the study—with or without the

benefit of community organizers' assistance—water users associations failed to last much beyond the end of the project. Yet the Assiz study goes on to point out that the involved government of Indonesia agencies became less resistant to the idea of using mediators to foster and support water users association development and even to the use of nongovernmental organizations in this process. The study also concluded that the lack of water users association sustainability resulted from the community organizers' failure to plan and institute a viable program of operations and maintenance which might have sustained them. A similar point that water users associations which are externally fostered are only maintained as long as they have some design or construction function to serve is also made in Max Goldensohn's study of water users associations in Asia and Egypt (see Goldensohn).

The Small-Scale Irrigation Management Project approach called for the formation of embryonic water users associations at the survey and design stage of each surface water irrigation system, followed by a process of membership expansion and institutional formalization to parallel the transition of system development from design to construction and on to operations and maintenance. Although extensive surveys were done for a number of tentative sites in South Sulawesi and Nusa Tenggara Barat, actual farmer group and water users association organizational activities came to be limited to those three locations where Small-Scale Irrigation Management Project construction activities were actually undertaken—Awo in South Sulawesi and Kalimantan II and Tiu Kulit in Nusa Tenggara Barat. One common bond among these diverse locations was provided by the fact that the Institute of Economic and Social Research, Education, and Information was contracted to provide, train, and supervise water users association organizers for all three locations.

The basic steps which characterize the approach developed were: (1) the identification of a basic operational or sociological unit of farmer interest—e.g. a potential tertiary block or prior rainfed hydrological unit—which would form the basis for a farmer participation group (KPP); (2) the further clustering of farmer participation groups to form a larger farmer participation group cluster (KPPG) of an appropriate size and composition to form the basis for the formation of a water users association; and (3) the actual formation, formalization, and support of water users associations and their ultimate nesting in common interest federations. The actual succession of stages and their manifestation, in fact, varied from one location to another in ways which both betray problems to be addressed by the approach, as well as significant variation in the social milieu and technical circumstances.

Succession from one stage to the next was also linked to the progression from

one engineering phase to the next in project development. Farmer participation in the design of tertiary and quaternary system components was matched by only the most preliminary efforts at formal organization. Review of design information and simplified drawings and the conduct of system “walkthroughs” was sometimes limited to the informal leaders of the various farmer participation groups, which would be expected to pass on this information to their larger farmer audiences and solicit their comments. Similar use of these identified leaders was characteristic of farmer participation group clusters involvement in the mobilization of farmer participation in the construction phase for the provision of raw materials, facilities, and actual farmer labor. These leaders negotiated with contractors over terms and levels of resources required and then assisted in mobilizing the required forces from among their respective memberships.

At the same time, these farmer participation group clusters were being prepared for full-fledged water users association status. In some cases the extent of formal organization achieved at this stage was indicated by the willingness of farmer group members to commit all or part of their compensation for labor and services to the unofficial treasury of their embryonic water users association. The process of water users association formation was allowed to develop slowly in order to allow for the building of a sense of belonging among the membership. Simultaneous engagement in the process of physical construction—both main and tertiary systems—also aided in providing concrete evidence of the benefits to be derived from active participation in the affairs of the water users association.

The most difficult phase was only reached when the physical requirements of system construction had been met and the newly formed water users associations passed to the operations and maintenance phase—often without a comparable clearly marked transition on the part of the project organization which had guided development up to that point. The final organizational demands were met when the newly formed water users associations were recognized in a formal decision of the district chief (Beeped) that they should be registered as legal entities—capable of entering into contracts, borrowing money, and maintaining bank accounts—with the district court, and organized into federations for purposes of collective representation. All of this is a prerequisite to the introduction of the irrigation service fee, which is intended to extend farmer participation in operations and maintenance to the primary and secondary canals of the system and provide a routine source of need-based budgeting to, at least partially, displace the existing, inadequate system of project-based subsidies.

The overall design of Small-Scale Irrigation Management Project called for a roughly comparable line of water users association development to be followed by the groundwater sites in South Sulawesi, Nusa Tenggara Barat, and Nusa Tenggara Timur. But in those instances the more speculative nature of groundwater development and the significantly smaller size of the systems under development seem to have called for an even more tentative movement toward formalization and less need for institutional complexity. It may also be that preoccupation with the technologies of exploration and exploitation left the questions of farmer organization to be treated as an afterthought. It was noted by the evaluation team that only in the case of Nusa Tenggara Timur was prior consideration given to the type of nongovernmental organization involvement in water users association organizers development, which had become characteristic of the surface water sites.

The preceding is a summary review of what the evaluation team believes to have been the model which was developed for introduction by the Small-Scale Irrigation Management Project. It should be noted that not all elements of this model were apparent at the outset of the project and that some modifications were made while the project was in progress. What remains to be seen in the following sections is the extent to which introduction of this model was successful in achieving the project purpose with respect to the specific points raised above. It was noted earlier that implementation seems to have varied in some significant ways from one location to another and it may be that this variation (and its causes) points the way toward some of the areas of continuing concern which remain to be addressed.

#### **5.2.2. Water users associations and water users association organizers in surface water systems of South Sulawesi and Nusa Tenggara Barat**

The three surface water irrigation systems constructed under the Small-Scale Irrigation Management Project range in command area from 2,815 ha at Kalimantanong II (K II) (this includes 479 ha in Kalimantanong I (K I) that receive supplemental water from K II), a roughly comparable 2,605 ha at Awo to 1,800 ha at Tiu Kulit. The table below shows a comparison of these systems with respect to tertiary blocks, water users associations and water users association organizers support. (The K II figures do not include the 479 ha in K I nor the three water users associations that were established by the farmers in that area.)

System	Water users association organizers	Total ha	Water users associations	Farmers/ farm HHs	No. KPP/ tert. blks.
Awo	7	2605.3	17	2008	56
K II	6	2336	17	2181	54
Tiu Kulit	6	1800	17	1124	22

Source: Social and Institutional Consultancy for Recruitment, Training, and Management of the Water Users Association Organizers Programme within the Framework of the Small-Scale Irrigation Management Project, Phase II (Jakarta, May 11, 1994)

Field observations at the Awo site gave the impression that the composition of this system was more complex with respect to water users association organization. Delays in contracting with Institute for Economic and Social Research, Education, and Information resulted in the initiation of water users association organizers activities some six months after the design consultants had completed their work. To compensate for this gap a design review committee was set up by the project to review farmer inputs and proposals for design modifications. It appears that, while these design reviews emphasized contact with the informal leaders of the 56 KPP, which had been identified at this stage, they were successful in generating a large number of technically acceptable modifications. Approximately 80 percent of those proposed were incorporated into the designs. A similar indirect approach appears to have dominated negotiations with contractors for farmer participation in the provision of raw materials, labor and other services. When ordinary farmer-members of the water users associations were queried by the evaluation team on their participation in design review or contact with contractors, most were unable to respond without some prompting from their informal leaders. However, this may have been due to the fact that most of the farmers in that area do not speak Indonesian, but Buginese, the local dialect.

Following the design and construction activities, the KPPGs experienced an expansion of ordinary membership as well as a process of institutional formalization. This included election of officials, drafting of the water users association by laws, application for recognition by the Bupati and preparation for legal recognition by the district court. The resulting organizational structures give the appearance of being large and complex, with several layers of officers imposed on the more operational

level of tertiary or quaternary membership. For example, one of the larger of the water users associations observed in Awo was made up of six tertiary blocks, with each, in turn, further subdivided into two to five quaternary blocks. The representation of each of these levels on the organization chart by at least a block chief results in more than twenty water users association officials among a total membership of 186. It also results in a loss of operational focus at the important tertiary and quaternary levels and an increasing danger that members will lose faith in the organization's commitment to their needs.

Discussions with water users association organizers, water users association officers and farmers at both Kalimantan II and Tiu Kulit left a rather different impression, which is not necessarily supported by the numbers involved. While the numbers indicating the size and complexity of water users associations in Kalimantan II appear to be quite similar to those at Awo, the impression created was one of clearer operational lines and greater organizational effectiveness. At Tiu Kulit the smaller size of the command area and its constituent blocks has made for a smaller water users association average size. The important point here is that ideally water users associations should be small enough to be operationally self-contained and to generate a true sense of ownership among its members. Large units with several organizational layers tend to be directed from above and are more suitable for serving the control needs of external authorities than the needs of the members. It is always possible to serve the collective needs of more than one water users association by nesting and creation of increasingly larger federations of water users associations. This has already been accomplished in the case of the newly formed Left and Right Bank water users association Coordination Forums at Kalimantan II. (However, most problems thus far presented to these forums appeared to be those that should be solved at the water users association level; this raises doubts as to whether the forums are needed at this time.)

**Conclusion:** The stratified organizations formed—at least at Awo and Kalimantan II—may be too complex to express and channel the real needs and interests of their farmer members.

**Recommendation:** Efforts should be made to determine the optimal water users association size and level of organization for farmers to manage their own irrigation operations. Observations from other countries have noted that the tertiary or even the quaternary block is the most appropriate level for basic operations.

The Small-Scale Irrigation Management Project experience to date with the functioning of water users associations during the design and construction phases do not provide a very good basis for judging performance in the more demanding operations and maintenance phase. Although in both Awo and Kalimantan II, some parts of the system have been in operation long enough to provide some experience with and training in proper operations and maintenance procedures, the planned period of water users association organizers support for two to three planting seasons will not be realized throughout these systems prior to the project activity completion date. Care must be taken that water users associations in the Small-Scale Irrigation Management Project areas do not experience the same decline noted in the HPSIS Study because of the lack of a concrete operations and maintenance program.

There is also ample evidence of disagreement among concerned parties over just what role water users associations are intended to play and what type of "technical" direction and assistance needs to be provided by water users association organizers. Also noted were differences in the present and future status of water users association organizers between provinces. In most cases the water users association organizers recruited by Institute for Economic and Social Research, Education, and Information are generalists with little formal training in either irrigation engineering or irrigated agriculture. Recruitment in South Sulawesi and Nusa Tenggara Barat differed on this point and on the question of whether or not they should be drawn from government service. In Nusa Tenggara Barat a number of water users association organizers were drawn from the Provincial Water Resources Service and the Regional Development Planning Board (BAPPEDA), while recruits in South Sulawesi came solely from private sector backgrounds. In either case it was the intention of the program to overcome this lack of formal technical qualifications by not only providing some training in technical matters, but by emphasizing the role of water users association organizers as facilitators who would encourage interaction between water users associations and the government of Indonesia's technical agencies that bear responsibility for such extension activities. The effectiveness of such coordination efforts seemed to vary between the two provinces.

While the project and the technical assistance team were able to attract the attention and participation of both agricultural extension agents and irrigation overseers and gatekeepers in their demonstration activities in both provinces, water users association organizers were less able to solicit such participation in their water users association meetings and activities in South Sulawesi than in Nusa Tenggara Barat. In both provinces, water users association organizers expressed some frustration over

the extent to which farmers expected them to be capable of providing advice on agricultural matters and the difficulties they sometimes encountered in attempting to get agricultural extension workers to respond to these demands. There also appeared to be greater consensus among water users association organizers and government of Indonesia agency personnel on the role of water users association organizers in Nusa Tenggara Barat than in South Sulawesi. As the project cycle has advanced from design to construction and has now just entered the operations and maintenance phase in both locations, the need for coordination with technical agencies is expected to increase and both water users associations and water users association organizers must shift the focus of their activities to facilitate this coordination.

Many of the early organizational efforts by water users association organizers have entailed either responses to the engineering demands of system design and construction or efforts to conform to legal and procedural rules for establishing water users associations and getting them registered. Those activities have been time consuming. Now, after almost five years of rather steady and intense effort, the systems are only now entering the stage of operations and maintenance where the demands for flexibility on water users associations are likely to increase. A single example of the differences in the skills which water users association organizers have attempted to instill may be seen in the case of the financial arrangements which have been introduced to water users associations and the challenge which they now face in adjusting and adapting those arrangements to a needs-based budgeting system.

An interview with one of the quaternary block chiefs — who was encountered in the process of cutting grass and cleaning the canals in keeping with his responsibility for operations and maintenance at his level of the system—produced the revelation that officials at all levels were scheduled to receive some level of compensation from the postharvest fee to be collected from each water users association member for purposes of operations and maintenance. This cursory review of the planned allocation of such fees appeared to make only scant provision for the larger and more long-term needs of system maintenance in comparison with the more immediate demands of system operation. At the same time it was observed that there was already substantial damage to two of the control structures which would require repair. It was acknowledged that the repairs were needed and would be done, but a special allocation of funds was being sought from the village government for that purpose. Significant variation in the level of fees proposed for collection by water users associations does not appear to be based on any rational calculation of the level of expected expenditures and the only real cost calculations which have been done

are of the expected payments to be made to each water users association official. Of course it must also be remembered that much of the area covered by these projects has yet to produce the first crop and even in the areas which have been operating for several seasons the reliability of water supply has been erratic. This has resulted in delays in attempts to even assess the fees on which agreement has already been reached.

**Conclusion:** Following five years of water users association organizers support for water users association establishment and development the Small-Scale Irrigation Management Project systems are only now beginning to experience the critical phase of operations and maintenance. It is during the early period of adjustment to this phase that these organizations are in greatest need of adjustment and support to meet new challenges.

**Recommendation:** Consideration ought to be given to the design of a follow-on program of support for water users associations during the critical period of early operations and maintenance.

### **5.2.3. Water users associations and water users association organizers in the groundwater systems of South Sulawesi, Nusa Tenggara Barat and Nusa Tenggara Timur**

Differences in the technology or engineering approach followed by the Small-Scale Irrigation Management Project in identifying and developing sites for groundwater exploitation called for some differences in the approach to water users association formation and development as well. The most fundamental of these differences lies in the transition from survey and design to construction. In the case of groundwater wells, drilling is completed before there is a clear indication as to whether a distribution system is feasible. This requires that the initial approach to farmers in a particular location must take care not to imply a promise or commitment to the delivery of irrigation water. It also dictates that the exact coverage of such a distribution system can only be determined after the capacity of the well is established. Pre-construction surface water surveys allow for much greater certainty with respect to the dimensions and capacity of a proposed system which can be used to prepare farmers for their later role in system design, construction and operations and maintenance.

In at least two of the Small-Scale Irrigation Management Project provinces—Nusa Tenggara Barat and South Sulawesi—this may have led to a preoccupation

with the engineering features of groundwater exploration and delivery, leaving concern over farmer participation and distribution systems as an afterthought. The evaluation team was unable to determine the details of groundwater activity in Nusa Tenggara Barat, other than to confirm that no work had been approved for reimbursement and no sites were included in the field visit itinerary in that province.

In South Sulawesi, the original project paper called for the Small-Scale Irrigation Management Project to establish the groundwater project organization and activities in the province, but delays in Small-Scale Irrigation Management Project implementation led to that distinction being claimed by a World Bank project. Nevertheless, the Small-Scale Irrigation Management Project was certainly involved in some of the very early groundwater work in the province; the novelty of the engineering aspects of that work probably led to less than full attention to the sociological aspects of farmer organization.

Groundwater development in South Sulawesi was contracted out to two private firms, which had responsibility for construction services and water users association formation and development and agricultural demonstration, respectively. The few sites that the evaluation team visited in Kabupaten Bone varied in the extent of distribution system development and gave little indication of the presence of active water users associations.

The second characteristic of groundwater systems is that they are much smaller and more direct in their delivery of irrigation services to individual—or small groups of—farmers. This can be either an advantage or disadvantage with respect to farmer organization. The primary advantage lies in the small, cohesive nature of the group, which needs to identify their common interest in the design and operations and maintenance of the system. Once the system is fully constructed and operational it is virtually within the control of the water users association or farmer group in a way that is seldom true of surface water systems. The two-year period of subsidy for fuel and other operating expenses and the longer period of guaranty against major pump repairs do not detract from the fact that day-to-day pump operations are largely under the control of the water users.

The disadvantages to the water users or water users association lie in the relatively high operating and replacement costs that must be borne by the members of a typically small system. In spite of the speculative nature of groundwater drilling, once a well has been proven to deliver it is necessary that the farmers be organized

to exploit its full irrigation potential. It takes time to convince farmers—particularly if they have no prior experience with groundwater irrigation—of the reliability of water supply and the need for new agricultural practices and discipline in planting and cropping patterns. The need for capital for land preparation and inputs also means that farmers may only be able to utilize part of their land under the new system. This also implies the need for some external agency to assist in the organization of these small groups of farmers and the need for such efforts to deal with large numbers of small, fragmented systems instead of the large, cohesive systems that characterize surface water irrigation.

Efforts at groundwater exploitation by the Small-Scale Irrigation Management Project in Nusa Tenggara Timur appear to have differed substantially from those in South Sulawesi and Nusa Tenggara Barat both in organization and in the success achieved. There were no surface water activities planned for Nusa Tenggara Timur, and it was, therefore, less likely that competition for technical assistance and other scarce resources would detract from the attention devoted to the groundwater program. But it is also likely that Nusa Tenggara Timur groundwater activities benefited from a long period of advance preparation, which included careful attention to the needs of social organization. Both during the early preparation of the Small-Scale Irrigation Management Project design and in the interim period before the Harza technical assistance team was in place, USAID had provided technical assistance under personal services contract arrangements, which emphasized the problems of social organization and the groundwater situation in Nusa Tenggara Timur. There is also evidence of an early concern for the demands of changing agricultural practices and the heightened need created for extension services, cropping pattern field trials, and demonstrations, which were only an afterthought in surface water sites.

Nusa Tenggara Timur was also the only groundwater site to be designated for implementation of a water users association organizer program with the support of a nongovernmental organization, which had become characteristic of the surface water sites in South Sulawesi and Nusa Tenggara Barat. The tensions over the appropriate role of water users association organizers and the skills that candidates ought to possess became even more serious here than in the previously cited experience in Awo and the other surface water sites. The water users association organizers program established by the nongovernmental organization, Yayasan Indonesia Sejahtera (YIS), was never able to overcome the perception that what was really needed in Nusa Tenggara Timur were cadres that could assist with the transition in agronomic practices. Yayasan Indonesia Sejahtera ultimately failed to produce an acceptable

proposal for continuation of its program and the Harza technical assistance team hired two water users association organizers and four assistants who possessed strong backgrounds in agriculture to continue the work.

**5.2.4. A replicable water users association organizers model, sustainable operations and maintenance, and introduction of irrigation service fee**

Whether a viable model for water users association establishment and support by means of water users association organizers intervention, which is capable of being widely applied by the government of Indonesia under either donor-funded or other projects, has been established under the Small-Scale Irrigation Management Project, is still undetermined. The belief that the Small-Scale Irrigation Management Project-water users association organizers approach has been successful in establishing water users associations which are capable of sustained activity is now widespread among decision makers and project implementation staff at all levels. In the surface water systems these organizations have already made substantial contributions during both design and construction phases, but the true test of their sustainability will come now that they have entered the phase of system operations and maintenance. It can not be ignored that the water users association organizers program of support at these sites has already been sustained continuously for five years and was initially planned to be continued for at least two-three planting seasons at the outset of operations and maintenance. While there have been some periods of relative slack during this time and it was possible to shift several water users association organizers from Kalimantan II to Tiu Kulit following the early intense organizational activities, water users association organizers have maintained a level of intense interaction with the water users associations over a much longer time than is typical of government of Indonesia approaches and activities.

The result has been a question as to whether this nongovernmental approach is not too expensive and time-consuming to prove viable for widespread application by the government of Indonesia in programs lacking donor support. It is likely that a compromise must be reached. First, the government of Indonesia must be convinced that the typical "scattergun" approaches, which are justified in the name of equity and form the basis of projects such as Proyek Tata Guna Air (a government of Indonesia program for water users association development), are simply more appropriate for providing a general introduction to the needs of water users association formation and support than they are for creating lasting institutions and achieving desired performance levels. (The Proyek Tata Guan Air project is widely viewed

as the standard approach for government of Indonesia efforts to establish and support water users associations and is comprised of seven training modules which are delivered by teams of local trainers to selected provincial, kabupaten, kecamatan, desa, and water users association groups.) On the other hand, it is unrealistic to expect that the government of Indonesia would adopt an approach which requires the high ratios of water users association organizers to water users associations over the five-year period, which is suggested by the Small-Scale Irrigation Management Project experience. It is more likely that a compromise solution would call for delaying water users association organizers involvement in the design review phase until construction schedules can be determined and increasing the number of water users associations to be supported by each water users association organizers as the cycle progresses from design to construction to operations and maintenance. There is cause for encouragement in noting the potential for further modification in these areas in combination with the finding that the average cost of providing water users association organizers Program support under the Small-Scale Irrigation Management Project was Rp. 280,000 per water users association organizers per year over the entire five year period. This cost calculation was presented as one of the primary conclusions of the National Workshop on the water users association organizers–Small-Scale Irrigation Management Project program in Bali. It compares favorably with the total per ha cost of new system development and the present standard in excess of Rp. 40,000 per ha, which is presently used for the Asian Development Bank and World Bank EOM (Efficient Operation & Maintenance) support programs.

It is noted elsewhere in this report that the evaluation team has reservations as to whether an adequate job is being done to guarantee the timely implementation of a program of operations and maintenance for the main structures of each system. The team did note substantial physical evidence of routine maintenance being performed at tertiary and quaternary levels of the systems, but also observed that more serious damage or maintenance needs were being deferred. Delays or the absence of provision for introduction of a routine program of operations and maintenance will undermine the performance of water users associations in this regard as well. Failure to clearly identify the operational units responsible for system operations and maintenance leaves the farmers and water users associations with only partial systems for which they can assume responsibility and a level of uncertainty about the larger questions of systems operations which can only undermine their confidence in the reliability of those operations.

Government of Indonesia policy in this area provides no easy solutions and it

should not be surprising that the respective project officers of Awo and Kalimantan II have drawn rather different conclusions about how best to deal with these conditions of uncertainty. In the case of Awo, efforts will be undertaken to fully exploit the recommended government of Indonesia program of postconstruction transition to routine operations and maintenance, which consists of:

- (a) PROM (preparation for operations and maintenance): approximately two years of software development and supplementary construction;
- (b) EOM (Efficient operations and maintenance): five years of declining subsidies from World Bank and Asian Development Bank Support Programs; and
- (c) operations and maintenance: the routine program which is funded by local government through a combination of irrigation service fee, PBB (land and building tax assessments), and local government subsidies.

The provincial water resources service in Nusa Tenggara Barat prefers a different approach for Kalimantan II which would shortcut this process by undertaking a brief program of supplemental construction and, then moving directly to the introduction of irrigation service fee. The irrigation service fee program is still in its early stages of development and it is unlikely that anything more than a cursory explanation of the broad outlines of the irrigation service fee program and how it will operate in the future can be introduced to the Small-Scale Irrigation Management Project areas and water users associations prior to the project activity completion date.

**Conclusion:** Providing a sound basis for operations and maintenance of the main systems in both Awo and Kalimantan II is a pre-requisite to a successful water users association program of operations and maintenance at tertiary and lower levels. Unless such a program is established soon, the functioning of the Small-Scale Irrigation Management Project water users associations is in danger.

**Recommendation:** A full program of operations and maintenance needs to be developed for both main systems and tertiary levels—with a clear provision for water users association responsibility at the latter—as quickly as possible. It is further recommended that the fully operational Small-Scale Irrigation Management Project systems be moved as quickly as possible into the irrigation service fee program.

### **5.3. Overseas Economic Cooperation Fund participation**

#### **5.3.1. Small-Scale Irrigation Management Project**

In 1989, the Overseas Economic Cooperation Fund of Japan signed a Memorandum of Understanding with the government of Indonesia and USAID in which they agreed to provide assistance to Small-Scale Irrigation Management Project by funding:

1. Construction of Tiu Kulit dam and irrigation system in Nusa Tenggara Barat (Sumbawa) to provide irrigation for 1,700 ha
2. Development of 600 ha of small groundwater irrigation systems
3. Special studies
4. Training to strengthen provincial water resources services in Nusa Tenggara Barat
5. Technical assistance, including consulting services
6. Supporting the beneficiary participation program
7. The water users association organizers program to be implemented at all sites

All the components were to be developed in collaboration with the Directorate General of Water Resources Development and USAID.

The evaluation team visited the completed Tiu Kulit irrigation system and saw that the dam and the canals were well done and that water was being delivered to the fields. water users associations have been formed and one was observed meeting while we were there. They told us they thought their water users association was useful and was giving them more say in the operation and maintenance of the their tertiary canals.

We know that the small well development, special studies, training and TA are all being done but have no information as to their status.

#### **5.3.2. Small-Scale Irrigation Management Project II**

The Overseas Economic Cooperation Fund is now in the early phases of the follow-on Small-Scale Irrigation Management Project II project under which they plan to construct nine more surface water irrigation systems, covering 12,227 ha, to be served by three dams, five weirs and one spring. These systems will be in South

Sulawesi, Nusa Tenggara Barat (Sumbawa) and Nusa Tenggara Timur (Flores, Sumba, and Timor). Three of the systems have already been designed under the Small-Scale Irrigation Management Project. These are the Gapit Dam System in Sumbawa and the Awo Extension and Salomekko Dam Systems in South Sulawesi. They will also construct two groundwater irrigation systems covering 2,000 ha to be served by approximately 900 shallow tube wells in Timor and Sumbawa. The evaluation team was hoping to meet with the team leader of Nippon Koe, the technical assistance firm being provided under the project, to determine whether they were going to continue with the water users association and water users association organizers program, but we were unable to make connections.

#### **5.4. Training**

The midterm evaluation acknowledged the adequacy of the planning and execution of the overseas training program, which sent twenty-nine provincial water resources services and BAPPEDA staff from participating provinces to the United States and India for training that lasted from nine to twenty-six months. Preparation for overseas training was directed by a USAID personal services contract training specialist, which allowed for early implementation of the training when Harza began its technical assistance contract in 1987. All of the participants had returned by mid 1990 and the evaluation team had occasion to meet with a number of them during the field visits to the provinces. Those with whom the team met seemed to be making good use of their advanced training. It was also impressive to note that the majority of those trained had returned to their provincial posts and had not been siphoned off to Jakarta as is often the case with such training.

The midterm evaluation also went on to note that much informal training was being done by the Harza technical assistance team, but further suggested that such training would be more effective if it were formalized and a comprehensive plan developed. In September 1989 Harza brought on a Training Coordinator who led a two month training needs analysis and then went on to assist in the implementation of the resulting training plan over the remainder of a two-year assignment. The Training Plan was both comprehensive and ambitious. It called for close cooperation in the preparation and presentation of materials among the technical assistance team, the Civil Engineering Faculty of the Bandung Institute of Technology (ITB), the Technical and Industrial Management Institute of ITB, the Water Resources Education and Training Bureau and the Asian Institute of Technology (AIT) in Bangkok. Where required, English language courses were provided by the local universities in

Ujung Pandang and Mataram and computer training was organized by local private schools in those locations.

Much of the training was deliberately modeled on or adapted from courses that had been prepared by consultants to the World Bank ISSP, in keeping with the Directorate General of Water Resources Development's desire to avoid unnecessary duplication; but there remained a need for modification and module preparation by the other actors cited above. In addition to these formal courses, transfer of knowledge of an informal nature continued to take place by virtue of the close interaction between the technical assistance team and its government of Indonesia counterparts and local consultants and contractors. The table on pages 52–53 lists details of the courses planned and implemented.

Although there were inevitable delays in USAID's preparation of PILs and contracts, preparation of module materials by members of the technical assistance team engaged in engineering activities and the actual scheduling of courses, the list of courses implemented closely matches the original plan. Course implementation also sometimes suffered from the attendance of inappropriate trainees or inadequate fulfillment of course requirements by those attending. The evaluation team did not have adequate opportunity to review the full range of course materials or meet systematically with course participants but there was a widespread sentiment that training had been effective and appropriate. Private sector consultants and contractors also begrudgingly acknowledged the value of the transfer of knowledge when they noted that Small-Scale Irrigation Management Project was known among their circles for "imposing international standards with a Rupiah budget."

The level of effort during Phase II of the project was less intensive than during Phase I. The technical assistance budget included only in-country training supervised by short-term staff. The overseas training program was not part of the technical assistance contract; instead it was guided and controlled budgetarily by USAID. In this second phase, the emphasis shifted from formal courses to more hands-on training.

Construction at the Awo and Kalimantanong II subprojects was the primary activity during Phase II. The secondary activity (operations and maintenance) would not begin until the construction phase was completed. However, planning for these efforts was underway. Training activities followed construction and operations and maintenance. They were concentrated first on construction related work and then on

identifying training needs, resources, and individuals targeted for operations and maintenance training.

The list of training activities does not include either the training of water users association organizers and community organizers by the Institute for Economic and Social Research, Education, and Information and by Yayasan Indonesia Sejahtera, Harza, or the private sector contractor. In this respect it was also noted that there was some feeling that water users association organizers training may have been excessive in view of the uncertain future of the water users association organizers following Project completion. However, it may also be that this perception arises out of a misunderstanding of the scope of water users association organizers training audiences. In addition to the training of water users association organizers and the officials and members of water users associations, the program in South Sulawesi and Nusa Tenggara Barat—as well as the early Yayasan Indonesia Sejahtera program in Nusa Tenggara Timur—also bore responsibility for training local government agencies in order to form and maintain water users association guidance teams at district and provincial levels. Evaluation team meetings at district planning boards in Nusa Tenggara Barat and Nusa Tenggara Timur indicated that nongovernmental organization and water users association organizers' efforts had been very successful in generating support for water users associations at this level.

Another area training which is not cited above and which appears to have received uneven treatment under the project is the training of farmers in support of new agricultural practices which are hoped to flow from the project's irrigation benefits. While there was some provision for field trials, demonstration and farmer training for groundwater activities in South Sulawesi and Nusa Tenggara Timur, similar provision for the postconstruction period in the surface water areas of South Sulawesi and NTB was neglected in the original design. It was only in the last twelve month extension of Harza's technical assistance contract that funding was provided to support demonstration and farmer training.

## **5.5. Special studies**

The Small-Scale Irrigation Management Project's policy agenda was intended to be strengthened by the appointment of a personal services contract irrigation policy advisor, who, in addition to providing advice to the Directorate General of Water Resources Development and BAPPENAS, was to oversee the implementation of a series of special policy studies. For this purpose he was to have at his disposal a

## Revised Small-Scale Irrigation Management Project Training Plan and Implementation (1990–91)

<i>Programs or topics</i>	<i>Location</i>	<i>Length</i>	<i>Number of participants: planned / actual</i>	<i>By</i>	<i>Dates</i>
<b>Surface design</b>					
· Overview of project selection	S Sul/NTB	3 D	20/12	TA	2/4-7/91; 2/18-21/91
· Survey and mapping	S Sul/NTB	2 M	10/8	TA	10/18-12/17/90
· Hydrology	S Sul/NTB	4 W	20/19	ITB	2/28-3/26/91; 3/4-4/5/91
· Lab technician	Bandung/NTB	4 W	15/16	ITB	5/6-17/91; 5/20-6/5/91; 6/17-29/91
· Land capability evaluation	S Sul/NTB	8 D	20/16	ITB	5/13-20/91; 5/23-6/7/91
· Economic analysis of irrigation projects	S Sul/NTB	1 W	20/17	TA	6/3-8/91; 6/3-8/91
· Irrigation and drainage layout	S Sul/NTB	1 W	20/18	TA	6/17-22/91; 6/24-29/91
· Design of small hydraulic structures	S Sul/NTB	2 W	20/20	ITB	7/1-8/91; 7/15-8/1/91
· Overview of dam design and construction	S Sul/NTB	2 W	20/21	ITB	7/29-8/5/91
· Review of the Small-Scale Irrigation Management Project structure and design	S Sul/NTB	1 W	20/19	TA	8/26-31/91; 9/2-7/91
· Planning, investigation, and design of embankment dams	S Sul/NTB	1 W	20/18	TA	10/7-11/91; 10/21-25/91
· Tender documents	S Sul/NTB	1 W	20/19	TA	9/9-14/91; 9/16-20/91
· Environmental impact assessment	Jakarta	2 W	10/10	BDP	???

special budget to fund studies in support of the following four policy objectives: (1) Strengthened Farmer Organizations; (2) Sustainable operations and maintenance; (3) Decentralized Irrigation Services; and (4) Improved Water Resources Policy. At some point during project implementation, USAID's emphasis shifted from identification of a policy agenda to more focused attention on the needs of system operations and maintenance.

While a large number of studies in support of the original agenda were actually completed either by the Harza technical assistance team or under contracts which were negotiated with personal services contracts, contractors or buy-ins to other projects—e.g. ISPAN, CASER, etc.—the overall list of accomplishments includes a much more varied list. Under this category came to be included the seven environmental assessment studies which Harza completed, not in its capacity as provider of technical assistance, but as direct deliverables to the project. The Small-Scale Irrigation Management Project midterm evaluation, this final evaluation, the training needs assessment, a series of workshops, and a study of lessons learned were also funded by this component.

## **5.6 Role of women in Small-Scale Irrigation Management Project development**

There are some differences in the role played by women in agriculture among the three Small-Scale Irrigation Management Project provinces. It is only in South Sulawesi that men provide the bulk of labor for the important planting work, while in all other phases women play an important—if not dominant—role. With this exception, it was apparent during team field visits that much of the agricultural work was done by women. But this did not appear to extend to the maintenance of irrigation canals and structures. Considering that a reliable source of irrigation water from Small-Scale Irrigation Management Project was just beginning to be experienced in most Small-Scale Irrigation Management Project locations when the evaluation team visited, it was difficult to determine if there had been any significant changes in this pattern as a result of project interventions.

When questioned directly about membership or participation in water users associations by women, several respondents reacted defensively by noting that this would come later; after appropriate procedures and peer relationships had been established. This was in spite of the fact that several of the water users association organizers were themselves women and appeared to have no difficulty in relating to their male colleagues or to the male-dominated water users association leadership.

**Surface construction**

- Construction supervision      Bekasi      4 W      20/20      BDP      5/15-6/15/91

**Groundwater**

- Introduction to groundwater development      Surabaya      4 W      25/18      BDP      1/31-2/28/90
- Site selection      NTB      1 W      12/12      TA      7/1-6/91
- Well design, testing and construction and construction      NTB      1 W      12/17      TA      9/9-14/91
- Operations and maintenance: wells, pumps, and irrigation systems      NTT      1 W      12/11      TA      10/7-12/91

**Project management**

- On-site seminars      NTB      1 W      30/30      ITB      5/20-25/91
- Mini lectures      NTB      3 D      30/30      ITB      6/3-5/91
- Bali Seminar      Bali      1 W      30/30      ITB      6/10-15/91

**Personal skills development**

- Computer courses      S Sul      —      25/23      Local school      8-12/89; 8/20-12/19/91
- English courses      S Sul      —      40/40      UNHAS/      8-12/89  
UNRAM      10/3-12/13/91
- Short-term overseas training      Bangkok      8 W      6/3      BDP/AIT      7/1-8/23/91; 10/21-12/13/91

---

Adapted from: Harza Engineering Company, *Phase I Technical Assistance Final Report* (Jakarta: April 1992) , Tables V-2 and V-3.

## **5.7. Increased agricultural production**

Increased agricultural production by diversifying production, cropping intensity and improving water reliability remains the goal of Small-Scale Irrigation Management Project. This was to be accomplished as follows:

- \* Addition of at least one crop a year.
- \* Crop production of 4 tons/ha per season of irrigated paddy cultivation.
- \* Nonpaddy cropping being grown in at least one season.

Information on agricultural production in the project areas was sparse and not properly documented by the executing agency or the technical assistance team. The reliability of the data available could not be determined. In the groundwater areas in South Sulawesi, no documented information on cropping patterns or production for the Small-Scale Irrigation Management Project areas were available. From the two sites visited, it became evident that the production figures would be very site specific. The better site was being cultivated for at least two crops a year with at least one paddy crop. The farmer interviewed indicated that he was getting in excess of 4 tons/ha for each paddy crop. He was planting at least three crops a year including legumes and horticulture. At the time of the team's visit, both soya bean and long beans were being grown. On the other hand, at the second site visited, the melons were very much undersized and showed signs of poor husbandry.

In Nusa Tenggara Timur also, data was sparse and could not be verified. In the areas visited around Oesao the farmers have adopted the new technologies and improved cultivation methods—particularly with reference to vegetables, maize and, to a limited extent, fodder crops. Most of the present crop showed good growth and the farmers were enthusiastic regarding increasing crop yields.

The Awo project is now in its first crop under full irrigation. The paddy crop in many areas had already headed and the technical assistance team's agronomist expects an average yield well above 5 tons/ha. This appeared to be well within the realm of probability.

At Kalimantanong II, where the system has already been in full operation for over a year, yield information was more readily available. Because of flood damage to the system during the first cropping season, part of the system had to be closed. This reduced the cropping intensity for the next two crops because of the need to repair the system. However, from data collected by the LP3ES survey of 13 water

users associations, concerning their 1994 third crop yields, paddy yields increased between 16 to 110 percent, with an average increase of 70 percent and an average yield of 5 tons per ha. Palawija production increased between 1 and 141 percent, with an average increase of 71 percent.

The surface water irrigation systems are now coming into full production and it will be interesting to see how the availability of water and an improved water management regime will translate to production increases. From observations to date, production of four tons per hectare may well be achieved within the first two years of project completion. Crop diversification will be determined by the availability of seed, agronomy support and the market. Nonpaddy crop cultivation will continue to increase as the farmers' knowledge of cultivation practices for irrigated legumes and horticulture increases and as their confidence in the availability of irrigation is boosted.

## **6. Project management**

### **6.1. USAID**

The USAID management of Small-Scale Irrigation Management Project has undergone many changes in its nine and a half years. During the first two years, the project had a U.S. engineer full time as project officer and two Indonesian engineers full time on the project. A U.S. social scientist was assigned to the project full time for the first year. For the next four years, there was a U.S. engineer as project officer full time, two Indonesian engineers full time, and one Indonesian engineer part time on the project. Also during this period, a personal services contract social scientist worked for two years in preparation of the water users association organizers program. During the last four years there have been three different U.S. project officers, none of whom is an engineer. Because they have the responsibility for other projects, they have been able to spend only one-fourth to one-half of their time on the Small-Scale Irrigation Management Project. The drastic reduction in U.S. project officer input to the project that has taken place while implementation demands have not been substantially reduced indicates a marked change in the Mission's priorities.

Continuity in management of the project has been provided by the Indonesian engineers, two full time and one part time, who have had to shoulder more of the management responsibilities. They have performed well in the circumstances; but because of the management demands, it has not been possible for them to do the amount of field inspection that would have been desirable for a project with so many activities spread over a huge geographic area.

For example, one management demand was created by a new regulation concerning host country contracts. The regulation required that before any contract for more than \$250,000 was made by the government of Indonesia, a capability assessment must be performed by a local contractor to determine if the government of Indonesia could successfully administer the contract. This, of course, meant a whole new array of procurement actions for the Small-Scale Irrigation Management Project project staff. One problem caused by the regulation was delay in the contracting process for the Institute for Economic and Social Research, Education, and Information, the nongovernmental organization that was in charge of establishing the water users associations with trained organizers.

On a positive note, one management problem pointed out in the midterm

evaluation was that a separate project implementation letter, based on detailed plans and cost estimates, was required for each one or two groundwater sites. This requirement was causing excessive delays in the groundwater program. Responding to a recommendation in the evaluation, the Mission instituted an annual "umbrella" earmark and commitment project implementation letter for each province, resulting in a considerable savings in management time.

## **6.2. The Directorate General of Water Resources Development**

One of the key factors in government of Indonesia project management structure is the fact that donor projects are not identical with the government of Indonesia project structures under which they are implemented. From the Directorate General of Water Resources Development perspective, the Small-Scale Irrigation Management Project has no comprehensive identity. Instead, it is a series of subprojects or activities, which are dispersed over a range of discrete national development budget (APBN) projects in the three Small-Scale Irrigation Management Project provinces. In the South Sulawesi and Nusa Tenggara Barat provinces, Small-Scale Irrigation Management Project activities were divided into surface and groundwater activities under different provincial projects; in the case of surface water design activities in Nusa Tenggara Barat, different systems were provided for under separate projects. The Nusa Tenggara Timur province has only groundwater activities, all under one project. It is common for construction and operations and maintenance activities for a single system to be covered by separate subprojects. The result at the provincial level can be a maze of intersecting responsibilities with no clear lines of authority and a requirement of management by committee. This situation was sufficiently complex in Nusa Tenggara Barat to prompt the establishment of a special position, the Small-Scale Irrigation Management Project coordinator, while SulSel chose to deal with the complexity by committee or coordination as needed.

The midterm evaluation noted that it was unable to identify a Small-Scale Irrigation Management Project management structure at the Directorate General of Water Resources Development in Jakarta and that responsibility for oversight of provincial implementation was divided among three separate organizers. Soon after this, a steering committee was established with membership consisting of all of the organizers that had participated in the Small-Scale Irrigation Management Project.

More recently the Directorate General of Water Resources Development has been completely reorganized, and oversight of implementation activities is now vested in the Directorate for Implementation Guidance in the Eastern Region. But

supporting roles continue to be played by the Directorates for Program Support and for Water Resource Utilization and Conservation. It is too soon to determine whether this new structure will enhance the Directorate General of Water Resources Development's management of activities like the Small-Scale Irrigation Management Project, but that is certainly one of the intentions of creating regional organizers, who place greater emphasis on support for development activities being planned and implemented in the provinces. Meetings that the evaluation team held with the director for the Eastern Region and members of his staff indicated considerable interest in the project and, particularly, in the water users association organizers approach to water users association support. The Directorate for Program Support also continues to show an active interest in the project.

Finally, in a lengthy discussion with one of the evaluation team members at the Bali Small-Scale Irrigation Management Project–Water Users Association Organizers Workshop, the director for Water Resource Utilization and Conservation made it clear that he is very much interested in the Small-Scale Irrigation Management Project's water users association organizers approach. He is well aware of the issues involved in determining whether this approach is capable of being replicated on a broader scale with government of Indonesia resources and would welcome the opportunity to continue to experiment with and modify this model in continued cooperation with USAID and the Institute for Economic and Social Research, Education, and Information.

### **6.3. Nongovernmental organizations**

While the Small-Scale Irrigation Management Project had envisioned mobilization of at least two national and an undetermined number of local nongovernmental organizations in support of the water users association organizers program, actual practice has proven to be much more limited. The longest and most extensive involvement in the project has been by the Institute for Economic and Social Research, Education, and Information, followed by a period of involvement by Yayasan Indonesia Sejahtera in Nusa Tenggara Timur groundwater activities for less than two years. It may be that there are lessons to be learned from the contrast between these widely different experiences. It was noted in the earlier section on farmer participation that the water users association organizers approach to water users association formation and development and the typical background of water users association organizers themselves make them susceptible to the criticism of being overly concerned with general organizational matters and legal principles—at the expense of what

others may consider to be the more important technical concerns of water management and agricultural practices. It is here that the nongovernmental need to instill both their cadre and field supervisors with the ability to coordinate their activities with those of the technical agencies' managers and field workers. It is reported that Yayasan Indonesia Sejahtera workers spent much of their time writing proposals for action that failed to gain the support of local project managers, related government agency field personnel, or the members of the technical assistance team. Higher levels of Yayasan Indonesia Sejahtera management—all the way up to Jakarta—also seem to have failed to take notice of how serious this communication gap was becoming until their contract was not renewed.

The situation manifested by the Institute for Economic and Social Research, Education, and Information presence in South Sulawesi and Nusa Tenggara Barat stands out in contrast, not because it has not encountered the same difficulties but because the management structure established by this nongovernmental organization has proved to be more responsive. The record with respect to water users association organizers coordination with supporting agencies in these two provinces is also not without critics. There is a sharp contrast in the relations between the water users association organizers teams in the two provinces with provincial water resources services officials—particularly the project officers for Awo and Kalimantan II. While the latter seems to have established a close working relationship and is fully informed on the day-to-day water users association organizers program of activities, there is considerable tension and a difficulty in communications between the former and the local water users association organizers field supervisor. Relations between and joint field activities with water users association organizers in Kalimantan II also seem to be more common for provincial water resources service and agriculture field-level staff in that location. It remains unclear whether this is evident to Jakarta-level managers and, if so, what actions might have been taken to resolve the situation.

#### **6.4. Technical assistance**

Technical assistance has been provided to the Small-Scale Irrigation Management Project by Harza Engineering Company, as the prime contractor, and by Development Alternatives Inc. (U.S.), Global Exchange, Inc. (U.S.), P.T. Wiratman and Associates (Indonesia), and C. Second (Indonesia) as subcontractors. Because of contracting problems, the technical assistance did not begin until September 1987, two years after the project was authorized.

Over the life of the project, Harza has had three chiefs of party. The first was replaced in November 1990 at USAID's request after the midterm evaluation was critical of the technical assistance management to that point. The second chief of party continued until the end of the first phase contract in March 1992, when Harza transferred him to another project. The third chief of party came at the beginning of the second phase contract (March 1992) and has continued to the present time. The midterm evaluation also recommended that an Indonesian operations assistant be included in the technical assistance contract to take care of the more routine logistics and operational work. As a result, an operations assistant was hired under the Wiratman contract in January 1990, and he has continued to the present time under the second phase contract.

The second chief of party instituted changes recommended by the midterm evaluation, which resulted in annual work plans being developed in cooperation with the provincial water resources service and USAID and in quarterly reports giving the progress achieved against the plan. Since then, the planning and monitoring aspects of the technical assistance management has been satisfactory.

The technical assistance provincial teams also had some start-up problems. The first teams fielded in SulSel for the Awo project and Nusa Tenggara Barat for the Kalimantan II project were not adequate to support the provincial water resources services design teams because they had underestimated the amount of assistance that would be needed by the provincial water resources service staff. The technical assistance contractor was slow to bring in the additional personnel needed. The first technical assistance team leader in SulSel was unsatisfactory and had to be replaced. By early 1990, however, the necessary adjustments had been made and the Jakarta and provincial teams were generally satisfactory.

The basic role of the technical assistance team, as called for under the contract, was to provide guidance and direction to the provincial water resources service staff and its local consultants and to help in critical technical areas where the staff lacked experience. The contract stated clearly, however, that the provincial water resources service staff and its local consultants were to be responsible for the selection, evaluation, design, and construction of the surface and groundwater irrigation projects.

The technical assistance team is to be commended for staying strictly in the difficult role of advising and assisting provincial water resources service and the local consultants instead of taking over for them when they were having difficulties.

As a result of adherence to this "hands off" policy by the technical assistance team, the provincial water resources service staff and the local consultants and contractors have been strengthened by having had full responsibility for the successful investigation, selection, and design of seven medium-scale surface water irrigation systems, the construction of three of the systems (one of them funded by Overseas Economic Cooperation Fund), and the selection, exploration, design, and construction of approximately sixty groundwater irrigation systems. The fact that the technical assistance team (with the concurrence of the USAID engineers) has the authority to withhold payment for poor quality work has been an incentive for the provincial water resources service engineers to insist upon better quality work. At present, the technical assistance team continues to provide advice and assistance for the operation and maintenance of the completed systems.

The technical assistance team was responsible for developing and managing an in-country training program for the staffs of the Department of Public Works and the local consultants and contractors. This program got off to a slow start (as was noted in the midterm evaluation report). It was not until September 1989 that Harza hired a training specialist to develop and implement a program. The program was aimed at strengthening the abilities of the provincial Public Works staff successfully to manage local consultants and contractors during the design, construction, operation, and maintenance phases of small- and medium-scale irrigation projects.

A training plan was approved in May 1990, and the training activities progressed rapidly after that. By December 1991, approximately 140 provincial water resources services consultant and contractor staff had participated in some twenty-one courses taught by the technical assistance staff, university faculty, and the Directorate General of Water Resources Development training staff in all three provinces. The technical assistance staff has also provided additional, more informal training for the provincial Department of Public Works' consultant and contractor staff through classes held after working hours. These classes have dealt with interpreting and understanding specifications, construction quality control, and the like. Training has continued throughout the project, and the training modules have been given to the appropriate government of Indonesia offices in each province for future use. Much training and technology transfer also occurred informally through the close working relationships developed between the technical assistance team and provincial water resources service consultant and contractor staff on a day-to-day basis. In view of the above, the management of the technical assistance training component is judged to have been successful.

To summarize, management of the technical assistance was weak to begin with but improvements were made in personnel and in procedures that resulted in a satisfactory management performance during the last five years of the project.

## **7. Anticipated future developments**

### **7.1. Surface water irrigation development**

Of the seven surface water irrigation systems that were designed under the Small-Scale Irrigation Management Project, three have been constructed under the project (one by the Overseas Economic Cooperation Fund) and two are slated for construction by the Overseas Economic Cooperation Fund under Small-Scale Irrigation Management Project II, as discussed in section 5.3. The two remaining systems are the Sell-Coppobulu and Ponre-Ponre dams, both in South Sulawesi. Sell-Coppobulu would serve an area of 2,000 ha, and Ponre-Ponre would serve an area of 4,000 ha. USAID has been having discussions with the World Bank and the Asian Development Bank about funding construction of these dams and is hopeful that one or both of them may be built in the future.

### **7.2 Groundwater irrigation development.**

Groundwater development, funded by both the government and development agencies, is continuing in all three provinces. As noted in section 5.3, Small-Scale Irrigation Management Project II will be developing an additional 2,000 ha, served by approximately 900 shallow tube wells, in Sumbawa and Timor. In addition, as they are beginning see the benefits of irrigated agriculture for crops other than paddy, the farmers themselves have dug significantly more wells. This is a welcome development, but there is a need for increased monitoring of the groundwater development in these areas to prevent overtaxing of the aquifers and interference between wells.

### **7.3. Decentralization of authority**

A major theme that fostered the Small-Scale Irrigation Management Project was confidence in the prospects for continuing decentralization of authority in the irrigation subsector—now the water resources sector. When the project was initiated, routine irrigation system operations and maintenance were the only functions that had been decentralized to the provincial level, and water users association formation and support was the sole function that had been decentralized to the district level. Most of the principles of delegation of responsibility, which were central to the Small-Scale Irrigation Management Project, would have been more appropriately identified as deconcentration or co-administration. Increases in local authority to select sites, approve designs and sign contracts with increasingly higher values have run parallel

to the life of the Small-Scale Irrigation Management Project, but there are indications now that a major step forward is imminent.

In addition to the upgrading of water resources management and development to the status of a sector under the present REPELITA (Five-Year Development Plan) and the reorganization of the Directorate General of Water Resources Development into a structure that emphasizes “implementation support” in the three major regions of Indonesia, pilot activities are planned for the introduction of autonomous district water resources services. These will have authority—and budgetary control—for routine irrigation system operations and maintenance. Discussion continues about the role of newly formed provincial Water Resource Allocation Committees, which are considered to be the spearhead of efforts to grant provinces greater control over the management, development, and allocation of their water resources. Also being discussed is whether supporting technical units ought to be established at the level of river basins. These latter developments will, no doubt, prompt a reorganization of the provincial water resources service—possibly along lines comparable to what has just occurred at the Directorate General of Water Resources Development.

Of particular relevance to the goals and objectives of the Small-Scale Irrigation Management Project are the efforts related to moving responsibility for irrigation system operations and maintenance to the district level. It is hoped that this will bring about a major shift toward needs-based budgeting, which is much more dependent on local revenue generation and relies more on the principle of “the user pays.” A major feature of this shift is a greater reliance on irrigation service fee and the underlying strength and viability of water users associations. Small system turnover and irrigation service fee are two of the main programs that provide a real mobilizing force behind the formation and strengthening of water users associations, which truly represent the farmers’ interests.

#### **7.4. Institutional development**

It was noted in an earlier section that the water users association organizers concept is not entirely a product of Small-Scale Irrigation Management Project. Experience with the USAID High-Performance Sederhana Irrigation Systems Project represents the stimulus for inclusion of the concept in the project design. More recently the Institute for Economic and Social Research, Education, and Information experience with both the Small-Scale Irrigation Management Project and its predecessor has prompted that nongovernmental organizations—in collaboration with the Directorate

General of Water Resources Development and the Ford Foundation—experiment with another variant of this approach in support of the small system turnover (PIK) project. In this instance the Institute for Economic and Social Research, Education, and Information is assisting in the training of provincial water resources service staff to foster water users association formation and development as a prerequisite to the turnover of small systems (under 500 ha) to those organizations. This approach contrasts with the water users association organizers—Small-Scale Irrigation Management Project program of providing a cadre of facilitators who are independent of government and work directly with farmers in assisting them to pursue their own interests through water users association organization. The small system turnover project activities lie much closer to the standard government of Indonesia approach as characterized in Proyek Tata Guna Air. A detailed study of these two experiences ought to be conducted to determine their relative strengths and weaknesses.

There remains no question that many of the key Directorate General of Water Resources Development and provincial water resources services decision makers who have been exposed to the water users association organizers and community organizer approaches are convinced of the viability of this approach, but there are two obstacles to its wider application. First, it is uncertain that the government of Indonesia would approve of a widespread effort at social mobilization of this nature by a nongovernmental agency. Questions remain as to whether a water users association of this type is—and should continue to be—a routine concern of the three government of Indonesia agencies that now have responsibilities in this area—the Directorate General of Water Resources Development, Agriculture, and Local Government. Related to this point is the question whether nongovernmental organizations have a comparative advantage and possess skills or an approach that would be difficult for government agencies to match. The second obstacle is the cost of supporting what appears to be a sizable cadre for a considerable length of time for nurturing relatively small numbers of water users associations.

It was noted in an earlier section that at least one influential Small-Scale Irrigation Management Project decision maker is willing to try to cope with both of these difficulties. The project officer of the Sumbawa Irrigation Project is hoping to take on the Kalimantan II water users association organizers as project personnel when the Small-Scale Irrigation Management Project ends. He will offer them government-level salaries and ask them to work within that system to continue their work in forming and supporting new water users associations. The related issue of unit cost was also cited earlier with the surprising conclusion from the Bali Work-

shop that the cost is Rp. 280,000 per ha per water users association organizer per year over the full five-year period of the program.

Of more immediate concern is the question of the potential continuation of this experiment under Small-Scale Irrigation Management Project II, which is being funded by Overseas Economic Cooperation Fund. Under the collaborative arrangements between that donor and USAID, the former has already gained considerable experience with the water users association organizers approach during the design and construction of Tiu Kulit. A visiting contingent of Japanese nongovernmental organizations has also visited Small-Scale Irrigation Management Project II sites and is said to be prepared to lobby the Japanese government for continuation of this activity under the next phase of the Project. Directorate General of Water Resources Development and provincial water resources service decision makers are also very much in favor of Small-Scale Irrigation Management Project II going ahead with the water users association organizers approach included. At this point it is not known whether Overseas Economic Cooperation Fund and the Nippon Koei Consultants are in agreement or whether funding for this component has been provided. It is interesting to note that it was suggested at the Bali Workshop that it would be both appropriate and welcome for USAID to continue its collaboration with the Japanese donor by continuing to provide water users association organizers program support under Small-Scale Irrigation Management Project II in what would become a new project with the action research orientation recommended in section 8.3.

## **8. Recommendations**

### **8.1 Improving the contracting process**

**Prequalification.**—The prequalification process is lengthy and encumbered by numerous checks but should be imposed more rigorously if the problems experienced with the contractors at Awo and K II are to be minimized (see Sections 5.1.1.1 and 5.1.1.2).

**Recommendation:** It is recommended that closer scrutiny of a contractor's technical resources and capabilities would serve to reduce the inclusion of contractors who misrepresent themselves in these areas. A contractor's financial resources should be proven to be adequate to prefinance contract activities beyond mobilization. Equipment and personnel resources should be visually verified as serviceable and available for deployment to the contract. More rigorous checking of details of a contractor's technical capability and past performance is required. Information contained in the contractors prequalification documents should be verified for accuracy. The system of bonding contractors should be given greater consideration in contractor preparation.

**Mobilization:** The mobilization process also has room for improvement. Contractors should be aggressively encouraged to mobilize to the extent required to perform to the level indicated in the proposed progress schedule. This is probably the period when the greatest influence can be exercised over the contractor's resource allocation. At this point, the client's expenditure is still relatively small, and threatened contract termination due to lack of progress will be more effective than it will be later in the contract period.

**Recommendation:** The Department of Public Works should include or make better use of the liquidated damages clause of their contracts. This clause holds contractors liable for damages incurred by the client as a result of late completion. It is best used sparingly, but it should be there to serve as a reminder to contractors that there are limitations to the contract completion period, a consideration that seems to be often overlooked on Department of Public Works projects.

## **8.2. Improving the Directorate General of Water Resources Development project management implementation capabilities**

The implementation capabilities of the project managers for development projects such as Small-Scale Irrigation Management Project have been greatly increased during the Small-Scale Irrigation Management Project construction period. The increased authority given to the project managers with regard to project development and contract and construction supervision has decidedly improved the management process. Project managers now have the authority to adjust management and project activities to facilitate local and current conditions. What continues to hinder the effectiveness of this development is that these managers have not been given the training or tools to utilize this new authority. With projects becoming more integrated and complicated, management by trial and error is no longer adequate. Management must now be recognized as a science with a myriad of tools to support the individuals who are trained to use them effectively..

*Recommendation:* Management training should become an essential requirement for all project managers either before or during the initial stages of project implementation.

## **8.3. Continued support for water users associations' and water users association organizers' programs**

Faced with demands for a total of approximately 60,000 water users associations nationally and the fact that only 25,000 presently exist (approximately 80 percent of which exist in name only), efforts are being directed toward a crash program that may result only in deluding policymakers into believing that the problem has been solved. For at least ten years, efforts to multiply the numbers of water users associations have relied on training programs that are too brief and try to include too many participants. Nevertheless, the demand for drastic increases is being generated by programs that require increasing organizational quality and capability—development of new surface water and swamp systems, rehabilitation and upgrading, special maintenance and efficient operation and maintenance of older systems, irrigation service fees, and small system turnover.

A program of intervention along the lines of the Small-Scale Irrigation Management Project water users association organizers approach has real potential to respond to these demands because it is intensive and results oriented. It has also

now proven to have established high levels of credibility among the Directorate General of Water Resources Development decision makers at all levels. The drawbacks, described in detail in earlier sections of this report, are that it is time and labor intensive. The approach is in need of review with a view toward identifying modifications which will make the approach more practical for wider application. Until a more precise idea of what modifications can be made without radically altering the effectiveness of the approach and how these modifications might be made, it is unlikely that the Directorate General of Water Resources Development and provincial water resources service will themselves be successful in applying this model across a wider range of applications. This is the type of effort which requires a critical view toward policy formulation coupled with a small-scale program of action research. It would appear to be the type of activity which would fit well within the present definition of USAID interests and, at the same time, not require the level of funding or management overhead which has been demanded of an infrastructure development effort like the Small-Scale Irrigation Management Project. Furthermore it would build upon the substantial comparative advantage which USAID already possesses in this area by virtue of its fifteen years of collaboration with the Directorate General of Water Resources Development, the Ford Foundation and Institute for Economic and Social Research, Education, and Information.

***Recommendation:*** That USAID and the Directorate General of Water Resources Development follow up the Bali Workshop on the water users association organizers-Small-Scale Irrigation Management Project Program with discussions and a program of mutual investigation to pursue the possibility of designing a project to further test and refine the water users association organizers approach to water users association formation and development.

***Note:*** Other conclusions and recommendations of a more limited or immediate nature have been included in the earlier section on beneficiary participation under the heading "Project accomplishments."

## **Bibliography**

**Aziz, Mohamad Amin, Soedodo Hardjoamidjojo, Richard Hutapea, Peter Reiss and Sutarwi Surowinoto**

Privatization and Sustainability of Small-Scale Irrigation in Indonesia: A Reassessment of Sederhana and HPSIS Systems (n.p., September 1991).

**Bruns, Bryan**

Sustaining Water User Associations for Irrigation Operation and Maintenance, A Study in South Sulawesi (March 11, 1993).

**Departemen Dalam Negeri, Dit. Jen. Pemerintahan Umum Dan Otonomi Daerah.**

Irrigation Service Fee (ISF) Project. (n.p., November 1991).

**Departemen Pekerjaan Umum**

Laporan Evaluasi Kursus Supervisi Konstruksi Tingkat Senior (Bekasi, 21 Mei-19 Juni 1991).

**Duewel , John. W**

Quarterly Report No. 8 July 1, 1988–February 28, 1989, and Final Termination Report, Vol. 1 (Jakarta, April 1989).

**Early, Alan**

Water Users Associations Training Impact Study, Indicative Results of a Case Study from South Sulawesi (March 17, 1993)

**Gerards, Jan L.M.H.**

“Introduction of Irrigation Service Fee (ISF) in Indonesia: Institutional Development in Action for Resources Management, “ in *Irrigation and Drainage Systems*, 6: 223-247 (Netherlands, 1992).

**Irrigation Service Fees (ISF) in Indonesia: Toward Irrigation Co-Management with Water Users Associations through Contributions, Voice, Accountability, Discipline and Plain Hard Work (n.p., June 1994).**

**with Drs. Birong S. Tambunan and Mr. Bachtiar Harun**

**Payment for Irrigation Services in Indonesia: Creating Mutual Accountability Through Participation and Voice: Experience with Pilot Project Introduction (1989–1991), Paper Presented at the International Commission on Irrigation and Drainage Eighth Afro-Asian Regional Conference, Bangkok, 1991.**

**Goldensohn, Max D.**

**Participation and Empowerment-an Assessment of Water User Associations in Asia and Egypt (n.p., December 1994).**

**Harza Engineering Company**

**Annual Report 1992–1993 and Detailed Work Plan 1993–1994 (n.p.).  
Final Report, Phase II Technical Assistance for Ground Water in Sulawesi Selatan (n.p., May 1993).**

**Ground Water Irrigation Development of the Oesao-Pariti Plain, Nusa Tenggara Timur (n.p., September 1992).**

**Ground Water Irrigation Development Nusa Tenggara Timur (February 1994).**

**Interim Report Agricultural Program (n.p., February 5–12 1995).**

**Kalimantong II Irrigation Project (n.p., n.d.)**

**Laporan Pelatihan Operator Mesin Pompa Jaringan Irigasi Air Tanah Di Oesao-Pariti Kabupaten Kupang (Augustus 24–26 1993).**

**Operation and Maintenance Activities in the K II System (n.p., n.d.).**

**Report on Training (Operation And Maintenance) South Sulawesi (September 1993)**

Report on Training (Operation And Maintenance) West Nusa Tenggara  
(November 1993)

Small-Scale Irrigation Management Project Annual Report 1992–1993 and  
Detailed Work Plan 1993–1994 (n.p., n.d.)

Small-Scale Irrigation Management Project Ground Water Development Nusa  
Tenggara Timur (n.p., February 1994)

Small-Scale Irrigation Management Project Inception Report (n.p., March 1988)

Small-Scale Irrigation Management Project Kalimantanong II Irrigation Project,  
NTB, Operations and Maintenance Progress Report No. 18 (n.p., November 1994)

Small-Scale Irrigation Management Project Kalimantanong II Irrigation Project,  
NTB, Operations and Maintenance Progress Report No. 19 (n.p., December 1994)

Small-Scale Irrigation Management Project Phase I Technical Assistance Final  
Report (n.p., April 1992)

Small-Scale Irrigation Management Project Phase II Technical Assistance Work  
Plan (n.p., June 1992)

Small-Scale Irrigation Management Project Project Justification Report Awo  
Irrigation Project, Ujung Pandang, South Sulawesi (October 1991)

Small-Scale Irrigation Management Project Report on Training (Operation and  
Maintenance) West Nusa Tenggara (November 1993)

Small-Scale Irrigation Management Project Training and Human Resources De-  
velopment Plan, April 1990–September 1993 (n.p., March 1990)

Small-Scale Irrigation Management Project Quarterly Report No.25  
(October–December 1993)

Small-Scale Irrigation Management Project Quarterly Report No.26 (January-  
–March 1994)

Small-Scale Irrigation Management Project Quarterly Report No.27 (April-June 1994)

Technical Aspects of Project Management Vol. 1 (n.p., May 1991)

**Haider, Mohammed I.**

Various Consultancy Progress Reports

**ISPAN**

Facilitators' Report Small-Scale Irrigation Management Project Second Implementation Workshop, Werdhapura, Sanur, Bali, February 1-5, 1988 (n.p., n.d.)

Third Implementation Workshop for The Small-Scale Irrigation Management Project, Puncak Pass, West Java, February 12-16 1990 (n.p., n.d.)

**Johnson, Sam, Suprodjo Pusposutardjo, Peter Reiss, G.T. Keith Pitman, Sigit Supadmo Arif, Roger Jackson, Agus Pakpahan, Effendi Pasadaran, Abunawan Mintoro, Tjahjadi Sugianto, Sumaryanto, And Hendiarto**

Policy Alternatives for Pump Irrigation in Indonesia (n.p., May 1993)

**LP,ES (Institute for Economic and Social Research, Education, and Information)**

Draft Prosedur Dan Mekanisme Pembangunan Irigasi Secara Partisipatif (Jakarta, 25 Maret 1994).

Final Report Social and Institutional Consulting Service for Recruitment, Training and Management System of Water Users Association Organizers, Small-Scale Irrigation Management Project (Jakarta, June 1992)

Laporan Kondisi Akhir Dan Rencana Pembentukan P3A Program water users association organizers-Small-Scale Irrigation Management Project Tahap II Daerah Irigasi Awo Propinsi Sulawesi Selatan (n.d.)

Laporan Working Group Pembentukan Forum Koordinasi P3A Di Kalimantan II Program Water Users Association Organizers, Small-Scale Irrigation Management

**Project Tahap III (Sumbawa Besar, September 1994)**

Partisipasi Petani Dalam Pembangunan Irigasi: Suatu Kajian Pengalaman Program Water Users Association Organizers-Small-Scale Irrigation Management Project, Paper presented at Lokakarya Nasional Program Water Users Association Organizers-Small-Scale Irrigation Management Project dalam rangka Pembahasan Prosedur dan Mekanisme Partisipasi Petani dalam Pembangunan Irigasi (Denpasar, Bali: 21-24 February 1995)

Pedoman Untuk Mendorong Pembentukan Dan Pembinaan P3A: Suatu Kajian Pengalaman Program water users association organizers-Small-Scale Irrigation Management Project, Paper presented at Lokakarya Nasional Program water users association organizers-Small-Scale Irrigation Management Project dalam rangka Pembahasan Prosedur dan Mekanisme Partisipasi Petani dalam Pembangunan Irigasi (Denpasar, Bali: 21-24 February 1995)

Perumusan Hasil Lokakarya Nasional Program water users association organizers-Small-Scale Irrigation Management Project (Denpasar, Bali: 21-24 February 1995)

Social And Institutional Consultancy For Recruitment, Training And Management Of water users association organizers Programme Within The Framework Of Small-Scale Irrigation Management Project Phase II (Jakarta, 11 May 1994)

Tata Laksana Pembangunan Irigasi Secara Partisipatif, Paper presented at Lokakarya Nasional Program water users association organizers-Small-Scale Irrigation Management Project dalam rangka Pembahasan Prosedur dan Mekanisme Partisipasi Petani dalam Pembangunan Irigasi (Denpasar, Bali: 21-24 February 1995)

**Menninger, William H.**

Final Report (Jakarta, March 1987).

**Nippon Koci Co., Ltd.**

Pembentukan Dan Pembinaan Kelompok Kecil Petani, Program Small-Scale Irrigation Management Project-OECF, Bagian Proyek Pengembangan Air Tanah-

**Timor Di Dataran OESAO-PARITI, Kabupaten Kupang Nusa Tenggara Timur  
(Agustus 1994)**

**Overseas Economic Cooperation Fund, Japan**

Annual Report 1994

**Pettit, John And Dennis Hamilton**

Facilitators' Report Small-Scale Irrigation Management Project Second Implementation Workshop Werdhapura, Sanur, Bali. (February 1-5 1988)

**Priest, John E.**

Study of Lessons Learned, Small-Scale Irrigation Management Project Phase I (Jakarta, 24 September 1991)

**Proyek Irigasi Sumbawa, NTB, Bagian Proyek Irigasi Kalimantanong**

Proyek Irigasi Kalimantanong II (n.p., n.d)

**Proyek Irigasi Sumbawa, NTB, Bagian Proyek Pengembangan Air Tanah (P<sub>2</sub>AT)**

Pola Pengembangan Air Tanah (n.p., n.d.)

Proposal Operasi Dan Pemeliharaan Sumur Pompa Di Pulau Sumbawa (Sumbawa, Nopember 1994)

**Thomas, William R. 3rd, Sjöfjan Asnawi, E. Walter Coward, Jr, and Jack Keller**

Midterm Evaluation Small-Scale Irrigation Management Project, Indonesia. (n.p., November 1989)

**Uphoff, Norman**

Observations on Water User Association Organizer Program Related Subjects.

(September 30, 1992)

## **USAID INDONESIA**

Director Implementation Reviews, Briefing Book for DIR Small-Scale Irrigation Management Project (n.p., October 21–23, 1992)

Small-Scale Irrigation Management Project, Project Paper (497-0347) Vols. I and II (Jakarta, August 1985)

Small-Scale Irrigation Management Project (497-0347) Project Paper Amendment No. 1 (Jakarta, January 24, 1994)

## **Walter, Michael F. and Surjadi Irwan**

Assessment Capability, Kalimantan II and Awo for USAID, Jakarta (Jakarta, November 1992)

Second Progress Assessment, Kalimantan II and Awo for USAID Jakarta (Jakarta, March 1993)

## **Winrock International**

Strategy Options For Water Resources Development In Indonesia, Vols. I & II (Jakarta, May 1992)

## **Wright, Martin**

The Initial Development of Small-Scale Irrigation Management Project, Experimental Groundwater Irrigation Systems (Kupang, May 1998)

## **Yayasan Indonesia Sejahtera (YIS)**

Laporan Akhir Tugas Program Pembentukan Dan Pembinaan P3A Small-Scale Irrigation Management Project-USAID Di Kupang Nusa Tenggara Timur (October 1, 1992)

Small-Scale Irrigation Management Project

**"Site Profiles" Untuk Delapan (8) Desa Proyek Di Kecamatan Kupang Timur,  
Kabupaten Kupang, Nusa Tenggara Timur (Oktober 1991)**

**Appendix A. Schedule of activities of Small-Scale Irrigation Management Project final evaluation team**

Jan. 14-17	Team mobilization
Jan. 16-17	Review background materials
Jan. 18	Orientation and scope of work review with USAID. Develop schedule for meetings with the Directorate General of Water Resources Development and field visits
Jan. 19-21	Meetings with the Directorate General of Water Resources Development, Harza technical assistance team, Institute for Economic and Social Research, Education, and Information
Jan. 22	Travel Jakarta to Ujung Pandang
Jan. 23	Meeting with S. Sulawesi provincial water resources services; dinner with ex-training coordinator; overnight in Ujung Pandang
Jan. 24	Travel to Awo via Bone, visit groundwater sites near Watampone, overnight at Awo White House
Jan. 25	Tour of Awo system, meetings with Project staff, water users association organizers and farmers and members of water users associations, meeting with BAPPENAS Water Resources Bureau Staff, overnight at Awo White House
Jan. 26	Visit Bulucenrana Parallel operations and maintenance and training site, return to Ujung Pandang, meeting with ex-Team Leader, overnight in Ujung Pandang
Jan. 27	Wrap-up meeting with provincial water resources service, meeting with ex-Training Coordinator, Travel to Denpasar
Jan. 28-29	Review materials and begin writing in Bali
Jan. 30	Travel to Mataram (NTB), meeting with provincial water resources service, Travel to Sumbawa, partial tour of Kalimantanong System, overnight at K-II guest house
Jan. 31	Continue tour of K-II, meetings with farmers/members water users associations, meetings with water users association organizers and Project staff, overnight at K-II guest house
Feb. 1	Travel to Sumbawa Besar, meeting at Sumbawa Irrigation Project Office, tour Tiu Kulit, meeting with water users association organizers & Maris Gama water users association officials at Tiu Kulit, overnight in Sumbawa Besar
Feb. 2	Meeting with BAPPEDA Tk II Sumbawa Infrastructure Chief, return to Mataram, overnight in Mataram

- Feb. 3           Wrap up meeting at Lombok Irrigation Project Office, Travel to Denpasar
- Feb. 4-5       Review materials and report writing in Bali
- Feb. 6           Travel to Kupang (Nusa Tenggara Timur), meeting P2AT Office, tour  
groundwater sites, overnight in Kupang
- Feb. 7           Meetings provincial water resources service, Head of BAPPEDA Tk II  
Timor, water users association organizers and assistants, overnight in  
Kupang
- Feb. 8           Wrap up meeting provincial water resources service, Travel to Jakarta via  
Denpasar
- Feb. 9-15       Meetings with USAID, the Directorate General of Water Resources Devel-  
opment, Harza technical assistance team, ISF Consultant
- Feb. 16         Submit Draft Final Report to USAID and the Directorate General of Water  
Resources Development, discussion of report at USAID
- Feb. 17         Discussion Draft Final Report with the Directorate General of Water  
Resources Development (postponed), revise report
- Feb. 18         Revise/Complete Report, operations and maintenance Engineer travel to  
U.S.
- Feb. 20         Discussion Draft Final Report with the Directorate General of Water  
Resources Development, revise/complete report
- Feb. 21         Revise/Complete Report, Team Leader meeting at USAID, Social Scientist  
travel to Bali water users association organizers-Small-Scale Irrigation  
Management Project Workshop
- Feb. 22         Team Leader travel to U.S., Bali Workshop continues
- Feb. 23         Bali Workshop continues
- Feb. 24         Close Bali Workshop, Travel to Jakarta
- Feb. 25-26       Complete Final Report
- Feb. 27-28       Social Scientist return to U.S.

**Appendix B. Persons Contacted by Small-Scale Irrigation Management Project Final Evaluation Team**

**USAID Indonesia**

- Vikka Moldren, deputy mission director
- Ben Stoner, chief of AEE office
- Andrea Yates, project officer Small-Scale Irrigation Management Project
- Irwan Surjadi, mission engineer
- Gunawan Widjaja, Small-Scale Irrigation Management Project staff
- Joes Oemarhamzah, Small-Scale Irrigation Management Project staff
- D. Richards, team leader, environmental program design

**BAPPENAS (National Development Planning Board)**

- Bambang Adinugroho, staff of Bureau Chief of Water Resources and Irrigation

**Water Resources Education and Training Project (*Diklat Pengairan*)**

- Several Staff

**Directorate General of Water Resources Development, Directorate for Planning Support (*Bina Program*)**

- Dr. M. Basuki Hadimulyono, head of suborganizer of Evaluation of Implementation and Benefit Monitoring
- Ir. Wahyu Djoko Marjanto, MSc, head of section for evaluation of program implementation (and ex-Small-Scale Irrigation Management Project coordinator in Nusa Tenggara Barat)
- Ato Suwarso, MSc, head of section for evaluation of program benefits

**Directorate General of Water Resources Development, Directorate of Utilization and Conservation of Water Resources (*Perencanaan Pengembangan Sumber Daya Air*)**

- Ir. Soenarno, director
- Ir. Soenarto Sundjaya, Meng., head of suborganizer for Guidance on Role of Private and Public Sectors
- Ir. Winarno Tjiptoraharjo Dipl HE, head of suborganizer for Guidance of Water Resources Institutions

- Drs. J. Wayan Suyadnya, head of section for Investment Analysis
- Ir. Soekarso Djunaedi, head of section for Beneficiary Level Institutions

**Directorate General of Water Resources Development, Directorate for Implementation Support Western Region (*Bina Pelaksanaan Wilatyah Barat*)**

- Ir. Bambang Waluyono, ex head of suborganizer for Construction Guidance in the Eastern Region, Directorate of Irrigation I

**Directorate General of Water Resources Development, Directorate for Implementation Support Central Region (*Bina Pelaksanaan Wilatyah Tengah*)**

- Ir. Soesono S, ex head of suborganizer for operations and maintenance, Directorate of Irrigation (Directorate General of Water Resources Development), Directorate for Implementation Support Eastern Region (*Bina Pelaksanaan Wilatyah Timur*)
- Ir. Moch. Yusuf Gayo, Director
- Ir. Rubiyanto, Dipl. HE, Head of Sub-Directorate for Eastern Region II
- Mr. Prabowo, BIE, Head of Section for Irrigation
- Ir. M. Kartabrata, Dipl. HE, Head of Sub-Directorate for Eastern Region IV

**Provincial Water Resources Service, South Sulawesi**

- Ir. H. Sanapati Tarebbang, Head of provincial water resources service
- Ir. H. Syamsul Arida, Dipl. HE, Ex-Project Manager of South Sulawesi Irrigation Project
- Ir. Yus Suyono Asmono, Dipl. HE, Project Manager of South Sulawesi Irrigation Project
- Ir. Suprpto, Msc, Ex-Site Engineer of Awo Project
- Drs. Abd. Wahab, M. TH. CES., Chief of Project Benefit Monitoring & Evaluation, provincial water resources service
- Mr. Sumule S. Malik, BIE, Head of operations and maintenance Sub-Division, provincial water resources service
- Mr. Said Fatah, operations and maintenance Sub-Division Staff, provincial water resources service
- Ir. Drs. Suwarno HP, Awo Sub-Project Manager
- Mr. Supratman, Head of Awo Ranting, provincial water resources service
- Ir. Emmawan Haryono, Groundwater Development Sub-Project Manager
- Mr. Machmud, BIE, Head of Groundwater Irrigation Section, provincial water

resources service

**Provincial Water Resources Service, Nusa Tenggara Barat**

- Ir. Budi Satriyo, Msc, Sumbawa Irrigation Project manager
- Mr. Haryanto, ME, Kalimantan II Subproject manager
- Mr. Parijoto, B.E., head of Operations and Maintenance Division, provincial water resources service
- Purwanto, groundwater development subproject

**Provincial Water Resources Service, Nusa Tenggara Timur**

- Ir. Heru Marsudi, head of provincial water resources services
- Ir. Krisno D. Herwantoko, Msc, Manager of Timor groundwater development subproject, Timor irrigation project

**Institute for Social and Economic Research, Education, and Information (LP,ES,  
*Lembaga Penelitian Pendidikan dan Penerangan Ekonomi dan Sosial*)**

- Dr. Rustam Ibrahim, director
- Drs. Safril Salim, team leader water users association organizers program
- Drs Abdul Rozak, institutional specialist
- Hamdani Haruna, water users association organizers coordinator, Awo
- Awo water users association organizers
- Lalu Rusnawadi, water users association organizers coordinator, Kalimantan II
- Kalimantan II water users association organizers
- Sudirman, water users association organizers coordinator, Tiu Kulit
- Tiu Kulit water users association organizers

**Harza technical assistance team**

- Mr. David E. Bogan, chief of party
- Mr. Terry Haryanto, operations coordinator
- Mr. Wayne A. Bougas, ex training coordinator
- Mr. Harry Clark, South Sulawesi team leader and senior operations and maintenance and construction management engineer

- Mr. Albert Van Paddenburg, agriculturalist (South Sulawesi and Nusa Tenggara Barat)
- Mr. Endro Nusianto, construction management engineer, South Sulawesi
- Mr. Lili Sunarya, operations and maintenance engineer, South Sulawesi
- Mr. Tito A. Cerdan, Nusa Tenggara Barat team leader and senior operations and maintenance engineer
- Mr. Hadi Purwanto, Nusa Tenggara Timur team leader and operations and maintenance engineer
- A. William Ruscoe, PhD, ex groundwater agronomist, Nusa Tenggara Timur
- Mr. S. Edison Puah, Nusa Tenggara Timur water users association organizer
- Mr. Syarief Hoesein, Nusa Tenggara Timur water users association organizer
- Water users association organizer Extension Assistants, Nusa Tenggara Timur

**Overseas Economic Cooperation Fund (OECF) of Japan, Jakarta Office**

- Atsushi Matsushita, representative

**The Ford Foundation**

- Suzanne E. Siskel, assistant representative and ex personal services contractor, Nusa Tenggara Timur Groundwater Development Project and Small-Scale Irrigation Management Project for USAID Jakarta

**Gaia International Management Inc.**

- Dr. Ir. Jan L.M.H. Gerards, president and managing director and former designer of USAID HPSIS Project