

**Towards Establishing a System of Monitoring and Evaluation for the
Participatory Irrigation Management and Development Program
in Cambodia**

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I. INTRODUCTION

Background

The Participatory Irrigation Management and Development (PIMD) program is Cambodia's strategy to ensure sustainable utilization of irrigation system in water resource sector (RGC 1999). In turn, this program will enable farmers to take over the management of their irrigation systems and contribute to increased productivity and profitability of the irrigated agriculture sector. The Strategy for Agriculture and Water endorsed by the Ministry of Water Resources and Meteorology (MOWRAM) and the Ministry of Agriculture, Forestry and Fisheries (MAFF) clearly identifies the PIMD program as the core element in the development of sustainable irrigation (RGC 2006, 2007). PIMD is premised on the idea that community participation and ownership will improve the performance of irrigation systems and result in operational sustainability. The Royal Government of Cambodia (RGC), in accordance with its Circular No. 1 on Sustainable Irrigation Policy (1999) devolves the responsibility for all aspects of scheme operations to Farmer Water User Communities (FWUCs). Specifically, PIMD is defined as an irrigation system management where farmers (through the farmer water users communities or FWUCs) take the lead in: (1) specifying what irrigation services they will receive, (2) managing delivery and financing of those services, and (3) identifying what support services they require (RGC 2003a). The government is then tasked with regulating the irrigation sector and together with other organizations, providing support services and building the capacity of the FWUCs.

MOWRAM is tasked with reviewing and evaluating all irrigation systems with the potential to effectively serve the development of national economy, standardizing the statutes of the Farmer Water Users' Community (FWUC) to facilitate the organization of farmers, and cooperating with the concerned ministries to create the FWUCs. These tasks are in addition to carrying out feasibility studies and constructing irrigation systems to supply irrigation water to farmers' fields in an efficient and sustainable manner (Sinath 2003, 2001). MOWRAM has been implementing the PIMD program since 2000. It is tasked with implementing the PIMD program in 24 provinces in the country. As of September 2007, a total of 144 FWUCs have been created and officially recognized. An inventory of irrigation systems in 1993-1994 by the Mekong Secretariat listed over 900 irrigation schemes in Cambodia comprising over 300,000 ha (Sinath 2001). At the current pace of FWUC establishment, MOWRAM needs guidance on how this process can be facilitated and its effort made more effective.

The Purposes of Establishing a PIMD M&E System

The PIMD program implementation currently lacks a master plan or a roadmap for its implementation in Cambodia. Several studies are currently focusing on the identification of opportunities and constraints in the PIMD implementation under CKH 3008 "Support to the definition of Agricultural Sector Policies" funded by Agence Française de Développement (AFD) and the Technical Cooperation Programme (TCP) funded by the Food and Agriculture Organization of the United Nations (FAO). A monitoring and evaluation (M&E) system

together with these studies will lead to the formulation of a master plan. More importantly, this M&E system will provide a systematic database of all information necessary to enable the Royal Government of Cambodia to (RGC 2003b): (1) better plan and supervise the implementation of PIMD; (2) further revise and develop the PIMD policy and strategy; and (3) mobilize additional resources for further actions in support of PIMD.

Specifically, the M&E system will obtain all pertinent data, create an appropriate database and issue timely reports on PIMD (RGC 2003b). The database should include information on the following components (RGC 2003b): (a) condition of irrigation schemes prior to intervention; (b) progress and problems encountered in building capacity implement PIMD successfully and provide essential support services; (c) progress and problems encountered in establishing and building capacity of FWUC; (d) progress and problems encountered in participatory infrastructure improvement; (e) outcomes of FWUC development, infrastructure improvement and provision of support services; and (f) impacts of FWUC development, infrastructure improvement and provision of support services.

Implementing the PIMD M&E System

MOWRAM is responsible for coordinating planning and implementation of the M&E system for the PIMD program. Establishing an M&E system involves four steps: (1) identification of information requirements, (2) selection and definition of indicators, (3) collection and management of data, and (4) reporting and use of M&E results.

To pilot the M&E system, MOWRAM set up a Working Group for Irrigation System Management (WG-ISM) to monitor and assess the organization and development of Farmer Water User Communities in Takeo, Kampong Speu and Kampong Cham provinces. Nine schemes where the FWUCs have been formed under different projects, have been selected for this pilot M&E. To be able to cover the nine schemes, the WG-ISM members involved in the field work were divided into three teams of three staff each. Each team collected data for three schemes under the supervision of IWMI:

| Group 1 | Group 2 | Group 3 |
|----------------|----------------|----------------|
| Tan Naren | Uk Channarith | Sorn Serey |
| Chan Sopheak | Nuon Soveng | Earm Sophorn |
| Sreng Tiang | Laing Sokim | Kouy Sinak |

Each team spent three days for each scheme. The first day was spent on explaining the objectives and background of the fieldwork and interviewing the FWUC chairmen, vice chairmen and some group leaders to obtain secondary data. The second day was spent on focus group discussions for committee members (with one WG-ISM staff doing this), farmers (two staff did this), and combined farmers and committee members (by all three staff). The third day was spent interviewing agencies with links to the studied schemes. Two staff members were assigned to do this. The third member of each team was assigned with filling data gaps from the first day interviews. The entire fieldwork was completed in 21 days.

The *identification of information requirements* and selection of indicators was undertaken prior to the fieldwork by the WG-ISM with the assistance and support of the International Water Management Institute (IWMI). The *indicators selected* are intended to monitor implementation, outcomes and impacts as presented in the following sections. Some basic characteristics of the systems are also included. Ideally, baseline information should be collected for each irrigation system before PIMD is implemented in order to have information that can be used to compare the impact of the implementation program. Monitoring of the same indicators after PIMD implementation will help establish whether the program is progressing well and is succeeding in achieving its objectives. To address this concern in this pilot M&E, a *recall approach* was applied where respondents are asked about the situation before the program. The *implementation indicators* cover various aspects of FWUC functionality such as organizational and financial management, and systems operation and maintenance. The *outcome and impact indicators* cover physical improvements to the system, water availability, area irrigated, yields, crop diversification, cropping intensity and increase in incomes.

For consistency in *data collection* across irrigation systems, a list of basic area and system characteristics and guide questions are used in key informant interviews, focus group discussions and other participatory rapid rural appraisal (PRA) activities. Specifically, a structured questionnaire was implemented during the focus group discussion with FWUC committees and group leaders and farmers. **Appendix 1** contains the survey questionnaire with the basic information required and the guide questions. The key informants included members of the FWUC committee, group and sub group leaders, officers of provincial and district level agencies and farmers. The other PRA activities included system mapping, drawing of cultivation calendar, mind mapping and problem ranking. The focus group discussion with farmers was used to validate the outcome indicators and the provincial and district officers provided information on agency linkages and support services. **Appendix 2** gives the detailed schedule of the fieldwork and data collection. An important aspect in data collection is ensuring the quality of data collected. Part of this aspect is finding obvious errors and making corrections while the data collectors are still at or near the site and while the collector still remembers the circumstances of the interview.

The original data and information obtained from the questionnaires were in Khmer and translated into English. To better *manage the data*, they were entered into the computer soon after the collection. At present, the data are in Microsoft Excel format. A data management staff should eventually be appointed to maintain and update this database, and put in place a more systematic data storage, retrieval and processing protocol which will include creating data management guidelines, having data entry and handling protocols and report templates.

On *reporting and use of M&E results*, the MOWRAM Working Group produced its first M&E Report based on the data collected (MOWRAM WG-ISM 2007). The report satisfies some key principles for M&E such as simplicity, providing pertinent information that can be used as input into planning, focused on key findings using formats that are brief, clear and highlight the main points and more likely to be read by “busy” stakeholders. The report focuses on 4 key aspects for each of the schemes surveyed: (1) basic physical characteristics of the scheme, (2) annual maintenance and renovation implemented, (3) key *issues* pertaining to the FWUC and scheme operation, and (4) priority *needs* of the scheme and FWUC. The M&E reports should aim for brief and concise reports in easy to read formats.

This report is organized as follows: the following section presents selected basic characteristics of the nine schemes covered; the third section examines the progress of FWUC establishment and the fourth discusses the outcomes and initial impacts; this is followed by a summary of findings and the last section provides some recommendations in improving the M&E system and database.

II. BASIC INFORMATION ON IRRIGATION SCHEMES

Selective information on the characteristics of each scheme are presented in **Table 1**. Eight of the nine irrigation schemes surveyed were constructed during the Pol Pot era. The schemes were then rehabilitated under different projects and one was partly rehabilitated using government social funds. The Phlaur Touk scheme which was originally built in the Pol Pot period, had been extended and rehabilitated under the PRASAC project.

Table 1. Scheme location, year of construction and rehabilitation and fund source

| Scheme | Province | Year constructed | Era/Fund source | Year last rehabilitated | Fund source |
|-----------------|--------------|------------------|-----------------|-------------------------|---------------|
| Tam Lap | Takeo | 1977 | Pol Pot period | 2003 | Seila program |
| Banteay Thleay | Takeo | N/A | Pol Pot period | 1996 | PRASAC |
| Kork Kandal | Takeo | N/A | Pol Pot period | 2004 | FERP |
| Thoam Ney | Takeo | 1950 | French project | 2004 | FERP |
| Thnoat Te | Takeo | 1976 | Pol Pot period | 1996 | ADB |
| Phlaur Touk | Takeo | 1976 | Pol Pot period | 1996 | PRASAC |
| Chan Thnal | Kampong Speu | 1976 | Pol Pot period | 1996 | PRASAC |
| Seventh March | Kampong Cham | 1976 | Pol Pot period | 1996 | PRASAC |
| Tumnuv Santesok | Kampong Cham | 1975 | Pol Pot period | 2004 | Social funds |

Note: N/A means not available. PRASAC stands for Programme de Rehabilitation et d'Appui au Secteur Agricole du Cambodge funded by the European Union. FERP stands for Flood Emergency Rehabilitation Project funded by the World Bank.

Physical Characteristics

The key physical characteristics such as water sources, type of scheme, and reservoir capacity for each scheme are provided in **Table 2**. Seven of the nine irrigation schemes are shown to have reservoirs with capacities ranging from three to 42 million m³. Kork Kandal and Thoam Ney schemes were rehabilitated to serve a dual purpose of irrigation and flood control. In two pumping schemes with canal systems only, water is pumped out from the main canals and transported into the secondary and field canals by private contractors. These contractors have signed agreements with the FWUCs, local authorities and the Department of Water Resources and Meteorology (DOWRAM). Four of the nine schemes directly feed from the Mekong river while two feed from its tributaries. One scheme is completely dependent on rainwater.

Table 2. Physical system information

| Scheme | Main water source | Other water source | Scheme type | Reservoir capacity ('000 m ³) |
|-----------------|---|--------------------|-----------------------------|---|
| Tam Lap | Mekong River | Rain water | Reservoir | 26,500 |
| Banteay Thleay | Mekong River | | Pumping | - |
| Kork Kandal | Mekong River | Rain water | Reservoir/ Flood control | 11,936 |
| Thoam Ney | Sla Koun Stream, O' Ta Sok | Rain water | Reservoir/ Flood control | 4,000 |
| Thnoat Te | Sla Koun Stream, Domrey Roneal Mountain | Rain water | Reservoir | 42,000 |
| Phlaur Touk | Mekong, Vej Te Stream (from Vietnam) | | Pumping | - |
| Chan Thnal | Rain Water | | Reservoir | 3,000 |
| Seventh March | Mekong River | Rain water | Reservoir | 19,000 |
| Tumnuv Santesok | Andong Lave Stream | Rain water | Reservoir | 3,000 |

Socio-economic Characteristics

Consideration of socioeconomic factors is essential for understanding scheme characteristics and should contribute to making sound decisions. Socio-economic data should complement the physical profile for each scheme. The data collected in this pilot M&E include information on the number of farmers per scheme, average sizes of lands, type of crops and cultivated areas per season. Six of the nine schemes included in this M&E pilot can be considered small to medium scale covering a thousand to over three thousand hectares (**Table 3**). The average landholding characterizes smallholder farming with areas ranging from 0.3 ha in Chan Thnal to slightly over a hectare in Seventh March scheme. Paddy is the main crop in all the schemes. Wet season cultivation is practiced only in Chan Thnal and Tumnuv Santesok while dry season cultivation is practiced in all the other schemes. In Phlaur Touk, two crops are cultivated in the dry season.

Table 3. Some socio-economic characteristics of schemes

| Scheme | No. of farmers | Average land holding (ha/farmer) | Crops cultivated | Wet season cultivated area (ha) | Dry season cultivated area (ha) | Total cultivated area (ha) |
|-----------------|----------------|----------------------------------|------------------|---------------------------------|---------------------------------|----------------------------|
| Tam Lap | 2,394 | 0.9 | Paddy | | 2,197 | 2,197 |
| Banteay Thleay | 1,877 | 0.7 | Paddy | | 1,314 | 1,314 |
| Kork Kandal | 1,461 | 0.5 | Paddy | | 783 | 783 |
| Thoam Ney | 284 | 1.0 | Paddy | | 325 | 325 |
| Thnoat Te | 1,904 | 1.0 | Paddy | | 3,200 | 3,200 |
| Phlaur Touk | 2,924 | 1.0 | Paddy | | 3,501 | 3,501 |
| Chan Thnal | 2,300 | 0.3 | Paddy | 1000 | 115 | 1,000 |
| Seventh March | 1,180 | 1.2 | Paddy | | 1,878 | 1,878 |
| Tumnuv Santesok | 103 | 0.5 | Paddy | 65 | - | 65 |

Institutional Characteristics: Irrigation System Management and FWUCs

Understanding the institutional context of PIMD and FWUC formation is as important as knowing the physical and socio-economic profiles. The institutional characteristics provide information on the structure and functions of the institution. In the irrigation sector of Cambodia, the farmer water user community (FWUC) became the central body in irrigation system management when the government embraced the policy of irrigation management transfer (IMT) or participatory irrigation management (PIM) in the late 1990s. The FWUCs were formed or strengthened to enable them to manage rehabilitated irrigation systems mostly built during the Pol Pot era.

Table 4 reports the year the FWUCs were formed in the surveyed nine schemes. It is interesting to note that in five schemes, the FWUCs have been formed as far back as 1995-7. These FWUCs however, had to be revived as a prerequisite to rehabilitation of the schemes, which were funded under various projects.

Table 4. Formation of Farmer Water User Communities (FWUCs)

| Scheme | Year formed | Project/Assistance |
|-----------------|-------------|---|
| Tam Lap | 2000 | MOWRAM, PDOWRAM |
| Banteay Thleay | 1996 | PRASAC |
| Kork Kandal | 2003 | Flood Emergerygency Rehabilitation project |
| Thoam Ney | 2004 | Flood Emergerygency Rehabilitation project |
| Thnoat Te | 1996 | ADB |
| Phlaur Touk | 1997 | PRASAC |
| Chan Thnal | 1995 | PRASAC |
| Seventh March | 1996 | PRASAC |
| Tumnub Santesok | 2004 | PDOWRAM |

Notes: PDOWRAM means Provincial Department of Water Resources and Meteorology.

ADB stands for Asian Development Bank. PRASAC stands for Programme de Rehabilitation et d'Appui au Secteur Agricole du Cambodge.

All the farmers within the irrigation scheme are considered members of the respective FWUC with the ascribed membership. The FWUCs in all schemes, except Thnoat Te, follow the standard statute prepared by the MOWRAM and register with the MOWRAM (**Table 5**). Thnoat Te is still in the process of registering.

Table 5. Membership and registration

| Scheme | Total no. of farmers | Total membership (% of no. of farmers) | Type of statute | Registered with MOWRAM |
|-----------------|-----------------------------|---|------------------------|-------------------------------|
| Tam Lap | 2,394 | 100 | Standard | Yes |
| Banteay Thleay | 1,877 | 100 | Standard | Yes |
| Kork Kandal | 1,461 | 100 | Standard | Yes |
| Thoam Ney | 284 | 100 | Standard | Yes |
| Thnoat Te | 1,904 | 100 | Temporary | No |
| Phlaur Touk | 2,924 | 100 | Standard | Yes |
| Chan Thnal | 2,300 | 100 | Standard | Yes |
| Seventh March | 1,180 | 100 | Standard | Yes |
| Tumnub Santesok | 103 | 100 | Standard | Yes |

According to the given statute of FWUCs in Pracas 306, the basic functions of the FWUC are: (1) to manage irrigation schemes, (2) collect irrigation service fee (ISF) to cover the cost of service delivery and operation and maintenance (O&M), (3) bring together farmers who have farming land in an irrigated area and form a group for facilitating the supply of irrigation water to them, (4) supply adequate water for irrigation to the members, (5) acquire knowledge of management, O&M of the irrigation system and financial affairs, (6) increase the yields and seasonal cropping, and (7) facilitate support from the government.

The FWUC is responsible for: (1) the collection of the ISF that it determines, (2) the preparation of a work plan, (3) the formulation of statutes (constitution), contracts and internal regulations of the community, (4) the maintenance of the irrigation system to enable the provision of irrigation for the whole season, (5) the management and distribution of water to all members, (6) the strengthening of use, management and improvement of the irrigation system in an efficient manner, and (7) the resolution of problems within the community.

III. PROGRESS OF THE PIMD PROGRAM AND FUNCTIONALITY OF FWUCS

In this report, whether FWUCs are functional or not is assessed in terms of how they perform their functions and responsibilities with respect to four key areas of *organizational management*, *financial management*, *system operation* and *system management*. Under organization management, four sub areas are examined: (a) structure, (b) leadership, (c) decision making, and (d) record keeping. On *structure*, the sub groups, groups and FWUC committees are defined as functional by the degree of their involvement in the operation and maintenance of their irrigation schemes and the carrying out of their defined functions. *Leadership* is measured by the extent of engagement of the chairpersons, group and sub group leaders in the implementation of their roles and responsibilities or all FWUC related activities. The *decision making* capacity of the FWUCs is gauged by the process and extent of participation of members. *Record keeping* is to measure how well organized and transparent the FWUCs operate. The *financial* indicators show

the sources and utilization of funds and potential viability of the FWUCs. *System operation and maintenance* capture the involvement and activities of FWUCs and indications of farmers' satisfaction. The specific indicators used to assess the functionality of FWUCs in terms of the four areas are given in **Table 6**.

Table 6. Functionality of FWUCs

| Performance areas | Sub-Areas | Indicators |
|------------------------------|--------------------|--|
| 1. Organizational management | a. Structure | - No. of operational SFWUGs - No. of operational FWUGs - No. of operational FWUCs - Involvement in O&M & other FWUC activities |
| | b. Leadership | - Functionality of leaders - Expected activities implemented by leaders |
| | c. Decision making | - Frequency of committee meetings - Participation in meetings |
| | d. Record keeping | - No. of records - Quality of records |
| 2. Financial management | | - Yearly progress in collection of fees - Quality of financial record - Funds utilization |
| 3. System operation | | - Degree of involvement in system operation - Procedures followed - Degree of farmer satisfaction on system operation |
| 4. System maintenance | | - Adequacy, Reliability and Flexibility - Degree of involvement in Minor repair - Degree of involvement in Major repair (earthwork and concrete work) - Degree of farmer satisfaction of quality of constructions |

Organizational Management

Organizational management is an essential element in an organization's development. In this context, we focus on structure, leadership and decision making. With the farmer water user communities (FWUCs) as the key institutions in carrying out PIMD, monitoring progress of PIMD implementation is equivalent to assessing the organizational management of FWUCs.

a. Structure

Comprising the structures of FWUCs are the farmer water user groups (FWUGs) which are in turn composed of sub farmer water user groups (SFWUGs). In all the irrigation schemes, except Banteay Thleay and Seventh March, the FWUGs were formed based on administrative boundaries of communes and the SFWUGs have been formed based on village boundaries. The FWUGs and SFWUGs in Banteay Thleay and Seventh March irrigation schemes were formed based on some hydrological boundaries. However, these hydrological boundaries are not very clear. Of the SFWUGs formed, only those in Tam Lap, Phlaur Touk and Tumnuv Santesok are functional (**Table 7**). The FWUGs in seven irrigation schemes are functional while the core

members of the FWUC committee are functional in six schemes. In some schemes, there are a few positions which are not functional at all.

Table 7. Functionality of Sub-groups, Groups and FWUC management committee

| Scheme | No. SFWUGS | % functional | No. FWUGs | % functional | No. of FWUC committee core members | % functional |
|-----------------|------------|--------------|-----------|--------------|------------------------------------|--------------|
| Tam Lap | 19 | 100 | 5 | 100 | 4 | 100 |
| Banteay Thleay | 14 | 14 | 3 | 100 | 4 | 100 |
| Kork Kandal | 18 | 0 | 3 | 100 | 4 | 100 |
| Thoam Ney | 6 | 50 | 2 | 100 | 4 | 50 |
| Thnoat Te | 38 | 0 | 22 | 100 | 4 | 100 |
| Phlaur Touk | 28 | 100 | 6 | 100 | 4 | 100 |
| Chan Thnal | 23 | 0 | 4 | 100 | 4 | 75 |
| Seventh March | 32 | 13 | 6 | 67 | 5 | 80 |
| Tumnuv Santesok | 3 | 100 | 1 | 100 | 4 | 100 |

Table 8 presents the implementation of activities by the SFWUGs, FWUGs and FWUCs. The SFWUGs established in Tam Lap scheme are involved in implementing *most* of their main activities more regularly than those in other schemes. In Banteay Thleay and Seventh March schemes, the SFWUGs are partly functional with a few leaders implementing only *some* of the activities.

Table 8. Involvement in activities by SFWUGs, FWUGs and FWUC management committee

| Scheme | SFWUGs | FWUGs | FWUC committee |
|-----------------|--|--|-----------------------------------|
| Tam Lap | Do most main activities regularly | Do some main activities occasionally | Do most main activities regularly |
| Banteay Thleay | Do some main activities by few leaders regularly | Do some main activities by few leaders regularly | Do some main activities regularly |
| Kork Kandal | Not functional | Do some main activities regularly | Do most main activities regularly |
| Thoam Ney | Do few activities occasionally | Do some main activities occasionally | Do some main activities regularly |
| Thnoat Te | Not functional | Do few main activities occasionally | Do some main activities regularly |
| Phlaur Touk | Do some main activities regularly | Do some main activities regularly | Do most main activities regularly |
| Chan Thnal | Not functional | Do some main activities occasionally | Do some main activities regularly |
| Seventh March | Do some activities by few leaders regularly | Do some main activities regularly | Do most main activities regularly |
| Tumnuv Santesok | Do few main activities regularly | Do few main activities regularly | Do few main activities regularly |

Notes: "Regular involvement" in operation means continuous implementation of the given roles and responsibilities each season. "Regular involvement" in maintenance means full implementation of routine and main repairs each season. "Occasional involvement" means involvement only upon request by farmers or the FWUC.

Comparing across structures and schemes, the FWUGs appear to be more functional than the SFWUGs and most of the FWUGs implement some of the main activities of the FWUCs. The existing core members of the FWUC committees in all irrigation schemes are involved in implementing their given roles and responsibilities regularly. Most of the main activities are being regularly implemented by the core FWUC committee members in Tam Lap, Kork Kandal, Phlaur Touk and Seventh March (Table 8).

In the majority of the irrigation schemes, the SFWUGs are *very weak*. They are either defunct or functional at a very low level. These weaknesses are largely due to weaknesses in the process of their formation. Specifically, most of them have been formed without identifiable irrigation boundaries and had much less incentive to be active and cooperate. Majority of the SWUGs have been formed based on village boundaries which do not match irrigation boundaries. Some of the SFWUGs (e.g. Kork Kandal, Seventh March) were formed only to fulfill the requirements for FWUC registration. In addition, system deficiencies prevented the active involvement of the sub-groups in implementing their given roles and solving field problems as this was beyond their capacities. The lack of clear assignments and corresponding training also contributed to the groups' being inactive.

b. Leadership

Leadership is a key aspect in organizational management. It is important in ensuring effectiveness in organizations. The functionality of the FWUC committee, group and sub group leaders is central in the sustainability of FWUCs. **Table 9** sums up how the leaders are selected, how involved they are in their functions and whether farmers are satisfied with the leadership. The leaders carry out the tasks and responsibilities specified in their FWUC statutes. The core members of the FWUC committee comprise the Chairman, first Vice Chairman, second Vice Chairman and third Vice Chairman. The chairmen and vice chairmen were selected through elections among farmers in all the schemes except in Tam Lap, where they have been selected by sub groups. Some positions for vice chairmen are not functional in Chan Thnal and Seventh March schemes.

The Chairmen of the FWUCs in Tam Lap, Kork Kandal and Phlaur Touk are found to be highly devoted in carrying out all their assigned roles and responsibilities. Particularly, the service of the Chairman of Phlaur Touk is evaluated by farmers as *very good*. *Farmer satisfaction* is measured subjectively in the survey. Rather than “yes” or “no” answer, it was decided to capture to some extent the “degree” of satisfaction or dissatisfaction by giving five choices ranging from “very weak” (when farmers are least satisfied) to “very good” (when farmers are most satisfied). So, if many farmers rate their satisfaction with their leaders as “good” to “very good,” then they are likely to be impressed by the leadership in their respective schemes.¹

The chairmen of the FWUCs in the rest of the irrigation schemes, except for Tumsub Santesok, carry out most of their responsibilities. All the core members of the FWUC committee in Tam Lap irrigation scheme actively implement their given roles and responsibilities and their services have been evaluated by farmers as *good*. The Vice chairmen in all the irrigation schemes except Chan Thnal and Tumsub Santesok, implement most of their given roles. The Vice chairman of Chan Thnal implements only part of his given roles and responsibilities while all the

¹ A caveat here is that the responses reported may not be directly comparable across farmers.

core members of the FWUC committee including the Chairman in Tumnub Santesok irrigation schemes implement only a few of their expected roles and responsibilities.

Table 9. Leadership of FWUC committees, groups and sub-groups

| Leaders | Selection | Functional or not | Involvement in activities | Farmer satisfaction |
|-----------------------|------------------|--------------------------|-------------------------------------|----------------------------|
| Tam Lap | | | | |
| Chairman | By sub-groups | Functional | Do expected roles | Good |
| 1st Vice chairman | By sub- groups | Functional | Do expected roles | Good |
| 2nd Vice chairman | By sub- groups | Functional | Do expected roles | Good |
| 3rd Vice chairman | By sub-groups | Functional | Do expected roles | Good |
| Group leaders | Election | Functional | Do most of expected roles | Good |
| Sub group leaders | Election | Functional | Do most of expected roles | Good |
| Banteay Thleay | | | | |
| Chairman | Election | Functional | Do most of expected roles | Moderate |
| 1st Vice chairman | Election | Functional | Do most of expected roles | Good |
| 2nd Vice chairman | Election | Functional | Do some of expected roles | Moderate |
| 3rd Vice chairman | Election | Functional | Do most of expected roles | Moderate |
| Group leaders | Election | Majority not functional | Very few involved in few activities | - |
| Sub group leaders | Election | Majority not functional | Very few involved in few activities | - |
| Kork Kandal | | | | |
| Chairman | Election | Functional | Do expected roles | Moderate |
| 1st Vice chairman | Election | Functional | Do most of expected roles | Moderate |
| 2nd Vice chairman | Election | Functional | Do most of expected roles | Moderate |
| 3rd Vice chairman | Election | Functional | Do expected roles | Moderate |
| Group leaders | Election | Functional | Do some of expected roles | Moderate |
| Sub group leaders | Election | Not functional | - | - |
| Thoam Ney | | | | |
| Chairman | Election | Function | Do most of expected roles | Good |
| 1st Vice chairman | Election | Not functional | - | - |
| 2nd Vice chairman | Election | Functional | Do most of expected roles | Good |
| 3rd Vice chairman | Election | Not functional | - | - |
| Group leaders | Election | Functional | Do some of expected roles | Moderate |
| Sub group leaders | Election | Functional | Do few of expected roles | Moderate |
| Thnoat Te | | | | |
| Chairman | Election | Functional | Do most of main activities | Moderate |
| 1st Vice chairman | Election | Functional | Do most of main activities | Moderate |
| 2nd Vice chairman | Election | Functional | Do most of main activities | Moderate |
| 3rd Vice chairman | Election | Functional | Do main activities | Moderate |
| Group leaders | Election | Functional | Do few of expected roles | Moderate |
| Sub group leaders | Election | Not functional | - | - |

Table 9. (continuation)

| Leaders | Selection | Functional or not | Involvement in activities | Farmer satisfaction |
|------------------------|---------------------|--------------------------|---|----------------------------|
| Phlauv Touk | | | | |
| Chairman | Election | Functional | Do expected roles | Very good |
| 1st Vice chairman | Election | Functional | Do most of expected roles | Good |
| 2nd Vice chairman | Election | Functional | Do most of expected roles | Good |
| 3rd Vice chairman | Election | Functional | Do expected roles | Good |
| Group leaders | Election | Functional | Do some of expected roles | Moderate |
| Sub group leaders | Election | Functional | Do some of expected roles | Moderate |
| Chan Thnal | | | | |
| Chairman | Election | Functional | Do most of expected roles | Good |
| 1st Vice chairman | Election | Functional | Do most of expected roles | Good |
| 2nd Vice chairman | Election | Functional | Do most of expected roles | Good |
| 3rd Vice chairman | None | | | |
| Group leaders | Election | Functional | Do most of expected roles | Good |
| Sub group leaders | Election | Not functional | - | - |
| Seventh March | | | | |
| Chairman | Election | Functional | Do most of expected roles | Good |
| 1st Vice chairman | Election | Functional | Do most of expected roles | Good |
| 2nd Vice chairman | Election | Not functional | - | - |
| 3rd Vice chairman | Election | Not functional | - | - |
| Assistant | Appointed by MOWRAM | Functional | Do some of expected roles | Moderate |
| Group leaders | Appointed by MOWRAM | Functional | Do some of expected roles by some sub group leaders | Moderate |
| Sub group leaders | Appointed by MOWRAM | Majority not functional | Do few of expected roles by few sub group leaders | Moderate |
| Tumnuv Santesok | | | | |
| Chairman | Election | Functional | Do few of expected roles | Weak |
| 1st Vice chairman | Election | Functional | Do few of expected roles | Weak |
| 2nd Vice chairman | Election | Functional | Do few of expected roles | Weak |
| 3rd Vice chairman | Election | Functional | Do few of expected roles | Moderate |
| Group leaders | Election | Functional | Do few of expected roles | Moderate |
| Sub group leaders | Election | Functional | Do few of expected roles | Moderate |

The positions of first and third Vice Chairmen of the FWUC are not functional and remain vacant in Thoam Ney irrigation scheme. The person who held the position of first Vice Chairman has been selected as a commune chief while the person selected for third Vice Chairman is not interested to get involved in FWUC activities. Also, the second and third Vice Chairmen of Seventh March scheme are not functional as those selected to hold the positions do not have any leadership qualities.

Overall, the involvement of sub group and group leaders in FWUC activities in the majority of the irrigation schemes is relatively *weak*. In some schemes, these positions are

nominal and not functional. In Banteay Thleay, the farmers are not even aware of the existence of such positions. Improper selections and unclear assignments/responsibilities are the reasons for the low level of functioning of group and sub-group leaders. The functionality of majority of FWUCs largely depends on how active the core members are and in some irrigation schemes, on the strong leadership of the chairmen.

c. Decision making

Decisions made are as important as the process which led to the decisions. The quality of decision making contributes to how organizations are successfully managed. The meeting of FWUC committee is the forum for collective planning and decision making for each scheme. These committee meetings are held more frequently and with majority of farmer members in only three schemes participating (**Table 10**). While these meetings are held weekly during cultivation period in one scheme, no such meeting is held in three schemes. In these three schemes, decisions are made by the FWUC chairmen. Where decisions are made without the buy in of members, less cooperation and contributions can be expected. In Table 10, it appears that this aspect of organizational management is still relatively weak in majority of the schemes.

Table 10. Frequency of FWUC committee meetings and participation

| Scheme | Frequency of meetings | Participation (% of farmer members) |
|-----------------|------------------------------------|--|
| Tam Lap | Weekly (during cultivation season) | 53 |
| Banteay Thleay | No meetings | - |
| Kork Kandal | No meetings | - |
| Thoam Ney | Once in two years | 36 |
| Thnoat Te | Regularly & whenever necessary | 75 |
| Phlaur Touk | Once a month | 80 |
| Chan Thnal | Once a year | 84 |
| Seventh March | Three times a year | 86 |
| Tumnub Santesok | No meetings | - |

d. Record keeping

Good record keeping is a must in managing organizations. Maintaining quality records should contribute to well informed decisions. The following basic records are supposed to be maintained by FWUCs as attested to by the farmers and MOWRAM-PIMD staff: (i) list of members, (ii) minutes of meetings, (iii) record of land holdings, (iv) fee collection record, and (v) financial record (e.g. record of cash and fund utilization). All these five records are maintained by FWUCs in four schemes (**Table 11**). The qualities of records maintained in Tam Lap and Phlaur Touk are reported to be *good*. The Seventh March FWUC maintains four records while the FWUCs in the other four irrigation schemes maintain only financial records.

Table 11. Number and quality of FWUC records

| Scheme | No. of records | Quality of records |
|-----------------|-----------------------|---------------------------|
| Tam Lap | 5 | Good |
| Banteay Thleay | 1 | Good |
| Kork Kandal | 1 | Moderate |
| Thoam Ney | 1 | Moderate |
| Thnoat Te | 5 | Moderate |
| Phlauv Touk | 5 | Good |
| Chan Thnal | 5 | Moderate |
| Seventh March | 4 | Moderate |
| Tumnuv Santesok | 1 | Weak |

Notes: "Good" means records are well prepared, complete, regularly updated and used by the FWUCs for decision making; "Moderate" means records are available but only some are regularly updated and they partly used for FWUCs' decision making; "Weak" means existing records are hardly updated and used in decision making.

While records are maintained by FWUCs, there is no uniformity in the type of records kept apart from financial records. Record keeping appears to depend on the knowledge and ability of FWUC chairmen and other committee members. As they are, the records kept cannot fully support the FWUCs functions nor make possible review of progress of activities. In many schemes, the information required for some decisions are not available.

Financial Management

Financial management serves as the backbone for organizations. For FWUCs to function, they require financial resources. FWUCs need to raise funds to support their activities. After system rehabilitation, the responsibility for O&M and emergency repair is supposed to be transferred gradually by government to FWUCs in the span of five years. The first year after rehabilitation, the government covers 80% while the farmer members cover the remaining 20%. This sharing continues until the fourth year with government share decreasing and those of farmer members increasing by 20% per year. On the fifth year, the farmer members are expected to fully cover O&M and emergency repairs.

Before the FWUC formation, there was no mechanism for charging farmers for water (RGC 2003c). The total cost of construction, operation and maintenance fell upon government. Without income from water charges and with generally limited government resources, MOWRAM and later on the local authorities, were unable to provide maintenance to keep existing systems operational. Without good service, farmers will be unwilling to pay even minimal water charges.

Tables 12 and 13 illustrate how the FWUCs are managing with respect to their finances. For FWUCs which have been around for sometime, there is already more experience and confidence in collecting of irrigation service fees (ISFs). For instance, the FWUCs in Banteay Thleay, Thnoat Te, Phlauv Touk and Chan Thnal have been continuously collecting ISFs since 1998 (**Table 12**). In Banteay Thleay and Phlauv Touk, the ISF is collected by private contractors involved in pumping water as part of their contractual obligation. In Tumnuv Santesok scheme, the ISF was collected only for one year. This may reflect the lack of motivation of leaders to collect and incentives for farmers to pay because not much improvement and benefits are felt.

Table 12. Collection of fees ('000 Riels)

| Scheme | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | Remaining balance |
|--------------------------|--------|--------|--------|--------|--------|--------|-------------------|
| Tam Lap | | | | | 18,007 | 20,218 | 23,284 |
| Banteay Thleay | 15,242 | 14,263 | 25,802 | 47,008 | 31,128 | 43,731 | 9,823 |
| Kork Kandal | | | 3,208 | 3,400 | 1,290 | 800 | None |
| Thoam Ney | | | | 1,050 | 6,500 | | 530 |
| Thnoat Te | 1,334 | 1,238 | 8,615 | 5,704 | 7,032 | 8,899 | None |
| Phlaur Touk | 73,049 | 79,034 | 48,741 | 85,277 | 75,927 | 62,972 | 44,841 |
| Chan Thnal ^{1/} | 2,470 | 3,050 | 1,951 | | 14,474 | 948 | 9,844 |
| Seventh March | | | | | N/A | 13,750 | 5,300 |
| Tumnub Santesok | | | | 700 | | | 700 |

Notes: 1/ Figure for 2006 refers to 2005/2006. N/A means not available.

Collection of ISF is the only source of funds for FWUCs in six irrigation schemes. FWUCs in Banteay Thleay and Phlaur Touk are able to collect fees from boats using the main canals although the ISF remains the primary source of income (**Table 13**). Auctioning of fishing rights in the reservoir is the main source of income for the Seventh March FWUC. This FWUC also charges a toll fee for vehicles passing through the reservoir bund road and does not collect ISF (Table 13).

As of the survey period, seven schemes have remaining funds from past collections after deducting all expenses. In three schemes, all the collected funds are fully spent while in one scheme, the fund is not spent on any activity. In most cases, the FWUCs used their funds for major and minor system repairs and to pay committee members. Four FWUCs maintain bank accounts.

Table 13. Fund sources and utilization

| Scheme | Source of funds | Utilization of funds | Maintenance of bank account |
|-----------------|--|--|-----------------------------|
| Tam Lap | ISF | 1. System repair 2. Payment to FWUC committee 3. Administrative expenses | Yes |
| Banteay Thleay | 1. ISF (collected by contractors) 2. Boat fee | 1. System repair 2. Payment to FWUC committee | Yes |
| Kork Kandal | ISF | 1. System repair 2. Payment to FWUC committee | No |
| Thoam Ney | ISF | System repair | No |
| Thnoat Te | ISF | System repair | No |
| Phlaur Touk | 1. ISF (collected by contractors) 2. Boat fee | 1. System repair 2. Payment to FWUC committee 3. Administrative expenses | No |
| Chan Thnal | ISF | 1. System repair 2. Payment to FWUC committee 3. Administrative expenses | Yes |
| Seventh March | 1. Fish auction 2. Vehicle fee | 1. System repair 2. Payment to FWUC committee | Yes |
| Tumnub Santesok | ISF | Not utilized | No |

Notes: Payment to FWUC committee includes salaries of the Chairman and Vice chairmen.

Administrative expenses include official travel expenses, items for the office, etc.

Boat fee is the fee charged from boats that use the canal for transportation of goods.

Fish auction is the auctioning of fishing rights in the reservoir and canals.

Vehicle fee is the fee collected from vehicles passing through the reservoir bund road.

System Operation

System operation is basically concerned with allocation and distribution of water to farmer members. The demands involved in system operation depend on the available structures in each scheme. **Table 14** reports the available canal systems for each of the irrigation schemes. The Tumnub Santesok scheme has only main canals. In Kork Kandal and Phlaur Touk, no tertiary level structures are available.

Table 14. Canal system

| Scheme | Main | Secondary | Tertiary |
|-----------------|------|-----------|----------|
| Tam Lap | Yes | Yes | Yes |
| Banteay Thleay | Yes | Yes | Yes |
| Kork Kandal | Yes | Yes | No |
| Thoam Ney | Yes | Yes | Yes |
| Thnoat Te | Yes | Yes | Yes |
| Phlaur Touk | Yes | Yes | No |
| Chan Thnal | Yes | Yes | Yes |
| Seventh March | Yes | Yes | Yes |
| Tumnub Santesok | Yes | None | None |

Banteay Thleay, Kork Kandal and Phlaur Touk irrigation schemes were not functional before the formation of FWUCs. In others, system operation had been done by the village or commune chiefs based on farmer requests while in Tumnub Santesok, system operation had been done by the farmers themselves (**Table 15**).

Table 15. System operation before FWUC

| Scheme | Main system | | Secondary system | | Tertiary (field level) | |
|------------------------------|-----------------------------------|-------------------|---------------------------|-------------------|---------------------------|-------------------|
| | Responsible | Procedure | Responsible | Procedure | Responsible | Procedure |
| Tam Lap | Dept. of Agric., Commune chief | Farmer request | Village chief, farmers | Farmer request | Farmers | |
| Banteay Thleay ^{1/} | | | | | | |
| Kork Kandal ^{2/} | | | | | | |
| Thoam Ney | Village chief | Farmer request | Farmer groups | Farmer request | Farmer groups | |
| Thnoat Te | Village chief, farmers | Farmer request | Village chief, farmers | Farmer request | Village chief, farmers | Farmer request |
| Phlaur Touk ^{3/} | | | | | | |
| Chan Thnal | Commune chief | Farmer request | | | | |
| Seventh March | Commune chief | Not clear | Village chief | Not clear | Farmers | |
| Tumnub Santesok | Farmers | Own way | | | | |

Notes: 1/ No proper canal and irrigation system.

2/ No proper canal and irrigation system; the system is dilapidated.

3/ No proper canal system.

The FWUCs in all the irrigation schemes are involved in system operation and four are involved in operation from the main system up to the field level (**Table 16**). The two irrigation schemes which are pumping, consist only of canal systems. In these cases, the contractors are involved in pumping water from main canal to the secondary canals. In Banteay Thleay, the contractors sometimes pump water from the secondary canals up to farmers' fields.

System operation is undertaken based on the plan prepared by FWUCs in only two irrigation schemes: Tam Lap and Phlaur Touk (Table 16). In other systems, operation is done on farmer request.

Table 16. FWUC Involvement in system operation

| Scheme | Operation responsibility | Procedure followed |
|-----------------|--|--|
| Tam Lap | Main/secondary/field | Plan prepared by FWUC |
| Banteay Thleay | Main system (contractor) | On farmer request |
| Kork Kandal | Main system | On group request |
| Thoam Ney | Main system | On group request |
| Thnoat Te | Main/secondary/field | On farmer request |
| Phlaur Touk | Main system (contractor)/ Field level | Plan prepared by FWUC Contractor/ Group leaders |
| Chan Thnal | Main/secondary/field | On farmer request |
| Seventh March | Main system Secondary/field | On farmer request |
| Tumnub Santesok | Main system | On farmer request |

Table 17 gives the *water availability* for cultivation in both seasons as reported by farmers. The quality of the service of FWUCs in system operation highly dependent on the level of involvement of the respective core members of the committee, FWUG and SFWUG leaders, and on the availability of operational systems more than water availability. For instance, in Kork Kandal, the inadequacy of water is mainly due to the location of some lands and lack of field canals. In Thnoat Te, the inadequacy of water is mainly due to the lack of proper canal systems and control structures. In Seventh March irrigation scheme, water inadequacy is a management problem related to operating the feeder canal gate during floods. In this scheme, the position of the second Vice chairman who is responsible for water distribution, is not functional. In Tumnub Santesok, farmers have inadequate water due to the shallow reservoir.

Table 17. Water availability

| Scheme | Cultivation season | Water availability |
|-----------------|-------------------------------|-------------------------------|
| Tam Lap | Dry | Inadequate |
| Banteay Thleay | Dry | Adequate |
| Kork Kandal | Dry | Inadequate |
| Thoam Ney | Dry | Adequate |
| Thnoat Te | Dry | Inadequate |
| Phlaur Touk | Dry | Adequate |
| Chan Thnal | Wet | Adequate |
| Seventh March | Dry | Inadequate |
| Tumnub Santesok | Wet | Inadequate |

The problem of inadequate water is reduced in schemes where the FWUCs are involved in water distribution. Specifically, towards the end of the season when water in Tam Lap is insufficient, the FWUC start pumping water from a stream. Farmers are quite happy with this service. In Kork Kandal, the core members of the FWUC and some group leaders are involved in water distribution to mitigate irrigation problems.

In Banteay Thleay, farmers have irrigation problems even if water is available at the main canal. Water distribution in this scheme is the responsibility of private contractors who are apparently not performing as they should. However, in Phlaur Touk where the private contractors are also responsible for water distribution, the FWUC is more involved. Specifically, the FWUC develops the overall plan which includes water distribution to the fields. According to farmers, the quality of service in this scheme is relatively good. In Chan Thnal, although water is adequate, the lack of adequate structures at the field level prevents the delivery of a better service. In Tumnub Santesok scheme, the FWUC uses a lottery system to allocate water when there is not enough in the reservoir to irrigate the total coverage area.

System Maintenance

System maintenance includes major and minor repairs of headworks and canal system. A well maintained system will make possible better system operation and delivery of quality service. Before the formation of the FWUCs, system maintenance in the functional irrigation schemes was limited to some minor repairs in reservoir bunds and main canals as organized either by the

village or commune chiefs (**Table 18**). Minor repairs of secondary canals were implemented only in one irrigation scheme. There was no maintenance work at all in Tumnub Santesok irrigation scheme before the formation of the FWUC. As described in Tables 19-20, the FWUCs are involved in implementing both minor and major maintenance except in Tumnub Santesok, where the involvement is limited to minor repairs.

To be able to gauge performance of system maintenance before and after FWUC establishment, *farmer satisfaction* is measured by its “degree” of satisfaction or dissatisfaction. The rating ranges from “very weak” (when farmers are least satisfied or happy with the outcome) to “very good” (when farmers are most satisfied or happy with the outcome). A “moderate” rating means that the farmers are just about satisfied with the repairs. Farmer satisfaction on the quality of minor repairs was mostly *moderate* (Table 18).

Table 18. System maintenance before FWUC establishment (minor repairs)

| Scheme | Headwork / bund | | | Main canal | | | Secondary canal | | |
|------------------------------|------------------------|-------------|----------|------------------------|-------------|----------|------------------------|-----------|---------|
| | Responsible | Frequency | Quality | Responsible | Frequency | Quality | Responsible | Frequency | Quality |
| Tam Lap | Village chief, farmers | As required | Good | Village chief, farmers | As required | Moderate | No one | | |
| Banteay Thleay ^{1/} | | | | | | | | | |
| Kork Kandal ^{2/} | | | | | | | | | |
| Thoam Ney | Commune chief, farmers | Annually | Moderate | | | | | | |
| Thnoat Te | Village chief, farmers | As required | Weak | Village chief, farmers | Annually | Weak | Village chief, farmers | Annually | Weak |
| Phlaur Touk ^{3/} | | | | | | | | | |
| Chan Thnal | Commune chief, farmers | As required | Moderate | Commune chief, farmers | As required | Moderate | | | |
| Seventh March | Commune chief, farmers | As required | Moderate | Village chief, farmers | As required | Moderate | | | |
| Tumnub Santesok | No one | | | No one | | | | | |

Notes: 1/ No proper canal and irrigation system.

2/ No proper canal and irrigation system; the system is dilapidated.

3/ No proper canal system.

With the establishment of FWUCs, there was a clear body responsible for system maintenance at different levels. In all irrigation schemes, the FWUCs are involved in maintenance. In eight of the nine schemes surveyed, the FWUCs are involved in both minor and major repairs. These schemes regularly do minor repairs of reservoir bund and headworks. In Tumnub Santesok, system maintenance is limited to minor repairs of canal system.

Maintenance is either directly done by FWUC members or through contracts with private contractors for bigger repairs or individuals for small repairs. In Kork Kandal, Chan Thnal and Seventh March, the minor repairs are contracted out using FWUC funds. In other schemes, the repairs are done as a group work of farmer members.

Table 19 reports the farmers’ assessment of the quality of minor repairs. Minor repairs of headworks and bunds and main canal in Tam Lap, Chan Thnal and Seventh March schemes met the approval of farmers with satisfaction ratings of *good*. It is interesting to note that most repairs done through contracts resulted in more satisfied farmers than those done through group work.

Table 19. Involvement of FWUCs in system maintenance and farmer satisfaction (minor repairs)

| Scheme | Involvement | Level of Involvement | Mode of implementation | Frequency | Farmer satisfaction |
|---|-------------|---------------------------|-------------------------|--------------|---------------------|
| Minor repair: headworks and bund | | | | | |
| Tam Lap | Yes | Some repairs | Contracts Group work | Regularly | Good |
| Banteay Thleay | | | | | |
| Kork Kandal | Yes | Some repairs | Contracts | Regularly | Moderate |
| Thoam Ney | Yes | Some repairs | Group work | Regularly | Moderate |
| Thnoat Te | Yes | Some repairs | Group work | Regularly | Moderate |
| Phlaur Touk | | | | | |
| Chan Thnal | Yes | Some repairs | Contracts | Regularly | Good |
| Seventh March | Yes | Some repairs | Contracts | Regularly | Good |
| Tumnuv Santesok | | | | | |
| Minor repair: earthwork for main canals | | | | | |
| Tam Lap | Yes | Some earthworks (turving) | Group work Contracts | Regularly | Good |
| Banteay Thleay | Yes | Some earthworks | Contract | Regularly | Moderate |
| Kork Kandal | Yes | Some earthworks | Group work | Occasionally | Moderate |
| Thoam Ney | Yes | Some repairs | Group work | Regularly | Moderate |
| Thnoat Te | Yes | Some repairs | Group work | Regularly | Moderate |
| Phlaur Touk | Yes | Some repairs | Contracts | Regularly | Moderate |
| Chan Thnal | Yes | Some repairs | Contracts | Regularly | Good |
| Seventh March | Yes | Some repairs | Contracts | Regularly | Good |
| Tumnuv Santesok | Yes | Some repairs | Group work | Occasionally | Moderate |
| Minor repair: earthwork for secondary canals | | | | | |
| Tam Lap | Yes | Some earthworks | Group work | Regularly | Good |
| Banteay Thleay | Yes | Some repairs | Contracts | Regularly | Moderate |
| Kork Kandal | Yes | Some earthworks | Group work | Occasionally | Moderate |
| Thoam Ney | | | | | |
| Thnoat Te | Yes | Some repairs | Group work | Regularly | Moderate |
| Phlaur Touk | | | | | |
| Chan Thnal | Yes | Some repairs | Contracts | Occasionally | Good |
| Seventh March | | | | | |
| Tumnuv Santesok | | | | | |

Table 20 sums up the participation of FWUCs in major repairs. Comparing the engagement of FWUCs in minor and major repairs, it is apparent that they do mostly minor repairs. In Thnoat Te, Chan Thnal and Seventh March, the FWUCs are involved in some major earthwork repairs of the reservoir bunds. However, more FWUCs are involved in repairs of main canal and secondary canals. Interestingly, three schemes are even investing in concrete structure repairs. All the major repairs carried out by some of the schemes were undertaken through contracts paid by funds collected by the FWUCs. The performance of contracts in major repairs however, seems less impressive as in minor repairs. More farmers expressed only *moderate* satisfaction as opposed to the generally *good* rating that they gave to minor repairs done through contracts.

Table 20. Involvement of FWUCs in major repairs and farmer satisfaction²

| Scheme | Involvement | Mode of implementation | Frequency | Farmer satisfaction |
|--|--------------------|-------------------------------|------------------|----------------------------|
| Earthwork: reservoir bund | | | | |
| Tam Lap | | | | |
| Banteay Thleay | | | | |
| Kork Kandal | | | | |
| Thoam Ney | | | | |
| Thnoat Te | Yes | Contracts | As required | Moderate |
| Phlaur Touk | | | | |
| Chan Thnal | Yes | Contracts | Regularly | Good |
| Seventh March | Yes | Contracts | As required | Good |
| Tumnuv Santesok | | | | |
| Earthwork: main canal | | | | |
| Tam Lap | | | | |
| Banteay Thleay | Yes | Contract | Once a year | Moderate |
| Kork Kandal | Yes | Contract | Once a year | Moderate |
| Thoam Ney | | | | |
| Thnoat Te | Yes | Contracts | As required | Moderate |
| Phlaur Touk | Yes | Contracts | Once a year | Moderate |
| Chan Thnal | Yes | Contracts | As required | Good |
| Seventh March | Yes | Contracts | As required | Good |
| Tumnuv Santesok | | | | |
| Earthwork: secondary canals | | | | |
| Tam Lap | | | | |
| Banteay Thleay | Yes | Contract | Once a year | Moderate |
| Kork Kandal | | | | |
| Thoam Ney | Yes | Contracts | As required | Moderate |
| Thnoat Te | Yes | Contracts | As required | Moderate |
| Phlaur Touk | | | | |
| Chan Thnal | Yes | Contracts | As required | Good |
| Seventh March | Yes | Contracts | As required | Good |
| Tumnuv Santesok | | | | |
| Concrete work and structure repairs | | | | |
| Tam Lap | Yes | Contracts/FWUC | | Good |
| Banteay Thleay | | | | |
| Kork Kandal | Yes | Contract | Once a year | Moderate |
| Thoam Ney | Yes | Contract/culverts | Occasionally | Moderate |
| Thnoat Te | | | | |
| Phlaur Touk | | | | |
| Chan Thnal | | | | |
| Seventh March | | | | |
| Tumnuv Santesok | | | | |

² *Farmer satisfaction* is measured subjectively in the survey. Instead of a “yes” or “no” answer, it was decided to capture to some extent the “degree” of satisfaction or dissatisfaction by giving five choices ranging from “very weak” (when farmers are least satisfied) to “very good” (when farmers are most satisfied). A caveat here is that the responses reported may not be directly comparable across farmers. Nonetheless, if many farmers rate the repairs as “good” to “very good,” then farmers must have found the repairs and the corresponding results acceptable.

IV. OUTCOMES AND IMPACTS OF THE PIMD PROGRAM

Outcomes and impact indicators can gauge whether the PIMD program, through the establishment of FWUCs and rehabilitation of schemes, is effective and successful. The physical changes, water availability, irrigated area and agency linkages basically capture the outcomes while yield and cropping intensity quantify the impacts of the program. The specific indicators used to capture these outcomes and impacts are given in **Table 21**.

Table 21. Outcome and impact indicators

| Performance areas | Sub-areas | Indicators |
|-----------------------|-----------------------------------|--|
| 1. Physical changes | Improvement in control structures | Increase in number of control structures |
| | | Increase in type of control structures |
| | | Increase in no. of functional structures |
| | Improvement in canal structures | Increase in length of functional main canals |
| | | Increase in length of functional secondary canals |
| | Improvement in infrastructure | Increase in length of functional tertiary canals |
| 2. Water availability | Improvement in infrastructure | Improvement in village and canal roads (length) |
| | | Repair/construction of bridges, culverts |
| 3. Area irrigated | Improvement in infrastructure | Building of other infrastructure |
| | | Adequacy, reliability and flexibility of water in the head, middle and tail sections |
| 4. Yield | Improvement in infrastructure | Increase of area irrigated both in wet season and dry seasons |
| | | Decrease in area damaged due to irrigation problems |
| 5. Cropping intensity | Improvement in infrastructure | Increase in yields both in wet season/dry season for paddy and other crops |
| | | Increase of cropping intensity |
| 6. Agency linkages | Improvement in infrastructure | Increase in agency linkages |

Physical Changes

Improvements in physical system in terms of increases in control and conveyance structures and other infrastructures are good indications of positive outcomes. The physical structures in each scheme have been rehabilitated under different projects. **Table 22** shows that in a number of schemes, some control structures were added. In the nine schemes, the total number of gates for headworks has doubled while the control structures for main canals increased by six folds.

Table 22. Control structures before and after FWUC establishment

| Scheme | Headwork | | Main canal | | Secondary canal | |
|-----------------|--------------------------|-------------------------|----------------------------------|---------------------------------|----------------------------------|---------------------------------|
| | No. of gates (Before) | No. of gates (After) | No. of structures (Before) | No. of structures (After) | No. of structures (Before) | No. of structures (After) |
| Tam Lap | 5 | 5 | 10 | 37 | 30 | 30 |
| Banteay Thleay | - | - | - | - | - | - |
| Kork Kandal | - | 5 | - | 2 | - | - |
| Thoam Ney | 5 | 5 | 1 | 1 | 1 | 1 |
| Thnoat Te | 2 | 5 | - | - | - | - |
| Phlaur Touk | - | - | - | - | - | - |
| Chan Thnal | 3 | 5 | - | 10 | - | 2 |
| Seventh March | 1 | 10 | - | 16 | - | 11 |
| Tumnuv Santesok | - | 3 | - | 3 | - | - |

Extensions of the main canal systems were also undertaken (**Table 23**). Collectively, the number of main canals more than doubled after the rehabilitation/extension works. In terms of length, the increase is more than 12 times the composite length for the nine schemes of 38 kilometers before the establishment of FWUCs.

Table 23. Conveyance system before and after FWUC establishment

| Scheme | Number of main canal | | Total length (km) | |
|-------------------------|----------------------|-------|-------------------|-------|
| | Before | After | Before | After |
| Main canals | | | | |
| Tam Lap | 5 | 5 | 19.1 | 19.1 |
| Banteay Thleay | - | 11 | - | 57.9 |
| Kork Kandal | 2 | 2 | 14.1 | 18.1 |
| Thoam Ney | 5 | 5 | - | 7.2 |
| Thnoat Te | - | 5 | - | - |
| Phlaur Touk | - | 6 | - | 355.5 |
| Chan Thnal | 2 | 4 | - | 14.0 |
| Seventh March | 2 | 8 | 2.1 | - |
| Tumnuv Santesok | 3 | 3 | 3.0 | 3.0 |
| Secondary canals | | | | |
| Tam Lap | 30 | 30 | 38.4 | 38.4 |
| Banteay Thleay | - | 99 | - | - |
| Kork Kandal | - | 1 | - | 0.3 |
| Thoam Ney | - | 10 | - | 8.9 |
| Thnoat Te | - | 11 | - | 109.5 |
| Phlaur Touk | - | - | - | - |
| Chan Thnal | 2 | 5 | - | 2.4 |
| Seventh March | - | - | - | - |
| Tumnuv Santesok | - | - | - | - |

Also, other infrastructure such as village and canal roads, new bridges, culverts and office buildings for FWUCs were built as part of the rehabilitation projects (**Table 24**). From Tables 22-24, it is clear that there were improvements in the physical systems after the establishment of FWUCs. What is not apparent however, is whether the conditions of these structures are well maintained or they are left to deteriorate since their rehabilitation due to inadequate O&M funds.

Table 24. Added infrastructure after FWUC establishment

| Scheme | Village road (km) | Canal road (km) | Bridges | Culverts | Buildings |
|-----------------|----------------------|--------------------|---------|----------|-----------|
| Tam Lap | - | - | - | - | - |
| Banteay Thleay | 0.8 | - | 7 | - | 2 |
| Kork Kandal | - | - | - | 11 | - |
| Thoam Ney | 6.0 | - | - | - | 1 |
| Thnoat Te | - | - | 4 | - | 1 |
| Phlaur Touk | - | - | 5 | - | 1 |
| Chan Thnal | 7.0 | 14.0 | - | 5 | 2 |
| Seventh March | - | - | - | 10 | 1 |
| Tumnub Santesok | 0.6 | - | - | - | - |

Water Availability

Water availability is effectively the main outcome of FWUC formation and system rehabilitation. However, without quantitative measures of how much water was distributed, flowed into the canal systems and reached the fields of farmers, some qualitative indicators are utilized. The farmers' perceptions on *water adequacy*, *reliability* and *flexibility* at different sections of each scheme are used to capture the quality of system operation and water availability.³ A five step rating ranging from "very weak" to "very good," is used to measure the degree of farmers' satisfaction. A "very weak" rating for *adequacy* means water was not enough to grow crops; "moderate" means water was just enough; and "very good" means there was more water than required. For *reliability*, "very weak" means water supply was not regular or available when needed while "moderate" means water was available at critical times. A "very good" rating would mean that water is always available. On *flexibility*, a "very weak" rating means water service cannot cater to specific or additional requirements farmers may have while "moderate" means water service can cater to specific needs. A rating of "very good" for *flexibility* means water is available for any use at any time. According to farmers, the quality of service in most of the schemes particularly in *middle* and *tail* sections, was in the range of *weak* and *very weak* before FWUC establishment.

³ *Farmer satisfaction* is measured subjectively in the survey. Also, instead of a "yes" or "no" answer, it was decided to capture to some extent the "degree" of satisfaction or dissatisfaction by giving five choices ranging from "very weak" (when farmers are least satisfied) to "very good" (when farmers are most satisfied). A caveat here is that the responses reported may not be directly comparable across farmers. Nonetheless, if many farmers rate the service as "good" to "very good," then it is likely that the quality of service is really acceptable.

Table 25. Quality of system operation before and after FWUC establishment

| Scheme | Adequacy | | | Reliability | | | Flexibility | | |
|----------------------------------|-----------|-----------|-----------|-------------|-----------|-----------|-------------|-----------|-----------|
| | Head | Middle | Tail | Head | Middle | Tail | Head | Middle | Tail |
| Before FWUC establishment | | | | | | | | | |
| Tam Lap | Moderate | Moderate | Weak | Very weak | Very weak | Very weak | Very weak | Very weak | Very weak |
| Banteay Thleay ^{1/} | | | | | | | | | |
| Kork Kandal ^{2/} | | | | | | | | | |
| Thoam Ney | Moderate | Moderate | Moderate | Moderate | Moderate | Moderate | Moderate | Moderate | Moderate |
| Thnoat Te | Moderate | Moderate | Weak | Moderate | Moderate | Weak | Moderate | Moderate | Very weak |
| Phlaurv Touk ^{3/} | | | | | | | | | |
| Chan Thnal | Moderate | Weak | Very weak | Moderate | Weak | Very weak | Weak | Very weak | Very weak |
| Seventh March | Moderate | Very weak | Very weak | Moderate | Weak | Very weak | Weak | Very weak | Very weak |
| Tumnuv Santesok | Weak | Weak | Weak | Weak | Weak | Weak | Weak | Weak | Weak |
| After FWUC establishment | | | | | | | | | |
| Tam Lap | Very good | Good | Moderate | Good | Good | Good | Good | Good | Good |
| Banteay Thleay | Good | Weak | Weak | Good | Weak | Weak | Moderate | Weak | Weak |
| Kork Kandal | Moderate | Moderate | Weak | Moderate | Moderate | Weak | Moderate | Moderate | Weak |
| Thoam Ney | Good | Good | Good | Good | Good | Good | Moderate | Moderate | Moderate |
| Thnoat Te | Good | Good | Weak | Good | Good | Weak | Moderate | Moderate | Weak |
| Phlaurv Touk | Good | Good | Moderate | Good | Good | Moderate | Good | Good | Moderate |
| Chan Thnal | Good | Moderate | Weak | Good | Moderate | Weak | Moderate | Moderate | Very weak |
| Seventh March | Moderate | Moderate | Weak | Moderate | Moderate | Moderate | Moderate | Moderate | Weak |
| Tumnuv Santesok | Good | Moderate | Weak | Moderate | Moderate | Moderate | Weak | Weak | Weak |

Notes: 1/ No proper canal and irrigation system.

2/ No proper canal and irrigation system; the system is dilapidated.

3/ No proper canal system.

Unsurprisingly, the head sections in most of the schemes received better service after the FWUC establishment and system rehabilitation (**Table 25**). In Tam Lap, all three sections of the scheme received good service in terms of water adequacy, reliability and flexibility. In Banteay Thleay, where private contractors were responsible for distributing the water, the quality of service is reported to be *weak* for both middle and tail sections. However, in Phlaurv Touk, the situation appears to be better with more farmers expressing satisfaction.

Irrigated Area

This indicator is closely linked to water availability. With more water, the area that can be irrigated will also be greater. An increase or expansion in irrigated area will indicate a positive outcome of the FWUC establishment and rehabilitation of schemes. From the succeeding two tables, it is clear that the total cultivated area increased after the FWUC establishment. **Table 26** shows the proportion of cultivated area with water problems before and after the FWUC formation. Except for Thoam Ney, improvements are reported in all schemes. With fewer areas experiencing water problems after the FWUC establishment, there is effectively more irrigated land cultivated which indicates a positive outcome.

Table 26. Percent of cultivated area with water problems before and after FWUC establishment

| Scheme | Average area affected, dry season | |
|---------------------------|-----------------------------------|-----------|
| | Before (%) | After (%) |
| Tam Lap | 50 | 10 |
| Banteay Thleay | 80 | 30 |
| Kork Kandal ^{1/} | | 0 |
| Thoam Ney | 0 | 0 |
| Thnoat Te | 28 | 15 |
| Phlaur Touk ^{1/} | | 0 |
| Chan Thnal | 30 | 5 |
| Seventh March | 90 | 20 |
| Tumnuv Santesok | 50 | 20 |

Note: 1/ No cultivation before FWUC establishment.

Before the formation of the FWUCs, full dry season cultivation with all farmers within the scheme planting, was possible only in Thoam Ney (**Table 27**). There were some dry season cultivation in Tam Lap, Thnoat Te and Seventh March while in three other schemes, no cultivation was possible. With the formation of FWUCs and the corresponding rehabilitation of systems, dry season cultivation became possible in all schemes except for Tumnuv Santesok.

Table 27. Cultivated area, before and after FWUC establishment

| Scheme | Wet season | | Dry Season | |
|------------------------------|------------|-----------|------------|-----------|
| | Before (%) | After (%) | Before (%) | After (%) |
| Tam Lap | | | 50 | 100 |
| Banteay Thleay ^{1/} | 40 | | | 100 |
| Kork Kandal ^{1/} | | | | 100 |
| Thoam Ney | | | 100 | 100 |
| Thnoat Te | | | 75 | 100 |
| Phlaur Touk ^{1/} | 30 | | | 100 |
| Chan Thnal | 100 | 100 | | 12 |
| Seventh March | | | 27 | 100 |
| Tumnuv Santesok | 100 | 100 | | |

Note: 1/ No cultivation in the dry season, before FWUC establishment.

Increase in number of farmers

Irrigating entire scheme command areas effectively benefit all farmers within the scheme. (**Table 28**). This is the case for all schemes in the study except for Chan Thnal and Tumnuv Santesok. The farmers who practiced dry season cultivation in two schemes were unable to cultivate their entire land before the formation of FWUCs.

Table 28. Number of farmers cultivating before and after FWUC establishment

| Scheme | Wet season | | Dry season | | Dry season | |
|------------------------------|------------|--------|------------|------------|------------|------------|
| | Before | After | Before | | After | |
| | Number | Number | Number | % of total | Number | % of total |
| Tam Lap | | | 1939 | 81 | 2394 | 100 |
| Banteay Thleay ^{1/} | | | | | 1877 | 100 |
| Kork Kandal ^{1/} | | | | | 1461 | 100 |
| Thoam Ney | | | 384 | 100 | 384 | 100 |
| Thnoat Te | | | 1600 | 84 | 1904 | 100 |
| Phlaur Touk ^{1/} | | | | | 2924 | 100 |
| Chan Thnal | 2300 | 2300 | | | 50 | 2 |
| Seventh March | | | | | 1180 | 100 |
| Tumnub Santesok | N/A | 103 | | | | |

Notes: 1/ No cultivation in the dry season, before FWUC establishment.

N/A means not available.

Yields

Yields are indicators of the impact of the PIMD program. An increase in yields indicates an improvement in agricultural productivity partly brought about by better irrigation service resulting from the program. Relatively high paddy yields are registered after FWUC establishment in schemes which were unable to cultivate in the dry season without irrigation (**Table 29**). Interestingly, for schemes like Thoam Ney and Thnoat Te, which were already producing rice before the FWUC establishment, no improvement in yields is observed. It appears that irrigation has had little impact on these schemes. One possible explanation is that these schemes were already cultivating even before the FWUC formation because they had water and only a few areas in Thnoat Te had water problems (Tables 26-27). While irrigation improved the water situation in Thnoat Te, the increase in yields for the few farmers with water problems may not have been substantial to change the average yield for the entire scheme. Only the Seventh March scheme shows a clear increase in land productivity after FWUC establishment.

Table 29. Paddy yields before and after FWUC establishment (tons/ha)

| Scheme | Wet season | | Dry Season | |
|------------------------------|------------|-------|------------|-------|
| | Before | After | Before | After |
| Tam Lap | | | N/A | 4.5 |
| Banteay Thleay ^{1/} | 1.5 | | | 4.0 |
| Kork Kandal ^{1/} | | | | 3.5 |
| Thoam Ney | | | 2.5 | 2.5 |
| Thnoat Te | | | 2.5 | 2.5 |
| Phlaur Touk | 3.0 | | | 5.0 |
| Chan Thnal | 1.5 | 1.5 | | 3.5 |
| Seventh March | | | 2.5 | 3.0 |
| Tumnub Santesok | 2.5 | 2.5 | | |

Notes: 1/ No cultivation during dry season before FWUC establishment.

N/A means not available.

Cropping Intensity

Cropping intensity is another program impact indicator. Water availability leads to higher cropping intensity which in turn will result in higher productivity and a positive program impact. **Table 30** shows how much cropping intensity has increased with the availability of water made possible by system rehabilitation and FWUC formation. Before the FWUC formation, the cropping intensity was 100% in Thoam Ney and Chan Thnal only. Cropping intensity increased in all irrigation schemes after FWUC formation. In Phlauv Touk scheme, cropping intensity increased to 200% as farmers cultivate two dry season crops.

Table 30. Cropping intensity before and after FWUC establishment (%)

| Scheme | Before FWUCs | | | After FWUCs | | | |
|-----------------|--------------|------------|--------------------|-------------|------------|--------------|--------------------|
| | Wet season | Dry Season | Cropping intensity | Wet season | Dry season | Dry season-2 | Cropping intensity |
| Tam Lap | | 50 | 50 | | 100 | | 100 |
| Banteay Thleay | 40 | | 40 | | 100 | | 100 |
| Kork Kandal | | | | | 100 | | 100 |
| Thoam Ney | | 100 | 100 | | 100 | | 100 |
| Thnoat Te | | 75 | 75 | | 100 | | 100 |
| Phlauv Touk | 30 | | 30 | | 100 | 100 | 200 |
| Chan Thnal | 100 | | 100 | 100 | 12 | | 112 |
| Seventh March | | 27 | 27 | | 100 | | 100 |
| Tumnub Santesok | 100 | | 100 | 100 | | | 100 |

Agency Linkages

Linkages with various agencies are forged to assist farmers in many aspects with the underlying objective of increasing incomes, improving livelihoods and reducing poverty. In this study, agency linkages can be viewed as outcomes of the FWUC establishment which in turn contribute to PIMD's successful implementation. Before the formation of FWUCs, farmers in the nine irrigation schemes were linked to only one or two agencies, i.e., the local authorities and the Department of Agriculture (DOA) (**Table 31**). The farmers received assistance on system management and problem solving from local authorities, and agriculture extension from DOA.

After the formation of FWUCs, agency linkages increased substantially. In some schemes, it increased to six agencies (**Figure 1**). In addition to DOA and local authorities, there are the MOWRAM, the Provincial Department of Water Resources and Meteorology (PDOWRAM), Department of Water Resources and Meteorology (DOWRAM), rehabilitation project implementors and financial agencies. Also, the existing linkages with the local authorities and DOA have been strengthened with these agencies providing more services such as training and capacity building on PIMD and system management, assistance in FWUC activities, irrigation system improvement, agriculture extension and introduction to credit schemes. What is shown by this observation on increased linkages is that with PIMD/FWUCs establishment, farmers have greater access to support services and higher chances of becoming viable than when there were no FWUCs. It is, however, not clear how substantial are the support from these different agencies and how many farmers benefit from their interventions.

Figure 1. Increase in agency linkages

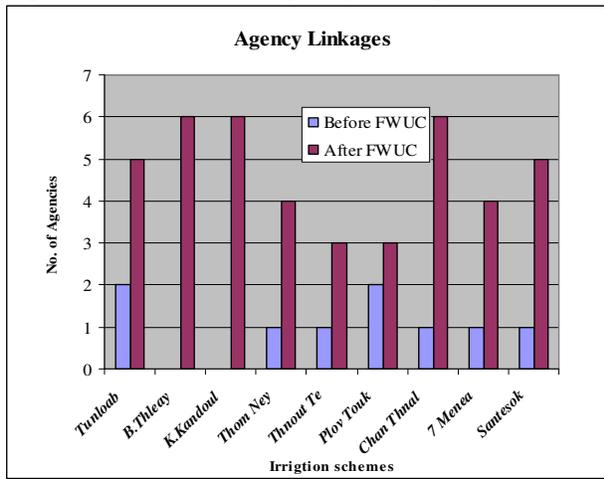


Table 31. Agency linkages before and after FWUC establishment

| Scheme | Before FWUC | | After FWUC | |
|-----------------|-------------------------|---------------------------|---|---|
| | Agency | Service | Agency | Service |
| Tam Lap | 1. Dept. of Agriculture | 1. Agricultural extension | 1. PDOWRAM/DOWRAM | 1. Establishing FWUC, training |
| | 2. Local Authorities | 2. System management | 2. Dept. of Agriculture 3. Siela, ADB 4. PRASAC, ACLEDA 5. Local Authorities | 2. Agricultural extension 3. System rehabilitation 4. Finance 5. Facilitating FWUC |
| Banteay Thleay | | | 1. PDOWRAM//DOWRAM/MOWRAM | 1. Training FWUC |
| | | | 2. Dept. of Agriculture 3. World Vision 4. ACLEDA 5. PRASAC 6. Local Authorities | 2. Agricultural extension 3. Finance 4. Finance 5. Finance 6. Assist FWUC (Contracts) |
| Kork Kandal | | | 1. PDOWRAM/DOWRAM/MOWRAM | 1. Training FWUC |
| | | | 2. Dept. of Agriculture 3. Local Authorities 4. ACLEDA 5. PRASAC 6. Local Authority | 2. Agricultural extension 3. Problem solving 4. Finance 5. Finance 6. Problem solving |
| Thoam Ney | Dept. of Agriculture | Agricultural extension | 1. PDOWRAM/DOWRAM/MOWRAM | 1. Training FWUC |
| | | | 2. Dept. of Agriculture 3. World Bank 4. World Vision | 2. Agricultural extension 3. Rehabilitation 4. Finance |
| Thnoat Te | Local Authorities | | 1. PDOWRAM 2. PRASAC 3. AMRIT | 1. Establishing FWUC, training 2. Finance 3. Finance |
| Phlaur Touk | 1. Local Authorities | Pump water | 1. PDOWRAM/DOWRAM/MOWRAM | 1. Training FWUC |
| | 2. Dept. of Agriculture | | 2. Local Authorities 3. PRASAC | 2. Assisting FWUC 3. Finance |
| Chan Thnal | Local Authorities | System management | 1. Dept. of Agriculture | 1. Assisting FWUC, Agric. extension 2. Training 3. Training |
| | | | 2. PDOWRAM/DOWRAM/MOWRAM 3. JICA 4. PRASAC 5. World Vision 6. Local Authorities | 4. Rehabilitation, finance 5. Finance 6. Assisting FWUC |
| Seventh March | Local Authorities | System management | 1. Dept. of Agriculture | 1. Establishing FWUC |
| | | | 2. PRASAC 3. PDOWRAM/DOWRAM/MOWRAM 4. Local Authorities | 2. Rehabilitation 3. Assisting FWUC, training 4. Assisting FWUC |
| Tumnuv Santesok | Local Authorities | Problem solving | 1. PDOWRAM/DOWRAM/MOWRAM | 1. Establishing FWUC, training |
| | | | 2. Dept. of Agriculture 3. Provincial Dept. of Health 4. Local Authorities 5. ACLEDA | 2. Agricultural extension 3. Training 4. Assisting FWUC 5. Finance |

Notes: ACLEDA stands for Association of Cambodian Local Economic Development Agencies; ADB stands for Asian Development Bank; PDOWRAM stands for Provincial Dept. of Water Resources and Meteorology; DOWRAM is Dept. of Water Resources and Meteorology; FWUC stands for farmer water user community; JICA stands for Japan International Cooperation Agency; MOWRAM stands Ministry of Water Resources and Meteorology; and PRASAC stands for Programme de Rehabilitation et d'Appui au Secteur Agricole du Cambodge. Seila program is an aid mobilization and coordination framework supporting Cambodia's decentralization and deconcentration reforms.

V. SUMMARY OF FINDINGS AND CONCLUSIONS

This report illustrates the information that can be obtained and initial cross scheme analysis that can be undertaken with the pilot M&E database that the MOWRAM WG-ISM collected using participatory rapid appraisal. This pilot M&E was carried out with the assistance of IWMI from the development of the initial set of indicators, to providing guidelines for the fieldwork, to implementation and collection of data, and writing of initial reports.

The M&E data collected has a wealth of information not all captured in this report but can be utilized in future reports. These variables include: other administrative area profile such as number of communes and villages per scheme, location and layout maps, number of families and average land size per village, land tenure, other (minor) crops cultivated and cropping system, crop calendar, whether farmers have lands in other schemes or rainfed areas and their average sizes, cost of production for paddy and other crops, amount of produce sold, selling price for paddy, average incomes from paddy and other crops, sources of credit, FWUC awareness of PIMD, provincial and district officers knowledge on PIMD basics, FWUC statute and functions and mobilization of farmers, and areas that need further capacity building. These data should help better capture the physical profile of the schemes, progress of FWUC implementation, and outcomes and impacts.

Progress in FWUC Formation and PIMD Implementation

- It is clear that the nine FWUCs in this pilot M&E database are at different stages of development, maturity and overall functionality. These differences are brought about by various factors at play within and outside each FWUC. Internal factors include organizational management, quality of leadership and decision making, understanding of financial aspects and system operation and maintenance. Among the external factors are the actual state of physical infrastructure, capacity of agencies assisting in the implementation of PIMD and strengthening of FWUCs, the type and quality of support services these agencies are extending, markets for products and inputs.
- The sub groups of the majority of FWUCs are weak. The difficulty to form strong groups based on physical or administrative boundaries that do not match irrigation boundaries, is an important concern for project implementers. It appears that not much attention has been given to these sub groups and it would appear that the main motivation for establishing them was to fulfill the requirement for registration with MOWRAM.
- The leaders of the groups and sub groups are relatively weak and are yet to fully function. In the majority of irrigation schemes, the functionality of FWUCs is largely due to the core committee members' active involvement in carrying out of their roles and responsibilities. In several FWUCs where some of the committee members are not active, the FWUC functionality depends on the chairman.
- All irrigation schemes are collecting funds. Collection is more stable where private contractors are involved in collecting. It is not clear however, whether the collected amounts are enough to fully cover O&M of emergency repair and whether collection will really be

sustained. If schemes will not be properly maintained and will be unable to provide good service, the farmer members will have no incentive to continue payment. Collection of incorrect ISF may lead to system deterioration and a vicious cycle begins. There are indications that O&M funds are not enough (RGC 2003c). The national government is largely dependent on external support to carry out system rehabilitation while the FWUCs may not be collecting adequate funds to meet their requirements.

- All FWUCs are involved in system operation and maintenance. Apparent system deficiencies make it difficult to deliver really good service to farmers. Only two of the nine schemes have system operation plans that shows how relatively weak the FWUCs are in this core function. The involvement of group and sub-group leaders in system operation somehow improves the quality of service.
- System improvements were largely focused on the main and secondary structures. Most of system rehabilitation done can be considered partial as tertiary and field level structures are yet to be built.
- System maintenance decisions are made by the FWUC committee. Where the committee is weak, the chairman makes the decisions. Similar to system operation, there is no system maintenance plan. System maintenance is done on an *ad hoc* basis and depends on availability of funds. Also, it is not clear whether the FWUC committee members tasked with maintenance have the necessary technical knowledge and skills to do quality maintenance.
- A project identification report in 2003 admitted that farmers and local authorities, supposedly tasked with providing technical support to FWUCs, “often do not have the knowledge to improve and repair systems that are technically unsound” (RGC 2003c). Because of this shortcoming, many structures failed shortly after rehabilitation. The rehabilitated system did not perform as expected and even caused inundation problems. It is not clear how much things have changed given that farmers and FWUC committees identified structure-related concerns as still the most important constraints in increasing productivity and delivering better water service.

PIMD Outcomes and Impacts

- Despite the seemingly bleak overall picture described above, system rehabilitation and the establishment of FWUCs brought about several positive outcomes. System management before the formation of FWUCs was the responsibility of local authorities. These authorities acted only on farmer requests and the quality of service was generally poor. In some cases, no one took charge of system management. After the FWUC formation, the responsibility for system management went to FWUCs. When they took the management responsibilities (including addressing water shortages and conflicts), system operation in all schemes improved. The areas in each scheme with water problems were reduced.
- After the formation of FWUCs and rehabilitation of systems, the cultivated area in each scheme increased. The number of farmers who received irrigation water also increased. Paddy production increased.

- Agency linkages increased after the establishment of FWUCs. This increase means that there are more service providers to support the FWUC in each of the rehabilitated scheme.
- According to farmers, the main benefit of FWUC formation and system rehabilitation is having water for cultivation. With available water, dry season cultivation and production of paddy became possible. Some farmers in a couple of schemes even reported improved living conditions. It is not clear however, how many farmers feel this improvement.

VI. RECOMMENDATIONS TOWARDS ESTABLISHING OF PIMD M&E SYSTEM

Should have a Clear Purpose and Use

- It is critical that MOWRAM is clear on the purpose and uses of the M&E system and database. Once the purpose is clear, the most appropriate indicators can then be identified. For instance, more quantitative indicators can be collected if the objective is to assess the technical capacities and states of each scheme so that rehabilitation projects can be better designed. For instance, MOWRAM can then collect data that would gauge of irrigation efficiency such as timing, flow rate, irrigation scheduling and farmers' participation in scheduling, duration of irrigation applications. If the objective is to better measure impact on poverty, aside from incomes, demographic background, assets, non-farm sources of incomes, and consumption patterns can be collected. Also, instead of per season data, monthly data can be collected to capture monthly variations in consumption and coping strategies of farming families. If the idea is to determine the potential for diversification to make farming in each scheme more viable, more detailed information on agricultural inputs and markets will have to be collected. Tracking and quantifying of impacts of PIMD should be part of a useful M&E system. To do this, farm level monitoring and data collection will be required and the appropriate data collection methodology used. A more immediate need is to strengthen the capacity to collect quality data that can be used for more systematic analysis. The capacity to carry out quantitative impact analysis will have to be developed within MOWRAM. Else, it can partner with research organizations with existing capacity for such analyses, e.g., Cambodia Development Resource Institute (CDRI) or the academia.

Increase Number of Sample Schemes

- Scale up the M&E to more irrigation schemes to get a better idea of the PIMD implementation and FWUC formation.

Do Further Training

- Aside from continuous training for the WG-ISM staff, other MOWRAM staff should also be trained in collecting, processing and analyzing M&E data.

- Train FWUCs in proper record keeping so that their data can feed into progress monitoring and evaluation and MOWRAM will simply collate.
- Train PDOWRAM to collect relevant information

Decide on Frequency of M&E

- Decide on the frequency of conducting M&E. Progress evaluation can be done more frequently. Impact evaluation can be done periodically (e.g. 2-3 years).

Involve More Stakeholders

- MOWRAM should involve key stakeholders in the M&E program. Below is a sample matrix which shows how responsibilities can be shared and what other stakeholders can contribute.

| Role | FWUC Officers | Provincial PIM Support Team | Local Gov't Officers | NGO & Tech'l Experts | Dept of Irrig Agric | PIMD Secretariat | Senior MOWRAM Officers |
|--|---------------|-----------------------------|----------------------|----------------------|---------------------|------------------|------------------------|
| Select indicators | √ | √ | √ | √ | √ | √ | |
| Collect & record data | √ | | | | | √ | |
| Computerize data | | | | | | √ | |
| Prepare M&E reports | | | | | | √ | |
| Present results | | | | | | √ | |
| Review results on Implementation | √ | √ | √ | √ | √ | √ | √ |
| Review results on Outcomes and Impacts | √ | √ | √ | √ | √ | √ | √ |
| Decisions about Implementation | | | | | √ | √ | √ |
| Decisions about Strategy or Policy | | | | | | | √ |

PIMD and partner agencies can modify this responsibility matrix as deemed appropriate.

Exploit Agency Linkages

- The increased linkages with other agencies which provide various supports to the FWUCs can be exploited. MOWRAM should take its coordinating role more explicitly to leverage the various supports to create greater impact. For instance, where local government has little power to take the initiative, MOWRAM can partner with other more active and capable non-government organizations or with private contractors as done by the PDOWRAM in Phlaur Touk and Banteay Thleay.

Reporting

- For an M&E system to be useful, MOWRAM-PIMD should strive to produce simple and timely summaries of results tailored to the requirements and context of decision and policy makers.

Go for a Dynamic M&E

- Lastly, an M&E system and database should be a dynamic system which will continually change to better serve the needs and requirements of the agencies it is supposed to contribute. First, it should be flexible and well suited to the capacities of MOWRAM and the needs of its client farmers/beneficiaries. With changing needs and improving capacities, more quantitative measures can be collected and farm level analysis of impact be carried out.
- Refine the main questionnaire. The questionnaire should be revised based on the experience gained by the WG-ISM in applying it by identifying the data that difficult to collect, totally not available, not relevant, etc.

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APPENDIX 1. QUESTIONNAIRE FOR MONITORING AND EVALUATION OF THE PIMD PROGRAM

Index No.
 Group No.
 Name/s of the data collectors
 Date of data collection:

Basic information

Location:

1. Name of the Irrigation Scheme:
2. Code Number:
3. Name of the Province:
4. Name of the District:
5. Number of communes:
6. Commune names:
7. Number of villages:
8. Village names:

Physical System

9. When was the system first constructed:
10. Whether the system is rehabilitated; Yes/No:
11. If yes construction details:

| Project Name | Year |
|--------------|------|
| | |
| | |
| | |

Project 1:

| | | |
|--|---------------|---------------|
| Headwork Y/N. If yes: Dam length: | | Gates: |
| Main canals: Y/N. If yes No. of canals: | Canal length: | No. of gates: |
| Secondary canals: Y/N. If yes No. of canals: | Canal length: | No. of gates: |
| Tertiary canals: Y/N. If yes No. of canals: | Canal length; | No. of gates: |
| Infrastructure: Y/N. If yes what? | | |

Project 2:

| | | |
|--|---------------|---------------|
| Headwork Y/N. If yes: Dam length: | | Gates: |
| Main canals: Y/N. If yes No. of canals: | Canal length: | No. of gates: |
| Secondary canals: Y/N. If yes No. of canals: | Canal length: | No. of gates: |
| Tertiary canals: Y/N. If yes No. of canals: | Canal length; | No. of gates: |
| Infrastructure: Y/N. If yes what? | | |

Project 3:

| | |
|-----------------------------------|--------|
| Headwork Y/N. If yes: Dam length: | Gates: |
|-----------------------------------|--------|

Dry Season:

30. Number of farmers who are having other cultivated lands outside the irrigated area: (if not available percentage)

31. Average lands sizes of different outside lands: 1. Irrigated lands
2. Highland cultivations

Institutional -FWUC

32. Name of the FWUC:

33. Year the FWUC was formed:

34. The project/personnel assisted in the formation of the FWUC:

35. Number of FWUGs:

36. How the FWUGs were formed: (On what basis)

37. Number of SFWUGs:

38. How the SFWUGs were formed: (On what basis)

39. Total membership:

40. Have statutes and by-laws: Y/N If yes: Temporary/Standard

41. Registered with the MOWRAM: Y/N

42. Process followed (steps) in the formation of the FWUC

| Steps | Held or not | Supported By whom |
|--|-------------|-------------------|
| 1. Initial Awareness meetings | | |
| 2. Identify irrigation boundary and membership | | |
| 3. Development of statute | | |
| 4. Selection of farmer leaders | | |
| 5. Training on O&M | | |
| 6. Training on Collection of ISF | | |
| 7. Collection of ISF | | |
| 8. Involvement in O&M | | |

Progress in the Formation of the FWUCs:

Organizational management

43. Functionality of Structure

| Structure level | No. functional | Activities involved | Level of involvement* |
|-----------------|----------------|---------------------|-----------------------|
| SFWUGs | | 1. 2. 3. | |
| FWUGs | | 1. 2. 3. | |

| | | | |
|----------------|--|----------------|--|
| | | | |
| FWUC Committee | | 1. 2. 3. | |

*1. Rarely 2. Occasionally 3. Regularly

44. Reason for not functioning structure:

| Levels | Reasons |
|----------------|----------------|
| SFWUGs | 1. 2. 3. |
| FWUGs | 1. 2. 3. |
| FWUC committee | 1. 2. 3. |

45. Selection and functionality of leadership

| Leaders | How selected | Functional or not | Activities involved | Farmer satisfaction* |
|-------------------|--------------|-------------------|---------------------|----------------------|
| Chairman | | | 1. 2. 3. | |
| 1 Vice Chairman | | | 1. 2. 3. | |
| 2 Vice chairman | | | 1. 2. 3. | |
| 3. Vice chairman | | | 1. 2. 3. | |
| F. organizer | | | 1. 2. 3. | |
| Group leaders | | | 1. 2. 3. | |
| Sub group leaders | | | 1. 2. 3. | |
| Group committee | | | 1. 2. 3. | |
| Sub group | | | 1. | |

| | | | | |
|-----------|--|--|---------|--|
| committee | | | 2. 3 | |
|-----------|--|--|---------|--|

* Degree of farmer satisfaction: 1. V. Weak 2. Weak 3. Moderate, 4. Good. 5. V. Good

46. Total no. of farmers eligible for membership

47. How the membership is received (membership criteria):

48. Holding meetings (decision making)

| Frequency of holding meetings | Participation (last three meetings) | |
|--|-------------------------------------|--------------|
| | Expected | Participated |
| No meetings | | |
| Meetings held rarely | | |
| Meetings held once a year | | |
| Meetings held once a season | | |
| Meetings regularly held whenever necessary | | |
| Meetings held regularly on a fixed date | | |

49. Record keeping

| Name of Records | Availability | Quality of them |
|------------------------|--------------|-----------------|
| Membership list | | |
| Meeting reports | | |
| Record of land extent | | |
| Fee collection records | | |
| Cash register | | |

Quality: 1. V. Weak. 2. Weak. 3. Moderate. 4. Good. 5. V. Good

Financial Management

50. Total funds available:

51. Funding sources: 1. Amount:
2. Amount:
3. Amount:

52. Has a bank account or not:

53. Collection of ISF

| Year | Rate charged | No. farmers expected to pay | Total farmers paid | Total collected | Total spent | Spent on what activity |
|------|--------------|-----------------------------|--------------------|-----------------|-------------|------------------------|
| | | | | | | |
| | | | | | | |
| | | | | | | |

Involvement in System Operation

54. What are the system operation responsibilities undertaken by the FWUC

| Level of involvement | Involved or not | If yes who involve | Procedure follow* |
|--|-----------------|--------------------|-------------------|
| Headwork | | | |
| Main canal operation | | | |
| Secondary canal operation/water issues | | | |
| Tertiary canal operation/water issues | | | |
| Field level water distribution | | | |

Procedure followed:

1. Operation plan prepared by PDOWRAM
2. Operation plan prepared by PDOWRAM and FWUC
3. Operation plan prepared by FWUC
4. Requests from group/sub groups
5. Requests from farmers
6. Routine practice

55. If there are any water shortage/conflicts at field level: Y/N

56. If yes how they are being solved:

57. If there are any water shortage/conflicts at system level: Y/N

58. If yes how they are being solved:

System Maintenance

59. Involvement in system maintenance in minor repair

| System Levels | Involved Y/N | Level of involvement * | Mode of implementation* |
|-----------------------|--------------|------------------------|-------------------------|
| Reservoir bund | | | |
| Headwork | | | |
| Main canals | | | |
| Tertiary canals | | | |
| Field canals (if any) | | | |

Level of involvement

Mode of implementation

- | | |
|---|--------------------|
| 1. All repairs | 1. Group work |
| 2. Some repairs | 2. Contracting out |
| 3. Occasionally involve in some repairs | |

60. Involvement in system maintenance of Major repair – earth work

| System Levels | Type of work | Involve ment* | If Funds Amount | If labor Man days |
|---------------|--------------|---------------|-----------------|-------------------|
| | | | | |

| | | | | |
|-----------------------|--|--|--|--|
| Reservoir bund | | | | |
| Headwork | | | | |
| Main canals | | | | |
| Tertiary canals | | | | |
| Field canals (if any) | | | | |

Involvement: 1. Supervisory. 2. Contribution of funds. 3. Contribution of labor

61. Involvement in system maintenance of Major repair – Concrete work

| System Levels | Type of work | Involvement* | If Funds Amount | If labor Man days |
|-----------------------|--------------|--------------|-----------------|-------------------|
| Reservoir bund | | | | |
| Headwork | | | | |
| Main canals | | | | |
| Tertiary canals | | | | |
| Field canals (if any) | | | | |

Involvement: 1. Supervisory. 2. Contribution of funds. 3. Contribution of labor

Outcome:

Physical Improvements

62. Improvement in controlling structures

| Controlling structures | Before FWUC | After FWUC and related rehabilitation |
|---|-------------|---------------------------------------|
| Type of Headwork | | |
| Number of headwork structure functional | | |
| Number of main canals controlling structures | | |
| Types of main canal structures | | |
| Number of main canal structures functional | | |
| Number of secondary canal structures functional | | |
| Types of secondary canal structures | | |
| Number of secondary canal structures functional | | |
| Number of tertiary canal structures | | |
| Types of tertiary canal structures | | |
| Number of tertiary canals functional | | |

63. Improvement in Canal Structures:

| Canals | Before FWUC | After having FWUC and related rehabilitation |
|---|-------------|--|
| Number of main canals | | |
| Total length of main canals | | |
| Total length functional of each | | |
| Total number of secondary canals | | |
| Total length of secondary canals | | |
| Total length of secondary canals functional | | |
| Total number of tertiary canals | | |
| Total length of tertiary canals | | |
| Total length of tertiary canals functional | | |

64. Infrastructure Improvements

| Infra-structure | Total length repair/ No |
|-----------------|-------------------------|
| Village roads | |
| Canal roads | |
| Bridges | |
| Culverts | |
| Buildings () | |

65. Farmer satisfaction of the Physical improvement of System rehabilitation after FWUC:

| Structures | Farmer satisfaction of quality | Farmer satisfaction of functionality |
|--|--------------------------------|--------------------------------------|
| Headwork | | |
| Main canal controlling structures | | |
| Secondary canal controlling structures | | |
| Tertiary canal controlling structures | | |
| Main canals | | |
| Secondary canals | | |
| Tertiary canals | | |
| Village roads | | |
| Canal roads | | |
| Bridges | | |
| Culverts | | |
| Buildings | | |

* Farmer satisfaction: 1. V. Weak, 2. Weak, 3. Moderate, 4. Good, 5. V. Good

Area irrigated

66. If there is any increase of area irrigated:

| Season | Yes/No | Total Increase |
|--------|--------|----------------|
| | | |

| | Head | Middle | Tail | (Extent / %) |
|-----|------|--------|------|--------------|
| Wet | | | | |
| Dry | | | | |

Water availability:

67. Main water source for the field : Before FWUC: Direct access =
Pumping =
Rain water=
Other sources =

After FWUC: Direct access =
Pumping =
Rain water=
Other sources =

68 Water availability (adequacy)before FWUC:

Wet season: Adequate: H: M: T:
Shortage: H: M: T:
Dry season: Adequate: H: M: T:
Shortage: H: M: T:
After FWUC: Wet season: Adequate: H: M: T:
Shortage: H: M: T:
Dry season: Adequate: H: M: T:
Shortage: H: M: T:

69. If not adequate before FWUC the area affected

| Season | No farmers Affected | | | Av. Area affected |
|--------|---------------------|---|---|-------------------|
| | H | M | T | |
| Wet | | | | |
| Dry | | | | |

If not adequate after FWUC area affected

| Season | No farmers Affected | | | Av. Area affected |
|--------|---------------------|---|---|-------------------|
| | H | M | T | |
| Wet | | | | |
| Dry | | | | |

No. of farmers

70. Number of farmers received irrigated water

| Season | No. of farmers received irrigation | |
|--------|------------------------------------|------------|
| | Before FWUC | After FWUC |
| Wet | | |
| Dry | | |

System Operation

71. System operation responsibility before FWUC

| System levels | Who was Responsible before FWUC | How the water issues were made* | Farmer satisfaction | | | | | | | | |
|----------------------|---------------------------------|---------------------------------|---------------------|---|---|-------------|---|---|-------------|---|---|
| | | | Adequacy | | | reliability | | | Flexibility | | |
| | | | H | M | T | H | M | T | H | M | T |
| Main system | | | | | | | | | | | |
| Secondary system | | | | | | | | | | | |
| Tertiary/Field level | | | | | | | | | | | |

*How the water issues are made: 1. On a plan. 2. On farmer request. 3. No idea

*Quality of service: 1. Adequacy, reliability, and flexibility of water delivery among head, middle and tail farmers. 1. Very Weak. 2. Weak. 3. Moderate. 4. Good. 5. Very Good

71. System operation responsibility after FWUC

| System levels | Who was Responsible after FWUC | How the water issues were made* | Farmer satisfaction | | | | | | | | |
|----------------------|--------------------------------|---------------------------------|---------------------|---|---|-------------|---|---|-------------|---|---|
| | | | Adequacy | | | reliability | | | Flexibility | | |
| | | | H | M | T | H | M | T | H | M | T |
| Main system | | | | | | | | | | | |
| Secondary system | | | | | | | | | | | |
| Tertiary/Field level | | | | | | | | | | | |

*How the water issues are made: 1. On a plan. 2. On farmer request. 3. No idea

*Quality of service: 1. Adequacy, reliability, and flexibility of water delivery among head, middle and tail farmers. 1. Very Weak. 2. Weak. 3. Moderate. 4. Good. 5. Very Good

72. If there were any irrigation problem before FWUC how they were solved

| Types of problems | How they were solved | Who assisted in solving them | Effectiveness of the service |
|-------------------|----------------------|------------------------------|------------------------------|
| Water shortage | | | |
| Structure problem | | | |
| Conflicts | | | |

73. Is there any decrease in the number and intensity of irrigation problems after the formation of the FWUC:

74. If are any irrigation problems after FWUC how they are being solved

| Irrigation problems faced | How they are solved | Who assist in solving them | Effectiveness of service |
|---------------------------|---------------------|----------------------------|--------------------------|
| Water shortage | | | |
| Structure problems | | | |
| Conflicts | | | |

75. Was there any area of cultivation damaged due to irrigation problems before FWUC: Y/N

76. If Yes: the average area of damage:

| Season | Area damaged | Reasons for damage |
|--------|--------------|--------------------|
| Wet | | |
| Dry | | |

77. Is there any area of cultivation damaged due to irrigation problems after FWUC: Y/N

78. If yes the average area of damage:

| Season | Area damaged | Reasons for damage |
|--------|--------------|--------------------|
| Wet | | |
| Dry | | |

79. Who was responsible for system maintenance before the FWUC:

| System levels | Who was involved | Quantity/extent | Frequency | Quality of work |
|------------------------|------------------|-----------------|-----------|-----------------|
| Minor repair-Bund | | | | |
| Minor repair-Head | | | | |
| Minor repair/main | | | | |
| Minor repair/Secondary | | | | |
| Major repair/Head | | | | |
| Major repair/Main | | | | |
| Major repair/secondary | | | | |

Quality of work related to water delivery: Improved or not

Degree of Quality of work related to construction: 1. Very Weak, 2. Weak, 3. Moderate
4. Good, 5 Very Good

80. Who is responsible for system maintenance after the FWUC:

| System levels | Who was involved | Quantity/extent | Frequency | Quality of work |
|------------------------|------------------|-----------------|-----------|-----------------|
| Minor repair/bund | | | | |
| Minor repair/Head | | | | |
| Minor repair/main | | | | |
| Minor repair/Secondary | | | | |

| | | | | |
|------------------------|--|--|--|--|
| Major repair/Head | | | | |
| Major repair/Main | | | | |
| Major repair/secondary | | | | |

Quality of work related to water delivery: Improved or not

Degree of Quality of work related to construction:

81. Are there an other services provide by FWUC beside O&M

If yes: Type of services/Activities

Benefits received: FWUC:

Farmers:

Cropping Systems

82. What are the crops cultivated before are after the FWUC

| Crops | Wet season | Dry season |
|--|------------|------------|
| Total area cultivated with paddy -before FWUC | | |
| Total area cultivated with Paddy – after FWUC | | |
| Total area cultivated with other field crops before FWUC | | |
| Total area Cultivated with other field crops after FWUC | | |

83. Change of cropping system:

Whether the area cultivated with crops increased after the FWUC:

| Crop varieties | Increased or not | | | Average increase | | |
|----------------|------------------|--------|------|------------------|--------|------|
| | Head | Middle | Tail | Head | Middle | Tail |
| | | | | | | |
| | | | | | | |
| | | | | | | |

84. What the paddy varieties cultivated:

85. Cropping calendar:

| | Months start | Crop growth | Harvesting |
|--------------|--------------|-------------|------------|
| Wet season | | | |
| Dry Season | | | |
| Water source | | | |

86. What is the average cultivated land size:

| Before FWUC | | After FWUC | |
|-------------|------------|------------|------------|
| Paddy | Other crop | Paddy | Other crop |
| | | | |
| | | | |

Yield and Income

87. What is average paddy yield: Before FWUC: H: M: T:
 After FWUC: H: M: T:

88. What are the average yields of other crops: Crop: Yield
 Crop: Yield
 Crop: Yield

89. What is the average cost of cultivation per ha:

| Input | Paddy | Other crops 1 | Other crop 2 | Other crop 3 |
|----------------|-------|---------------|--------------|--------------|
| Labor | | | | |
| Seed | | | | |
| Fertilizer | | | | |
| Agro-chemicals | | | | |
| Pumping | | | | |
| Processing | | | | |

90. What is the average percentage of selling of yield: before FWUC:
 After FWUC:

91. What is the selling price of Paddy:

92. Gross average income of other field crops:

Crop: Before FWUC: After FWUC
 Crop: Before FWUC After FWUC
 Crop: Before FWUC After FWUC

93. What is the selling price of paddy:

Problem ranking

94. What are the main problems faced by farmers in their cultivation before FWUC:

| Problems | Score | Rank |
|----------|-------|------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| | | |
|--|--|--|
| | | |
|--|--|--|

95. What are the main problems faced by farmers in their cultivation after FWUC:

| Problems | Score | Rank |
|----------|-------|------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

96. What are the credit sources available for farmers:

| Type of credit* | Credit sources | Repayments | % of farmers obtain credit |
|-----------------|----------------|------------|----------------------------|
| | | | |
| | | | |
| | | | |

*Type of credit: 1. Formal. 2. Informal. 3. In kind

Agency Linkages

97. What are the agencies linked with FWUC

| Agencies linked before FWUC | Services provided | Agencies linked after FWUC | Services provided |
|-----------------------------|-------------------|----------------------------|-------------------|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |

98. Frequency of the involvement of Provincial and district officers (PDOWRAM, Administrative) and in FWUC activities

| Positions | Activities involved | Frequency of involvement |
|-----------|---------------------|--------------------------|
| | | |
| | | |
| | | |
| | | |
| | | |

Awareness of the PIMD

Farmer Leaders:

99. Farmer leader awareness of PIMD

| Leaders | Level of awareness of different Subject matters | | | | | |
|---------------------|---|----------|-------------|-------------------|---------------|------------------|
| | Policy | Circular | Need of PIM | Functions of FWUC | FWUC statutes | Roles of leaders |
| Chairman | | | | | | |
| 1 Vice Chairman | | | | | | |
| 2 Vice chairman | | | | | | |
| 3. Vice chairman | | | | | | |
| F. organizer | | | | | | |
| Group leaders | | | | | | |
| Sub group leaders | | | | | | |
| Group committee | | | | | | |
| Sub group committee | | | | | | |

100. What are the problems faced in implementing the given roles by the leaders (Problem ranking:

| | |
|-----------|--------|
| Problems | Causes |
| Solutions | Needs |

Farmers:

101. How many (percentage) of farmers know about basics of PIMD

102. Whether PIMD is useful: Y= N=

If yes why: 1.

2.

3.

4.

If no Why: 1.

2.

3.

103. Whether the formation of FWUC beneficial to farmers: Y = ... N= ...

If yes why: 1.

2.

3.

4.

104. What are the benefits received after the formation of FWUC:

1.

2.

3.

4.

105. If the formation of the FUWUC is not beneficial why

If no Why: 1:

2.

3.

4.

106. Why the ISF is collected:

1.

2.

3.

107. If ISF is not paid why:

1.

2.

3.

108. What are the training provided to Farmers/farmer leaders

| Training | No. held | participation | Who held | Adequacy of training |
|-----------------------------------|----------|---------------|----------|----------------------|
| 1. Awareness of PIMD & FWUC | | | | |
| 2. FUWC Statute | | | | |
| 3. Roles and functions of leaders | | | | |
| 4. System operation | | | | |
| 5. System maintenance | | | | |
| 6. | | | | |

109. What are the other areas farmers/leaders think that need more training:

110. What are the suggestions of farmers/leaders for further improvement of the FWUC

Provincial and District level agency officers and Provincial, District and Community level administration officers:

111. Knowledge on subject matters

| Subject matters | Level of awareness of officers | | | |
|-------------------------|--------------------------------|------|----------|------|
| | Very good | Good | Moderate | Weak |
| PIMD policy | | | | |
| PIMD circulars | | | | |
| Essentials of PIMD | | | | |
| Essential of FWUC | | | | |
| FWUC statute | | | | |
| FWUC functions | | | | |
| Steps in Formation FWUC | | | | |
| Mobilizing farmers | | | | |

112. Type of training received on PIMD

| Subject matters | Trainers | No. attended | Comments on training |
|-----------------|----------|--------------|----------------------|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |

113. What are the areas that need further training:

114. Involvement in FWUC and services provided to farmers

| Services provided | Agency officer | Frequency of providing service |
|-------------------|----------------|--------------------------------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

115. What are the main problems that affect the FWUC

| Problems | Possible solutions to improve FWUC |
|----------|------------------------------------|
| | |
| | |
| | |
| | |

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|--|--|
| | |
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116. What are the problems faced by the officers in implementing PIMD program:

| Problems | Possible solutions |
|----------|--------------------|
| | |
| | |
| | |
| | |
| | |

Appendix 2. Detailed schedule of fieldwork and data collection

| Day | Methodologies | Time period | Activities |
|-------|---|--------------------|--|
| Day 1 | Interviews- collection of secondary data | 8:00 AM - 5:00 PM | <ol style="list-style-type: none"> Interviews with Chairmen, Vice chairmen, and some group leaders Collect the necessary secondary data *Shared the activities among the three members of each group |
| Day 2 | <ol style="list-style-type: none"> Focus group discussions System mapping Seasonal calendar Crop calendar Land use calendar Water use calendar Mind mapping Problem ranking | 8:00 AM - 11:00 AM | Group 1: FWUC committee members <ol style="list-style-type: none"> Focus group discussion System mapping Mind mapping *One of the PIMD group member is involved |
| | | 8:00AM - 11:00 AM | Group 2: Farmers: <ol style="list-style-type: none"> Focus group discussions Problem ranking * Two of PIMD group members are involved |
| | | 2:00 PM - 4:00 PM | Farmers+Committee members <ol style="list-style-type: none"> Seasonal calendar Crop calendar Land use calendar Water use calendar *Shared the activities among the group members |
| Day 3 | Interviews - Collection of secondary data | 8:00 AM - 5:00 PM | Interview with agency officers –PDOWRAM-MAFF, Commune chiefs-village chiefs *Two of group members are involved Gap filling of first day field data collection *One of group member is involved |