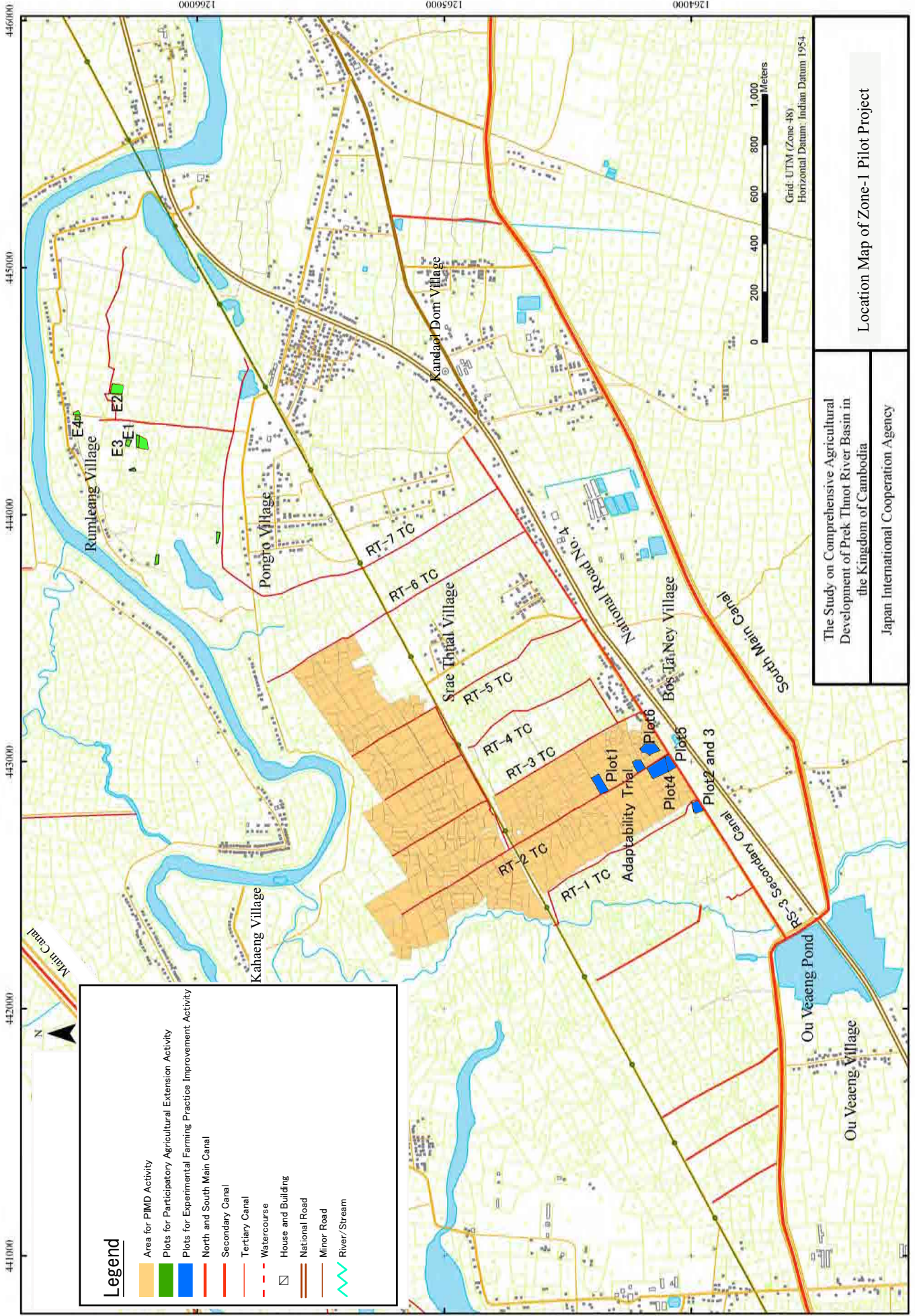


PART-B
PILOT PROJECTS (2006/2007)

Section-I
Irrigated Agriculture On-farm
Technology Improvement Pilot Project
in Zone-1



Improved Target Tertiary Canal (RT-2 Canal)
(Participatory Irrigation Management and Development Activities in Zone-1)



Legend

- Area for PIMD Activity
- Plots for Participatory Agricultural Extension Activity
- Plots for Experimental Farming Practice Improvement Activity
- North and South Main Canal
- Secondary Canal
- Tertiary Canal
- Watercourse
- House and Building
- National Road
- Minor Road
- River/Stream

The Study on Comprehensive Agricultural Development of Prek Thnot River Basin in the Kingdom of Cambodia

Japan International Cooperation Agency

Location Map of Zone-1 Pilot Project

Grid: UTM (Zone 48)
Horizontal Datum: Indian Datum 1954



4410000 4420000 4430000 4440000 4450000 4460000

0009921 0005001 0001921

PART-B: PILOT PROJECTS (2006/2007)

Section-I

Irrigated Agriculture On-farm Technology Improvement Pilot Project in Zone-1

Chapter BI-1 Framework of the Project

BI-1.1 Objective and Types of Project Activities

Objective of the “Irrigated Agriculture On-farm Technology Improvement Pilot Project in Zone-1 (irrigated area receiving sufficient water from the Prek Thnot River)” is to establish a good model of on-farm irrigated agriculture improvement in Zone-1. The model has to demonstrate effectiveness of the two-step improvement process with three types of activities.

Activity-1	Participatory Irrigation Management and Development (PIMD)
Activity-2	Participatory Agricultural Extension
Activity-3	Experimental Farming Practice Improvement

It should be noticed that the project target needs to be achieved in a sustainable and replicable way, otherwise project effects can not be transferred to other areas.

BI-1.2 Project Area

Areas for respective project activities were proposed as follows (see the location map of the pilot project area in Zone-1). The proposal was explained to local authorities in Kick-off seminars and finally approved by all. For detail of the seminars, see section BI-1.3.

BI-1.2.1 Area for the Participatory Irrigation Management and Development Activities

To carry out the Participatory Irrigation Management and Development, the project area needed to meet the following criteria.

- 1) The area should have existing major irrigation facilities such as main, secondary, and tertiary canals, since such facilities can not be provided by the pilot project
- 2) The area needed to be located in the upstream portion of the irrigation system, because the purpose of the pilot project was to decrease water loss in the upstream area and bring more water to the downstream farmers.
- 3) The area needed to be recognized as important by the farmers.

In Zone-1, only area RS-3¹ of the secondary canal met the criteria, so it was decided to execute the project activities in this area. However, PIMD pilot activities should be started in a small area, which is a tertiary block. This meant that one of the tertiary canals receiving water from the RS-3 secondary canal needed to be selected as the area. PDOWRAM and the JICA study team discussed this and decided to propose an irrigation area of RT-2² tertiary canal as the project area. The RT-2 tertiary canal was selected because it irrigated the largest area and is believed to be the most important one by the farmers. Another reason was that RT-2 tertiary canal was located relatively high upstream. If water would not be wasted in this area, downstream farmers could receive more water as compared with the current situation. The irrigation area of RT-2 tertiary canal spreads into two communes and five villages as shown below.

¹ Name of the canal RS-3 will be changed to SMC-S-1 when “Irrigated Agriculture Improvement Model Project” is implemented.

² Name of the canal RT-2 will be changed to SMC-S-1-T-2 when “Irrigated Agriculture Improvement Model Project” is implemented.

**Proposed Villages Related to the Participatory Irrigation Management and
Development Activities in Zone-1**

Name of Province	Name of District	Name of Commune	Name of Village
Kampong Speu	Samraong Tong	Kahaeng	Bos Ta Ney
			Kahaeng
			Ou Veang
	Chbar Mon	Kandaol Dom	Srae Thnal
			Pongro

BI-1.2.2 Area for Participatory Agricultural Extension Activities

Since the Participatory Irrigation Management and Development activities and participatory agriculture extension activities require intensive participation from the farmers, it was decided to conduct the two activities in different locations in the first year of the pilot project to avoid confusion of the farmers. For the participatory agriculture extension activities, Rumleang village in Kandaol Dom commune, Chbar Mon district was selected for the project area. The reason for the selection was that Rumleang village was the only village around the project area for the Participatory Irrigation Management and Development which did not transplant paddy when the JICA study team started the pilot project. It was obvious that if farmers already transplanted paddy, they had no chance to apply new farming practices. Rumleang village received irrigation water from same secondary canal as the Participatory Irrigation Management and Development activities area but was located further downstream.

BI-1.2.3 Area for Experimental Farming Practice Improvement Activities

Experimental farming practice improvement does not require intensive farmers' participation because the experimental farming on site was initiated by PDA and the JICA study team with the cooperation of several farmers. This means that the area for experimental farming practice could be overlapped with the Participatory Irrigation Management and Development activities area even in the first year. Bos Ta Ney village, which was a part of the area for the Participatory Irrigation Management and Development activities was selected for the experimental farming practice improvement since the farm plots were located furthest upstream of the RT-2 tertiary canal and were easy to supply with irrigation water.

BI-1.3 Kick-off Seminars

Kick-off seminar for Kahaeng commune was held at Kahaeng commune office on June 7 2006. The Commune Council and village leaders in the commune were invited. In the seminar, PDOWRAM staff explained the purpose and schedule of the pilot project. PDOWRAM also proposed the irrigation area of RT-2 for the area of participatory irrigation management and development activities. Some village leaders from outside of the area said that they also needed the assistance of PDOWRAM and PDA. PDOWRAM staff explained that if the pilot project was carried out successfully, they would try to expand the project area to the outer areas. Another village leader asked why the project was going to be carried out in the upstream area. PDOWRAM staff explained that the purpose of the pilot project was to distribute water properly. If they regulate water in the upstream, it benefits downstream farmers. The participants agreed with the explanation and the seminar was closed.

On June 21, 2006, a Kick-off seminar for Kandaol Dom commune was held at a school in the commune. The pilot project implementation team explained the outline of the project. Finally, the implementation schedule and area of the project were agreed to by the participants.

3 Target yield of the Mater Plan is confirmed to be achieved by applying SRI based improved farming practices	3-1 Yield of improved farming practices in experimental plots is higher than the target yields of the master plan	3-1 Crop yield surveys	
<p>Activities (1. Participatory Irrigation Management and Development) 1-1 To prepare land holding maps 1-2 To prepare water use maps 1-3 To prevent water loss 1-4 To establish FWUC sub-groups 1-5 To educate FWUC on proper water use 1-6 To prepare irrigation service plan 1-7 To construct on-farm irrigation facilities 1-8 To construct water courses 1-9 To improve FWUC administration 1-10 To construct FWUC meeting building 1-11 To train FWUC in water management (2. Participatory Agriculture Extension) 2-1 To organize study tours 2-2 To conduct village training 2-3 To carry out inter-village training 2-4 To hold farmers' field days (3. Experimental Farming Practice Improvement) 3-1 To conduct verification tests to confirm effectiveness of SRI based improved farming practices 3-2 To conduct small scale adaptability trials for further improvement of the farming practices</p>	<p>Input Donors Experts Transportation Equipment for monitoring irrigation water distribution Cost of study tours Construction cost of model irrigation facilities</p>	<p>Cambodia <u>FWUC and FWUGs</u> FWUC and FWUG members <u>Provincial government</u> Counterparts from PDOWRAM and PDA <u>Central government</u> Counterparts from MOWRAM and MAFF <u>NGO</u> Facilitators</p>	<p>- Continuous involvement of related government agencies and model FWUC during the project period - No severe natural disaster within the project period</p> <p>Precondition - High need for irrigated agriculture in the target area - Good understanding of the master plan by related organizations - Basic irrigation facilities are provided in the project area</p>

Chapter BI-2 Participatory Irrigation Management and Development Activities

BI-2.1 Objective

Objective of the Participatory Irrigation Management and Development activities are as follows.

Objective

To achieve efficient use of irrigation water in the pilot project area in a sustainable and replicable way

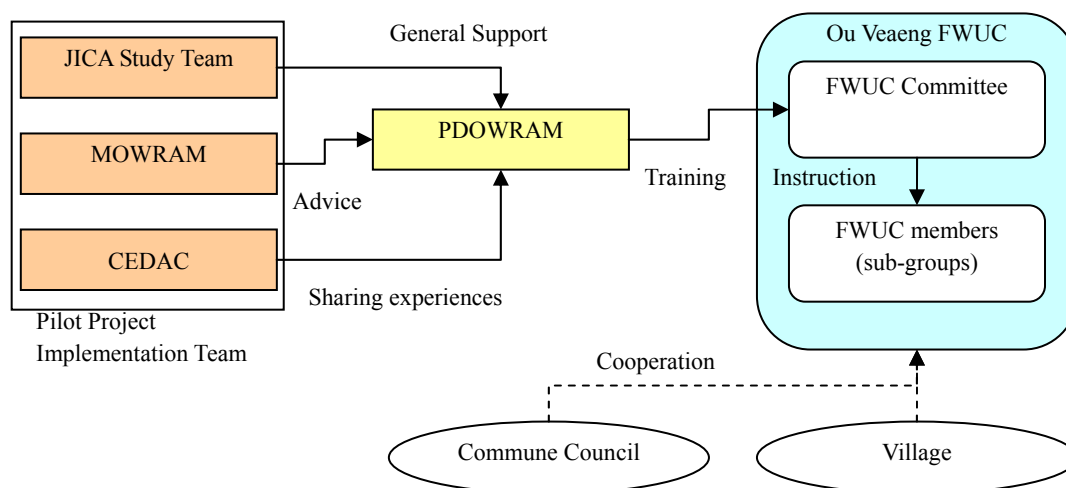
Efficient use of water in Zone-1 could be defined as irrigation water distribution based on an irrigation service plan. The efficient use of irrigation water could be achieved through efforts of the FWUC and the Government.

It should be noted that efficient use of irrigation water in the pilot project should be achieved in a sustainable and replicable way. If the Government intensively regulates water in the area, efficient use of irrigation water can be easily achieved. However, this is obviously not sustainable since the Government can not continue intensive water control for only the pilot project area. Efficient use of irrigation water needs to be achieved by the FWUC members themselves, so the role of the Government is to support and empower them.

BI-2.2 Institutional Set-up

Institutional set-up for the Participatory Irrigation Management and Development activities was decided based on the basic strategy for pilot project implementation, which is “Project Operation by a United Farmer-Government-NGO Project Team”.

The Participatory Irrigation Management and Development activities was implemented mainly by the Kampong Speu PDOWRAM office with support from the JICA study team, MOWRAM, and CEDAC. Role of PDOWRAM was to support existing Ou Veang FWUC. Relationship of those organizations is illustrated as below. PDOWRAM was in charge of training the FWUC with the JICA study team, MOWRAM, and CEDAC supporting PDOWRAM.



Institutional Set-up of the Participatory Irrigation Management and Development Activities

BI-2.3 Situation before Starting the Pilot Project

BI-2.3.1 Area for the Activities

As mentioned in section BI-1.2.1, the irrigation area of the RT-2 tertiary canal spreading over five villages was selected for the area of the PIMD activities.

BI-2.3.2 Method of Baseline Surveys

Baseline surveys were conducted to understand the situation of the pilot project area before starting the project. Various survey methods were applied such as interview surveys with key persons, questionnaire surveys for sampled farmers, and site inspections by experts.

BI-2.3.3 Agriculture

Agricultural condition in the area was favorable as compared with surrounding areas due to relatively stable irrigation water supply. About half of the farmers in the area were enjoying double paddy cropping in a year. Farmers in the area cultivated paddy with traditional farming practices. Under the traditional farming practices, farmers transplanted seedlings older than 30 days with 4-5 plants per hill.

The existence of SRI was well known by many farmers but no farmer in the area adopted it. The farmers said that they wanted to introduce SRI but did not know how to do it.

BI-2.3.4 Irrigation and Drainage / Water Management

BI-2.3.4.1 Irrigation System

Irrigation water diverted from the Prek Thnot River by the Roleang Chrey Regulator flows down to the South Main Canal. Part of the water is diverted into RS-3 secondary canal and finally reaches the RT-2 tertiary canal. Major irrigation facilities along this water course are as described and illustrated below.

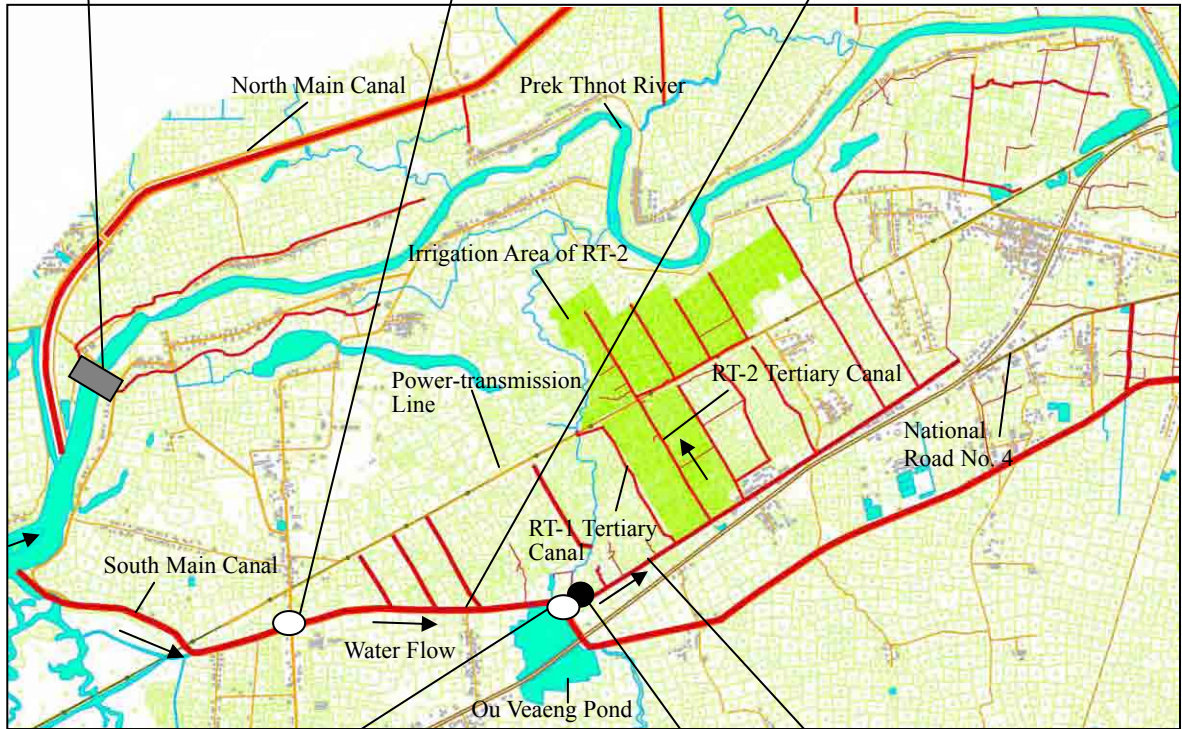
(1) Facilities on the Approach Channel and South Main Canal

Water for the project area was diverted from the Prek Thnot River at Roleang Chrey Regulator. The diverted water flows for 160 m down to the right bank approach channel and reaches Vat Krouch Intake. Amount of water flowing into the South Main Canal is controlled at the intake. The water flows about 150 m down into the South Main Canal and is then diverted to the RS-3 secondary canal at a turnout in the middle reach of the Ou Veang pond. The pond functions as a regulating pond for the main canal. There were several tertiary canals between the Vat Krouch Intake and the RS-3 secondary canal but those tertiary canals were not functioning well due to a lack of diversion structures.

(2) Facilities on the RS-3 Secondary Canal

Ten meters downstream of the RS-3 turnout, a spillway structure was provided and water was released from the canal to a stream. Farmers located further downstream were using this water in their paddy. Water flows down for another 80 m supplying several small canals on the left bank side and finally reaches the RS-1 tertiary canal. There was no turnout structure at the division point to the RS-1 tertiary canal, only a pipe was buried. A turnout structure with a gate was located about 20 m downstream of the RS-1 division point.

Major Irrigation Facilities Located Upstream of RT-2 Tertiary Canal

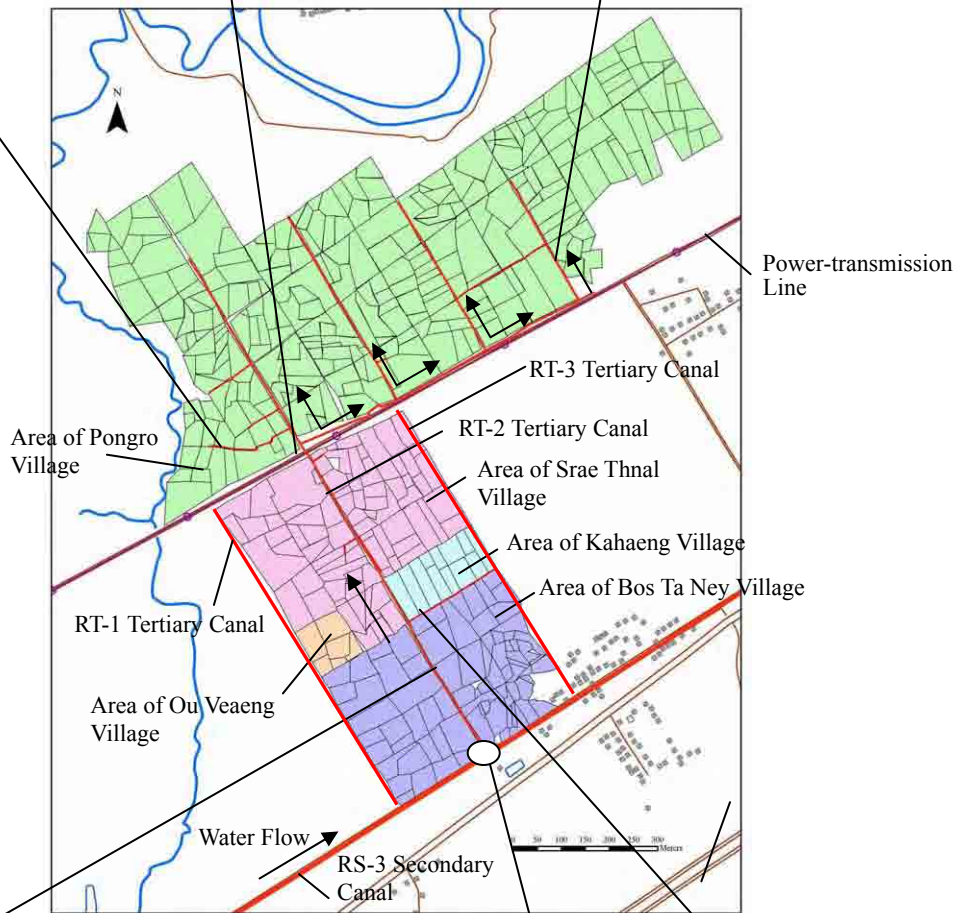


(3) Facilities on the RT-2 Tertiary Canal and Water Courses

Irrigation area of the RT-2 tertiary canal could be divided into two areas. The one was the upstream area and the other was the downstream area. The upstream area was the area from the RT-2 turnout to the power-transmission line. The downstream area spread further downstream. In the upstream area, RT-2 canal irrigated both sides. However, the area received water from other tertiary canals as well. The left bank area received water from the RT-1 tertiary canal and the right bank area received water from the RT-3 tertiary canal. On the other hand, the downstream area could receive water only from the RT-2 tertiary

canal, since the RT-1 and RT-3 tertiary canals did not cross the power-transmission line. The RT-2 tertiary canal was divided into two canals just after crossing the power-transmission line. Those two canals were further divided into several canals to irrigate the downstream area.

Major Irrigation Facilities on the RT-2 Tertiary Canal and Water Courses



BI-2.3.4.2 Drainage System

There was no drainage canal in the project area. When floods come, farmers drained water from their plots to other plots. If water level in RT-2 tertiary canal was low, farmers also drain water from their plots to RT-2 canal. Farmers in the area faced difficulties in draining water because the water level of neighboring plots or RT-2 canal was normally high during the flood period.

A cross drain structure made of pipe was provided in the middle reaches of the RT-2 canal to accelerate plot-to-plot drainage. However, Ou Veang FWUC committee said that the diameter of the pipe was too small to drain water and also much leakages were observed, so that they always have problems with drainage.

BI-2.3.4.3 Water Management

Ou Veang FWUC was in charge of operation of the intake structures on the South Main Canal. PDOWRAM was only operating Roleang Chrey Regulator and intake structures on the main canal.

There was no definite water distribution schedule. The FWUC committee (in most cases only FWUC chief) operated the turnouts on secondary and tertiary canals based on farmers requests and past experience. According to the FWUC chief, there had been conflicts in water distribution, especially upstream farmers against downstream farmers. The FWUC chief faced difficulty in water distribution, since too many farmers bring conflicting requests to him.



Farmers were taking water directly from the RT-2 tertiary canal by making holes

There were no division boxes on the RT-2 tertiary canal. Since the size of the RT-2 canal was relatively large for a tertiary canal, farmers had a hard time introducing water from the RT-2 canal to their fields. The farmers made many holes in the embankment of the RT-2 canal to take water from the canal as shown above. They introduced water to each paddy plot without any consensus.

The FWUC committee had received training on water management from PDOWRAM but PDOWRAM staff confessed that the training was inadequate. Due to lack of budget PDOWRAM could not organize complete training for them.

BI-2.3.4.4 Facility Maintenance

Since the RS-3 secondary canal and RT-2 tertiary canal were recently rehabilitated (year 2003), there were no severe maintenance problems at present. However, maintenance of the facilities was anticipated to become a problem. Ou Veang FWUC could not collect irrigation service fees properly, so that the FWUC did not have enough funding to repair the facilities, even for small scale maintenance.

BI-2.3.5 Organization

BI-2.3.5.1 Ou Veang Farmer Water Users Community (FWUC)

One FWUC, Ou Veang FWUC, manages the area irrigated with water from the RT-2 tertiary canal. The area spreads over 5 Villages, 2 Communes and 2 Districts.

Low payment rate of irrigation service fees was a general problem of Ou Veang FWUC. All of the benefited farmers who have been paying the irrigation service fees held

irrigated land along the RT-2 tertiary canal. For more detailed information of Ou Veang FWUC, see Volume-II: Feasibility Study for Priority Projects.

(2) Comparison of Advanced FWUCs with Ou Veang FWUC

To attain a deeper understanding of the current situation and of the actions to be taken for improvement of Ou Veang FWUC, an analysis of Ou Veang FWUC as compared to three relatively advanced FWUCs; Ou Traeng, Sdao Kaong, and Phoum Rong FWUCs was carried out. The table below summarizes the features of the three FWUCs and Ou Veang FWUC.

Comparison of the FWUCs

Name of FWUC	Ou Treang FWUC	Sdao Kaong FWUC	Phoum Rong FWUC	Ou Veang FWUC
Remarks	Strongly supported by MOWRAM as one of the model FWUCs	- Organizational strengthening supported by CEDAC - Irrigation facilities constructed by MOWRAM	Intensively supported by a World Bank project	FWUC in Zone-1 of the Pilot Project Area
1. Administrative Location				
1) Province	Kampong Speu	Prey Veng	Kampong Speu	Kampong Speu
2) District	Kong Pisei	Ba Phnom Kampong Tabaek	Chabar Mon	Samraong Tong, Chbar Mon
3) Commune	Prey Nheat	Sdao Kaong Kansom Ork Kampong Trabek	Svay Kravan	Kahaeng Kandaol Dom Tang Krouch Chbar Mon
4) No. of Villages	13 Villages	4 Villages	11 Villages	23 Villages
2. Irrigation System				
1) Name of the system	Ou Traeng irrigation system	Sdao Kaong Irrigation system	South main canal irrigation system (Roleang Chrey Regulator)	North & South main canal irrigation systems (Roleang Chrey Regulator)
2) Type of water source	Reservoir	River (floating pump)	River (Roleang Chrey regulator)	River (Roleang Chrey regulator)
3) Main canal	3 canals (11.3 km)	1 canal (4.6 km)	1 canal (1km)	2 canals (13km; North: 8km South: 5km)
4) Secondary	7 canals (9.1 km)	15 canals (500m each)	3 canals (4.5km)	10 canals (11.6 km)
5) Tertiary canals	11 canals (17.5 km)	None	7 canals (8km)	8 canals (10.6km)
6) On-farm irrigation system	Gravity Movable pumps	Gravity	Gravity Movable pumps	Gravity Movable pumps
3. FWUC Organization				
1) Year of establishment	1998 (supported by MOWRAM)	2004 (supported by CEDAC)	2004 (supported by WB and PDOWRAM Kampong Speu)	2002 (supported by PDOWRAM Kampong Speu)
2) Registration in MOWRAM	In the process	Registered in 2004	In the process	In the process
3) Written regulations	Prepared in October 2000	Prepared in October 2004	Prepared in June 2004	Prepared in November 2001
4) List of water users	Available	Available	Available but not updated since 2004	Available but not updated since 2002
5) Land holding map	Not Available (since sub-groups are working well, they have no problem without a land holding map)	Available (prepared by CEDAC and farmers by using rope)	Partly available (prepared by MOWRAM under the financial support from World Bank)	Not Available

Comparison of the FWUCs

Name of FWUC	Ou Treang FWUC	Sdau Kaong FWUC	Phoum Rong FWUC	Ou Veang FWUC
6) Number of members	876 families	232 families	1,106 families	2,432 families
7) Size of management area	297 ha (but it varies from year to year due to water resources availability)	301 ha	518 ha	976 ha (514 ha is irrigable at present)
8) Existence of the other FWUC using the same canal for irrigation water	No	No	With Ou Veang FWUC (located in upstream irrigation areas) and Bak Thmei FWUC (located in downstream irrigation area)	With Phoum Rong FWUC and Bak Thmei FWUC (located in downstream irrigation areas)
9) Number of groups and sub-groups	1 Group by Village 7 sub-groups by secondary canal	14 Groups by canal layout 4 Groups by Village	5 FWUGs 11 Sub-FWUG by canal layout	4 FWUGs by Commune 23 Sub-FWUG by Village (not functioning at all)
10) Boundary of groups and sub-groups	Group by Village boundary Sub-group by canal layout	Canal layout and Village boundaries (for two types of groups)	Canal layout and Village boundaries	Commune and Village boundaries
4. FWUC Committee				
1) Number of Committee members	4 persons (Chief 1st Deputy Chief 2nd Deputy Chief Accountant)	4 persons (Chief 1st Deputy Chief 2nd Deputy Chief Accountant)	4 persons (Chief 1st Deputy Chief 2nd Deputy Chief Accountant)	4 persons (Chief 1st Deputy Chief 2nd Deputy Chief Accountant)
2) Persons related to the FWUC Committee	Group Leaders Sub-Group Leaders 2 advisors (Kong Pisei District Chief and Prey Nheat Commune Chief) 1 farmers' representative	14 Group Leaders 4 Irrigation Service Fee Collectors 4 Village Representatives 1 Voluntary Auditor (Ex-Accountant)	20 Representatives of FWUG 44 Representatives of Sub-FWUG 1 Commune Council member	None (Representatives of FWUG and Sub-FWUG don't work)
3) Pay for Committee members	Chief: \$17 1st Deputy Chief: \$15 2nd Deputy Chief: \$15 Accountant: \$17 District Chief: \$20 Commune Chief: \$18 Representative of farmers: \$13 (US\$/ month)	Chief: \$27.5 1st Deputy Chief: \$22.5 2nd Deputy Chief: \$22.5 Accountant: \$17.5 (US\$/ cropping season)	25% of collected Irrigation Service Fee divided into 3 portions 1) 12%: Committee 2) 12%: Representatives of FWUG and Sub-FWUG 3) 1%: CC member	None
5) Meeting building	Available	Available	Available	Not available
6) Frequency of meetings	Regularly	Regularly (at least once/month)	Regularly (at least twice/week)	3 times/year (only in the bylaws)
5. Irrigation Service Fee (ISF)				
1) Value of ISF in Riel per cropping season	Rainy season 1) Gravity and pump R 20,000/ha 2) Pump R 10,000/ha Dry season 1) & 2): R 40,000/ha	1st Year: R 7,000/ha 2nd Year: R 8,000/ha 3rd Year: R 11,000/ha	1) Gravity R 40,000/ha 2) Pump R 10,000/ha	1) Gravity R 30,000/ha 2) Gravity and pump R 20,000/ha 3) Pump R 10,000/ha

Comparison of the FWUCs

Name of FWUC	Ou Treang FWUC	Sdau Kaong FWUC	Phoum Rong FWUC	Ou Veang FWUC
2) Ratio of ISF collection	80 – 85%	99%	35%	10% (but most of the members pay less than determined amount)
3) Person in charge of ISF collection	Group Leaders	Irrigation Service Fee Collectors	Representatives of FWUG and Sub-FWUG	Chief of the FWUC Committee
4) Process of ISF collection	4 Steps	16 Steps	3 Steps	Not determined
6. Water Management				
1) Structures that the FWUC is responsible for operating	Structures on the main and secondary canals	Structures on the main and secondary canals	Structures on the main and secondary canals	Structures on the main and secondary canals
2) Timing of water supply	Based on request from farmers	Based on request from farmers	Based on request from farmers	Based on FWUC Committee decision
7. Agriculture				
1) Major crops and yield in the rainy season	Paddy (3t/ha)	Paddy (3t/ha)	Paddy (2t/ha) Beans, cucumber, cabbage, morning glory (1-1.5t/ha)	Paddy(3.5 -4t/ha in irrigated areas)
2) Application of canal water in the rainy season	Usually no (only spill out water from the reservoir)	Yes	Yes	Yes
3) Major crops and yield in the dry season	Water melon (N.A.)	Paddy (3-3.5t/ha) Cucumber (N.A.: April - June)	Morning glory (1-2t/ha) Cabbage (300-400g/ha) Cucumber (1t/ha)	Paddy (3t/ha)
4) Application of canal water in the dry season	Yes	Yes	No	Yes

Source: Interview survey with FWUCs







The steps for establishing and developing an FWUC in Cambodia were proposed in the “Training Manual for Participatory Irrigation Management and Development in Cambodia, Module 5” prepared by MOWRAM in 2003. The following table shows a comparison of the situations of the above four FWUCs and which steps they have completed. As seen in the table, it is obvious that Ou Veang FWUC needs to start with Step 2 and it needs to be empowered by training.

Steps to establishing and developing the FWUC	Ou Treang FWUC	Sdau Kaong FWUC	Phoum Rong FWUC	Ou Veang FWUC
Step 1 Hold initial meetings at system or sub-system level	Done	Done	Done	Done
Step 2 Identify irrigation service area and potential members of FWUC and conduct participatory rural appraisal	Done (without land holding map)	Done	Partly done (about 50%)	Not yet
Step 3 Farmers agree to form FWUC and plan organizing activities	Done	Done	Done	Done
Step 4 Farmers prepare and adopt FWUC statute and by-laws	Done	Done	Done	Done
Step 5 Farmers establish FWUC and select leaders	Done	Done	Done	Partly Done
Step 6 Build capacity of FWUC to prepare an irrigation service plan	Done	Done	Done	Not yet

Step 7 FWUC adopts and implements initial irrigation service plan	Done	Done	Done	Not yet
Step 8 Prepare and adopt management transfer agreement	Done	Done	Done	Not yet
Step 9 Repair and improvement of irrigation structures	Done	Done	Done	Not yet
Step 10 Continue capacity building and provision of support services	Done	Done	Done	Not yet

Physical situations of the three advanced FWUCs are also observed as shown below.

Physical Situations of Advanced FWUCs

Ou Treang FWUC	Sdau Kaong FWUC	Phoum Rong FWUC
Irrigation Facilities		
		
Check on Main Canal	Turnout to Secondary Canal	Secondary Canal
Administration		
		
Meeting in the Building	Meeting in the Building	Meeting Building

As shown in the comparative analysis, the differences between the advanced FWUCs and Ou Veang FWUC are identified as follows.

Differences between the advanced FWUCs and Ou Veang FWUC

Strengths and Opportunities

- The FWUC has sufficient water resources as compared with the other FWUCs.
- The FWUC is located upstream, and thus has easy accesses to irrigation water.

Weakness and Threats

- The FWUC suffers from low water level of the canals for on-farm gravity irrigation.
- The FWUC is not functioning very well, especially its sub-groups.
- The FWUC was able to collect very little amount of irrigation service fees.
- The FWUC does not have a land holding map.
- The FWUC does not have the sub-groups based on canal layout.
- The FWUC does not have a meeting building for its administration works.
- The FWUC does not pay its committee members or other representatives.
- The FWUC is managing the largest area among the four FWUCs.

BI-2.3.5.2 Community Organizations

- (1) Commune Council

The Commune is the smallest administrative unit under the Ministry of the Interior. The five target villages for PIMD activities are located in two Communes; Kandaol Dom (Chbar Mon District) and Kahaeng (Samraong Tong District). A Commune is governed by a Commune Council consisting of a Commune Chief, Deputy Commune Chief(s) and Commune Council members who are elected by the Commune dwellers every three years. The latest election of a Commune Council was conducted in February 2002, according to the Village Chiefs of the Communes. The number of Commune Council members with sex ratio and their activities are summarized in the table below.

Features of Commune Council

Name of Commune	No. of the Members (Male : Female)	Activities
Kandaol Dom	7 (7 : 0)	<ul style="list-style-type: none"> - To disseminate information to Village Chiefs and farmers - To arrange meetings about development of agriculture and the community with Village Chiefs - To solve any kind of problems related to the Commune dwellers (roads, schools, hospitals, health centers)
Kahaeng	7 (6 : 1)	<ul style="list-style-type: none"> - To develop and maintain the security of the Commune - To encourage the dwellers to join in the Commune development - To register births, marriages, and deaths - To arrange elections

Source: Rapid Community Organization Survey conducted by the Study Team

According to the activities of the Commune Councils, it was observed their influence and role in the villages are huge. In reality, they have a power to gather and encourage the people to participate in development works.

(2) Village Development Committee (VDC)

VDC was established according to the guidelines approved by the Government in 1999. It was expected to be a facilitator of village wide community development. The VDC members worked for village development without any pay. In the five target villages for PIMD activities, all 5 Villages had established VDC in their villages. Number of VDC members was 4 - 5 persons. The features of the 5 VDCs were i) 3 out of 5 VDCs included the Village Chief or Group Leader in the VDC, ii) gender balance is good (Male 61%: Female 39%) and iii) the members of the 5 VDCs were selected by elections conducted from 2003 to 2006, and iv) the main occupation of the members was farming.

Limited to the Pilot Project Area, the existence of VDCs is not so outstanding but the VDCs continue their activities such as acting as an intermediation organization for some donors. Nevertheless, as mentioned above, most of the VDCs include administrative local leaders, and thus it is not absolutely necessary to contact with them for entering into the village.

BI-2.4 Identified Constraints for PIMD Activities

BI-2.4.1 Irrigation and Drainage / Water Management

The following problems related to irrigation and drainage and water management were identified by the baseline survey.

- Farmers in the area were using water without consensus among the water users (upstream farmers seemed to be able to take water easily).
- Importance of proper water distribution was not recognized by farmers.
- Farmers in the area had no experience in proper water management.
- There was no water distribution schedule.
- There was no irrigation diagram for water management.

- Many farmers were taking water directly from the RT-2 canal by destroying the canal bank, since there was no division box or turnout structure.
- The irrigation system could not supply water by gravity for some parts of the area due to insufficient irrigation facilities.
- Farmers in the area were suffering from lack of drainage since they have no drainage canals.

BI-2.4.2 FWUC

The following problems in Ou Veang FWUC were identified by the baseline survey.

- Ou Veang FWUC attempted managed, both generally and technically, too huge an irrigation area (916ha) to be managed by one FWUC. As a result, many farmers who held farmland in its irrigation management area, even those in the 68ha of the RT-2 tertiary canal command area, did not know the mission of the FWUC and/or the name of the Chief. They mistakenly believed that the FWUC was only organized for reaching a consensus on irrigation infrastructure improvement because of the framework of the past project. The other reason of low awareness of the FWUC's mission could be that 2 FWUGs (Commune level) and 5 Sub-FWUGs (Village level) did not function at all although they had been organized as the subordinate organizations of the FWUC.
- Lack of a land holding map for the pilot project Area as well as for the whole management area caused overestimation or underestimation of irrigation service fees. Inevitably, many of farmers did not pay estimated irrigation service fees. The system of collecting irrigation service fees was also poor.
- Lack of a land holding map also induced that FWUGs and Sub-FWUGs had been organized by administrative area but not by canal layout. It was difficult for FWUGs and Sub-FWUGs organized by administrative boundary to reach a consensus on water distribution depending on canal layout.
- The Committee members were not sufficiently trained for organizing and facilitating meetings for discussing the FWUC activities and reporting them to the benefited farmers, administrating the tasks of the Committee including accounting and budgetary control, formulating plans concerning water distribution and its management, or the technique of water management.

BI-2.5 Activities Conducted for Improvement

BI-2.5.1 Participatory Preparation of Improvement Plan

BI-2.5.1.1 Study Tour to Ou Treang FWUC

Based on the basic strategy for implementation, which is "Strategy-1: Learning from Good Farmers' Practices in Cambodia", a study tour to an advanced area was planned. According to the baseline survey result, it was found that Ou Veang FWUC members have to understand how the FWUC should be structured and managed. A study tour to the advanced Ou Treang FWUC was conducted to learn this matter from them.

On August 2, 2006, 20 members of Ou Veang FWUC, including Commune Council members and Village Chiefs, visited Ou Treang FWUC together with PDOWRAM and the JICA study team. A meeting was held in the meeting building of Ou Treang FWUC. They discussed their activities with each other. Ou Treang FWUC committee explained their system of FWUC operation, especially for the irrigation service fee collection and canal layout based sub-group activities. After the discussions, Ou Veang FWUC members visited the irrigation facilities of the Ou Treang irrigation system.



BI-2.5.1.2 Review Workshops to prepare Improvement Plan

It is essential for Ou Veang FWUC members to understand their situation and find what they have to do by themselves. In this connection, a participatory planning method was applied to preparation of their improvement plan.

(1) Review Workshop to enable FWUC Members to Identify Differences

After coming back from the study tour to Ou Treang FWUC, a review workshop was held. Ou Veang FWUC leaders were gathered in the PDOWRAM office and compared the situations of Ou Veang and Ou Treang FWUCs to identify what they have to do.

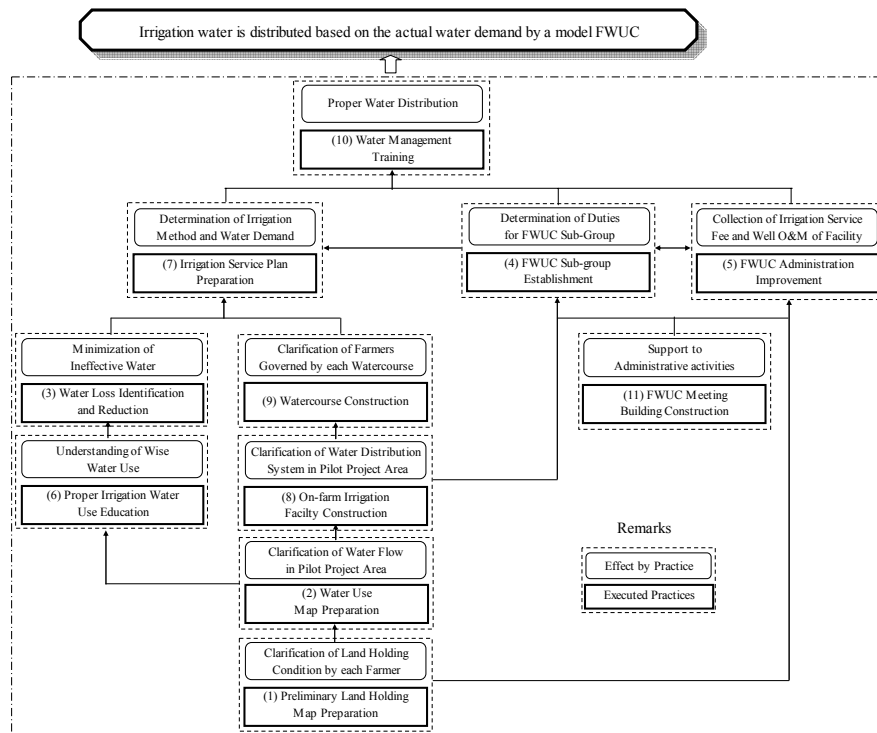


(2) Review Workshop to Prepare Improvement Plan by PDOWRAM

Based on the differences between Ou Veang FWUC and Ou Treang FWUC that were identified, an improvement plan for Ou Veang FWUC was prepared by PDOWRAM and the JICA study team. The following 11 improvement practices were proposed.

- | |
|--|
| <p><u>Elaborated Ou Veang FWUC Water Management Improvement Plan</u></p> <ol style="list-style-type: none"> 1) Preliminary land holding map preparation practice 2) Water use map preparation practice 3) Water loss identification and reduction practice 4) FWUC sub-group establishment practice 5) FWUC administration improvement practice 6) Proper irrigation water use education practice 7) Irrigation service plan preparation practice 8) On-farm irrigation facility construction practice 9) Watercourse construction/rehabilitation practice 10) Water management training practice 11) FWUC meeting building construction practice |
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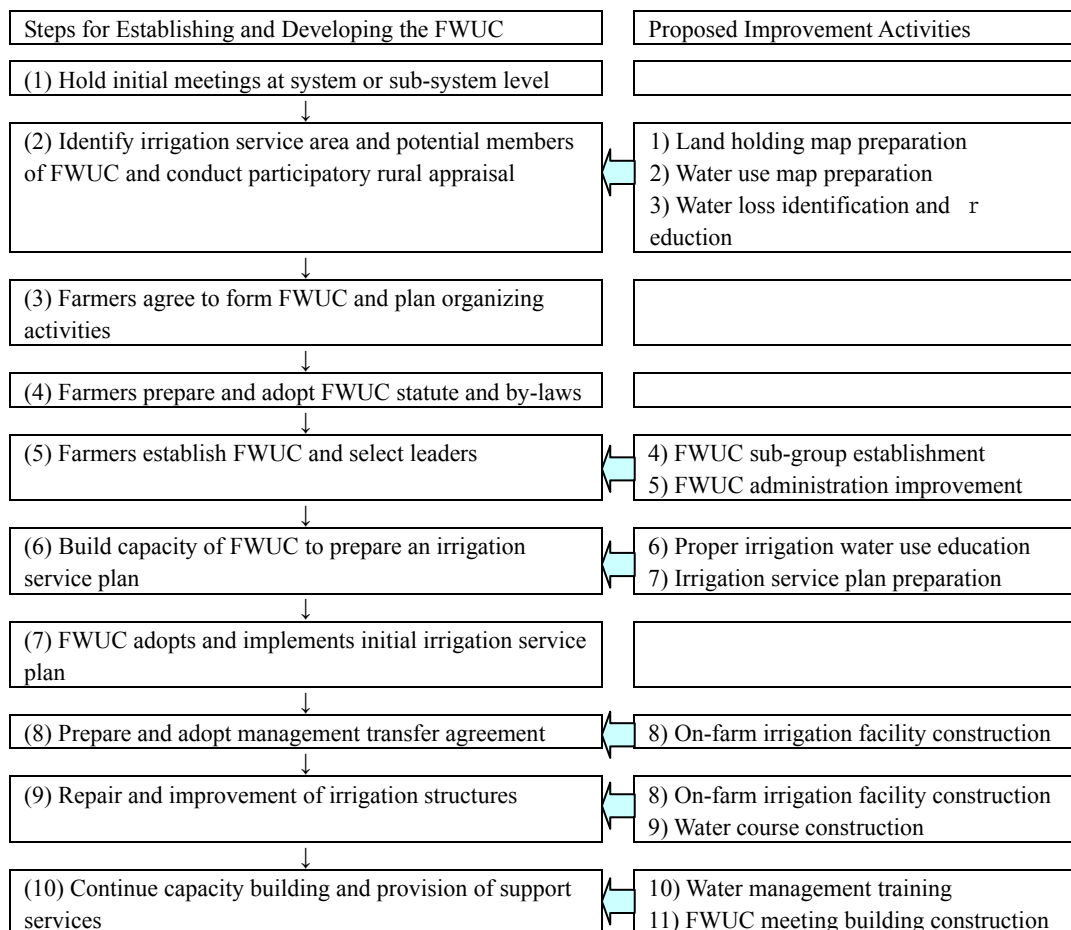
The relation between these practices and the objective of the Irrigated Agriculture On-farm Technology Improvement Pilot Project is figured as follows:



<p>PDOWRAM staff and MOWRAM counterpart were reviewing problems of the FWUC that were identified by FWUC leaders</p>	<p>PDOWRAM staff and MOWRAM counterpart were preparing an improvement plan under facilitation of the JICA study team</p>

(3) Relationship of Proposed Improvement Activities with MOWRAM Manual

PIMD activities in Cambodia should be conducted in accordance with MOWRAM policy for PIMD. The MOWRAM policy is presented in the “Training Manual for Participatory Irrigation Management and Development (MOWRAM, 2003)”. Proposed improvement activities for Ou Veang FWUC and steps for establishing and developing FWUC introduced in the training manual were compared. A strong relationship between them was confirmed as follows.



BI-2.5.2 Implementation of the Improvement Plan

BI-2.5.2.1 Preliminary Land Holding Map Preparation Practice

(1) Objective

Objective of the practice is to identify water users in the pilot project area.

(2) Actions Taken

Participatory land holding mapping was experimentally applied as follows (see the figure in next page).

- Necessity of the activities and procedure for preparing a paddy plot resource map were explained by PDOWRAM staff to Ou Veang FWUC committee members and related local authorities (Commune Council members and Village Chiefs).
- Paddy plot resource map, which shows all the paddy plots receiving water from the target canal of pilot project (RT-2 tertiary canal), was prepared by the FWUC committee under assistance of local authorities.
- Coordinates of paddy plot corners shown in the paddy plot resource map were surveyed by PDOWRAM with FWUC committee by using a handheld GPS.
- Surveyed data was transferred from GPS to computer and shapes of paddy plots were digitized by PDOWRAM staff using GIS software.
- Draft land holding map was prepared by the JICA study team by entering users' names.
- The draft land holding map was presented to farmers and checked by them. After necessary corrections, the map was finalized.

(3) Result and Observations

As a result, the following numbers of water users were identified in the pilot project area. The map includes all the water users who are using water from RT-2 even if only occasionally.

Identified Number of Water Users of RT-2 Tertiary Canal

Village	Bos Ta Ney	Kahaeng	Ou Veang	Srae Thnal	Pongro	Total
Number of Water Users	34	11	5	43	73	166
Area (ha)	12.7	2.2	1.1	13.6	50.4	80.0
Average Land Holding Size (ha)	0.37	0.2	0.22	0.32	0.69	0.48

Note: One farmer had lands in both Srae Thnal and Pongro. This farmer is counted in both.

Effectiveness of preparing land holding map in simple way was confirmed as follows.

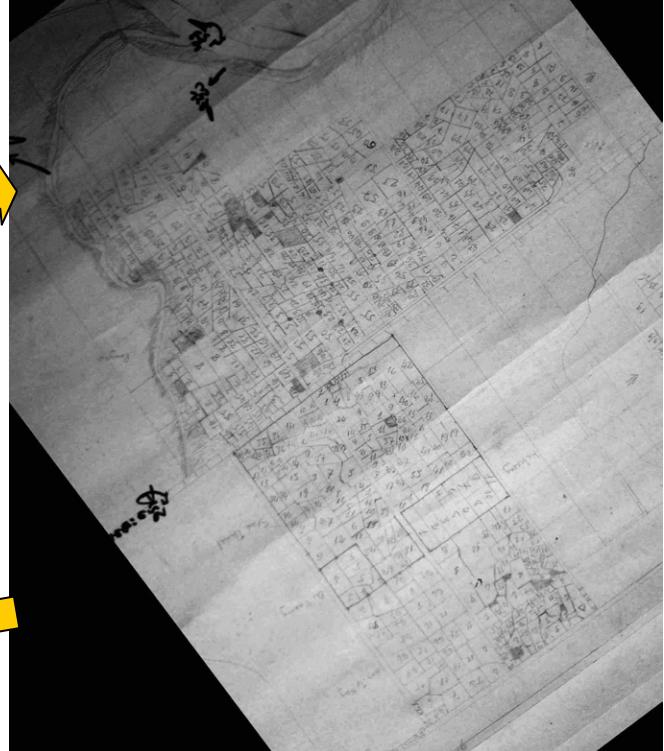
- The FWUC members believed the map that was prepared is accurate enough compared with the previous situation (they had no map previously)
- The FWUC and farmers were very cooperative in preparing the map and providing their local information, even though the project did not provide pay for them
- The FWUC committee said they are ready to cooperate more for preparing land holding maps of outer pilot project areas, if PDOWRAM helps them
- Proper paddy plot resource maps need to be prepared prior to field surveys, otherwise the field surveys take a long time
- It seems difficult for one person to prepare a proper paddy plot resource map if the area of the map is larger than 30 ha
- Field surveys should be done with the farmers, since they know the best route to survey
- Participatory mapping helps farmers to raise their interest in FWUC activities
- The FWUC must establish a system for updating the land holding map since water users change sometimes
- The mapping team should be careful about the names of the water users, since the last names of husbands and wives are different in Cambodia

Process of Participatory Land holding Mapping

1) Explanation on how to prepare the paddy resource map by PDOWRAM



2) Prepared paddy resource map by FWUC committee



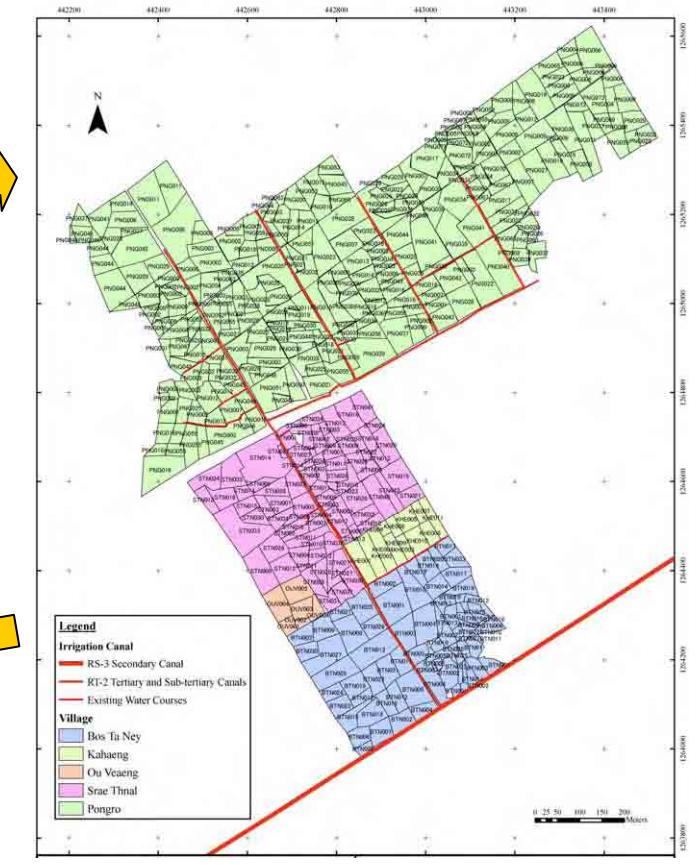
3) Field survey with handheld GPS by PDOWRAM and FWUC



4) Data transfer from GPS to GIS by PDOWRAM



5) Prepared land holding map by PDOWRAM with support of the JICA study team



6) On-site confirmation of the map by PDOWRAM and FWUC (the map was modified if some errors found)



BI-2.5.2.2 Water Use Map Preparation Practice

(1) Objective

Objective of the practice is to deeply understand the situation of the project area.

(2) Actions Taken

Questionnaire surveys of identified water users were executed by PDOWRAM with assistance of the Commune Council. Results of the surveys were plotted on a map.

(3) Result and Observations

The following results were obtained by preparing six types of water use maps as presented in the next page.

- Three upstream villages (Bos Ta Ney, Kahaeng, and Ou Veang) could receive water by gravity but villages in the middle reaches and downstream (Srae Thnal and Pongro) had to use portable pumps to take water from the canal.
- Many farmers in two upstream villages (Bos Ta Ney and Kahaeng) were enjoying double cropping of paddy but only a limited number of farmers in downstream villages could cultivate twice a year.
- The name of the FWUC chief, who was a resident of Bos Ta Ney, the most upstream village, was well known in the upstream area but only about half of the farmers in the most downstream village (Pongro) knew his name.
- Many farmers in the most downstream village (Pongro) attended the FWUC meeting.
- About 15% of farmers were not paying any irrigation service fees at all and another 15% of farmers were paying the full amount of the irrigation service fees as determined in the by-laws. The remaining 70% of the farmers were paying some irrigation service fees but not the full amount.
- Rate of irrigation service fees payment was the lowest in the most upstream village (Bos Ta Ney) even though they enjoy double cropping.
- About 30% of the farmers had jobs in addition to farming. Especially, in Srae Thnal village located near from the national road, 50% of the farmers had other jobs.
- There was a tendency that there were farmers who were paying irrigation service fees properly in the areas where suitable water courses had been constructed by the farmers themselves.

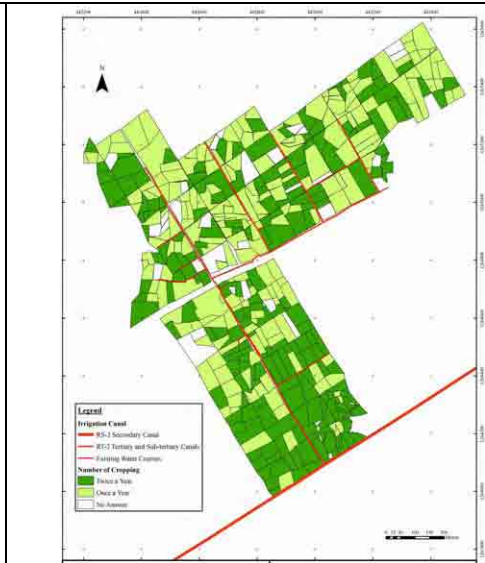
From the survey result, the following features of the villages were suggested.

- Bos Ta Ney villagers located the farthest upstream were not paying irrigation service fees properly, even if they could receive water by gravity and enjoy double cropping.
- About half of Srae Thnal villagers located in the middle reaches had other businesses.
- Pongro villagers located downstream were working relatively hard for the FWUC.

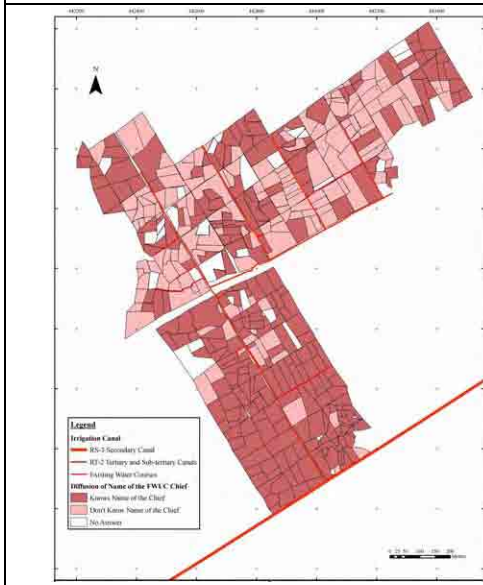




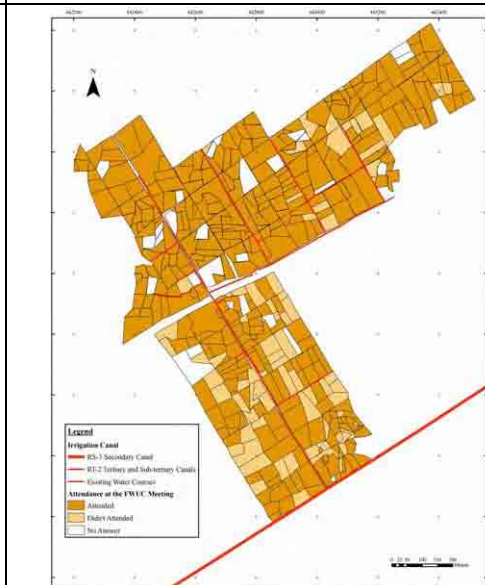
1) Irrigation Method



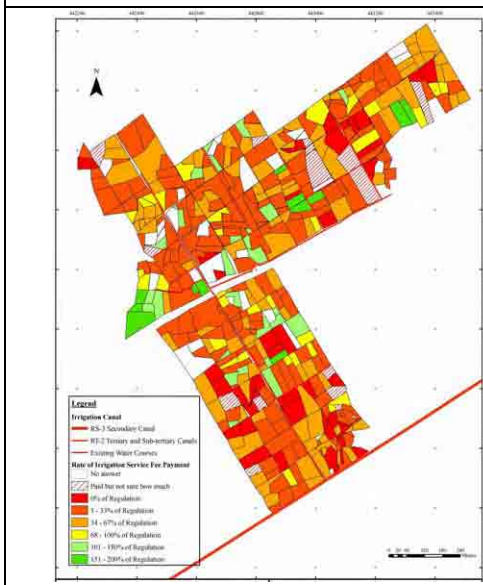
2) Number of Croppings



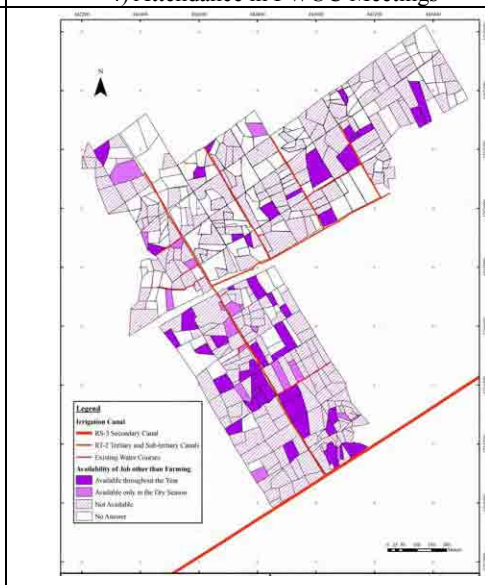
3) Knowledge of Name of FWUC Chief



4) Attendance in FWUC Meetings



5) Rate of Irrigation Service Fee Payment



6) Availability of Jobs other than Farming

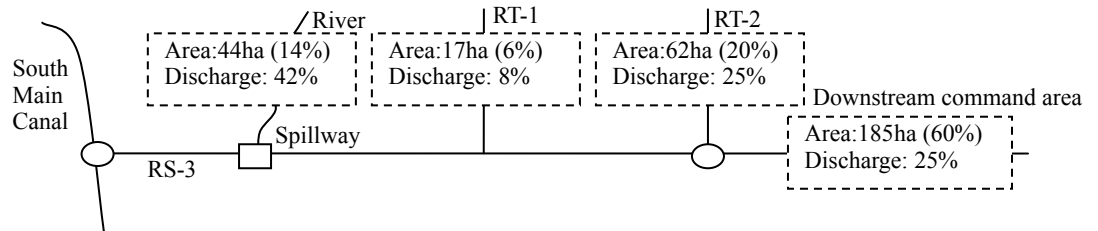
BI-2.5.2.3 Water Loss Identification and Reduction Practice

(1) Objective

Objective of the practice is to improve water use in the pilot project area by identifying and preventing water loss. In addition, it is important to make FWUC members understand the importance of their efforts for minimizing water loss.

(2) Actions Taken

Discharge of the canal was measured at the several points from July 3 to December 1 in 2006 to determine the current situation of water distribution. The discharge measurements were carried out by PDOWRAM using a current meter supplied by the JICA study team. It was revealed that the amount of water released from RS-3 secondary canal at the spillway located just downstream of the turnout on Ou Veang Pond is too great as compared with the size of the irrigation area. As shown in the figure below, 42% of the water diverted to the RS-3 secondary canal overflows into the river but the area using this water is only 14% of the total command area of RS-3 secondary canal. This water loss causes insufficient water downstream of RT-2 (area is about 60% of the total command area of RS-3 but they received only 25% of the water). Probable reason for this water loss is that the spillway does not have gates to control the water flow. At present, a wooden stop log is used to control the water flow but it does not work well. The JICA study team and the FWUC committee discussed the problem and agreed to provide gates to regulate the water properly.



Present Water Distribution (Proportional Basis)

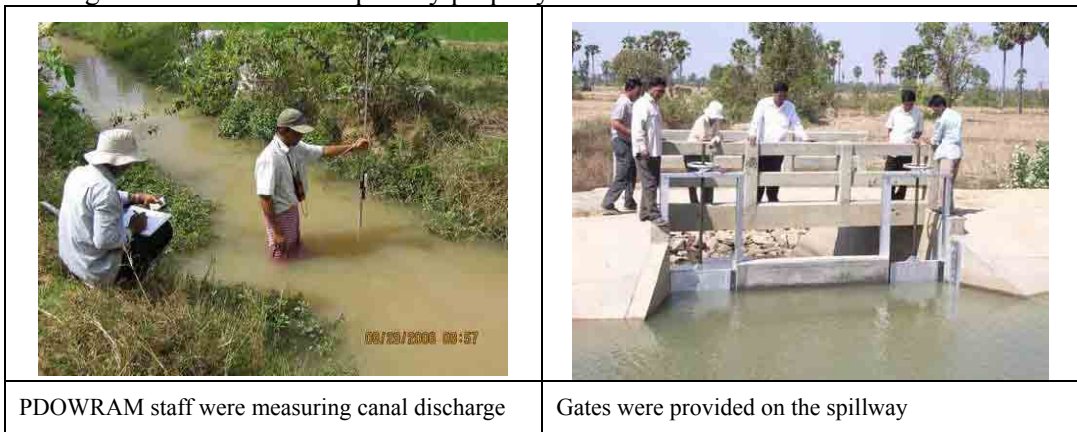
(3) Results and Observations

Effect of the gates to be provided on the spillway will be evaluated next season.

(4) Actions to be taken Next Season

The following activities are planned for next season.

- Motivate the FWUC committee to inform those farmers that are using the water from the spillway that the FWUC is going to regulate the water properly
- Regulate water from the spillway properly and confirm the effect



BI-2.5.2.4 FWUC Sub-group Establishment Practice

(1) Objective

Objective of the practice is to organize active sub-groups of the FWUC based on the canal layout. Expected functions of the sub-groups are water distribution and irrigation service fee collection.

(2) Actions Taken

The following actions were taken in the first season.

- Importance of active canal layout based sub-groups was explained to the FWUC committee members by PDOWRAM staff
- The FWUC committee members were motivated to discuss how to divide the pilot project area into sub-groups
- Difficulties in forming canal layout based sub-groups were observed, so the FWUC committee and the pilot project implementation team discussed the problems and decided to start with forming village sub-groups
- Village meetings at five related villages were organized and villagers were asked to select their village sub-group leaders by election
- Responsibilities of sub-group leaders were explained by advanced Sdau Kaong FWUC leaders in Prey Veng province in the study tour

(3) Results and Observations

It was found to be difficult to form canal layout based sub-groups immediately in the Ou Veang FWUC. If FWUC members understood the need of canal layout based sub-groups, the sub-groups could be formed immediately. However, less Ou Veang FWUC members understood what proper water management was and so could not comprehend the need of canal layout based sub-groups. It was decided to form village sub-groups first and after educating farmers in village meetings, the pilot project implementation team will guide them to reform their organization to canal layout based sub-groups.

(4) Actions to be taken Next Season

The following actions will be taken next season.

- Continue to strengthen and educate village sub-group leaders
- Discuss the necessity of reforming sub-groups based on canal layout with the FWUC committee and village sub-groups (probably, this action will be taken when farmers start to construct water courses by themselves.
- Necessity of village sub-groups will be analyzed since they could be dissolved or kept alive by giving them some task such as irrigation service fee collection



BI-2.5.2.5 FWUC Administration Improvement Practice

(1) Objective

The biggest obstacle of the FWUC was revealed to be their insufficient capacity to hold meeting by themselves. If they do not organize their own meetings, no activities can be sustainable. It was also found that the FWUC committee is not keeping account records. This could be one of the reasons for their low rate of irrigation service fee collection. If the FWUC committee does not keep account records, farmers do not believe them and do not want to pay irrigation service fees any more.

Objective of the practice is to improve administration of the FWUC, such as meeting arrangements and accounting.

(2) Actions Taken

At first, a CEDAC staff member provided training to PDOWRAM staff to share his experience. After the training, PDOWRAM staff trained the FWUC committee and village sub-group leaders. This first series of training was planned to be initial guidance. The following are the subjects of the training related to administration.

Trainings of FWUC Leaders

No.	Date	Major Issues	No. of Participants
Activities in Year 2007			
1	January 16	- Organizing meetings by themselves	20
2	January 25	- Preparation of reports and letters	12
3	February 8	- Responsibility of each committee member	16
4	February 26	- Preparation of activity plans and budget plans	10
5	to be conducted	- Collection of irrigation service fees	-
6	to be conducted	- Financial management and accounting	-

(3) Results and Observations

Since the training sessions were provided recently, no substantial effects were observed. However, the FWUC leaders said that they were improved by the training, even if they could not understand all the issues. Importance of this kind of training was confirmed during the training on “organizing meetings” because the FWUC leaders seemed not able to organize meetings by themselves until they were empowered through the training.

(4) Actions to be taken Next Season

Series of training with the same subjects will be provided to the FWUC leaders, but in more detail and with practical applications.



BI-2.5.2.6 Proper Irrigation Water Use Education Practice

(1) Objective

Objective of the practice is to make FWUC members understand the necessity and importance of proper irrigation water use.

(2) Actions Taken

The following actions were taken in the first season.

- Holding village meetings to disseminate the importance of FWUC activities
- Motivating farmers to maintain the RT-2 tertiary canal by themselves.

In the village meetings, PDOWRAM and MOWRAM explained the following points.

- Farmers can take the necessary amount of irrigation water but should not waste it.
- The irrigation system is for the farmers, so it should be managed by the farmers themselves.
- The pilot project implementation team can not support farmers forever. Farmers have to continue their activities even after the project since it will benefit them.

Moreover, the pilot project implementation team motivated farmers to maintain the RT-2 tertiary canal by themselves to make them realize the importance of the canal.

(3) Results and Observations

It was found that the attendance rates at meetings in Bos Ta Ney and Srae Thnal village were low. The participants said that some farmers could not come because they were busy in their businesses. This must be true, especially in Srae Thnal village, because nearly half of the farmers in the village were part-time farmers and also worked elsewhere according to the water use map survey. It was found to be crucial for the FWUC to involve part-time farmers in the FWUC activities but even just distributing information is difficult because they do not join in the meetings. To convey the necessary information to them, it was decided that the pilot project implementation team would publish an FWUC magazine and the FWUC leaders were requested to distribute the magazine to all the water users.

To make the FWUC members understand the importance of the canals, maintenance of the RT-2 tertiary canal by the farmers was proposed by PDOWRAM. On October 18, 2006, Pongro village farmers cleaned the canals. On October 26, 2006, 51 farmers from three villages joined in the maintenance work for RT-2 canal without physical incentives from the project.

(4) Actions to be taken Next Season

- Continue to publish and distribute the FWUC magazine
- Support FWUC village leaders to distribute important information to villagers



Pongro villagers were reading the FWUC Magazine



Farmers were clearing RT-2 tertiary canal

BI-2.5.2.7 Irrigation Service Plan Preparation Practice

(1) Objective

Objective of the practice is to support Ou Veang FWUC to prepare an irrigation service plan. Preparation of the irrigation service plan by the FWUC is recognized to be one of the most important activities in the “Training Manual for Participatory Irrigation Management and Development (MOWRAM, 2003)”. The irrigation service plan consists of i) an irrigation schedule, ii) drainage schedule, iii) maintenance plan, and iv) financial records. However, preparation of the plan is difficult for the FWUC; therefore, proper support from the Government is required.

(2) Actions Taken

The following support to the FWUC by PDOWRAM was given in the first season. Measuring equipment for percolation rate tests, pan evaporation, and rainfall were manufactured using locally available material by the JICA study team and installed by PDOWRAM staff and the FWUC committee members.

- Measure percolation rate of the area at seven points to prepare the irrigation schedule
- Observe evaporation and rainfall at one location to prepare the irrigation schedule
- Provide training on irrigation service plan preparation to the FWUC

(3) Results and Observations

Percolation rate of the pilot project area was estimated at 11.2 mm/day, which is higher than that for the master plan Target Area. This means that more water needs to be supplied to this area. Especially, the downstream area (Pongro village area) has a higher value.

Preparation of the irrigation service plan seemed to be difficult for the FWUC, so PDOWRAM staff will continue providing training on this matter such as water distribution and financial management.



PDOWRAM staffs were measuring evaporation on site

(4) Actions to be taken Next Season

- Continue to provide training to the FWUC on how to prepare the irrigation service plan
- Prepare definite irrigation schedule based on the observed data



PDOWRAM staff were measuring percolation rate of the paddy fields



The FWUC leaders were learning the importance of financial management

(1) Objective

Objective of the practice is to provide minimally required on-farm irrigation facilities and to contribute to efficient water use in the pilot project area.

(2) Actions Taken

Necessity of on-farm irrigation facilities were discussed by PDOWRAM staff and the FWUC committee members. The FWUC committee members prepared their plan with assistance from PDOWRAM and they presented the plan to villagers in the village meetings. The villagers generally agreed with the plan. The JICA study team also gave technical support to them and finally all the stakeholders agreed to construct the following on-farm irrigation facilities under the budget of the pilot project (see the figure on the right).

- Division box with check (6 each)
- Off-take (2 each)
- Cross drain (1 each)

It was also agreed to provide gates on the spillway as described in the water loss identification and reduction activities.

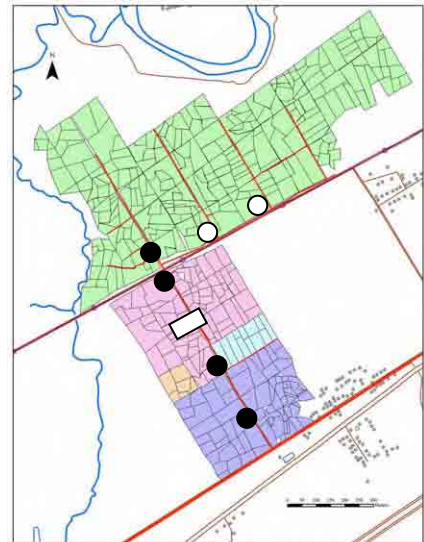
Construction works were started by a local contractor in December 2006 and completed by January 2007.

(3) Results and Observations

Effects of the provided on-farm irrigation structures will be evaluated next season.

(4) Action to be taken Next Season

- Monitor operation and maintenance situation of the facilities



Location of Provided On-farm Irrigation Facilities

- Division box with check
- Division box
- Cross drain



Division box under construction at Pongro village



Division box with check at Bos Ta Ney village (upstream view)



Division box with check at Bos Ta Ney village (downstream view)

BI-2.6 Preliminary Improvement Plan to be executed in Next Season

Among 11 practices proposed in Ou Veang FWUC water management improvement plan, the following three practices were completed in the first season.

- 1) Land holding map preparation practice
- 2) Water use map preparation practice
- 3) On-farm irrigation facility construction practice

The following five practices were started in 2006.

- 1) Water loss identification and reduction practice
- 2) FWUC sub-group establishment practice
- 3) FWUC administration improvement practice
- 4) Proper irrigation water use education practice
- 5) Irrigation service plan preparation practice

The following three practices are planned to be started in next year

- 1) Water course construction practice
- 2) Water management training practice
- 3) FWUC meeting building construction practice

BI-2.7 Specific Findings in Zone-1 PIMD Activities

The following are the findings of PIMD activities in Zone-1.

(1) Effectiveness of Participatory Mapping

Through the pilot project activities in Zone-1, effectiveness of participatory mapping, especially for land holding mapping, was confirmed. Since the FWUC leaders prepared a paddy plot resource map well, the following field survey could be conducted very effectively. The land holding map was prepared with a minimum of time and cost. In addition, the FWUC leaders realized the importance of basic information and improved their interest in FWUC activities through the mapping activities. They showed their strong willingness to prepare land holding maps for other areas even if they do not receive any physical incentives. It was concluded that participatory mapping was very effective in this case.



FWUC leaders were showing their strong willingness to prepare maps for other areas even without physical incentives

(2) Existence of Large Amount of Water Loss

According to the canal discharge measurements, farmers in the pilot project area are not using a lot of water even though the area is located upstream. The reason is because the water level of the South Main Canal drops occasionally, therefore, farmers in the area can not physically take the water.

However, a large amount of water loss was found in the upstream portion of the pilot project area. From the spillway structure on the RS-3 secondary canal, a lot of water was found to be lost. To make all the stakeholders understand that such water loss needs to be prevented, physical



Water was flowing out from the spillway

measures on the spillway were implemented. Effects of these improvements will be regularly measured next season.

(3) Difficulty in Distributing Information to Part-time Farm Households

It was found that there are many part-time farm households in the project area. The number of households in which some members had additional non-farm employment could increase since the area is under the influence of the economic growth in the region.

It was revealed that involvement of such part-time farmers into FWUC activities is very difficult. They did not join in the village meetings, so there was no chance to deliver information to them. This means that such part-time farmers will not step forward even for the first step. To deliver information to them, Ou Veang FWUC magazines were published by PDOWRAM under assistance of the JICA study team. The FWUC leaders were requested to distribute the magazines to farmers who attended the village meetings and to the part-time farmers who did not attend the village meeting. Effect of giving the FWUC magazines to the part-time farmers is not known at present but farmers who attended the meetings were very interested in the magazines, so that some positive effects on the part-time farmers could also be expected.



Published Ou Veang FWUC Magazines

(4) Functional Disorder of Existing Sub-groups of Ou Veang FWUC

There were village based sub-groups of Ou Veang FWUC already existing. According to the FWUC committee, the sub-group leaders were previously elected by farmers. However, it was found that these sub-groups did not function well. Reason for this was the low level of awareness of the sub-group leaders. The sub-group leaders did not understand their responsibilities clearly. Then, the project implementation team held village meetings to explain the responsibilities of the sub-group leaders and to select sub-group leaders again.

(5) Difficulties in Organizing Canal Layout Based Sub-groups without Village Based Sub-groups

To conduct irrigation water distribution properly, it is essential to form FWUC sub-groups based on canal layout. Farmers can not discuss water distribution with each other without canal layout based sub-groups. However, it was revealed that it is difficult for the FWUC committee members, who do not have any experience with proper water distribution to understand the necessity of canal layout based sub-groups. On the other hand, the importance of sub-groups and awareness raising regarding FWUC activities were easily understood by them. They also pointed out that awareness raising activities can be implemented easily if they have village based sub-groups. It was decided to restructure the village based sub-groups first and proceed to canal layout based sub-groups after all the FWUC understand what they have to do.



PDOWRAM staff was explaining the necessity of canal layout based sub-groups to the FWUC committee

It was concluded that canal based sub-groups should be formed when the FWUC realize the necessity of doing so. At present, they never experience proper water distribution so it is difficult for them to understand the necessity of canal layout based sub-groups. However, when the pilot project implementation team starts to train them in proper water distribution with appropriate irrigation facilities next season, the FWUC members will realize the necessity of canal layout based sub-groups, since they will have to discuss and decide how to distribute water by themselves.

(6) Difficulties for Ou Veang FWUC to Organize Meetings by Themselves

Ou Veang FWUC committee and members worked hard to improve their FWUC in the first season of the pilot project. However, they worked hard only when PDOWRAM arranged everything for them. They joined meetings scheduled by PDOWRAM but never held meetings by themselves. The pilot project implementation team strongly requested that they hold meetings by themselves but they did not. Then it was decided to provide them with training on the skill of organizing meetings by themselves. Throughout the training, it was found that their management and planning skills were very weak and they did not have enough capacity to hold meetings by themselves. Only Commune Council members seemed to have the capacity to organize meetings.



The FWUC leaders were learning how to prepare agenda of meeting

It was concluded that empowerment of farmers, especially their management and planning skills would be necessary. If the project provides training only on technical matters, they may not be able to apply the technical skills in the field, because they can not coordinate with each other.

(7) Difficulties in Preparing Irrigation Service Plan by FWUC

It was found to be difficult for FWUC to prepare the irrigation service plan. It might be difficult for PDOWRAM staff as well. As mentioned in the “Training Manual for Participatory Irrigation Management and Development (MOWRAM, 2003)” the irrigation service plan should be prepared prior to construction of irrigation facilities. However, it is difficult for FWUC to prepare it without practicing how to regulate irrigation water. In the pilot project, the FWUC could not prepare an irrigation service plan well but the concept and necessity of the irrigation service plan was explained by PDOWRAM staff and the FWUC fully understood the explanation. The irrigation service plan will be prepared in the second season of the pilot project by the FWUC with support from PDOWRAM.



PDOWRAM staff was explaining the necessity of an irrigation service plan to the FWUC committee

(8) Willingness of Farmers to Contribute to Improving Their Irrigation System

It was confirmed that farmers can contribute to improving the irrigation system. During the first season of the pilot project, farmers agreed to contribute in the following manners.

- Maintain canals by themselves.
- Construct water courses by themselves.

In the first season, maintenance of RT-2 tertiary canal was executed by the farmers without any physical incentive. The pilot project implementation team also explained that they have to continue the maintenance work at least once a year. Farmers seemed happy after they saw the smooth water flow in the canal. From this experience it was found that farmers can work on the irrigation system if the FWUC leaders guide them properly. Construction of water courses will be started next season.



Farmers were removing rubbish from the canal

(9) Weakness of Ou Veang FWUC in Their Administration

It was found that administration of Ou Veang FWUC is very weak. The FWUC committee did not keep any records, such as exchange of letters, accounting, or results of meetings. It was obviously necessary that their administration should be improved otherwise the FWUC will not function well.

(10) Low Collection Rate of Irrigation Service Fees

It was found that Ou Veang FWUC is not collecting the proper amount of irrigation service fees. The FWUC chief confessed that the FWUC collected only 10% of the irrigation service fees which agreed to by all the inhabitants of the entire management area. In the pilot project area, the situation is better than in other areas. About 30% of the irrigation service fees were paid according to the interview survey with the farmers. The irrigation facilities are relatively better than other areas, so farmers in the area might pay more. However, the irrigation service fees were still not high enough even in the pilot project area. The reason was that they did not pay the full amount of the irrigation service fees. It was found by interview survey that about 70% of the farmers paid some irrigation service fees but not the full amount. It is guessed that they would be ashamed if they did not pay anything but they did not want to pay the full amount or they did not know how much they were supposed to pay.

(11) Difficulties in Holding Meetings or Executing Training in the Open Air

Since Ou Veang FWUC does not have a meeting building, meetings or training to the FWUC members are conducted in the open air. This was found to be difficult. When it seemed like it was going to rain, not many FWUC members joined the activities. When rain started to fall, the meeting was closed without conclusion. When strong winds blow, participants in the training lost their concentration. The pilot project implementation team tried to search for an appropriate location for meetings and training in the villages, but there was no such space. It was concluded that a proper facility for meetings and training is essential, especially for training in the rainy season.



Village meeting in Bos Ta Ney village was closed without conclusion due to a heavy rain

(12) Unstable Water Level in the Main Canal

During the canal discharge measurement and percolation test, it was observed that the water supply in the irrigation system was very unstable. Even in the rainy season, no

water in the canal or dried up paddy were often observed. The reason for these on-farm level problems was the unstable water level in the South Main Canal. Unstable water level in the main canal could occur due to low water flow of the Prek Thnot River or improper water control in the South Main Canal because of insufficient major facilities.



No water flow in the RT-2 tertiary canal in beginning of September 2006

Chapter BI-3 Participatory Agricultural Extension Activities

BI-3.1 Objective

Objective of participatory agricultural extension activities is as follows.

Objective

To disseminate information regarding low cost and low inputs type SRI (called low inputs SRI) by farmer-to-farmer extension

Strategy-4
Minimum material and equipment input
from the farmers

Strategy-5
Introduction of farmer-to-farmer
extension

“Strategy-4: Minimum material and equipment input from the farmers” is important because if a new farming practice requires a lot of input, farmers could not apply it. It is also important that the project should minimize supports to farmers in a physical way. If the project fully supplies such physical inputs to farmers, farmers may mistakenly believe that they can not apply the new farming practice without them and will stop applying it after the project. To raise the sustainability of the activities, it was decided that the project would give only technical assistance but no physical support.

“Strategy-5: Introduction of farmer-to-farmer extension” is necessary since farmer-to-farmer extension can reduce the cost of extension work. If proposed extension work requires a high level of funding, the agencies in charge of extension work could not disseminate information regarding the effects of the pilot project to other areas. To raise replicability, the activities were designed to introduce a mechanism of farmer-to-farmer extension.

BI-3.2 Institutional Set-up

Institutional set-up for participatory agricultural extension activities was made based on the basic strategy for pilot project implementation, which is “Project Operation by a United Farmer-Government-NGO Project Team”.

In the first year, participatory agriculture extension activities were implemented mainly by CEDAC (Cambodian NGO) under the support of the JICA study team.

BI-3.3 Situation before Starting Pilot Project

BI-3.3.1 Area for the Activities

As mentioned in sub-section BI-1.2.2, the irrigated area in Rumleang village was selected as the area for participatory agricultural extension activities.

BI-3.3.2 Method of Baseline Surveys

Baseline surveys were conducted to understand the situation of the pilot project area before starting the project. Various survey methods were applied such as interview surveys to key persons, questionnaire surveys for sampled farmers, and site inspections by experts.

BI-3.3.3 Agriculture

Agricultural conditions in the area were found to be average as compared with the surrounding areas. The area could receive water from the irrigation system but it did not seem to be enough. No farmer in the area cultivates paddy twice in a year. Farmers in the area cultivated paddy with traditional farming practices. Under the traditional farming practices, farmers transplanted seedlings older than 30 days with 4-5 plants per hill.

The existence of SRI was well known by many farmers but no farmer in the area adopted it. The farmers said that they wanted to introduce SRI but did not know how to do it.

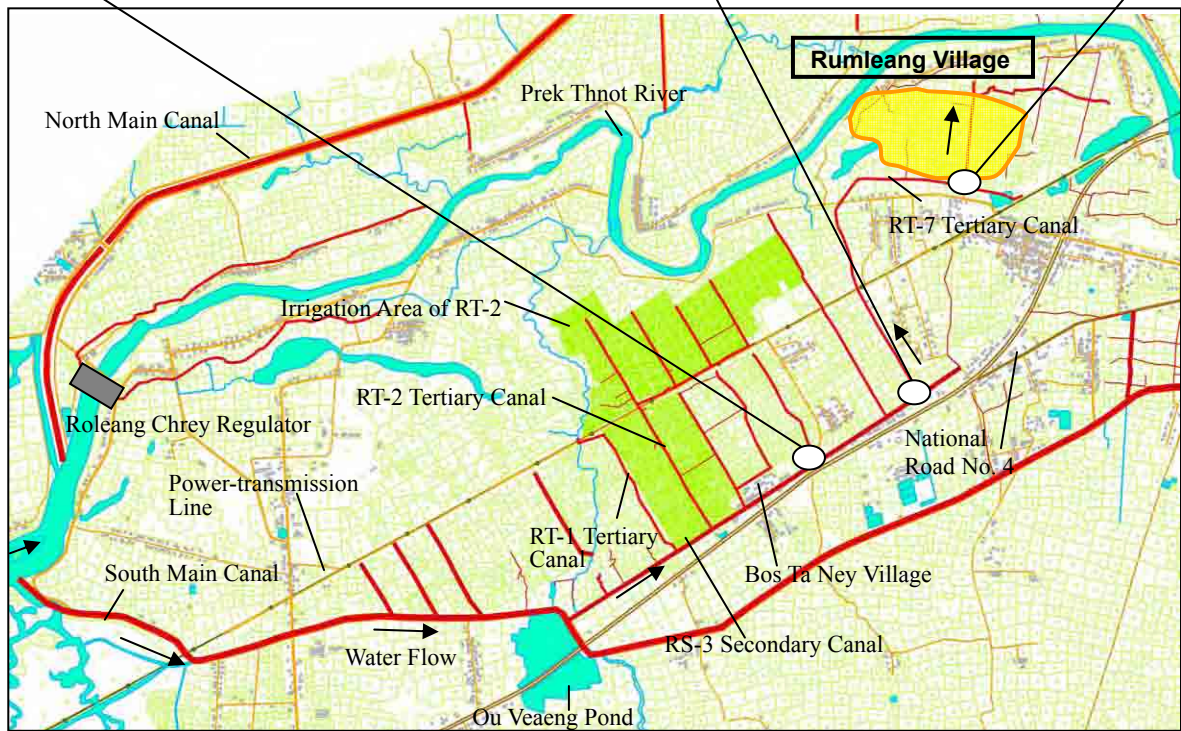
BI-3.3.4 Irrigation and Drainage Systems

Irrigation water diverted from the Prek Thnot River by the Roleang Chrey Regulator flows down to the South Main Canal and the RS-3 secondary canal and finally reaches the most downstream tertiary canal (RT-7³) to irrigate paddy plots in Rumleang village. The irrigation area of the RT-7 tertiary canal always suffers from water shortage since they could not receive a proper amount of water since the people in the upstream area took too much water.

Irrigation facilities located between Roleang Chrey Regulator and RT-2 tertiary canal are shown in clause BI-2.3.4.1 and facilities between RT-2 and RT-7 canals are as below.

There was no major drainage facility in the area. Since the village is located near the Prek Thnot River, the area was be easily attacked by flood.

Major Irrigation Facilities Located between RT-2 and RT-7 Tertiary Canals



³ Name of canal RT-7 will be changed to SMC-S-1-T-8 when “Irrigated Agriculture Improvement Model Project” is implemented.

BI-3.3.5 Organizations

The following two farmers' groups existed in Rumleang village before starting the pilot project.

i) Joint guarantors' group

This was a group of debtors who borrow money from Amret. Amret is a formal micro finance institution. The farmers were required to organize the group for guaranteeing each other and obtaining relatively low interest rate (3%/month). The problems they faced were i) sometimes a debtor delays repayment, and ii) it is hard for farmers to prepare many kinds of documents for borrowing money. On the other hand, the advantage to be a member was that the members did not need to go to informal financial institutions for borrowing money when they face emergencies.

ii) In-kind bank users' group

Pig and Rice Banks functioned in Rumleang village. This in-kind bank was not managed by farmers' groups. NGOs provided this service to the groups of users. The users did not identify any serious problems with the bank. They were satisfied with the system of the banks.

BI-3.4 Constraints Identified for Participatory Agricultural Extension Activities

BI-3.4.1 Agriculture

The following agricultural problems were identified by the baseline survey.

- Innovations in paddy farming such as SRI were not introduced even though the farmers were interested in them.
- No agricultural extension program was provided to the farmers in the village.
- Farmers could not receive irrigation water properly due to improper water use in the upstream area.

BI-3.4.2 Farmers' Group

The following organizational problems were identified by the baseline survey.

- Most of the farmers did not have any idea of how to organize their groups spontaneously. After the security in Cambodia became rather stable (after 2000), many donors came to the villages and started assistance activities. The farmers' groups were organized mainly for receiving support from them. Therefore, the nature of the farmers' groups was very passive. Farmers did not have the opportunity to consider the importance of self-reliant farmers' groups.
- The history of the groups was short. Thus, it could be assumed that the solidarity of the members is not very strong.
- The constraints of the farmers' groups that the farmers identified were mostly those of their supporting agency and natural conditions such as shortage of water. This meant that the group members lacked a sense of ownership of their groups.
- Most of the existing farmers' groups were only gatherings of farmers who willingly join in the activities and/or the training that the donors provide.

BI-3.5 Activities Conducted for Improvement

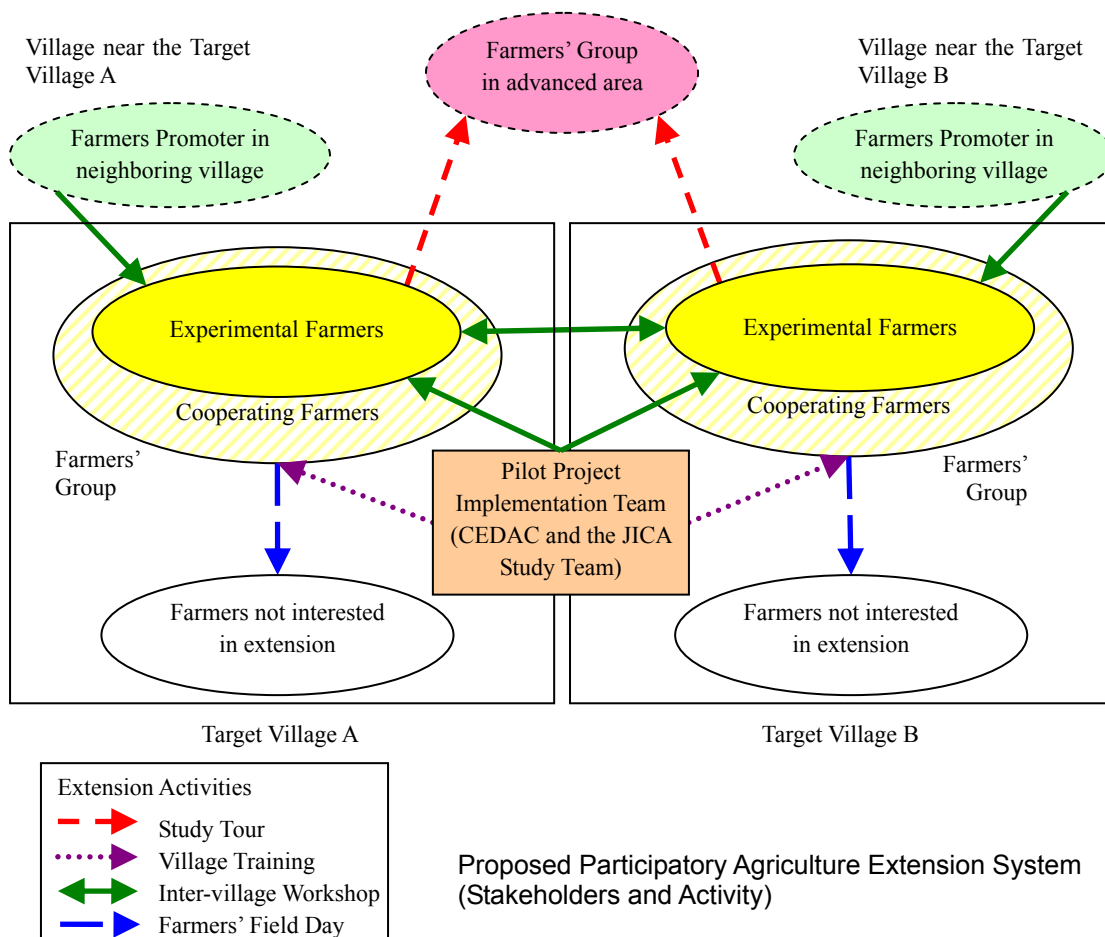
BI-3.5.1 Preparation of Improvement Plan

An improvement plan was prepared based on the basic strategy for pilot project Implementation, which is "Introduction of farmer-to-farmer extension".

As a framework of farmer-to-farmer extension systems, the agriculture extension system commonly applied by NGO (CEDAC) in other areas was chosen to be introduced in the pilot project, due to the following reasons.

- 1) According to the survey of the farmers' groups supported by CEDAC in the advanced area, the extension system works well even after the project ended its support, since it contains the function of farmer-to-farmer extension.
- 2) Cambodian NGO could easily continue to disseminate agricultural improvement techniques to other villages after the Pilot Project period ended.

The participatory agriculture extension system introduced in the pilot project is illustrated as follows.



(1) Stakeholders

(a) Experimental Farmers

Experimental farmers are the farmers that live in the pilot project target village and are highly interested in the project activities. Intensive training in agricultural innovations (such as low inputs SRI) will be given to the experimental farmers and the farmers have to cooperate with monitoring activities. The experimental farmers are expected to be the core of the farmers' group and the center of farmer-to-farmer dissemination of information regarding the innovation. It is desirable for dissemination of information regarding the innovations, if the Village Chief voluntarily becomes an experimental farmer, so the JICA study team and CEDAC try to convince the Village Chief to be an experimental farmer.

(b) Cooperating Farmers

Cooperating farmers are the farmers that live in the target village and are interested in introducing innovations. It is considered that once a farmer joins some project activities, he or she is recognized as a cooperating farmer. The cooperating farmers join some of the

extension activities but still have some reservations regarding the innovation; therefore, they want to see the results of other farmers first. The cooperative farmers have no obligation for keeping records of their activities for project monitoring purposes. The farmers' group consists of experimental farmers and cooperating farmers. There are no restrictions on becoming a member of a farmers' group. Considering the importance of the Village Chief in extension activities, the JICA study team and CEDAC try hard to convince the Village Chief to be a cooperating farmer if the Village Chief is reluctant to be an experimental farmer.

(c) Farmers not Interested in the Extension

There are some farmers in the target village who are not interested in innovation and do not want to join the extension activities.

(d) Farmer Promoters

Farmer promoters are the farmers who have already adopted the advanced agricultural techniques (such as low inputs SRI) and live from the target village.

(e) Farmers' Group Members in Advanced Areas

Farmers' group members in advanced areas are those who already belong to a developed farmers' group under another project by CEDAC. Commonly, experimental farmers are elected as leaders of the group by the group members and they promote group activities, such as SRI extension, chicken raising, and saving.

(2) Activities

(a) Study Tours

Based on the basic strategy for implementation, which is "Strategy-1: Learning from Good Farmers' Practices in Cambodia", study tours to advanced areas were planned. The experimental farmers were invited by the hosting farmers' group in an advanced area who have already adopted innovation. The experimental farmers can see their activities on site and ask questions about them from the farmers' view points. It is expected that this will motivate the experimental farmers to start the activities. According to Cambodian custom, the hosting farmers' group takes care of the experimental farmers by staying a night together and supplying food to them. However, the necessary cost for the hosting farmers is compensated by the project, so that the hosting farmers' group willingly takes care of the visitors.

(b) Village Training

Village training is provided basically once a month in the target villages of the pilot projects. A facilitator employed by the JICA study team visits the village and discusses issues with the farmers' group (experimental farmers and cooperative farmers). Normally, the facilitator gives the following guidance.

- Review the principles of innovation
- Confirm the progress of their activities
- Discuss their problems
- Give ideas to solve the problems
- Explain the schedule for the future

(c) Inter-village Workshops

Inter-village workshops are held basically once a month at Kampong Speu. The experimental farmers from three target villages and farmer promoters to guide them are invited. In the inter-village workshops, situations and problems in each village are

compared. By comparing their situations, the experimental farmers are expected to be further motivated with support from the farmer promoters. Because they have to come to Kampong Speu from their villages, their traveling cost is provided by the project.

(d) Farmers' Field Days

Farmers' field days are organized to show the project activities and effects of innovation to farmers who do not apply the new innovations in the village. By organizing the farmers' field days, the information regarding the innovations is expected to be disseminated to such farmers.

BI-3.5.2 Farmer-to-farmer Low Inputs SRI Extension Practice

BI-3.5.2.1 Initial Guidance

Initial guidance on low input SRI extension was held at Rumleang village on July 6, 2006. Only seven farmers, including one woman, joined the guidance (there were 136 families in the village according to SEILA Commune Database in year 2004). There might be two reasons for the poor attendance rate. The one is miscommunication between the Village Chief and the villagers and the other is that many farmers were busy in transplanting. In Rumleang and surrounding villages, transplanting in the traditional way was already started when the pilot project Implementation Team started the activities. In the guidance, the following 12 principles for low inputs SRI were explained to the Rumleang villagers by the JICA study team and also by the farmer promoters from Kahaeng village of Kahaeng commune. The farmers who are interested in SRI were motivated to apply the principles as much as possible considering their field situation.

12 Principles of Low Inputs SRI

- 1) Level the paddy field and provide drainage
- 2) Select purified and dense seeds for sowing
- 3) Raise nursery beds or use dry nursery beds
- 4) Select big seedlings and transplant them immediately
- 5) Transplant young seedlings (seedlings younger than 15 days)
- 6) Transplant one plant per hill
- 7) Transplant seedlings at a shallow depth and keep the roots horizontal
- 8) Transplant seedlings in a line
- 9) Transplant seedlings 25-40 cm apart
- 10) Weed at least 2-4 times a season
- 11) Keep the water depth in the paddy field shallow
- 12) Apply natural fertilizer as much as possible

In the initial guidance, the following points were explained to address the farmers concerns regarding introduction of SRI.

Recommended Way of Introducing Low inputs SRI by Farmers

- 1) Farmers should divide the plots into two parts and compare low inputs SRI and traditional farming practice by themselves
- 2) Farmers should start applying low inputs SRI on a micro-scale
- 3) Farmers should start to apply low inputs SRI without additional agricultural inputs, such as fertilizers and seeds

As a result, all participants were interested in SRI and five of them said that they want to apply SRI from this season. Four farmers who showed strong willingness were selected from among the villagers as experimental farmers.

BI-3.5.2.2 Study Tour

The study tour to Ang and Khtom village, Cheng Prey and Ba They districts, Kampong Cham province was organized on July 10 and 11, 2006 for the purpose of learning about SRI practice on site. From three pilot project target villages, 27 experimental and interested farmers joined the tour.

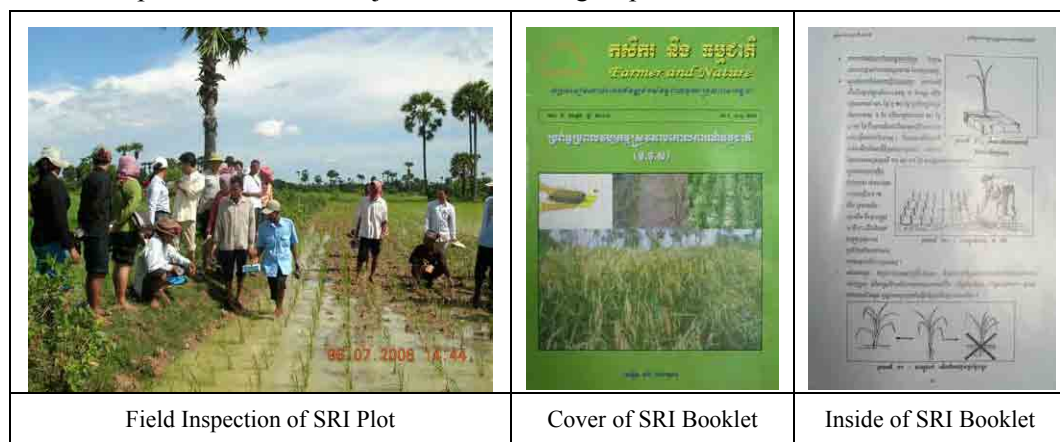
On the first day, the 27 participants were divided into two groups and stayed in two hosting villages. After arriving at the hosting villages, representatives of hosting farmers' groups gave explanations of their activities, such as SRI farming, savings groups, chicken raising, improved cook stoves, and home gardens (vegetable farming in the garden). Field inspections of the SRI farming plots were held after the explanations and the farmers' group representatives answered questions raised by the participants of the study tour.

On the second day, a review workshop to determine what the participants learned from the study tour was held in Phnom Penh. The participants were asked to compare traditional paddy farming and SRI farming. SRI farming practices were also introduced to the participants in a pictorial booklet and video. The booklet was distributed to all the participants and a video CD was given to each village to understand SRI in detail (for the booklet, see the photos below). It was stressed that low inputs SRI did not need additional chemical fertilizer, but rather, may allow the farmer to decrease the amount of it. It was also explained that farmers should start SRI by comparing the results with the traditional farming practices. This means that the farmers should divide their plots into two parts and practice SRI in one portion and the traditional farming in the other. The farmer will compare the result and re-size the plot for next year. After the explanation, the facilitator explained the plan of activities. The facilitator also explained that the following incentives will be provided by the project if farmers join the activities, but no other things such as seeds and fertilizer.

Incentives to be Provided by the Project for Experimental Farmers

- Weeding tool
- Prize for three best practice farmers
- Compensation for any loss of paddy product caused by introducing SRI

It was confirmed that four experimental farmers will strongly cooperate in the participatory agriculture extension activities because they saw the effects of SRI on site. Furthermore, they promised to disseminate information regarding SRI to other farmers in the village. Unfortunately, the Rumleang Village Chief already transplanted seedlings in the traditional way, so that he could not be an experimental farmer. However, he promised to be a cooperative farmer and join the farmers' group.



BI-3.5.2.3 Village Training

Village training was given to the farmers' group of Rumleang village at their village basically once a month. The following issues related to SRI were discussed in the village

training. Attendance rate in the training is the lowest among the three target villages (there were 136 families in the village according to SEILA Commune Database in year 2004).

Major Issues regarding SRI in the Village Training

No.	Date	Major Issues	No. of Participants
Activities in Year 2006			
1	July 14	- Sharing experiences from the Study Tour - Comparison of traditional farming with SRI	15
2	August 11	- How to solve problems (weeding and crabs in the paddy field)	11
3	October 19	- Confirmation of the flood damage in August - Application of weeding tool	12
4	November 22	- Results of harvesting SRI crops - Selection of good seeds	11
Activities in Year 2007			
5	January 22	- Impression of SRI - Participatory analysis of fertilizer utilization	11

A major concern for the farmers' group members in Rumleang was weeding. Since their paddy plots were irrigated, they were easily covered by weeds. A weeding tool was supplied by the project as a sample (see the photo below). The farmers tested the tool and found it was very practical. They also found that only one weeding tool was not enough, so the facilitator asked them to make a plan for purchasing tools.

The Rumeleang farmers also faced a difficulty in combating crabs in the paddy. Since the crabs cut the young seedlings, they were afraid of transplanting young seedlings. Farmer promoters and the facilitator advised them to put pieces of pumpkin to trap crabs or to put chopped siam weed (weed with a strong smell) in the paddy.



Crabs can possibly damage young seedlings

It should be noted that Rumleang village suffered a severe flood in the middle of August in 2006. The flood occurred immediately after they transplanted seedlings and submerged them for about three days. Since Rumleang village is located very close to the river bank of the Prek Thnot, their damage was very severe as compared with other areas. Since farmers had no seeds to transplant again, they decided to let the damaged seedlings grow. The seedlings finally survived but were damaged to some extent.



Village Training at Rumleang



A Farmer is Checking the Width of the Weeding Tool

BI-3.5.2.4 Inter-village Workshops

Inter-village workshops are held in Kampong Speu basically once a month by inviting experimental farmers and farmer promoters for the three villages. Major issues discussed about SRI in the inter-village workshops are as follows.

Major Issues regarding SRI in the Inter-village Workshop

No.	Date	Major Issues
Activities in Year 2006		
1	August 18	- Confirmation of damage of the flood in August, 2006 - Ease and difficulties in SRI practice
2	September 15	- Sharing good and bad SRI practices - Possibility of planting upland crops in the dry season
3	November 17	- Harvesting (participatory comparison between SRI and traditional farming)

In the inter-village workshop in August, 2006, ease and difficulty in SRI practice was discussed. Among the 12 principles of low inputs SRI, farmers said that the following four principles were difficult. However, Rumleang farmers said that transplanting young seedlings is not difficult, since they did not face severe drought problems.

Difficult SRI Principles to Apply

- 1) Transplant young seedlings (seedlings younger than 15 days)
- 2) Weeding at least 2-4 times a season
- 3) Do not keep much water in the paddy field
- 4) Apply natural fertilizer as much as possible

In the inter-village workshops, experiences and progress of dissemination of information regarding SRI in the three villages were introduced and also compared. By comparing the SRI dissemination progress in each village, experimental farmers were motivated to work harder for the dissemination of SRI.



Inter-village Workshop

BI-3.5.2.5 Farmers' Field Day

Farmers' field day was held at Rumleang village to demonstrate the effectiveness of SRI to farmers who did not apply SRI. Major issues discussed in the farmers' field day were as follows.

Major Issues regarding SRI in the Farmers' Field Day

No.	Date	Major Issues	No. of Participants
Activities in Year 2006			
1	September 18	- Answering questions from farmers who did not apply SRI - Confirming effect of SRI in the field	14
2	December 12	- Comparing yield of SRI and traditional farming practice	28

(1) Farmers' Field Day in September 2006

In the farmers' field day in September 2006, all participants discussed SRI. During the discussions, the following questions were raised by farmers who did not apply SRI.

Questions Raised by Farmers who Did not Apply SRI

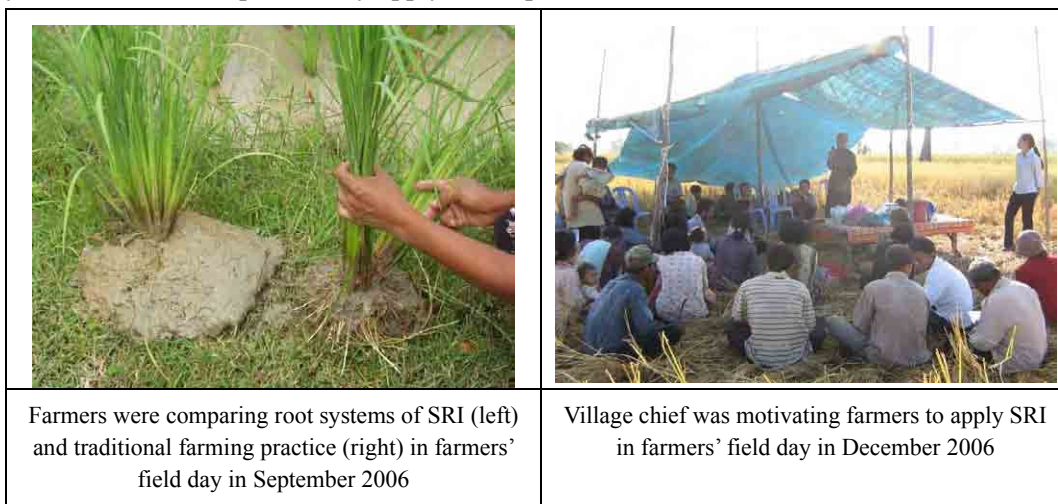
- How many seeds did you use per hectare?
- If you compare young seedlings and old seedlings planted in your field, which seedlings will give you better results?
- Did it take you a long time to transplant in SRI practice (transplant in rows)?

Then, the experimental farmers took all the participants to their fields. The participants

compared root systems of paddy grown by SRI and traditional farming practice by pulling out samples from the paddy. As a result, participants understood SRI paddy is growing better. Farmers who did not apply SRI said they will try it next year if the experimental farmers get higher yields.

(2) Farmers' Field Day in December 2006

In the farmers' field day in December, yield of SRI and traditional farming practice paddy was confirmed by the farmers. The participants confirmed that they can obtain higher yields with fewer inputs if they apply low inputs SRI.



BI-3.5.2.6 Results

The results could basically be evaluated in a participatory manner. This means that the farmers decide for themselves whether they want to continue to apply SRI or not. Normally, farmers in the project area heavily rely on paddy farming, so they evaluate the results of their farming severely. They do not change their farming practices without rational reasons such as increase of their financial benefit. In other words, if farmers want to continue to apply an innovation, it is because they have judged the innovation to be useful. They did not receive any physical incentives such as fertilizer, seeds, etc. but they evaluated that the innovation can improve their farm budget. It can be considered that the results of the participatory agriculture extension could be evaluated through the change in the number of farmers who applied the innovation. Yields obtained from SRI are also an important evaluation factor but they are easily affected by weather or soil conditions, so the yields are only used as a supporting factor of the evaluation. Indicators of the result could be summarized as follows.

- Number of farmers who applied SRI (the most important indicator)
- Number of cooperative farmers or member of farmers' groups (indicator for possibility of future dissemination of information regarding the innovation)
- Participatory yield comparison between SRI and traditional farming

(1) Number of Farmers who Applied SRI

It was decided that if farmers apply more than three principles of low inputs SRI, those farmers are recognized as applying SRI. This criterion is commonly used by CEDAC, so that we can compare the situation with other areas. A total of 6 farmers (there were 136 families in the village according to SEILA Commune Database in year 2004) including four experimental farmers, applied low inputs SRI in Rumleang village. Four out of the six farmers (including 3 experimental farmers) tested SRI by comparing SRI and traditional farming practices but the other 2 farmers applied SRI without a comparison test. The number of farmers applying SRI is less than the other pilot project areas in Zone-3 and Zone-4 (16 farmers in Zone-3 and 18 farmers in Zone-4). The reason

might be the delay in starting the activities. When the pilot project implementation team held the first village training, it was found that many farmers in Rumleang village were already busy transplanting or preparing for transplanting. Such farmers were interested in SRI but missed the chance to join the activities.

(2) Total Area of SRI Applied Paddy Plots

Area of SRI applied paddy plots was preliminarily surveyed by handheld GPS under assistance of the JICA study team. In Rumleang village, SRI was applied on 0.27 ha in total for 7 paddy plots. Among them 0.16 ha for 4 plots were cultivated by the 4 experimental farmers. It should be noted that the accuracy of this survey was not very good since the survey was conducted by handheld GPS, but it should be adequate to get an overview of the extent of SRI practice in the village.

Total Area of SRI Applied Paddy Plots in Rumleang Village

	Experimental farmers	Cooperative farmers	Total
Number of Plots	4	3	7
Total Area (ha)	0.16	0.11	0.27
Average Area (ha)	0.04	0.04	0.04

(3) Number of Cooperating Farmers (Members of Farmers' Groups)

All four experimental farmers said that they want to continue SRI next season. They also replied that they want to enlarge their SRI area and reduce the area for traditional practices. The reasons for their strong intension to continue SRI are as follows.

Reasons for Continuing SRI after Seeing the Field Results

- SRI produces higher yields.
- SRI requires less input such as seeds, fertilizers, and labor.

It is also expected that more farmers will apply SRI after they saw the results of the experimental farmers. Since 30 farmers (there were 136 families in the village according to SEILA Commune Database in year 2004) attended the village training for at least one time this season, some of them may apply SRI next season.

(4) Participatory Yield Comparison between SRI and Traditional Farming

The project implementation team instructed the experimental farmers to divide their paddy plots into two parts and compare SRI and traditional farming practices. When the farmers harvested the paddy, they were requested to compare the yields of the two different practices. It should be clearly understood that the purpose of the comparison was not to obtain accurate yield data but to make the farmers understand the effects of SRI. To make them confident in SRI, the crop cutting and comparisons were carried out by the experimental farmers themselves.

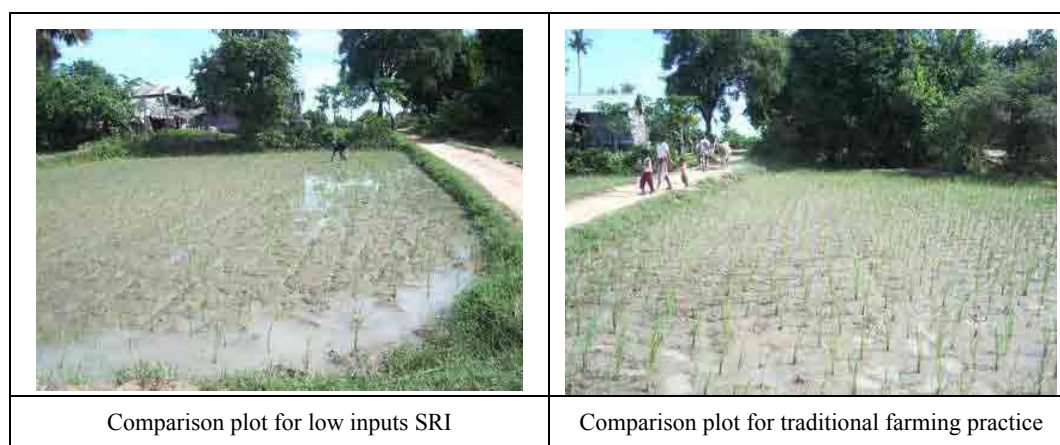
As a result, the experimental farmers confirmed that the yields of SRI were higher than those of traditional farming. So, none of the experimental farmers complained about yields or requested the project to compensate them for any loss. Even though some plots had low yields, the farmers understood that such low yields did not happened because of introduction of SRI. The yields of SRI were higher than traditional yields even in this case. It should be noted that these data should not be compared with other plots, since farmer-based crop cutting might contain some errors. However, it can be concluded that yields of SRI are always higher than those of traditional practice, since the same farmer conducted the crop cutting for both plots.

Farmer-based Yield Comparison of Traditional Farming with SRI in Rumleang

No.	Fictitious Name	Sex	Variety	Yield (ton/ha)		Balance
				SRI	Traditional	
E1	Farmer-A	Male	Riang Chey	4.0	3.7	+0.3
E2	Farmer-B	Female	Riang Chey	3.9	3.3	+0.6
E3	Farmer-C	Male	Riang Chey	3.1	2.4	+0.7
E4	Farmer-D	Male	Kphor Dong	3.5	2.0	+1.5
Average				3.6	2.9	+0.7

Note: See map for the locations of plots for experimental farmers.

As compared with the other two pilot project areas in Zone-3 and Zone-4, Rumleang had the second highest yield though it was expected to be the highest since the area is irrigated. The reason for this relatively low yield might be the damage caused by the flood in the middle of August 2006 and insufficient irrigation water. The area is located furthest downstream of the RS-3 secondary canal so the area could not receive enough water. This fact was confirmed by canal discharge measurements conducted as a part of PIMD activities.



(5) Participatory Agricultural Input Comparison between SRI and Traditional Farming

Amount of agricultural inputs applied to SRI plots and comparison plots for traditional farming practice were interviewed to the four experimental farmers.

Talking about fertilizer, all the four experimental farmers applied chemical fertilizer to their comparison plots based on their traditional farming practice. They applied 190 kg/ha of chemical fertilizer in average (see the table below). It cost about US\$ 50/household assuming that the average farm paddy holding size was 0.7 ha/household.

One experimental farmer applied a lot of chemical fertilizer to SRI plot even he/she was instructed to decrease amount of chemical fertilizer. Other three experimental farmers did not apply any chemical fertilizer to their SRI plots. Two of them applied 4.4 ton/ha of organic fertilizer such as cow manure instead of chemical fertilizer without any cost. The other one did not apply any kind of fertilizer to his SRI plot since he thought the plot was fertile enough.

Concerning other agricultural inputs, the experimental farmers answered that they could decrease labor and seeds for transplanting for SRI plots.

The result indicates possibility of increasing paddy production with decreasing agricultural inputs by applying SRI. It was supposed that the average farm household could save US\$ 50 of cash and labor by applying SRI. It was also suggested that they might be able to purchase new seeds to increase their production more, since SRI does not require a lot of seeds. However, availability of organic fertilizer needs to be carefully analyzed. It would be a problem for SRI in future, if farmers expand their area for SRI.

Farmer-based Agricultural Input Comparison of Traditional Farming with SRI in Rumleang

Farming Practice	Traditional (comparison plot)			SRI		
	Chemical	Organic	None	Chemical	Organic	None
Fertilizer	4	0	0	1	2	1
No. of Farmers	190kg/ha	-	-	250kg/ha	4.4ton/ha	0
Average Amount						

BI-3.5.3 Farmer-to-farmer Ecological Chicken Raising Extension Practice

BI-3.5.3.1 Trigger of Starting the Activities

After harvesting the rainy season paddy, there are no intensive activities relating to SRI except training on compost preparation. However, it is very important for the farmers' group to continue some activities; otherwise their commitment to the activities would become weak. During the village training in October, the farmers' group in Rumleang village was asked what they wanted to improve in the dry season. The facilitator tried to motivate them to plant beans or vegetables in the paddy fields using the remaining moisture in the soil. However, it was found that the farmers were not interested in that because of the following reasons.

Reasons for lack of Interest in Bean or Vegetable Cultivation in the Paddy Fields during the Dry Season

- There is not enough rain
- Farmers are busy in other businesses such as i) preparation of Khmer noodles, ii) work on construction sites, iii) work in factories, and iv) finding bees in the forest in the dry season.

Then, the farmers were asked by the facilitator if there was any other agricultural improvement which can be carried out without disturbing their businesses in the dry season. The facilitator gave some ideas to farmers and some farmers answered that they want to improve their chicken raising practice. They said that some farmers in the village are raising chickens without cages but they are facing problems of theft, damage by other animals, and easy spread of disease. The facilitator explained that there is a possibility of improving the situation. The facilitator also explained they can show the advanced activities of farmers in other areas but farmers who want to introduce chicken raising have to buy chicks at their own expense.

BI-3.5.3.2 Study Tour

For the purpose of understanding chicken raising and other activities, a study tour to Bro Boeung, Thnot Bak, Ang and Trob village, Cheng Prey and Ba Theay districts, Kampong Cham province was organized on November 13 and 14, 2006. From three villages, 8 interested farmers joined the tour.

During the two days, the participants visited four villages and learned advanced activities. They learned that they could earn more income by applying ecological chicken raising innovations. In addition to the chicken raising, visitors learned other advanced innovations as listed below.

Innovations which Visitors Learned in the Study Tour

- Ecological chicken raising
- Pig raising
- Frog raising



Ecological Chicken Raising at Kampong Cham

- Home gardening (vegetable cultivation in the garden)
- Improved cook stoves

In addition to the above, the visitors were very interested in village regulations and also feel that the same kind of regulations could be applied in their villages, since they said the situations of the villages are very similar.

BI-3.5.3.3 Village Training

Village training is given to the farmers' group of Rumleang village at their village basically once a month. The following issues were discussed in the village training.

Major Issues regarding Chicken Raising in the Village Training

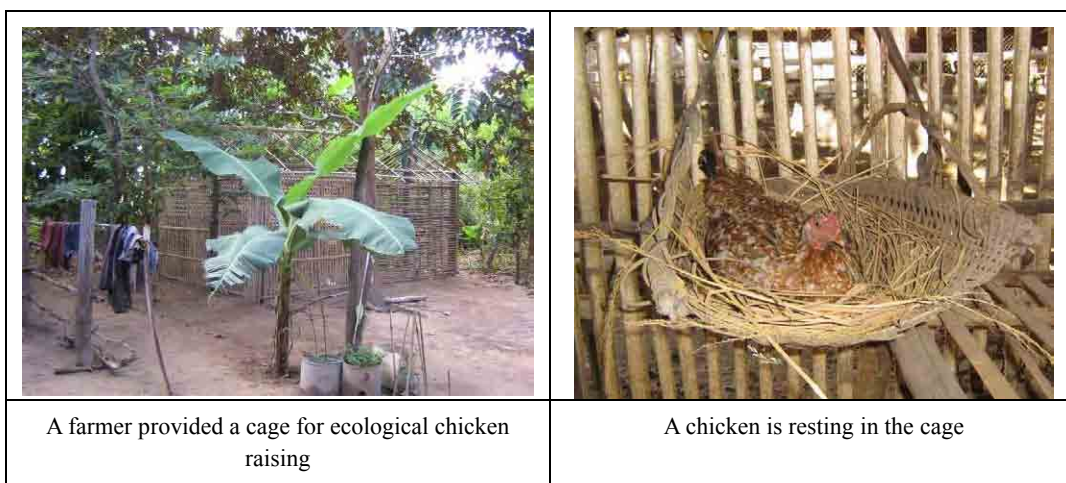
No.	Date	Major Issues	No. of Participants
Activities in Year 2006			
1	October 19	- Farmers' plans in the dry season (ecological chicken raising etc.)	12
2	November 22	- Sharing the experiences of the study tour	11
3	December 8	- 13 principles of ecological chicken raising	10

In the village training in December, the farmer promoter invited from Prey Veng province shared his knowledge and the following 13 principles were explained to the participants.

13 Principles of Ecological Chicken Raising	
1)	Select a good breed with a disease free history and avoid inbreeding
2)	Keep chickens in a suitable yard with a fence
3)	Maintain favorable micro-climate conditions in the yard by growing bushes and fodder trees
4)	Build a suitable house for the chickens
5)	Provide clean water for the chickens regularly
6)	Provide good quality feed 2-3 times per day
7)	Make chicken compost to raise insects and larva for feeding the chickens
8)	Administer traditional medicines to the chickens by soaking them in drinking water or mixing them with the feed
9)	Prevent mites and bugs from infesting chicken nests by putting neem leaf, lemon grass, or custard apple leaves under the nest.
10)	Control eggs during hen sitting by rotating them to maintain appropriate temperature
11)	Brood chicks with the hens for at least 15 days after hatching.
12)	De-worm chickens monthly by using betel nut or ipil seed
13)	Clean chicken yard, house and tools everyday

BI-3.5.3.4 Results

As a result, five farmers have already started to apply ecological chicken raising innovations and six farmers plan to start. Some farmers hesitated to apply them because they have no capital to build a house for their chickens.



BI-3.5.4 Farmers' Group Strengthening Practice

BI-3.5.4.1 Importance of Farmers' Groups

An active farmers' group is the key for successful farmer-to-farmer agricultural extension. It is also important to strengthen farmers' capacity on planning and management of their farming practice and also for various social activities. Benefits of an active farmers' group in agriculture and rural development could be summarized as follows.

- Farmers who want to apply innovations could share the knowledge from advanced farmers in the farmers' group.
- By enhancing farmer-to-farmer extension in the group, the government can reduce the cost of extension.
- Existence of a farmers' group motivates farmers to think and improve their situations by themselves. Farmers who can think, decide, and improve by themselves would further improve SRI practices by themselves. This means that farmers' groups have a strong relationship with the empowerment of farmers.
- Farmers' group activities may potentially be expanded in the future and further benefit group members. For example, the group might start group procurement and group shipping activities in the future.

BI-3.5.4.2 Study Tour

During the two study tours for SRI and chicken raising, the Rumleang experimental farmers were impressed with the advanced farmers' group activities in Kampong Cham province. They were impressed with and learned about advanced group activities as shown below.

Major Issues regarding Farmers' Groups in the Study Tour

No.	Date	Destination (Province)	Major Objective	Issues about Farmers' Group
Activities in Year 2006				
1	October 19	Kampong Cham	- SRI	- Savings Group
2	November 22	Kampong Cham	- Chicken Raising	- Role of Farmers' Group - Village Regulations

BI-3.5.4.3 Village Training

Village training is given to the farmers' group of Rumleang village at their village basically once a month. The following issues were discussed in the village training.

Major Issues regarding Farmers' Groups in the Village Training

No.	Date	Major Issues	No. of Participants
Activities in Year 2006			
1	August 11	- Benefits of farmers' groups - Election of three temporary representatives of the farmers' group - Possibility of establishing a savings sub-group	11
2	October 19	- Progress and problems of the savings sub-group - Training in accounting	12
3	November 22	- Progress of the savings sub-group	11

It was found that many members were interested in forming a farmers' group, especially in forming a savings sub-group.

BI-3.5.4.4 Results

(1) Formation of a Farmers' Group

As a result, a farmers' group has been organized in Rumleang village with 30 farmers. The expected activity of the farmers' group is the dissemination information regarding SRI to other farmers in the village. Effect of farmers' groups in the dissemination of information regarding SRI will be evaluated next rainy season.

(2) Formation of a Savings Sub-group

Rumleang farmers' group has organized a savings group as a sub-group of the farmers' group. Four leaders including three experimental SRI farmers were elected by the members. As of February 2006, 14 farmers had joined the activities and they saved 470,000 Riels in total. Their rule for operation of the group is as follows.

- Borrower has to return the money within five months.
- Property of the borrower would be confiscated if they do not return the money
- If it was a reliable reason, the group could decide to wait more than five months for repayment.

Eight members borrowed money from the saving sub-group to establish cages for chicken raising, to make Khmer noodle, or to sell cakes. It is noted that four borrowers already paid buck their loans with 3% of interest. The members said they are happy to be able to obtain easy access to credit with low interest rates. It was observed that the activities of the savings sub-group makes the farmers' group more sustainable, since the savings sub-group members have to hold regular meetings. It is expected that SRI would be discussed by such farmers through their regular meetings.

BI-3.6 Specific Findings in Zone-1 Participatory Agriculture Extension Activities

The following are the findings from the participatory agricultural extension activities in Zone-1.

(1) Necessity of Conducting Initial Guidance at the Proper Time

Due to a delay in initial set-up of the pilot project implementation team, initial guidance for Rumleang village was held on July 06, 2006. This delay did not affect the pilot project implementation schedule in Zone-3 and Zone-4, since they heavily rely on rainfall and have to wait for a long time to transplant. But in Zone-1, Rumleang village, this delay affected the pilot



Experimental farmers are checking function of weeding tool (one of them was donated)

project activities a lot. When the pilot project implementation team started to work in Rumleang village, many farmers had already transplanted or were busy in preparing for transplanting. It affected the participation rate in the project activities in Rumleang village as compared with Zone-3 and Zone-4 target villages.

(2) Strong Need for Weeding Tools

Because the paddy plots in Rumleang village are irrigated, the field environment is favorable for paddy but also for weeds. The experimental farmers in Zone-1 faced difficulty in removing such weeds from their plots. This problem does not happen in the traditional paddy farming practice, because the paddy field is covered by dense paddy seedlings in the traditional farming practice, so that there is not much chance for weeds to grow. On the other hand, in the SRI plot, farmers tried to keep a greater distance between the seedlings, so there are more chances for weeds to grow. To combat this problem, a weeding tool was provided to the farmers' group as a sample. Experimental farmers in Rumleang village tested the weeding tool and found it very effective. However, they also found that only one weeding tool in the village is not enough. The farmers were motivated to purchase more weeding tools at a minimum cost from the pilot project implementation team. It is necessary to monitor their actions on this matter carefully.

(3) Farmer to Farmer Extension Effective for Establishing Savings Groups

The Rumleang farmers' group shows a stronger demand for establishing a savings group as compared with other target villages in Zone-3 and Zone-4. This is because the Rumleang farmers were strongly influenced by their farmer promoter. The farmer promoter for Rumleang village came from Kahaeng village and he is the chief of the Kahaeng village savings group. Kahaeng village savings group is recognized as one of the most successful savings group. The farmer promoter introduced his experience during a break in the meeting. This fact also endorses the effectiveness of farmer-to-farmer extension.

Chapter BI-4 Experimental Farming Practice Improvement Activities

BI-4.1 Objective

In the master plan study on Comprehensive Agricultural Development of Prek Thnot River Basin, improved farming practices are proposed to be introduced to attain the target yields of the Plan. However, it is necessary to confirm that the target yields of the master plan are achievable through verification tests.

Objective

To verify that the targets of the master plan are achievable based on improved farming practices on site and to modify the practices for further improvement.

(1) Farming Practices Proposed in the Master Plan

In the master plan, the following farming practices for rice were proposed. Since the practice is similar to low inputs SRI, it is expected that farmers who introduced low input SRI will easily proceed to these improved farming practices in the future.

Proposed Farming Practices for Zone -1 in Master Plan

Major improvements envisaged from the current prevailing practices are: i) proper land leveling & preparation, ii) use of quality seed, iii) raised nursery beds, iv) planting of young seedlings, v) regular planting, vi) reduced number of plants per hill, vii) fertilization (increased & timely application including compost or cow dung), viii) introduction of proper on-farm water management & water saving procedures, ix) intensified weeding and x) improvement of post-harvesting practices.

(2) Proposed Agricultural Development Plan Formulated in Master Plan

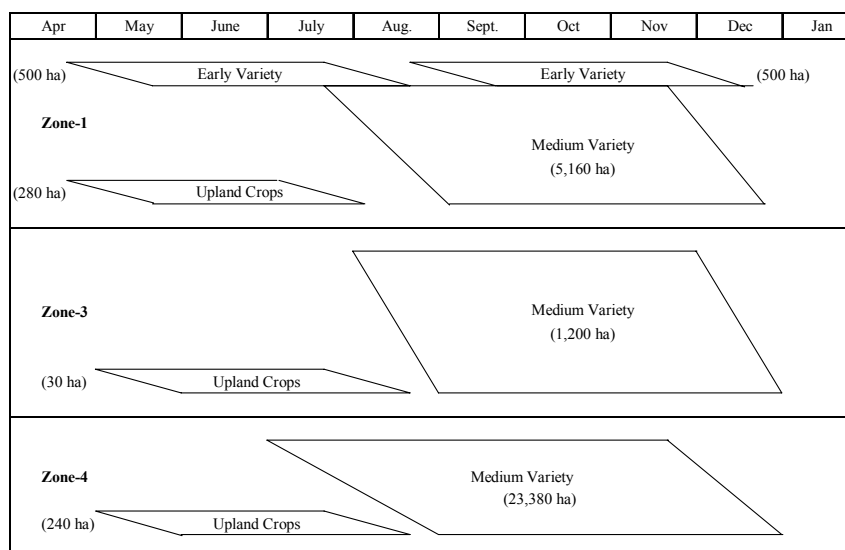
The proposed agricultural development plan formulated in the master plan for Zone-1 is as follows;

Proposed Agricultural Development Plans for Zone-1

Zone	Cropping Pattern		Cropping Intensity (%)			Target Yield (paddy ; ton/ha)
	Early Rainy	Rainy	Early Rainy	Rainy	Annual	
Zone -1	early rice + upland crops	early rice or medium rice	14	100	114	early rainy: 3.3 rainy: 3.0 ~ 3.3

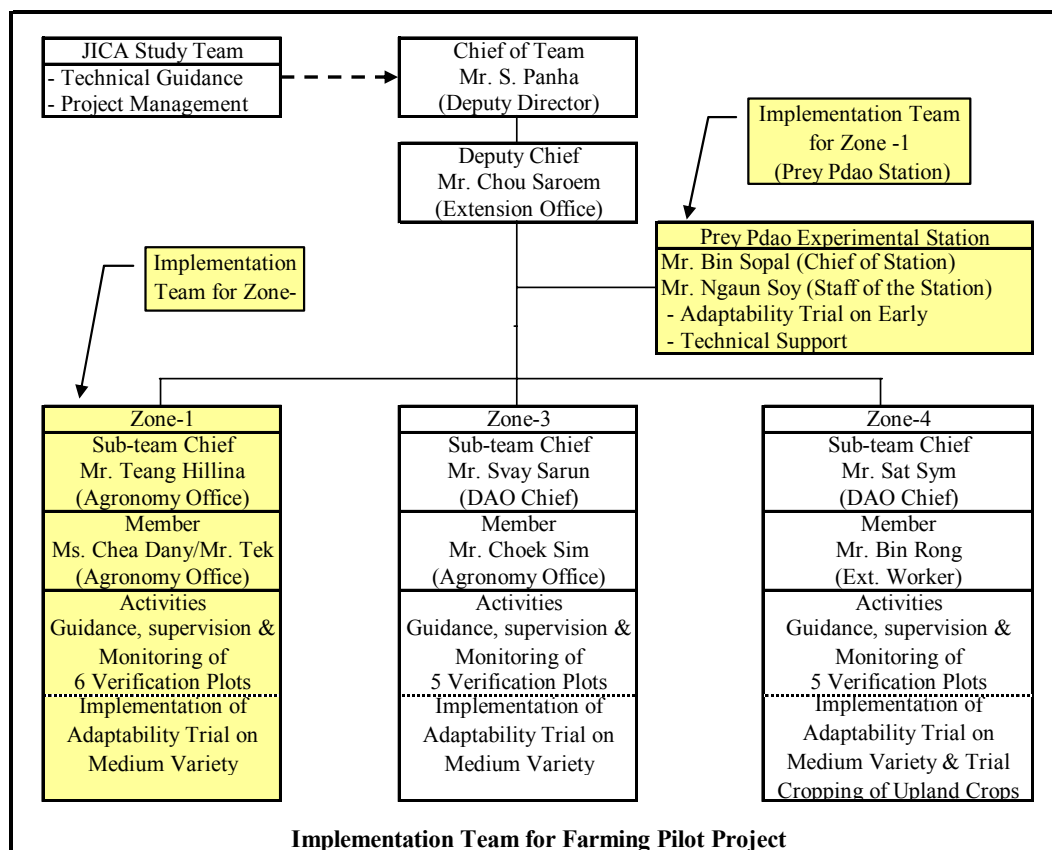
Source: Interim Report of the Master Plan, 2006

The proposed cropping pattern for Zone-1 is illustrated as shown below.



BI-4.2 Institutional Set-up

For the implementation of the pilot project in Zone-1, the Implementation Team for the farming pilot project was formed by PDA staff and staff of Prey Pdao Experimental Station of DAALI with technical guidance and managerial role of the JICA study team as illustrated below.



BI-4.3 Situation before Starting Pilot Project Activities

BI-4.3.1 Area and Demonstrators for the Activities

(1) Selection of the Area for the Activities

Bos Ta Ney village was selected as the area for the activities in Zone-1 considering the following criteria for selection.

- The area should have sufficient irrigation water supply from a canal, and
- The area should be free from flooding.

(2) Selection of Demonstrators for the Activities

At the preparatory workshop at Bos Ta Ney village held on June 26, 2006, paddy plots for verification tests and small scale adaptability tests were selected with the following basic criteria for the selection.

- The fields should have sufficient irrigation water supply from a canal, and
- The fields should be free from flooding.

Six verification test plots and one adaptability test plot in the project area were mutually selected and the four owners of the verification plots were recognized as demonstrators.

BI-4.3.2 Method of Baseline Surveys

Baseline surveys were conducted to determine the situation of the pilot project area before starting the project. The data was obtained from existing databases or interview survey to

farmers who were interested in the improved farming practices.

BI-4.3.3 Farming Practices in Bos Ta Ney Village

In Bos Ta Ney village, rice production was almost the exclusive crop sub-sector activity, however, vegetables such as morning glory and string beans were grown to an extremely limited extent. Major fruit trees were mango and sugar palm. Agriculture conditions of the village before the project are briefed in the following table.

Agricultural Profiles of Bos Ta Ney Village

No. of Families	94	Land Use		Farm Machinery/Facilities	
No. of Farm Families 1/	76	Rice Field	52 ha	Water Pumps	8
Population	476	Upland Field	1 ha	Rice Mills	2
Labor Force/Family	2.2	Rice Cropped Area/Yield/ Production			
Rice Field Holding/Farm F.	0.68 ha	Year	Cropped Area	Avg. Yield	Production
Cattle Population	132	2003	52 ha	2.0 t/ha	104 ton
Pig Population	about 100	2004	46 ha	2.0 t/ha	92 ton
Families with Cattle (No.)	65	2005	46 ha	2.0 t/ha	92 ton
No. of Hand Tractors	3	2006	52 ha	2.0 t/ha	104 ton

1/: Crop growing farm families Source: SEILA Data base 2005 & village chief

Aiming at identifying prevailing rice farming practices, interview surveys to farmers were conducted. Identified prevailing farming practices of the farmers who were interested in the improved farming practice, are summarized below.

Prevailing Rice Farming Practices in Bos Ta Ney Village

Practices	
Nursery	Common variety: Riang Chey, Neang Ming (rainy) & IR66 (early rainy) Seeding rate: avg. 60 (early) - 70 (medium) kg/ha; Seed source: own products; Seed replacement: seldom replaced with quality seed
Land Preparation	Draft animals; 2 plowing & 1 harrowing
Transplanting	Random planting; density: 20 ~ 25 cm, avg. 4 - 5 plants/hill (medium variety) 2 - 5 plants/hill (early variety), seedling age: 35-45 (medium) & 21 - 25 (early) days
Fertilization	Manure: 1.7 ton/ha; total doses: DAP 58 & Urea 70 kg/ha (Socio-economic Survey)
Irrigation	Continuous flooding
Harvesting	Harvesting: manual 100%; manual threshing; engine winnower; threshing at home yard
Paddy Yield	Rainy season: 2.3 & early rainy season: 2.4 t/ha; (Socio-economic Survey in 2006)

BI-4.3.4 Soil Conditions of Verification Test and Small Scale Adaptability Trial Fields

Soils distributed in the verification and small scale adaptability trial fields were classified as Gleyic Acrisol Medium Textured Phase (mapping symbol: GAM2). Chemical properties of the soils are as follows;

Soil Chemical Properties of Verification Test and Adaptability Trial Plots in Zone 1

Soil Depth	Texture	pH (H ₂ O)	Total C (%)	Total N (%)	Total P P ₂ O ₅ (%)	Available P ₂ O ₅ (ppm)	CEC	Exchangeable Cation		
								Ca	Mg	K
0-15cm	SL~SCL	5.2	0.29	0.04	0.01	27.0	8.0	1.8	1.3	0.1
15-30cm	SCL~SC	6.0	0.20	0.04	0.01	39.0	6.5	2.3	1.5	0.2

Source: JICA Study Team

As shown, the surface layers of the soils have: i) acid reaction, ii) very low content of N & C, iii) low CEC & dystic exchangeable bases saturation and iv) low content of exchangeable Ca, Mg & K. However, the soil analyses indicate a high content of available P₂O₅ in both surface and sub-surface layers of all the soils.

BI-4.3.5 Identified Constraints for Farming Practices Improvement

Primary agronomic constraints identified in the project area through the baseline survey

and field survey and the same identified through the Socio-economic Survey were: i) low yield of paddy even in irrigated area largely because of prevailing traditional or inadequate farming practices, ii) unstable water supply in the early rainy season partly attributed to negligence of on-farm water management, iii) low land use intensity in early rainy season due to restricted water supply and iv) limited coverage of extension services.

BI-4.4 Strategies Established for Pilot Project and Overall Framework for Pilot Project

BI-4.4.1 Strategies Established for Pilot Project

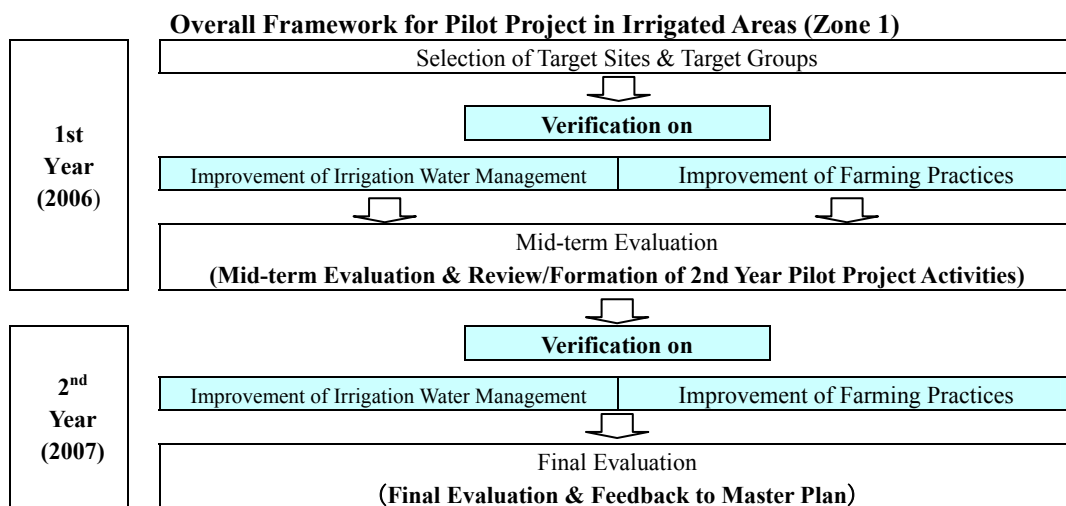
The strategies for the agricultural pilot project for Zone-1 established in accordance with the overall objectives and proposed agricultural development plans are presented in the followings.

Objectives of and Strategies Established for Agricultural Pilot Project

Zone	Objectives	Strategies
1	- Verification of proposed agricultural development Plans	1 st year (2006) - Verification of improved rice farming practices under ordinal irrigation in rainy season - Implementation of small scale adaptability trial
		2 nd year (2007) - Verification of improved rice farming practices under water saving irrigation - Implementation of small scale adaptability trial
	- Assessment of sustainability through examining adoptability of the improved farming practices of rice	1 st year (2006) - Selection of demonstrators & formation of a farmer group - Provision of technical guidance to demonstrators & group members
		2 nd year (2007) - Selection of demonstrators - Provision of technical guidance to demonstrators & group members

BI-4.4.2 Overall Framework for Pilot Project

The pilot project is scheduled to be implemented in 2 years from 2006/07 to 2007/08 in the zone. The overall framework for the pilot project is presented in the following figure.



BI-4.5 Programs and Program Descriptions

The programs of the pilot project in 2006/07 and their descriptions are briefed in the following table.

BI-4.7.1 Verification Test

Purpose of the verification test was to confirm that the target yields and cropping pattern of the master plan are achievable by introducing improved farming practices.

The verification tests conducted in 2006 are as shown in the following table.

Verification and Trial Activities Implemented in 2006 in Zone 1

Category of Variety	Plot No.	Plot Size	Variety	Demonstrator
Medium Variety	Plot 1	23.1 a	Riang Chey	Koung Sok (M)
	Plot 2	8.1 a	Riang Chey	Um Sokkea (F)
	Plot 3	4.5 a	Riang Chey	Um Sokkea (F)
	Plot 4	31.5 a	Neang Meng	Som Bot (M)
Early Variety	Plot 5	14 a	Sen Pidao	Bu Phat (F)
	Plot 6	8 a	Sen Pidao	Koung Sok (M)

BI-4.7.2 Small Scale Adaptability Test

The trial activities carried out in the zone include a small scale adaptability test (simple trial on medium variety in RT2 operated by the Implementation Team for Zone 1 and the same for early variety implemented in and by the Prey Pdao Experimental Station of DAALI, MAFF located at Samraong Tong District as shown in the following table.

Trial Activities Implemented in 2006 in Zone 1

Activities	Trial Components	Period
Small Scale Adaptability Test		
- Adaptability Test on Medium Variety	- Variety trial	July ~ Dec.
- Adaptability Test on Early Variety	- On-farm water management	July ~ Nov.
	- Seeding rate & planting method	

BI-4.7.3 Farmers' Acceptability Survey

For the preliminary assessment of the adaptability of the proposed improved farming practices introduced in the verification plots, simple interview surveys with the demonstrators were carried out.

BI-4.7.4 Field Guidance Activities

The guidance and extension activities provided to demonstrators and farmer groups under the pilot project include: i) field guidance, ii) OJT on farming practices, iii) farmer field day, iv) joint field visit, v) farmer training course and vi) field visit by the Implementation Team.

(1) Field Guidance

The field guidance was conducted for 4 times; 1st and 2nd guidance for demonstrators and a simple trial cooperators and the 3rd and 4th guidance for Farmer Group members. The objectives, activities, and topics/subjects are as shown in the following table.



Objectives, Activities and Materials Used in Field Guidance

Guidance	Objectives/Subject Farming Practices	Activities
1 st Guidance July 11 Participants: 5	- Providing practical guidance on improved farming practices (seed bed preparation to transplanting)	- Demonstration of seed selection - Scheduling seed bed preparation - Field check of target fields
	Scheduling seed bed preparation/sowing	- Provision of seeds
2 nd Guidance July 31	- Providing practical guidance on improved farming practices (from land preparation to harvest)	- Providing guidance to demonstrators using guidance materials

Participants: 5	- Scheduling for land preparation & Transplanting	- Scheduling for land preparation & transplanting - Provision of fertilizer
3 rd Guidance Jan. 24 Participants: 24	- Explanation of results of the pilot project activities - Discussion on improved farming practices - Discussion on next year activities	- Presentation & discussion - Exchange opinion (program needs, farmers interests etc.)
4 th Guidance Feb. 14 Participants: 15	- Explanation of programs in 2007 - Selection of target farmers & fields for verification/demonstration activities in early rainy season in 2007	- Providing guidance to group members - Selection of target farmers among members - Field check of candidate fields

The materials used for the 1st and 2nd guidance are: “Proposed Rice Farming Practices in Zone 1, 3 & 4” and the same for the 3rd guidance are: “Results of Yield Surveys” and “Basic Farming Practices Applied in the Pilot Project”.

At the 3rd guidance, the JICA study team asked opinions or programs to be implemented in the next season to the participants. Major farmers’ requests were as follows;

- Similar programs on dry season rice (demonstration/trial)
- Cultivation of mungbeans in rice field
- Cultivation of vegetables

(2) OJT on Farming Practices

OJT on farming practices was the most important and appealing guidance and extension activities employed in the pilot project and consist of OJT on raised seed bed preparation and regular planting. Activities of the Implementation Team are practical training of demonstrators on the main proposed farming practices of seed selection, seed bed preparation, seeding rate and sowing in the former and seedling uprooting and regular planting using planting line as follows;



Objectives and Activities of OJT on Farming Practices

Guidance	Objectives/Subject Farming Practices	Activities
OJT on Raised Seed Bed Preparation July 16 - Aug. 2	- Providing practical guidance on: - seed selection with salt water - preparation of raised seed bed - seeding density for nursery & sowing	- Providing guidance to demonstrators & assisting their practices
OJT on Regular Planting July 12 - Aug. 17	- Providing practical guidance on: - uprooting seedlings by shovel - regular planting using planting line	Providing guidance to demonstrators & assisting their practices

(3) Farmer Field Day

Farmer field days were carried out in the zone as summarized below.

Objectives and Activities of Farmer Field Day

Field Day	Objectives/Subject Farming Practices	Activities
1st Field Day Aug. 22 Participants: 19	- Guidance on proposed farming practices to Farmer Group members at verification & trial plots	- Explanation on proposed practices - Visit to verification & trial plots - Providing field guidance/discussion
2nd Field Day Nov. 11 Participants: 15	- Providing practical information on the potential production of early varieties in simple trial plot at the Prey Pdao Exp. Station	- Guidance in class & field provided by the chief of the Prey Pdao Station

(4) Joint Field Visit

Joint field visit of demonstrators and the Implementation Team members was arranged with an objective of providing guidance on insect & disease of rice plants through field observation on insect & disease infestation in verification plots as follows;



Joint Field Visit

Objectives	Activities	Schedule
Providing guidance on insect & disease of rice plants through field observation on insect & disease infestation in verification plots	Joint visit of demonstrators & guidance team to verification plots for provision of guidance at site	Oct. 19

(5) Farmer Training Course

A farmer training course on compost making and use was programmed aiming at providing Farmer Group members with theoretical and practical knowledge for the same. The components of the course consist of: construction of 2 simple compost yards in the zone, in-class training in 1 day and practical training in 1 day.

Farmers Training Course

Objectives	Activities	Schedule
Providing practical training on: - Construction of compost yard - Compost use	Providing training on compost making through: - Lessons on compost making & use - Construction of simple compost yard - Field practices on compost making	Schedule Jan. 24 -25 Participants 23
		Material: How to Make Compost (PDA)

Participants are enthusiastic in learning theory and practices because they we are well informed of the merit of compact, saving cash expenses for farming by reducing fertilizer doses. The results of pre- and ante- test were: 56 & 90 in Zone 1.

Major results or findings of the guidance are as enumerated below.

- Basically, farmers are well aware of economic importance (saving fertilizer cost) and agronomic meaning (improving soil condition) of compost/manure application. However, their compost/manure making and application in fields are not always proper manner. Their knowledge on compost/manure making and application was improved as indicated in the results of the pre- and ante-test. Issues to be considered are monitoring of participants practices to assess the effects of the training activity.
- Practice training by constructing sample compost yard was effective to attract farmers attention prior to training. However, problems exist in “farmers can afford to purchase materials for compost yard”.
- In this regard, a Farmer Group member in Zone 1 and 3 constructed a compost yard by his own expenses soon after the training course. The news pleased the Implementation Team a lot.



(6) Field Visit by the Implementation Team and the JICA Study Team

Provisions of field guidance to demonstrators were carried out to a certain extent by the Implementation Team members at times of their periodical visit to verification fields for growth survey. Further, the JICA study team also provided guidance at their visit to verification fields.

BI-4.8 Verification Test

BI-4.8.1 Objective

The objective of the verification test in the rainy season is the verification and demonstration of the improved farming practices of medium and early variety of rice. The target yields set in the master plan are as follows;

Rainy Season Rice	Medium variety: 3.0t/ha	Early variety: 3.3t/ha
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BI-4.8.2 Verification Plots

The verification tests were implemented at 6 plots in the zone as follows;

Verification Test Plots for Year 2006

Category of Variety	Plot No.	Plot Size	Variety	Demonstrator
Medium Variety	Plot 1	23.1 a	Riang Chey	Koung Sok (M)
	Plot 2	8.1 a	Riang Chey	Um Sokkea (F)
	Plot 3	4.5 a	Riang Chey	Um Sokkea (F)
Early Variety	Plot 4	31.5 a	Niang Meng	Soum Bot (M)
	Plot 5	14.0 a	Sen Pidao	Bu Phat (M)
	Plot 6	8.0	Sen Pidao	Koung Sok (M)

BI-4.8.3 Growth History and Key Farming Practices

(1) Overall Features

The progress reporting of the verification test plots is indicated in the following table.

Rice Farming Records in Verification Test Plots

Practice	Time /No. of Practices	Practice	Time/No. of Practices
Nursery		Fertilization	
- Seedbed preparation	June 22 - Aug. 2	- Basal dressing	July 11 - Aug. 16
- Sowing	June 23 - Aug. 2	- 1st Top dressing	Aug. 11 - Sep. 18
Final land preparation	July 11 - Aug. 16	- 2nd Top dressing	Sep. 29 - Oct. 31
Transplanting	July 13 - Aug. 17	Panicle Initiation	± Aug. 31 - Oct. 27
Irrigation in Field	5 to 8 times	Flowering	± Oct. 6 - Nov. 30
Weeding	2 times	Harvesting	Nov. 3 - Jan. 3
		Threshing	Nov. 3 - Jan. 6

Note: Date in the earliest plot - the last plot

The differences in the time of practices are mainly due to cultivation of both early and medium variety in the verification plots.

(2) Growth History

The main incident during the project activities in 2007 was the occurrence of inundation in Zone-1 from August 17 to 20. Fortunately, any verification plots in the zone were not seriously damaged due to the inundation and plant growth recovered soon, although adverse effects of inundation occurred in the later growth stage as outbreak of stem borer. As the pilot project activities were carried out in the rainy season, no water supply problems were encountered.

(a) Plot 1

Variety	Sowing	Transplanting	Panicle Initiation	Flowering	Harvesting (DAS)
Riang Chey	June 23	July 13	± Oct. 11	Nov. 14	Dec. 12-16

Because of the delay of start of the verification activities, nursery was prepared by a demonstrator in his own way and the adoption of proposed practices was from

transplanting in this plot.

Transplanting ~ Flowering

A major incident in this plot was the occurrence of inundation from August 17 to 20 and the plot suffered from complete inundation for about 2 days from the evening of August 17 to the night of August 19. After the inundation, rice growth in the plot recovered soon and showed good growth. However, the plot was infested with stem borer possibly due partly to the inundation and damages to plants became remarkable at around middle of September (around 65 days after transplanting (DAT)). No chemical control of the insects was done because of any experiences in use of chemicals by the demonstrator. Crop losses due to the insect were predicted at the time. Panicle initiation was around October 11 (DAT 91).



Growth difference between 1 plant/hill and 2~3 plants became not clear at around the middle of vegetative stage.

Flowering ~ Harvest

Flowering occurred around November 14 (124 DAT). At around the flowering stage, plant growth became vigorous. Harvesting was done from December 12 to 16 (153 DAT) in the plot.



(b) Plot 2 & 3

Variety	Sowing	Transplanting	Panicle Initiation	Flowering	Harvesting
Riang Chey	July 18	Aug. 7	± Oct. 17	Nov. 20	Dec. 21-22

Both plots are owned by a demonstrator and the farming activities were carried out under the same variety), sowing date (July 18) and transplanting date. Difference in practices is planting density applied, 25 x 25 cm in Plot 2 and 30 x 30 cm in Plot 3.

Nursery (Sowing ~ Transplanting)

The final plowing and harrowing was done on the day of seed bed preparation. Raised seed bed preparation had some difficulty because of poor harrowing due to insufficient water for puddling. Seed germination was even and nursery water management was fairly well done by a demonstrator and good seedlings were prepared for transplanting. The age of seedling at transplanting was 21DAS (days after sowing).

Transplanting ~ Flowering

Regular planting by using planting lines was adopted under the guidance of the Implementation Team. Except for uneven growth in a plot due partly to poor leveling, rice plants showed normal growth. Growth in Plot 2 was better than Plot 3. Such difference is due to soils conditions according to the demonstrator. Panicle initiation started around October 17 (DAT 72, days after transplanting).



Some infestation of brown spot was observed, but not serious. However, uneven growth in the plots continued up to flowering.

Growth difference between 1 plant/hill and 2~3 plants became not clear at around the

middle of vegetative stage due to uneven growth in each treatment plot.

Flowering ~ Harvest

Flowering date in both plots was around November 20 (106 DAT). At around the flowering stage, plant growth became vigorous and uneven growth of rice plants became less visible. At maturing stage, the differences in growth of the 2 plots became clear. Plot 2 was far better than Plot 3. Harvesting was done from December 21 to 22 (136 DAT or DAS 156) in both the plot.



The number of irrigations in both the plots is 8 times after transplanting. In the plots, intermittent irrigation and drainage are practiced on trial basis from the middle of September.

(c) Plot 4

Variety	Sowing	Transplanting	Panicle Initiation	Flowering	Harvesting
Neang Meng	July 26	Aug. 13	± Oct. 27	Nov. 30	Jan. 1-3

Local late variety, Neang Meng, was planted in Plot 4 with planting density of 30 x 30 cm. The plot suffered from inundation caused by a flood occurred in the middle of August.

Nursery (Sowing ~ Transplanting)

Seed bed preparation for the plot was well done and uniform seedlings were raised. Excessive seedling rate of the proposed practices became very clear in the plot as nearly half of the nursery remained untouched after transplanting. The age of seedling at transplanting was 19 DAS.

Transplanting ~ Flowering

A major incident in this plot was the occurrence of inundation on August 18 within a week after transplanting, however, the plot barely escaped from complete inundation. After the inundation, rice growth in the plot recovered soon and showed good growth. However, the plot was infested with stem borer possibly due partly to the inundation and damages to plants became noticed at around middle of September (around DAT 30).

		
Inundation, Aug. 19	After inundation, Aug. 23	After inundation, Sep. 12

Growth difference between 1 plant/hill and 2~3 plants became not clear at around the middle of vegetative stage because partly of uneven growth of rice in each treatment plot.

Panicle initiation in the plot was around October 27 (DAT 76).

Flowering ~ Harvest

Flowering date in the plot was around November 30 (110 DAT). At around the flowering stage, plant growth became vigorous and uneven growth of rice plants became less visible. Harvesting was done from January 1 to 3 (142 DAT).



The number of irrigations in the plot was 10 times after transplanting.

(d) Plot 5

Variety	Sowing	Transplanting	Panicle Initiation	Flowering	Harvesting
Sen Pidao	July 20	Aug. 6	± Aug. 31	Oct. 6	Nov. 3

The promising early variety, Sen Pidao, showed an excellent growth in the plot, although the plot suffered from serious crop losses due to rat attack as the rice plants reached maturing stage in an isolated timing.

Nursery (Sowing ~ Transplanting)

Seed bed preparation for the plot was fairly well done and uniform seedlings were raised. The age of seedling at transplanting was 18 DAS.

Transplanting ~ Flowering

In the plot regular planting was nicely carried out and field became looks very neat after taking root, attracting fellow farmers' attention as the plot located along secondary and RT2 tertiary canal.



Major incidents in this plot were damages caused by crab after transplanting and serious damages caused by rat at booting stage. Other than those, rice growth in the plot was very well. Panicle initiation in the plot was around August 31 (DAT 26).



Growth difference between 1 plant/hill and 2~3 plants became not clear at around the middle of vegetative stage

Flowering ~ Harvest

Flowering date in the plot was around October 6 (62 DAT). Rice growth in the plot was excellent up to harvesting and matured uniformly attracting attention of many farmers because of the fastest maturing around the plot. Harvesting was done on November 3 (90 DAT).



The number of irrigations in the plot was 5 times after transplanting.

(e) Plot 6

Variety	Sowing	Transplanting	Panicle Initiation	Flowering	Harvesting
Sen Pidao	Aug. 2	Aug. 17	± Sep. 13	Oct. 17	Nov. 14-15

The promising early variety, Sen Pidao, showed a good growth in the plot, although, similar to Plot 5, the plot suffered from moderate crop losses due to rat attack as the rice plants reached maturing stage in isolation.

Nursery (Sowing ~ Transplanting)

Seed bed preparation for the plot was well done and uniform seedlings were raised.. The age of seedling at transplanting was 16 DAS.

Transplanting ~ Flowering

In the plot regular planting was nicely carried out and field became looks very neat after taking root. Major incident in this plot was damages caused by rat at booting stage. Other than those, rice growth in the plot was well. Panicle initiation in the plot was around September 13 (DAT 28).



Growth difference between 1 plant/hill and 2~3 plants became not clear at around the middle of vegetative stage

Flowering ~ Harvest

Flowering occurred at around October 17 (62 DAT) in the plot. Rice growth in the plot was good up to harvesting and matured uniformly. Harvesting was done at 90 DAT as the case in Plot 5 on November 14 and 15. The number of irrigations in the plot was 6 times after transplanting.

(3) Key Farming Practices

The proposed rice farming practices for verification in 2006 were formulated through the series of consultation meeting on draft materials prepared by the JICA study team with PDA, CARDI and Implementation Team for the pilot project as shown in the following table.

Rice Farming Records in Verification Test Plots: Zone-1

Practices	Farming Practices Adopted	Current Prevailing Practices in the Zone 1/
1. Nursery		
- Seed/variety	- improved variety (Sen Pidao)	- improved variety (IR 66)
- Seed source	- commercial seed	- self multiplied seed
- Seed selection	- selection with salt water	- not practiced
- Incubation	- 1 day	- 1 - 2 days
- Seedbed preparation	- raised semi-wet bed	- flat semi-wet to wet bed
- Seeding rate	- 40kg/ha	- 62 kg/ha 2/
- Seeding density	- 40 g/m ²	- denser than 60 g/m ² 4/
2. Land Preparation	- 2 times 2 plows + 2 harrowing/leveling 2 plows + 1 harrowing/leveling	- 2 times 2 plows + 2 harrowing/leveling 2 plows + 1 harrowing/leveling
3. Transplanting		
- Planting density	- 20 x 20 cm	- \geq 20 x 20 cm 4/
- No. of plants/hill	- 2 ~ 3 plants/hill (comparison 1 plant/hill)	- 2 ~ 5 plants/hill
- Age of seedling	- \pm 20 days	- 21 ~ 25 days
- Planting method	- regular planting	- random planting
4. Fertilization		
- Basal: compost/manure	- applied (depending on farmers practice)	- applied
- Chemical fertilizer (kg/ha)	- applied: 15-15-15 & DAP (15-15-15: 100kg & DAP: 25kg)	- applied: urea or DAP or both
- 1st top dressing (kg/ha)	- applied: urea (43 kg)	- applied: urea or DAP or both
- 2nd top dressing (kg/ha)	- not applied	- seldom applied
- Total doses (kg/ha)	- Basic:168 for early variety	- urea 70 kg/ha & DAP 58 kg/ha
5. Weeding	- 2 times/season	- 2 times/season
6. Irrigation	- continuous flooding 3/	- continuous flooding
7. Harvesting/post harvesting		
- Harvesting	demonstrators current practices	- manual
- Threshing	demonstrators current practices	- manual threshing (threshing board or table)
- Winnowing	demonstrators current practices	- engine winnower
- Drying	- sun drying	- drying in field

1/: Socio-economic Survey in FS area conducted by JICA Study Team, 2006

2/: Interview survey with Agricultural Pilot Project Farmer Group members (20 farmers) in the zone

3/: in one plot, intermittent irrigation introduced from the middle growth stage

4/: field observation

The key proposed farming practices of nursery preparation, transplanting and fertilization adopted in the verification tests and irrigation done by farmers options are explained in the following.

(a) Nursery

Main improved practices for nursery adopted in the project, except for a local rice variety grown in Plot 4, are shown in comparison with current prevailing practices as shown in the following table.

Improved Farming Practices Adopted in Verification Plots in Zone 1

Practices	Practices Adopted	Current Prevailing Practices
Medium Variety		
Variety & Seed Source	Improved commercial seed	Self-multiplied local seed
Seed Bed	Raised semi-wet seed bed	Flat semi-wet to wet seed bed
Seeding rate/density	40 kg/ha & 40 g/m ²	70 kg/ha & > 60 g/m ²
Early Variety		
Variety & Seed Source	Improved commercial seed	Self-multiplied improved seed
Seed Bed	Raised semi-wet seed bed	Flat semi-wet to wet seed bed
Seeding rate/density	40 kg/ha & 40 or 50 g/m ²	60 kg/ha & > 60 g/m ²




		
Raised semi-dry seed bed	Seedlings ready for planting	Seedlings (21 DAS)

(b) Transplanting

Main improved farming practices of improved transplanting method under the project are adopted as follows;

Transplanting Method Adopted in Verification Plots

Practices	Practices Adopted	Current Prevailing Practices
Medium Variety	Regular planting, 25 x 25cm	Random planting
	2-3 plants/hill & 20 days seedling	4-5 plants/hill & 30-45 days seedling
Early Variety	Regular planting, 20 x 2cm	Random planting
	2-3 plants/hill & 20 days seedling	2-5 plants/hill & 20-25 days seedling

		
Regular planting	Plot 5 after planting (10 DAT)	Plot 1 after planting (25 DAT)

(c) Fertilization

Fertilization for early variety is basal dressing and 1 top dressing and the same for medium variety is basal dressing and 2 top dressings in principle. Fertilizer doses were basically determined in accordance with the proposed farming practices. However, based on reported volumes of manure applied by demonstrators and farmers' fertilization doses in the last year, some modifications in fertilizer volumes were made. According to the

results of interview with the demonstrators, all of them reported increase doses of fertilizer form the last year.

(d) Irrigation

No specific irrigation practices were adopted in the initial stage of verification tests in 2006, however, from the later vegetative growth stage, the adoption of intermittent irrigation was attempted in 4 plots by the Implementation Team in cooperation with demonstrators as trial bases.

The number of irrigation in each plot is reported as follows;

Irrigation Frequencies in the Verification Plots in Zone-1

Indicator	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6
No. of Irrigation/Season	-	8	8	10	5	6
No. of Drainage/Season	-	4	4	-	3	3

BI-4.8.4 Yield and Production of Verification Test Plots

In the project area, all the demonstrators reported production increase from the last year. The yield of the verification activities are presented in Table BI-4.1 and discussed below.

(a) Plot 1

Variety	Crop Cut Survey (t/ha)		Whole Plot		Demonstrators Assessment 1/	
	Range	Average	Field Yield	Production	Production	Assessment
Riang Chey	4.1 – 5.0	4.5	3.9 t/ha	892 kg	8000 kg	Increased
2-3 plants/hill	5.0 – 5.1	5.0				
1 plant/hill	5.0 – 5.1	5.0				

1/: Assessment by a demonstrator; production is rough estimate

The plot suffered from complete inundation in the middle of August and moderate to serious infestation of stem borer. The yield level was lower than expected from the growth at the initial vegetative stage. Limited numbers of panicle per unit area compared with the same in other plots might have been brought about by damages caused by stem borers. No clear differences was observed between 2-3 plants/hill and 1 plant/hill after around the middle of vegetative growth stage.



(b) Plot 2

Variety	Crop Cut Survey (t/ha)		Whole Plot		Demonstrators Assessment 1/	
	Range	Average	Field Yield	Production	Production	Assessment
Riang Chey	4.3 – 5.8	5.2	4.8 t/ha	386 kg	200 kg	increased
2-3 plants/hill	4.1 – 4.9	4.5				
1 plant/hill	4.1 – 4.9	4.5				

1/: Assessment by a demonstrator; production is rough estimate

The plot experienced no marked growth problems and attained higher yield, although uneven growth of rice plants continued up to harvest. No clear differences was observed between 2-3 plants/hill and 1 plant/hill after around the middle of vegetative growth stage.



(c) Plot 3

Variety	Crop Cut Survey (t/ha)		Whole Plot		Demonstrators Assessment 1/	
	Range	Average	Field Yield	Production	Production	Assessment
Riang Chey	3.6 – 4.6	4.1	3.9 t/ha	177 kg	120 kg	increased
2-3 plants/hill	4.5 – 4.9	4.7				
1 plant/hill	4.5 – 4.9	4.7				

1/: Assessment by a demonstrator; production is rough estimate

The plot experienced no marked growth problems, however, growth of rice plants in the plot was not comparable to that of neighboring Plot 2. Uneven plant growth continued up to harvest. The main cause of lower yield compared with that of Plot 2 is lower panicle numbers per unit area because 30 x 30cm planting distance adopted in the plot. No clear differences was observed between 2-3 plants/hill and 1 plant/hill after around the middle of vegetative growth stage.



(d) Plot 4

Variety	Crop Cut Survey (t/ha)		Whole Plot		Demonstrators Assessment 1/	
	Range	Average	Field Yield	Production	Production	Assessment
2-3 plants/hill	3.1 – 3.5	3.3	3.2 t/ha	1,005 kg	800 kg	increased
1 plant/hill	4.5 – 4.9	4.7				

1/: Assessment by a demonstrator; production is rough estimate

Considering the cultivation of local variety and fertilizer doses in last year, fertilizer doses were reduced to about 65% in total elements of the basic proposed rate. Further, a planting density of 30 x 30cm was applied in the plot at the request of the demonstrator. The number of panicles per unit area was substantially lower in the plot compared with those in other plots. The lower yield level of the plot, therefore, could be explained by limited fertilizer use and lower planting density and infestation of stem borer to a limited extent. No clear differences was observed between 2-3 plants/hill and 1 plant/hill after around the middle of vegetative growth stage.



(e) Plot 5

Variety	Crop Cut Survey (t/ha)		Whole Plot		Demonstrators Assessment 1/	
	Range	Average	Field Yield	Production	Production	Assessment
2-3 plants/hill	3.7 – 5.2	4.4	4 t/ha 2/	456 kg	- kg	increased
1 plant/hill	3.9 – 5.3	4.6				

1/: Assessment by a demonstrator; production is rough estimate 2/: Estimated yield as discussed below

The growth of rice plants in the plot was excellent the initial growth stage to harvest attracting interests of farmers around. However, isolated maturing of early variety in the rainy season also attracted rat and moderate crop losses resulted. However, as the maturing time of the variety could be adjusted to that of medium variety by adjusting planting time easily, crop losses due to rat attack can be reduced to normal level. The estimated yield was obtained assuming crop losses is maintained at ordinal level. If., high yielding variety of IR 66 is cultivated, higher yield than Sen Pidao will be expected as reported yield difference of about 1 ton/ha between Sen Pidao and IR66 by a FWUC leader in Takeo Province. No clear differences was observed between 2-3 plants/hill and 1 plant/hill after around the middle of vegetative growth stage.



(f) Plot 6

Variety	Crop Cut Survey (t/ha)		Whole Plot		Demonstrators Assessment 1/	
	Range	Average	Field Yield	Production	Production	Assessment
2-3 plants/hill	4.1 – 5.0	4.6	4 t/ha 1/	309 kg	290 kg	increased
1 plant/hill	3.9 – 4.2	4.0				

1/: Assessment by a demonstrator; production is rough estimate

The growth of rice plants in the plot was good from the initial growth stage to harvest.

However, the plot suffered from slight to moderate crop losses due to rat attack because of isolated maturing. The estimated yield was obtained assuming crop losses is maintained at ordinal level as is the case in Plot 1. No clear differences was observed between 2-3 plants/hill and 1 plant/hill after around the middle of vegetative growth stage.

BI-4.8.5 Results

Yield of six verification test plots were compared with target yield of the master plan as follows.

Yield Comparison with the Master Plan Target

Category of Variety	Variety	Plot No.	Target Yield of Master Plan (t/ha)	Average Yield in Year 2006 (t/ha)	Difference (t/ha)
Medium Variety	Riang Chey	Plot 1	3.0	3.9	+0.9
	Riang Chey	Plot 2	3.0	4.8	+1.8
	Riang Chey	Plot 3	3.0	3.9	+0.9
	Niang Meng	Plot 4	3.0	3.2	+0.2
	Average		3.0	4.0	+1.0
Early Variety	Sen Pidao	Plot 5	3.0	4.0 1/	+1.0
	Sen Pidao	Plot 6	3.0	4.0 1/	+1.0
	Average		3.0	4.0	+1.0

1/: Assesment by a demonstrator; production is rough estimate

As a result, yield of verification plots showed higher yield as compared with the target of master plan.

BI-4.9 Small Scale Adaptability Trials

BI-4.9.1 Objective

The general objective is to establish a trial field for the Implementation Team members to carry out trial on alternative farming practices such as improved rice farming practices such as improved rice farming practices, adaptability test on alternative farming practices and trial on element farming technologies such as variety trial. Another important side objective is to demonstrate alternative farming practices and responses of rice growth to the alternatives to farmers so that they could learn something from the differences in practices and growth. Individual objectives of the tests are explained as follows;

Objectives of Adaptability Test in Zone-1 in 2006/07

Trial	Objective
Simple Trial on Medium Variety (RT-2) & on Early Variety (Prey Pdao Station) - Variety Trial	To test adaptability of 4 medium varieties
- Nursery seeding rate	To test effects of seeding rate & number of plants/hill (1 plant/hill & 2-3 plants/hill) on growth & yield
Seeding Rate & Planting Method (Riang Chey)	To test effects of water saving rice culture on growth & yield To test adaptability of water saving rice cultivation

BI-4.9.2 Trial Design

The trial designs of the test in the zone are as shown in the following table.

Design of Adaptability Test in Zone -1 in 2006/07

Trial	Treatment
Simple Trial on Medium Variety (RT-2) - Variety Trial	4 medium variety (Riang Chey, Phka Rumchang, Phka Rumduol, Car 4)
- On-farm Water Management (Riang Chey)	Continuous flooding Intermittent irrigation in vegetative phase Continuous intermittent irrigation
Seeding Rate & Planting Method	Seeding rate 20, 40, 60 g/m ² & 1 plant/hill, 2-3 plant/hill

Simple Trial on Early Variety (Prey Pdao Station)	
- Variety Trial	4 early variety (IR 66, Sen Pidao, IR Kesar, Chul Sa)
- On-farm Water Management	Same as medium variety trial
- Seeding Rate & Planting Method	Same as medium variety trial

BI-4.9.3 Adaptability Test on Medium Variety

(1) Growth History and Key Farming Practices

The trial plot on medium variety in RT2 was suffered from inundation occurred from August 17 to 20 at 1 week after transplanting and was under complete inundation for about 2.5 days. After the inundation, rice plants recovered well and excellent growth was observed. However, from around the middle of vegetative growth, infestation of stem borer became serious and the results of trial were affected seriously by the incident. The results of the trial on medium variety conducted in RT2 are as shown in the Growth history and key farming practices were same as those for verification test shown in the section BI-4.8.

(2) Results

The trial plot on medium variety in RT2 was suffered from inundation occurred from August 17 to 20 at 1 week after transplanting and was under complete inundation for about 2.5 days. After the inundation, rice plants recovered well and excellent growth was observed. However, from around the middle of vegetative growth, infestation of stem borer became serious and the results of trial were affected seriously by the incident. The results of the trial are as follows;

Results of Simple Trial for Medium Variety in Zone -1

Trial/Variety	Treatment	Crop Cut Yield 1/	Whole Plot Yield
Variety Trial	Phka Rumchang	3.6 t/ha	-
	Phka Rumduol	3.9 t/ha	3.8 t/ha
	Riang Chey	5.9 t/ha	3.9 t/ha
On-farm Water Management (Riang Chey)	Continuous intermittent	4.7 t/ha	3.7 t/ha
	Intermittent in vegetative stage	5.9 t/ha	4.4 t/ha
	Continuous flooding	5.1 t/ha	3.2 t/ha
Seeding Rate & Planting Method (Riang Chey)	40 g/m ² & 2-3 plants/hill	5.5 t/ha	5.4 t/ha
	60 g/m ² & 2-3 plants/hill	5.8 t/ha	5.7 t/ha

1/: Samples taken at point showing normal growth

(a) Variety Trial

Phka Rumchang and Phka Rumduol matured earlier and harvested at DAT 101 or DAS 120. At harvesting time, both the varieties dried up due to unknown reason (poor drainage of the plot ?) and yield level was unexpectedly low due partly to infestation of stem borer. Rieng Chey also affected by stem borer but crop cut survey at a normal growth point indicated high yield. High potential yield of the variety was confirmed to a certain extent through the trial (potential yield reported by CARDI: 3.5 - 6.0 t/ha)

(b) On-farm Water Management

The trial was conducted as a preliminary test on water saving culture and to observe an effect of water saving on rice growth. The water saving methods applied were as follow;

Continuous intermittent irrigation up to late maturing stage	3 days flooding + 2 days dry-up
Continuous intermittent irrigation during vegetative phase	3 days flooding + 2 days dry-up
Continuous flooding up to late maturing stage	Continuous flooding

The trial was also adversely affected by the infestation stem borer, however, observations during a growth period indicate better growth in intermittent plots compared with a

continuous flooding plot. The irrigation methods and growth differences were explained to the demonstrators in the zone at a joint field visit made on October 19 so as to ensure their cooperation on water saving cultivation to be tested in the next season.

BI-4.9.4 Adaptability Test on Early Variety

The results of the trial on early variety conducted in Prey Pdao Station are as follows;

Results of Simple Trial for Early Variety in Zone -1

Trial/Variety	Treatment	Crop Cut Yield 1/	Whole Plot Yield
Variety Trial	IR 66	5.4 t/ha	5.9 t/ha
	Sen Pdao	5.9 t/ha	4.5 t/ha
	IR Kesar	5.2 t/ha	4.5 t/ha
On-farm Water Management (Sen Pdao)	Continuous intermittent	5.2 t/ha	4.1 t/ha
	Intermittent in vegetative stage	6.1 t/ha	4.4 t/ha
	Continuous flooding	5.6 t/ha	4.9t/ha
Seeding Rate & Planting Method (Sen Pdao)	40 g/m ² & 1 plant/hill	6.1 t/ha	5.1 t/ha
	40 g/m ² & 2-3 plants/hill	5.7 t/ha	4.6 t/ha

1/: Samples taken at point showing normal growth

The trial plot in the Station had excellent growth of rice plants in all the treatments.

(a) Variety Trial

High potential yield of IR 66 (whole plot yield of 5.9 t/ha) was confirmed. Yield level of IR 66 (whole plot yield) was about 1 t/ha higher than that of Sen Pdao as shown in the table above.

(b) On-farm Water Management

The trial was conducted as a preliminary test on water saving culture and to observe an effect of water saving on rice growth. The water saving methods applied were same to those applied in the trial on medium variety. Plant growth in intermittent irrigation plots comparable to that in a continuous flooding plot was learned through field observations.

(c) Seeding Rate and Planting Method

Growth of rice plants in each plot was excellent but no clear differences in growth among treatments were observed.

BI-4.10 Farmers' Acceptability Survey

BI-4.10.1 Objective

The farmers' acceptability survey was carried out with an objective of the preliminary assessment of the adoptability of improved farming practices introduced in the verification plots by farmers through the simple interview surveys with the demonstrators.

BI-4.10.2 Methodology

The acceptability survey was carried out on the improved rice farming practices by way of the simple interview survey with the demonstrators. Major inquiries made to the interviewee are as follows;

Major Inquiries for Farmers Acceptability Survey

Subject	Inquiry	Target Group
Improved Farming Practices	Assessment, reasons, comments on elements improved farming practices	Demonstrators
	Comparison of paddy production in verification plot with production in last year	

BI-4.10.3 Results

All the demonstrators (in total of 8 demonstrators) assessed as “good” or “proper rate” the improved farming practices adopted, except for variety, seeding rate, planting density and fertilization. Demonstrators’ major comments on such practices assessed unfavorably are: i) preferring IR 66 having higher yielding capacity to Sen Pidao (1 farmer), ii) excessive seeding rate of 30 kg/ha (3 farmers), iii) proper planting density of early variety 20 x 20 cm in stead of 20 x 25cm (5 farmers) and iv) excessive basal dressing (2 farmers). All the demonstrators in the rainy season assessed positively the simple line planting newly introduced in the season.

Six demonstrators reported yield increase of paddy from the last year. Their reasoning for yield increase include: *sufficient fertilizer, adoption of water management (irrigation & drainage), improved nursery & transplanting practices*. One demonstrator reported yield decrease because of poor weeding, poor leveling and missing hills due to crab cut.

For questioning whether they follow the proposed practices in the next season, almost all the demonstrators reported to follow seed selection, seeding density in nursery, number of seedlings/hill and fertilization. However, rather negative responses to raised seedbed preparation and regular planting are reported because of labor requirements for practices.