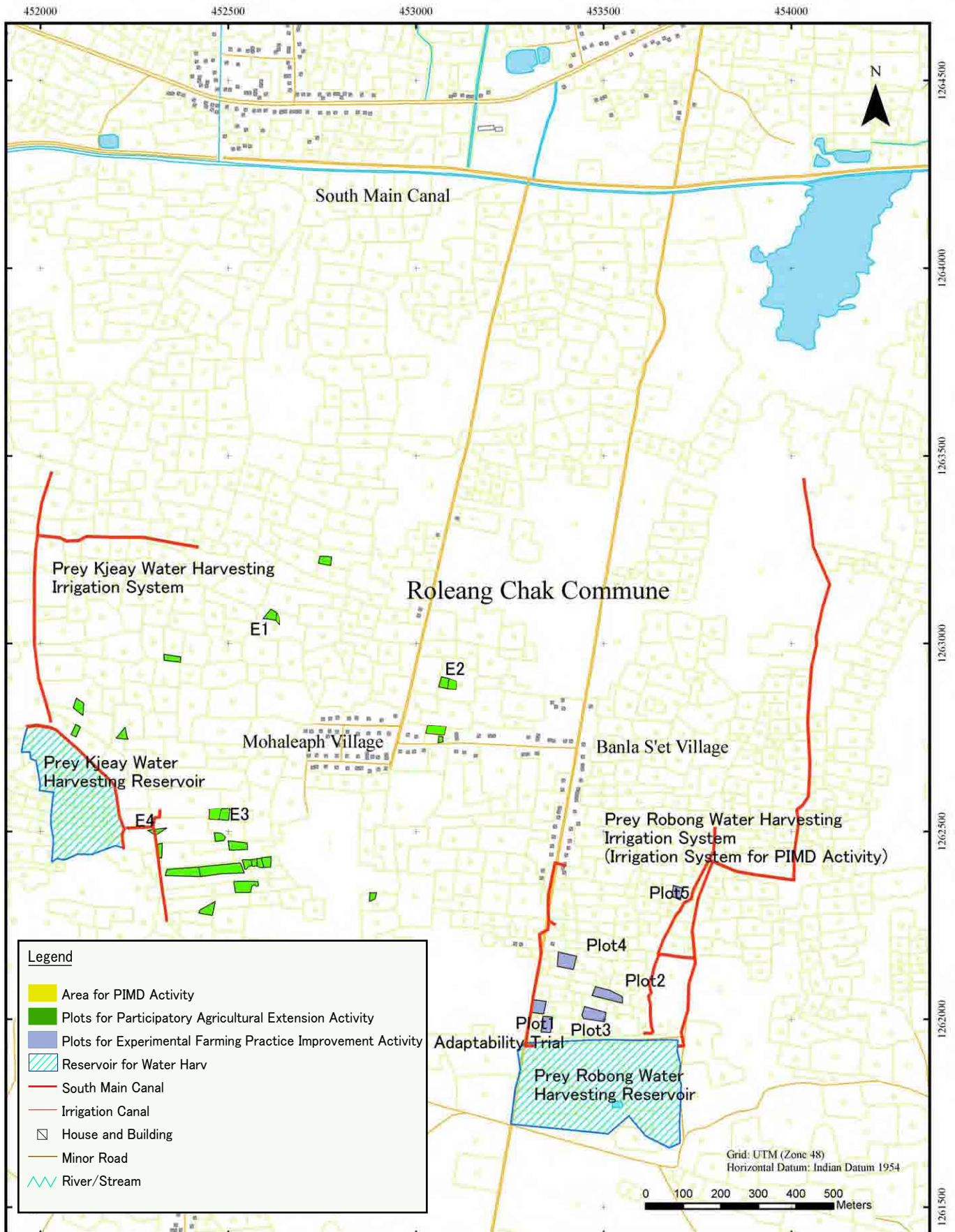


**PART-B**  
**PILOT PROJECTS (2006/2007)**

***Section-II***  
***Irrigated Agriculture On-farm***  
***Technology Improvement Pilot Project***  
***in Zone-3***



*Experimental Plot in Banla S'et Village*  
*(Experimental Farming Practice Improvement Activities in Zone-3)*



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

Japan International Cooperation Agency

Location Map of Zone-3 Pilot Project

## **PART-B: PILOT PROJECTS (2006/2007)**

### **Section-II**

## **Irrigated Agriculture On-farm Technology Improvement Pilot Project in Zone-3**

### **Chapter BII-1 Framework of the Project**

#### **BII-1.1 Objective**

Objective of the “Irrigated Agriculture On-farm Technology Improvement Pilot Project in Zone-3 (irrigated area by water harvesting irrigation system)” is to establish a good model of on-farm irrigated agriculture improvement in Zone-3. The model has to demonstrate the 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 Zone-3 areas.

#### **BII-1.2 Project Area**

Area for the project activities was proposed as follows (see the location map of pilot project area in Zone-3).

##### **BII-1.2.1 Area for Participatory Irrigation Management and Development Activities**

There are 49 water harvesting irrigation systems in Zone-3 according to the inventory survey of irrigation systems conducted in the Master Plan study. By using the result of the survey, two medium size water harvesting reservoirs were selected as candidate sites for the pilot project area. The candidates were located in the same commune, which is Roleang Chak commune in Samraong Tong district. As shown in section BII-1.3, the commune representatives were asked by the pilot project implementation team to choose one of them for the pilot project area. Finally, the commune representatives selected Prey Robong water harvesting irrigation system in Banla S’et village as an area for PIMD activities in Zone-3.

##### **BII-1.2.2 Area for Participatory Agricultural Extension Activities**

Since PIMD activities and participatory agriculture extension activities require intensive participation from the farmers, it was decided to conduct the activities in different locations in the first year of the pilot project to avoid confusion of the farmers. A water harvesting irrigation system which was not selected as an area for PIMD activities in Roleang Chak commune was selected as an area for participatory agricultural extension activities. The system chosen was the Prey Kjeay water harvesting irrigation system in the village of Mohaleph located in Samraong Tong district.

##### **BII-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 is initiated by PDA and the JICA study team with cooperation of several farmers. This means that the area for the experimental farming practice could overlap the PIMD activities area even in the first year. Banla S’et village, which is a PIMD activities area, was selected for the experimental farming practice improvement.

### BII-1.3 Kick-off Seminar

Kick-off seminar for Roleang Chak commune was held at Roleang Chak 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. There were two candidate irrigation systems (Prey Robong water harvesting irrigation system in Banla S'et village and Prey Kjeay water harvesting irrigation system in Mohaleaph village) for PIMD activities in the commune. The participants were requested to decide in which irrigation system they want to conduct PIMD activities. After hot discussion, it was decided by all the participants that Prey Robong irrigation system was more preferable for PIMD activities, since water resources of the system were larger than that of Mohaleaph irrigation system.



Roleang Chak commune chief was concluding the seminar

### BII-1.4 Schedule

The project started in May 2006 and will be completed in February 2008. First half of the pilot projects were executed until February 2007 as shown below. Second half of the project will start again from May 2007 and run to February 2008.

**Implementation Schedule of the Pilot Projects in Zone-3**

Activities	2006												2007												2008			
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3				
(1) Baseline Survey			■																									
(2) Kick-off Seminar			■																									
(3) Participatory Irrigation Management and Development																												
(4) Participatory Agriculture Extension																												
(5) Experimental Farming System Improvement																												
(6) Evaluation																												

### BII-1.5 Project Design Matrix (PDM)

Project Design Matrix (PDM) for the project was prepared as follows. The PDM was improved from the PDM which was proposed in the Master Plan.

(Target Group: Farmers in Zone-3 pilot project area)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<b>Overall Goal</b> Agricultural productivity centering on rice is improved in the target area	1-1 Agricultural productivity in the target area is improved as proposed in the Master Plan by year 2015	1-1 Agricultural statistics	
<b>Project Purpose</b> Good model of on-farm irrigated agriculture improvement in Zone-3 is established	1-1 Result of the pilot project is evaluated as being an applicable model for Zone-3 by stakeholders by year 2007	1-1 Questionnaire to the stakeholders	- All the proposed activities in the Master Plan in the post-project stage are implemented as scheduled - No significant climatic change - No severe damage to the irrigation facilities by natural disaster
<b>Outputs</b> 1 Irrigation water is distributed with minimum loss of water by model organization 2 Low inputs SRI awareness is disseminated by farmer-to-farmer extension	1-1 Irrigation water is distributed with minimum loss of water by model organization by year 2007 2-1 A total of 50 farmers in the model villages apply low inputs SRI by farmer-to-farmer extension by year 2007	1-1 Record of water distribution 2-1 Monitoring surveys	- Responsibility of each stakeholder in water management is not changed within the project period

3 Target yield of the Mater Plan is achieved by applying SRI based improved farming practice	3-1 Yield of improved farming practice in experimental plots is higher than the target yield of the Master Plan	3-1 Crop yield surveys	
<b>Activities</b> (1. Participatory Irrigation Management and Development) 1-1 To prepare water use maps 1-2 To prevent water loss 1-3 To educate irrigation management group on proper water use 1-4 To construct on-farm irrigation facilities in simple way 1-5 To train irrigation management group on water management (2. Participatory Agriculture Extension) 2-1 To organize study tour 2-2 To conduct village training 2-3 To carry out inter-village training 2-4 To hold farmers' field day (3. Experimental Farming Practice Improvement) 3-1 To conduct verification test to confirm effectiveness of SRI based on improved farming practices 3-2 To conduct small scale adaptability trials for further improvement of the farming practice	<b>Inputs</b> Donors  Experts Transportation Equipment for monitoring irrigation water distribution Cost of study tour Construction cost of model irrigation facilities	Cambodia  <u>Irrigation Management Organization</u> Organization members  <u>Provincial government</u> Counterparts from PDOWRAM and PDA  <u>Central government</u> Counterparts from MOWRAM and MAFF  <u>NGO</u> Facilitators	- Continuous involvement of related government agencies and model FWUC during the project period - No severe natural disaster within the project period  <b>Preconditions</b> - 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

## Chapter BII-2 Participatory Irrigation Management and Development Activities

### BII-2.1 Objective

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

#### Objective

To achieve efficient use of reservoir water for irrigation in a sustainable and replicable way

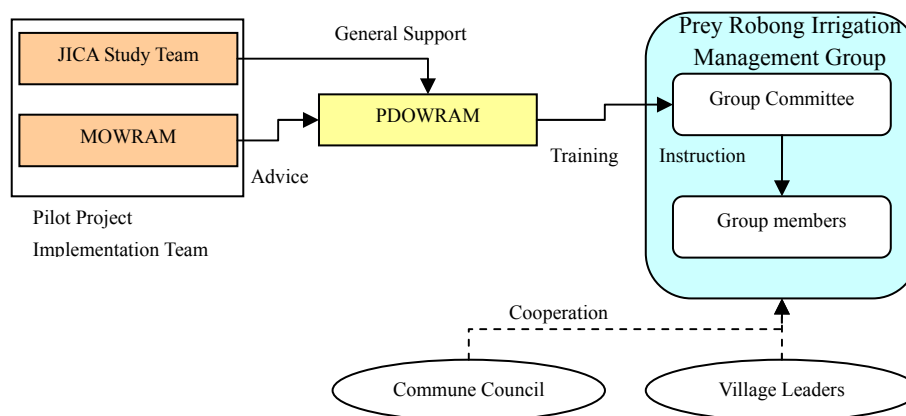
Efficient use of water in Zone-3 could be defined as irrigation water distribution with minimum loss of water by water users. The efficient use of irrigation water could be achieved by efforts of the irrigation water management group<sup>1</sup> and the Government.

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, it is obviously not sustainable, since the Government can not implement continuous intensive water control outside the pilot project area. Efficient use of irrigation water needs to be achieved by the irrigation water management group in the area, so the role of the Government is to support and empower the group. It also should be reminded that the group in the area strongly requested the development of water resources. However, the pilot project implementation team convinced the group that the objective of the pilot project is limited to effective use of water.

### BII-2.2 Institutional Set-up

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

In the first year of the pilot project, PIMD activities was implemented mainly by PDOWRAM Kampong Speu office with support from the JICA study team and MOWRAM. Role of PDOWRAM was to support the existing irrigation management group, which is Prey Robong irrigation management group. Relationship of those organizations is illustrated as below. Support for the group was carried out by PDOWRAM and the JICA study team and MOWRAM supported PDOWRAM.



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

<sup>1</sup> Irrigation management group in this report was defined as a group in charge of operation and maintenance of a water harvesting irrigation system with limited water resources. It is similar to an FWUC but simpler in structure (the group does not have sub-groups) and weaker in function (the group is not collecting irrigation service fees).

## BII-2.3 Situation before Starting Pilot Project Activities

### BII-2.3.1 Area for the Activities

As mentioned in sub-section BII-1.2.1, Prey Robong water harvesting irrigation system in Banla S'et village was selected for the area of PIMD activities.

### BII-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 to key persons, questionnaire surveys for sampled farmers, and site inspections by experts.

### BII-2.3.3 Agriculture

Agricultural condition in the area was not very favorable since the area was frequently suffering from drought. The exclusive crop in the area was paddy. Farmers in the area cultivated paddy with traditional farming practices. Under the traditional farming practices, farmers transplanted 45 day old seedlings with more than 5 plants per hill. For details of the agronomic conditions, see sub-section BII-4.3.3.

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

### BII-2.3.4 Irrigation and Drainage / Water Management

#### BII-2.3.4.1 Irrigation System

According to the interview with the chief of Trapeang Prey Robong irrigation management group (an organization responsible for management of Prey Robong water harvesting irrigation system), Prey Robong water harvesting irrigation system supplied water to 38ha of paddy fields in Banla S'et Village, Roleang Chak Commune, Samraong Tong District. Water source was a water harvesting reservoir. Water from some mountains via Kong Si Canal is stored in the reservoir in the rainy season. Types of irrigation are both i) gravity and ii) pump. Beneficial farmers are 63 families as of June 2006. The Chief estimates all village households were farmers who hold land in the irrigated area.

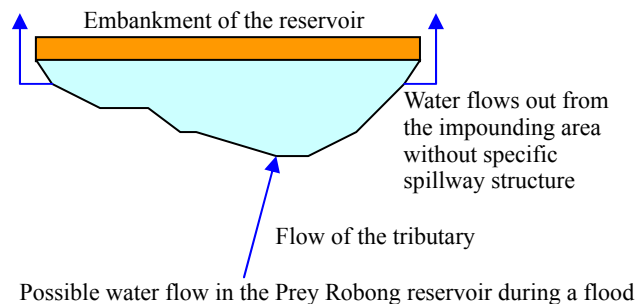
Prey Robong water harvesting irrigation system consists of the following facilities.

- Prey Robong water harvesting reservoir
- Intake for right bank canal
- Right bank canal (1.9km)
- Left bank canal (0.6km)

The Prey Robong reservoir had been constructed for domestic water use and it was enlarged in year 2003 with assistance of the World Food Program. Water resources of the reservoir were very limited and water in the reservoir could be easily lost

because of its shallow water depth. As a result, the reservoir could supply water to paddy fields only in end of the rainy season. No specific spillway structure was provided on the reservoir, but it seemed that water could flow out from the impounding area without spillway structure when floods come (see the figure above). It could be said that the reservoir was a typical water harvesting reservoir.

The water harvesting irrigation system had two canals, the right bank canal and left bank canal. The right bank canal supplied water from the intake structure on the reservoir.



Condition of the right bank canal was relatively good but some farmers placed obstructions in the canal to bring water to their plots. According to the chief of Prey Robong irrigation management group, the right bank canal could convey water for Banla S'et village of Roleang Chak commune and for Saen Dei commune when the reservoir had a lot of water. The left bank canal did not have an intake structure and received only spill out water from the reservoir. Farmers sometimes relied on the left bank canal water pumped from the reservoir. Situation of the irrigation facilities of Prey Robong water harvesting irrigation system are shown below.

#### Irrigation Facilities of Prey Robong Water Harvesting Irrigation System



#### BII-2.3.4.2 Drainage System

There is no drainage facility in the irrigation system.

#### BII-2.3.4.3 Water Management

Water in the Prey Robong reservoir was distributed by Trapeang Prey Robong irrigation management group. According to the chief of the group, the committee members open the intake structure and distribute water from the reservoir when farmers requested them to do so. The chief also confessed that there were conflicts in water distribution when water in the reservoir was inadequate, even though the conflicts were not very serious. The committee members had been trained by PDOWRAM under the SEILA project for the short term. The chief also noticed that the water distribution method explained in the training course was ideal but difficult to apply to their water harvesting irrigation system.



#### BII-2.3.4.4 Facility Maintenance

According to the interview with the chief of the irrigation management group, if the damage is not severe they repair damaged parts of the irrigation system with cooperation of Roleang Chak Commune Council. If they find severe damage in the system, they request support through the Commune Council.

#### BII-2.3.5 Organizations

##### II-2.3.5.1 Trapeang Prey Robong Irrigation Management Group

###### (a) Background

Trapeang Prey Robong irrigation management group was organized from 2003 to 2005. The trigger for forming the irrigation management group was an approach from the World Food Program “Food for Work” program from 2003 to 2004. Afterward, Roleang Chak Commune Council started initiating activities to organize it into an irrigation management group. In 2005, SEILA started to provide Commune Funds to Roleang Chak Commune. The farmers of Banla S’et Village needed to organize an irrigation management group to receive Funds for constructing irrigation facilities. Then, the villagers gathered to elect 3 persons to manage the irrigation management group.

###### (b) Management Board

Trapeang Prey Robong irrigation management group was managed by a committee consisting of 3 persons selected through the election mentioned above. The roles of each committee member are indicated in the table below.

**Roles of Each Committee Member**

Position	Role
Chief	1) To encourage the farmers not to waste water. 2) To observe the farmers.
Deputy Chief	The same as the Chief.
Accountant	The same as the Chief.

*Source: Interview with the chief of Prey Robong irrigation management group (June 2006)*

The chief of the irrigation management group was also the Deputy Commune Chief of Roleang Chak Commune and the deputy chief was also the Village Chief of Banla S’et village. Therefore, the chief was always busy with the works concerning the Commune Council and was only responsible for supervision. The other 2 members were farmers. The Committee did not function properly. They had held a meeting only once in 2004 when the Committee members had been elected. The existence of the irrigation management group was acknowledged at the level of the Commune Council but was not officially registered in PDOWRAM and MOWRAM.

###### (c) Irrigation Service Fees

Trapeang Prey Robong irrigation management group did not have written regulations; however, as was commonly known among the villagers, water collected in the reservoir could not be applied except for agricultural use. Other regulations were mentioned on the notice board beside the reservoir stating “Do not waste water,” “Use water properly,” and “Do not catch native fish in Trapeang Prey Robong.” There were no irrigation service fees. The farmers could use the water for free. When they needed water, they asked the chief to open the intake structure constructed by the SEILA Commune Fund.

#### II-2.3.5.2 Community Organizations

##### (1) Commune Council

Banla S'et village is located in Roleang Chak Commune, Samraong Tong District. The latest election of the Commune Council was conducted in 2003, according to the Village Chiefs of the commune. The number of Commune Council members was 7 and 6 of them were males. Its main roles were i) dissemination of information on village development, ii) provision of motor pumps, and iii) maintaining security.

##### (2) Village Development Committee (VDC)

Banla S'et village had established a VDC in their village. The number of VDC members was 3 persons. The features of the VDC were i) the Village Chief and Deputy Village Chief were the members of the VDCs, and ii) gender balance was good (males 2: female 1), and iii) Banla S'et VDC members were elected in June 2006.

#### II-2.3.5.3 Farmers' Group

There was a "Savings Group" organized in March 2005 through the initiative of CEDAC. Compared with the pilot project area of Zone-1, there were fewer farmers' organizations. It was observed that farmers of Banla S'et village had not received sufficient agricultural extension service.

### **BII-2.4 Identified Constraints for Participatory Irrigation Management and Development Activities**

#### **BII-2.4.1 Irrigation and Drainage / Water Management**

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

- Water resources of the water harvesting irrigation system were so limited that the farmers in the area could only receive water from the irrigation system at the end of rainy season.
- There was no water distribution schedule.
- There was no structure to distribute water properly.

#### **BII-2.4.2 Irrigation Management Group**

The following problems related to Trepeang Prey Robong irrigation management group were identified by the baseline survey.

- Most of the group members did not pay much attention to proper water use due to lack of official management and irrigation facilities, and limited water resources.
- The irrigation management group did not play the role of irrigation manager. The irrigation management group had been organized as a recipient organization of World Food Program and SEILA. Its functions had not been improved since its formation.
- Exact size of the management area of the irrigation management group and the number of water users were unknown. There was no cadastre or cadastral map.
- The irrigation management group had not received sufficient support from PDOWRAM and did not have written regulations.
- The chief of the group did not quite understand proper water management. The committee members had received training on water distribution only once from SEILA and PDOWRAM. The chief thought the contents of this training were not suitable for their water harvesting irrigation system.

## **BII-2.5 Activities Conducted for Improvement**

### **BII-2.5.1 Preparation of Improvement Plan**

When the pilot project implementation team started the activities for Prey Robong water harvesting irrigation system, there was little water in the reservoir (see the photo on the right). The water level was lower than the intake structure, so it was impossible to start irrigation. The implementation team asked Trepeang Prey Robong irrigation management group to inform PDOWRAM staff when they started irrigation. The implementation team also informed them that after they start irrigation, the team would try to determine the nature of the situation and prepare an improvement plan together with them.



Situation of Prey Robong Reservoir  
on July 21, 2006

While the project implementation team waited for the irrigation management group to start irrigation, the team decided to prepare maps of the irrigation system. It was decided to start the other improvement practices after preparation of the improvement plan.

### **BII-2.5.2 Implementation of Improvement Practices**

#### **BII-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**

Preparation of preliminary land holding map in a participatory manner was experimentally applied as follows.

- Necessity of the activities and procedures for preparing paddy plot resource maps were explained by PDOWRAM staff to the Trepeang Prey Robong irrigation management group chief.
- As the chief was busy in works for the Commune Council, he nominated the deputy chief of the group (Banla S'et Village Chief) to prepare the paddy plot resource map which shows all the paddy plots receiving water from the irrigation system.
- PDOWRAM staff tried to prepare a preliminary land holding map of the system without a proper paddy plot resource map and insufficient cooperation from the villagers.

##### **(3) Results and Observations**

Preparation of a proper paddy plot resource map failed. The deputy group chief tried to prepare the map but he could prepare only a part. He confessed that it was difficult for him to draw the map since he did not know much about the area. He also said that even he asked for help but nobody wanted to support him. It was found that farmers in the area were not paying attention to the water harvesting irrigation system. Then PDOWRAM staff tried to prepare the preliminary land holding map using an incomplete paddy plot resource map, but it was found to be very difficult. The incomplete paddy plot resource map misguided PDOWRAM staff and villagers were not very cooperative with the mapping. Finally the pilot project implementation team decided to postpone the mapping and restart it only if it is really necessary.



Chief of the irrigation management group was learning how to prepare the paddy plot resource map from PDOWRAM staff

Incomplete paddy plot resource map prepared by the irrigation management group

### BII-2.5.2.2 Water Use Map Preparation Practice

#### (1) Objective

Objective of the practice is to confirm the canal layout of the Prey Robong water harvesting irrigation system.

#### (2) Actions Taken

The following actions were taken for the mapping.

- Coordinates of the reservoir impounding area and canal routes were surveyed by PDOWRAM by using a handheld GPS.
- Surveyed data was transferred from the GPS to a computer and the shapes of the reservoir impounding area and canal routes were digitized by using GIS software.

#### (3) Results and Observations

Survey results (boundary of reservoir impounding area and canal layout) were presented on the location map of the pilot project area in Zone-3. Length of canals and canal layout were confirmed by the survey. The result will be used for water management improvement next season.

### BII-2.5.2.3 Severe Drought in Year 2006

Unfortunately, the drought in year 2006 rainy season continued until the end of the rainy season.

As a result, water level in the reservoir did not reach intake water level.

This means that water never flowed into the right bank canal. According to the Village Chief, several farmers introduced reservoir water into the left bank canal using portable pumps during the transplanting period. However, after several days, he instructed villagers to stop using reservoir water, since the water level of reservoir came to be extremely low.

Consequently, the situation of water distribution could not be confirmed on site this season. Thus, a water management improvement plan for Prey Robong water harvesting irrigation system could not be prepared in this season, since it was impossible to prepare it without seeing the actual situation.

The following photos are a comparison of the



Types of portable pump used for taking water from the Prey Robong water harvesting reservoir

situations at the end of the rainy season last season (left) and this season (right). Photos of last season show that there was some amount of water remaining in the reservoir and canals. On the other hand, the reservoir and canals were completely dried up this season.

Situation Last Season (February 07, 2006)	Situation This Season (January 24, 2007)
 <p data-bbox="493 734 724 763">Prey Robong Reservoir</p>	 <p data-bbox="1032 734 1264 763">Prey Robong Reservoir</p>
 <p data-bbox="440 1167 778 1196">Prey Robong Reservoir and Intake</p>	 <p data-bbox="979 1167 1318 1196">Prey Robong Reservoir and Intake</p>
 <p data-bbox="520 1592 699 1621">Right Bank Canal</p>	 <p data-bbox="1059 1592 1238 1621">Right Bank Canal</p>

**BII-2.6 Specific Findings in Zone-3 PIMD Activities**

The following are the findings of PIMD activities in Zone-3.

(1) Extremely Limited Availability of Water Resources

It was found that water resources for Prey Robong water harvesting irrigation system are extremely limited. The irrigation system could not supply water throughout the year. Trapeang Prey Robong irrigation management group said it usually can supply water only at the end of the rainy season even under normal weather conditions. It was revealed that facilities for the irrigation system need to be very simple or non-permanent type, since

only small benefit can be expected from this investment.

(2) Low Peoples' Interest in Unreliable Irrigation System

It was observed that Banla S'et villagers are not paying attention to Prey Robong water harvesting irrigation system, since the irrigation system rarely supplies water when they need it. The villagers were not very cooperative when the pilot project implementation team asked them to help prepare a paddy plots resource map.

(3) Necessity of Improving an Irrigation Management Group with a Different Concept than the FWUC in Zone-1

From the above mentioned facts, it was confirmed that the process for improving Trapeang Prey Robong irrigation management group must be different than that for Ou Veaeng FWUC in Zone-1. The improvement process should be simplified and collection of irrigation service fees can hardly be expected. Probably, it is deemed that the group should be placed as a lower branch of an existing organization such as a local authority (Commune Council and Village Chief).

(4) Difficulty in Preparing Preliminary Land Holding Map without a Proper Paddy Plot Resource Map or Farmers' Cooperation

The pilot project implementation team tried to prepare a preliminary land holding map of the area. During the map preparation, it was found to be difficult to prepare the preliminary land holding map without a proper paddy plot resource map or the farmers' cooperation. If boundaries of paddy plots were not drawn on the paddy plot resource map, the field survey team lost their way in the field. Cooperation from the villagers was also found to be essential, especially when the field survey team lost their way. Unfortunately, Banla S'et villagers were not very cooperative with the mapping work since they were not interested in their unreliable water harvesting irrigation system.

## Chapter BII-3 Participatory Agricultural Extension Activities

### BII-3.1 Objective

Objective of participatory agricultural extension activities is as follows.

#### Objective

To disseminate information regarding low cost and low input type SRI (so 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

The detailed explanation of Strategy-4 and Strategy-5 is given in section BI-3.1.

### BII-3.2 Institutional Set-up

Institutional set-up for participatory agricultural extension activities was decided 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.

### BII-3.3 Situation before Starting Pilot Project Activities

#### BII-3.3.1 Area for the Activities

As mentioned in sub-section BII-1.2.2, Mohaleaph village, which is receiving water from Prey Kjeay water harvesting irrigation system, was selected for the area of participatory agricultural extension activities.

#### BII-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 with key persons, questionnaire surveys for sampled farmers, and site inspection by experts.

#### BII-3.3.3 Agriculture

Agricultural condition in the area was similar to that of neighboring Banla S’et village. The area was always suffering from drought and the exclusive crop in the area was paddy. Farmers in the area cultivated paddy with traditional farming practices. Under the traditional farming practices, farmers transplanted old seedlings after about 45 days with more than 5 plants per hill.

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

#### BII-3.3.4 Irrigation and Drainage Systems

Prey Kjeay water harvesting irrigation system supplies water for 45ha of paddy field in Mohaleaph Village, Roleang Chak Commune, Samraong Tong District. Water source was a water harvesting reservoir. The water from some mountains via a stream was stored in the reservoir in the rainy season. Types of irrigation were i) gravity when the reservoir holds plenty of water and ii) pumping when the level of reservoir water is low. Benefited farmers were 63 families. This figure was the number of total households in Mohaleaph Village as of June 2006. The Chief estimates that all the villagers were farmers who hold

land in the irrigated area.

### Irrigation Facilities of Prey Kjeay Water Harvesting Irrigation System



Prey Kjeay water harvesting irrigation system consists of the following irrigation facilities as presented above.

- Prey Kjeay water harvesting reservoir
- Intake for right bank canal
- Right bank canal
- Left bank canal

A type of water harvesting reservoir similar to Prey Robong water harvesting reservoir was provided at neighboring Banla S'et village. The reservoir was called Prey Kjeay reservoir.

The water harvesting irrigation system has two canals, the right bank canal and left bank canal. Total length of canals was 1.9km. The right bank canal is supplied water from the intake structure on the reservoir.

There is no drainage facility in the irrigation area.

### BII-3.3.5 Organizations

#### BII-3.3.5.1 Farmers' Groups

There were no farmers' groups that engaged in activities in Mohaleaph village before starting the pilot project. Compared with the pilot project area of Zone-1, there were fewer farmers' organizations. It was also observed that farmers of the village had not received sufficient agricultural extension service so far and did not have convenient



access to rural micro finance either in cash or in-kind.

### BII-3.3.5.2 Prey Kjeay Irrigation Management Group

#### (a) Background

Prey Kjeay irrigation management group was organized in 2003 under the instruction of Roleang Chak Commune Council to receive SEILA Commune Funds. The Commune Council decided to use the funds to rehabilitate and deepen the reservoir in Mohaleaph Village.

#### (b) Management Board

Prey Kjeay irrigation management group was managed by a Committee consisting of 5 persons; the Chief, Deputy Chief, Secretary, Accountant, and Assistant. Roleang Chak Commune Council appointed them during the National Election in 2003 to repair part of the weir and prepare for establishing a FWUC. Roles of each committee member are indicated in the table below.

**Roles of Each Committee Member**

Position	Role
Chief	1) To distribute water (opening and closing the gates) 2) To organize a group to repair the weir and to protect water in the flood 3) To encourage the people to pay irrigation service fees 4) To request water from the small canal in a neighboring village and to request that the village keeps control of water during the rainy season
Deputy Chief	1) To maintain the reservoir 2) To distribute water 3) To observe the reservoir. If the reservoir collapses, instruct all villagers to take action.
Secretary	To record all spending for hiring a company to repair the broken part of the reservoir*
Accountant	1) To keep the money 2) To manage expenditures
Assistant	To assist meeting the requirements of the villagers and report to the Committee

Note: \* Financial source is the remains of the SEILA Commune Funds

Source: Interview with the Committee Chief of Prey Kjeay FWUC (June 2006)

The members were farmers and did not receive any pay or allowances for their activities from the irrigation management group or from the Commune Council. They said, they did not care about money and the most important thing was how much water they could obtain.

The Committee was more or less functional. They held two types of meetings; i) emergency meetings and ii) monthly meetings. The irrigation management group was not registered officially as a FWUC yet although the existence of the reservoir was already recorded by MOWRAM in 1986. The Committee intended to register the irrigation management group as a FWUC in the near future.

#### (c) Irrigation Service Fees

Prey Kjeay irrigation management group did not have any written regulations such as by-law. Irrigation service fees had not been determined yet. This means that nobody been paid irrigation service fees. In the future plan, the fees would be Riel 5,000/household/year to help pay for rehabilitating the reservoir and excavating a canal. The committee members stated that the beneficial farmers had already agreed with this plan.

### BII-3.3.5.3 Community Organization

#### (1) Commune Council

Mohaleaph village is located in Roleang Chak Commune, Samraong Tong District. The latest election of the Commune Council was conducted in 2003, according to the village chiefs of the commune. The number of Commune Council members is 7 and 6 of them are males and one is a female. Its main roles are i) dissemination of information on village development, ii) provision of motorized pumps, and iii) maintaining security.

(2) Village Development Committee (VDC)

Mohaleaph village had established VDC in their village. The number of VDC members was 2 persons. The features of the VDC were i) the Village Chief and deputy Village Chief are members of the VDC, and ii) gender balance was good (male 1: female 1), and iii) the VDC members were elected in June 2006.

### **BII-3.4 Identified Constraints for Participatory Agricultural Extension Activities**

#### **BII-3.4.1 Agriculture**

The following problems in agriculture were identified by the baseline survey.

- Innovations in paddy farming, such as SRI, had not been introduced although farmers were interested in it.
- No agricultural extension program was provided to farmers in the village.
- Farmers were could not receive irrigation water properly due to insufficient water source.

#### **BII-3.4.2 Farmers' Group**

Reasons for the lack of a farmers' group in Mohaleaph village were as follows.

- There were few opportunities for farmers to consider formation of a self-reliant farmers' group in order to obtain the collective benefits. There might be two reasons; i) tragic memories of collective works during the past regimes, and ii) lack of assistance from domestic and international support agencies.
- The farmers did not have the opportunity to organize a group, even for merely receiving agricultural extension services.

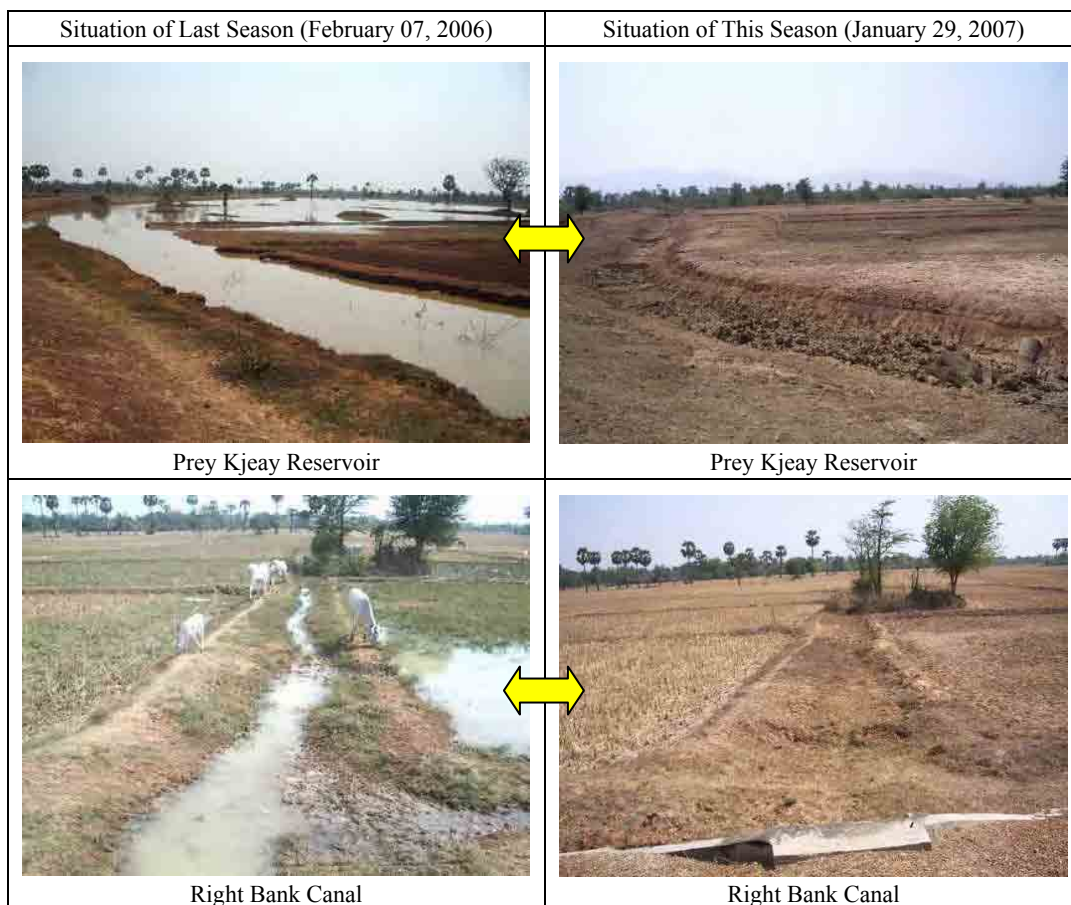
### **BII-3.5 Activities Conducted for Improvement**

#### **BII-3.5.1 Preparation of an Improvement Plan**

A system similar to the Zone-1 pilot project for the farmer-to-farmer agriculture extension system was selected for Zone-3 as well. For the farmer-to-farmer agricultural extension framework, see sub-section BI-3.5.1.

#### **BII-3.5.2 Severe Drought in Year 2006**

The Prey Kjeay water harvesting irrigation system was struck with severe drought in the rainy season of year 2006. The following photos are the comparison of situations at the end of the rainy season last season (left) and this season (right). Photos of last season show that there was water remaining in the reservoir and canal. On the other hand, this season the reservoir and canal are completely dried up.



### BII-3.5.3 Farmer-to-Farmer Low Inputs SRI Extension Practice

#### BII-3.5.3.1 Initial Guidance

Initial guidance on low inputs SRI extension was held at Mohaleaph village on July 5, 2006. A total of 34 farmers including 26 women joined the guidance (there were 62 families in the village according to SEILA Commune Database in year 2004). In the guidance, the 12 principles for low inputs SRI which were mentioned in clause BI-3.5.2.1, were explained to Mohaleaph villagers by farmer promoters from Pring village of Roleang Chak commune. The farmers who are interested in SRI were motivated to apply the principles as much as possible considering their field situation.

In the initial guidance, the 3 points which were mentioned in clause BI-3.5.2.1, were explained to remove farmers' concerns regarding introduction of SRI.

Almost all the participants were interested in SRI and 21 farmers 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.

#### BII-3.5.3.2 Study Tour

The study tour to Ang and Khtom village, Cheng Prey and Ba Theay districts, Kampong Cham province was organized on July 10 and 11, 2006 for the purpose of learning SRI practice on site. From three pilot project target villages, 27 experimental and interested farmers joined the tour. For details of the study tour, see clause BI-3.5.2.2.



Participants having discussions in the study tour

### BII-3.5.3.3 Village Training

Village training was given to the farmers' group of Mohaleaph village at their village basically once a month. The following issues related to SRI were discussed in the village training. Attendance rate to the training was the highest among the three target villages (there were 62 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 12	- Sharing experiences in the Study Tour - Comparison of traditional farming with SRI	25
2	August 10	- Problems in agriculture and livelihood	22
3	October 20	- How to combat draught - Application of weeding tools	12
4	November 21	- Selection of good seeds	14

The major concern for the farmers' group members in Mohaleaph was drought. Especially in the beginning, experimental farmers said it was difficult for them to transplant younger seedlings, since the seedlings had already grown big while they were waiting for rain and transplanting. Some farmers even mistakenly believed that they could not continue SRI because their seedlings had already grown big. The pilot project implementation team explained that they could continue SRI by applying other principles. Finally, they agreed to continue testing SRI. It was also recommended to pump water from a pond if there was a suitable one near their plots.



CEDAC facilitator in the village training at Mohaleaph



Village Training at Mohaleaph

### BII-3.5.3.4 Inter-village Workshops

Inter-village workshops were held in Kampong Speu basically once a month by inviting experimental farmers and farmer promoters for the three villages. Major SRI issues discussed in the inter-village workshop were as follows. See clause BI-3.5.2.4 for details of the discussions in the inter-village workshops.



Inter-village Workshop

### Major Issues regarding SRI in the Inter-village Workshops

No.	Date	Major Issues
Activities in Year 2006		
1	August 18	- Confirmation of damage from the flood in August - 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)

#### BII-3.5.3.5 Farmers' Field Day

Farmers' field day was held at Mohaleaph village to demonstrate 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 27	- Answering questions from farmers who did not apply SRI - Confirming effects of SRI in the field	17
2	December 19	- Comparing yield of SRI and traditional farming practice	26

#### (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 did you prepare the nursery?
- How old are your rice seeds?
- How did you transplant?
- What kind of fertilizer do you use?

Then, the experimental farmers took all the participants to their fields. The participants compared root systems of paddy grown by SRI and traditional farming practices 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.



Participants were checking SRI paddy in farmers' field day in September 2006

#### (2) Farmers' Field Day in December 2006

In the farmers' field day in December 2006, yields of SRI and traditional farming practice paddy were confirmed. The participants confirmed that they can obtain higher yields with fewer inputs if they apply low inputs SRI.

#### BII-3.5.3.6 Results

The results could be basically evaluated in a participatory manner. This means that farmers decide by themselves whether they want to continue to apply SRI or not by themselves. 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 decided to continue applying some innovation, it was because they judged the

innovation as 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 innovations. Yields obtained from SRI are also an important evaluation factor but these are easily affected by weather and/or soil conditions, so the yields are only used as a supporting factor of the evaluation. Finally, the indicators of the result could be summarized as follows.

- Number of farmers who applied SRI (the most important indicator)
- Number of cooperative farmers or members of farmers' groups (indicator for possibility of future dissemination of the innovation)
- Yield comparison between SRI and traditional farming made by the farmers themselves

(1) Number of Farmers who Applied SRI

It was decided that if farmers apply more than three principles of low inputs SRI, those farmers recognized that they are applying SRI. This criterion is commonly used in this dissemination of low inputs SRI, so that the situation can be easily compared with the other areas. A total of 16 farmers (there were 62 families in the village according to SEILA Commune Database in year 2004) including four experimental farmers applied low inputs SRI in Mohaleaph village. A total of 4 among the 22 farmers (including 3 experimental farmers) tested SRI by comparing SRI and traditional farming practices but the other 18 farmers applied SRI without a comparison test.

(2) Total Area of SRI Applied Paddy Plots

Areas of SRI applied paddy plots were preliminarily surveyed by handheld GPS under assistance of the JICA study team. In Molaleaph village, SRI was applied on 1.67 ha in total for 22 paddy plots. Among them 0.24 ha for 4 plots were cultivated by the 4 experimental farmers. It should be noted that although the accuracy of this survey was not so high since the survey was conducted by handheld GPS, it must be good enough to get an overview of SRI dissemination in the village.

**Total Area of SRI Applied Paddy Plots in Mohaleaph Village**

	Experimental farmers	Cooperative farmers	Total
Number of Plots	4	18	22
Total Area (ha)	0.24	1.43	1.67
Average Area (ha)	0.06	0.08	0.08

(3) Number of Cooperating Farmers (Members of the Farmers' Group)

All four experimental farmers said that they want to continue SRI next season. They also replied that they want to enlarge their SRI areas and reduce their areas 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 brings higher yields.
- SRI requires less input such as seeds, fertilizer, and labor.

It is also expected that more farmers will apply SRI after they saw the results of the experimental farmers. Since 51 farmers attended the village training (there were 62 families in the village according to SEILA Commune Database in year 2004) at least for one time in this season, some of them may also apply SRI next season.

(4) Farmer-based Yield Comparisons of Traditional Farming with SRI

The project implementation team instructed the experimental farmers to divide their paddy plot into two areas and compare SRI and traditional farming practices. When the farmers harvest 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 farmers understand the effects of SRI. To make them confident in SRI, crop cutting and comparison was 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 the yields or requested that the project compensate them for any losses. Even though some plots had low yields, the farmers understood that such low yields did not happen due to the introduction of SRI. The yields of SRI were higher than the traditional yields even in these cases. 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 the yields of SRI will always be higher than those of traditional practice, since the same farmers conducted the crop cutting for both the plots.

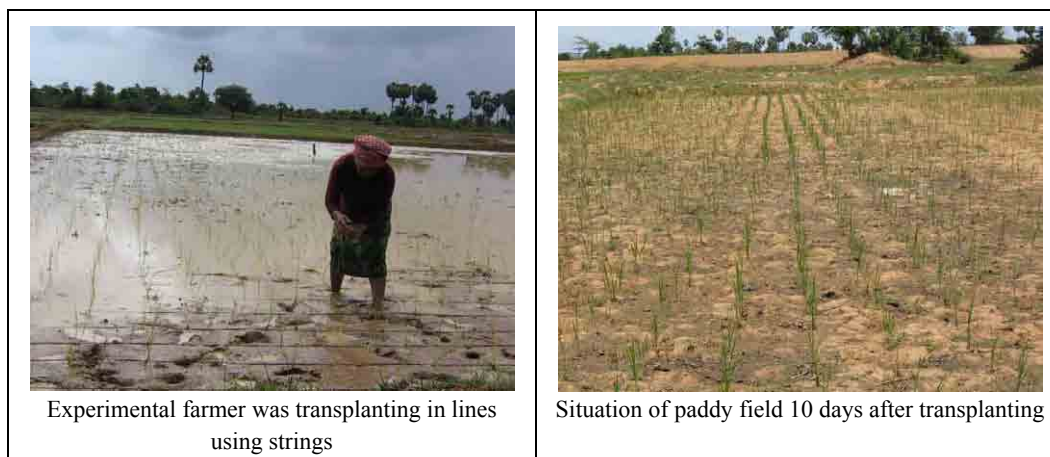
#### Farmer-based Yield Comparisons of Traditional Farming with SRI in Mohaleaph

No.	Fictitious Name	Sex	Variety	Yield (ton/ha)		Balance
				SRI	Traditional	
E1	Farmer-A	Male	Chung Kon Mon	0.2	0.1	+0.1
E2	Farmer-B	Female	Srov Krohorm	4.2	3.3	+0.9
E3	Farmer-C	Female	Kro Horn	4.0	3.3	+0.7
E4	Farmer-D	Female	Bey Kantom	3.4	2.7	+0.7
Average				3.0	2.4	+0.6

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

Experimental farmer-A faced severe drought, so his crops failed in both the farming practices.

As compared with the other two pilot project areas in Zone-1 and Zone-4, his result shows the lowest yield. The reason might be the severe drought. The pilot project in Zone-4 received more rainfall.



Experimental farmer was transplanting in lines using strings

Situation of paddy field 10 days after transplanting

#### (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 did not apply chemical fertilizer but organic fertilizer such as cow manure to their comparison plots based on their traditional farming practice in Mohaleaph village. They applied 2.6 ton/ha of organic fertilizer in average without any cost (see the table below).

All the four experimental farmers increased amount of organic fertilizer to SRI plots according to the instruction from the implementation team. They increased the amount from 2.6 ton/ha to 4.3 ton/ha without additional cost.

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 without additional cash but only local material available in the village 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 Mohaleaph**

Farming Practice	Traditional (comparison plot)			SRI		
	Chemical	Organic	None	Chemical	Organic	None
Fertilizer						
No. of Farmers	0	4	0	0	4	0
Average Amount	-	2.6ton/ha	-	-	4.3ton/ha	-

**BII-3.5.4 Farmer-to-farmer Ecological Chicken Raising Extension Practice**

**BII-3.5.4.1 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 activities would become weak. The farmers’ group in Mohaleaph village was asked what they wanted to improve in the dry season during the village training in October. 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 farmers are not interested in it, 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 rainfall
- Cattle running free would damage the fields

Then, the farmers were asked by the facilitator if there was any other agricultural improvement which can be carried out in their village. The facilitator gave some ideas to the 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 the problem of easy spread of disease. The facilitator explained that there is a possibility of improving the situation. The facilitator also explained they can show advanced activities of farmers in other areas but farmers who want to introduce chicken raising have to buy chicks at their own expense.

**BII-3.5.4.2 Study Tour**

For the purpose of learning about chicken raising and other activities on site, 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. For details of the study tour, see clause BI-3.5.3.2.



Participants were also learning about cook stoves in the study tour



#### BII-3.5.4.3 Village Training

Village training was given to the farmers' group of Mohaleaph 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 for the dry season (ecological chicken raising etc.)	12
2	November 21	- Sharing experience of the study tour	14
3	December 8	- 13 principles of ecological chicken raising	10

In the village training in December 2006, an experienced farmer promoter invited from Prey Veng province shared his knowledge and the 13 principles which were mentioned in clause BI-3.5.3.3, were explained to the participants.

#### BII-3.5.4.4 Result

In Mohaleaph village, several farmers said that they want to apply ecological chicken raising innovations, but they have not started their activities yet.

#### BII-3.5.5 Farmers' Group Strengthening Practice

##### BII-3.5.5.1 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 in 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 knowledge from advanced farmers in the farmers' group.
- By enhancing farmer-to-farmer extension in the group, the government can reduce the cost for extension.
- Existence of a farmers' group motivates farmers to think and improve their situation by themselves. Farmers who can think, decide, and improve by themselves would further improve SRI practice by themselves. This means that the group has a strong relationship with 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 procurements and group shipping activities in the future.

##### BII-3.5.5.2 Study Tour

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

##### Major Issues regarding the Farmers' Group in the Study Tour

No.	Date	Destination (Province)	Major Objective	Issues regarding the 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

### BII-3.5.5.3 Village Training

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

#### **Major Issues regarding the Farmers' Group in the Village Training**

No.	Date	Major Issues	No. of Participants
Activities in Year 2006			
1	October 19	- Progress of the farmers' group and savings sub-group	12

It was found that many members were interested in forming a farmers' group, especially for forming a savings sub-group. The farmers' group members said that they were organizing monthly regular meeting on 17th of each month by themselves. Existence of the savings sub-group could be one of the reasons to motivate them for organizing regular meetings by themselves, since they have to discuss their saved money regularly.

### BII-3.5.5.4 Results

#### (1) Formation of Farmers' Group

As a result, a farmers' group was organized in Mohaleaph village with 51 farmers. The expected activity of the farmers' group is the dissemination of SRI to other farmers in the village. Effect of farmers' group in SRI dissemination will be evaluated in the next rainy season.

#### (2) Formation of Savings Sub-group

Mohaleaph farmers' group members are interested in savings activities. Four leaders for the savings sub-group, including one experimental farmer for SRI dissemination and the Village Chief, were elected by the members. As of January 2006, they formed the savings sub-group but had not started to save money.

### **BII-3.6 Preliminary Improvement Plan to be executed in Next Season**

Similar to last year, activities such as i) Study tours, ii) Village training, iii) Inter-village workshops, and iv) Farmers' field days will be continued in the next season as well. The pilot project implementation team will try to involve more farmers in the village into the project activities. In addition, it is planned that Village Chiefs around Mohaleaph village will be invited to the activities to test the effectiveness of such trans-village extension.

### **BII-3.7 Specific Findings in Zone-3 Participatory Agriculture Extension Activities**

The following is the finding from the participatory agricultural extension activities in Zone-3.

#### (1) Extremely Limited Availability of Water Resources

It was found that water resources for Prey Kjeay water harvesting irrigation system are extremely limited. The irrigation system could not supply water throughout the year. Due to the drought, farmers in the irrigation area could not receive any water from the irrigation system. It affected yield of paddy.

It might be necessary next year to motivate farmers having paddy plots near the reservoir to be experimental farmers, so the effect of water harvesting irrigation could be examined.

## Chapter BII-4 Experimental Farming Practice Improvement Activities

### BII-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 input 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 the Master Plan

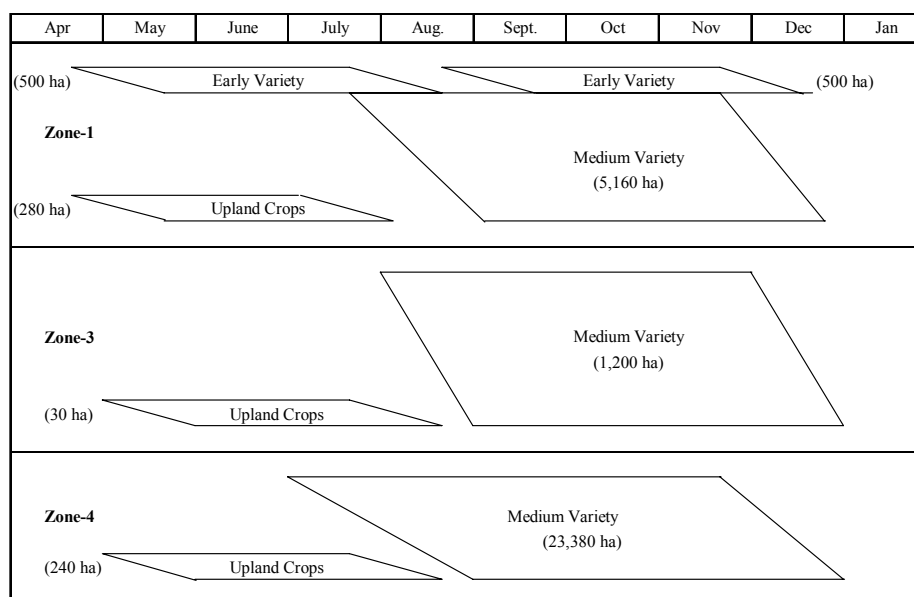
The proposed agricultural development plan formulated in the master plan for Zone 3 is as follows;

#### Proposed Agricultural Development Plan for Zone-3

Zone	Cropping Pattern		Cropping Intensity (%)			Target Yield (paddy ; ton/ha)
	Early Rainy	Rainy	Early Rainy	Rainy	Annual	
Zone-3	upland crops	Rice	5	100	105	2.8

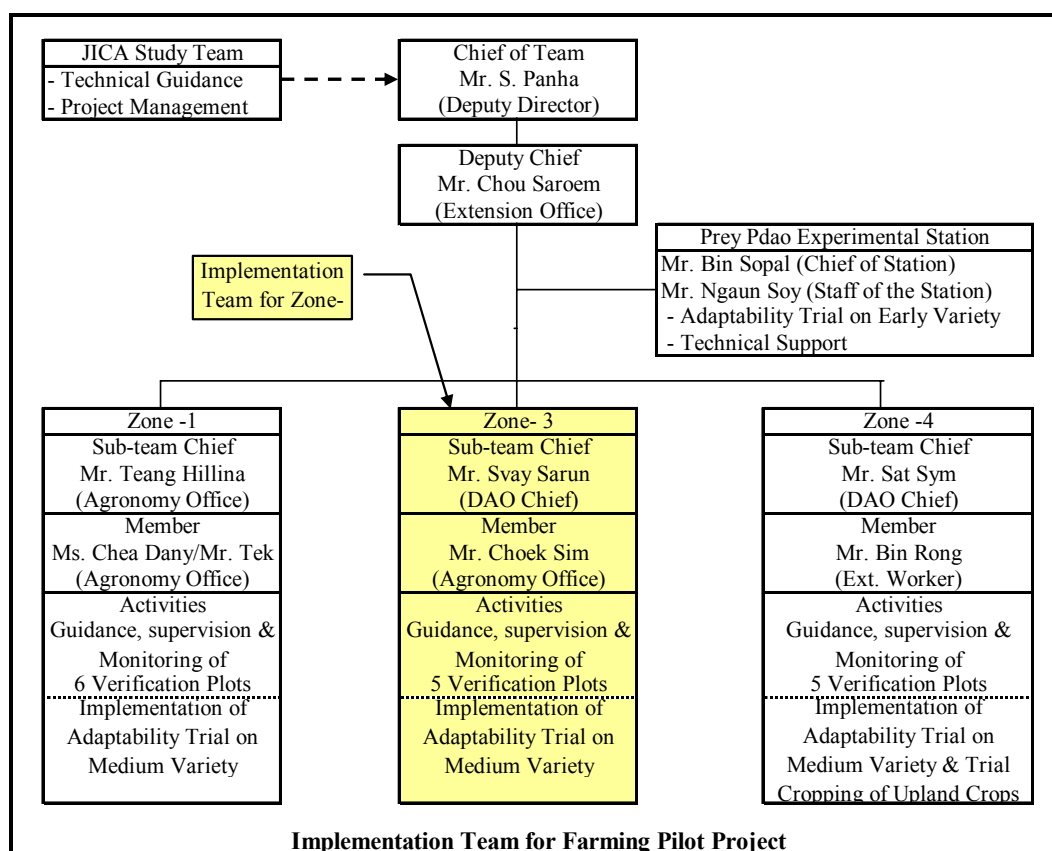
Source: Interim Report of the Master Plan, 2006

The proposed cropping pattern for Zone-3 is illustrated as shown below.



## BII-4.2 Institutional Set-up

For the implementation of the pilot project in Zone 3, the Implementation Team for the farming pilot project was formed by PDA staff with technical guidance and managerial role of the JICA study team as illustrated below.



## BII-4.3 Situation before Starting Pilot Project Activities

### BII-4.3.1 Area and Demonstrators for the Activities

#### (1) Selection of Area for the Activities

As explained in sub-clause BII-1.2.3, Banla S'et village, which was receiving water from Prey Robong irrigation system, was selected as the area for PIMD activities and also for experimental farming practice improvement activities.

#### (2) Selection of Demonstrators for the Activities

At the preparatory workshop at village level held on June 23, 2006, paddy plots for verification tests and small scale adaptability tests were selected with the following basic criteria for the selection.

- Target fields must have sufficient irrigation water supply from a canal,
- Target fields should be free from flooding, and
- Target fields should not be newly reclaimed fields (they should have been established for more than 10 years)

Five verification test plots and one adaptability test plot in the project area were selected and five owners of the verification plots were recognized as the demonstrators.

### BII-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.

### BII-4.3.3 Farming Practices in Bos Ta Ney Village

Banla S'et village is a drought prone area and occurrence of drought in 3 years (2003, 2004 and 2005) out of the 4 years from 2003 to 2006 was reported by the villagers. Rice production was the exclusive crop sub-sector activities and production of other annual crops was negligible. Major fruit trees are mango and sugar palm. Present agricultural conditions of the village are briefed in the following table.

**Agricultural Profiles of Banla S'et Village**

No. of Families	57	Land Use		Farm Machinery/Facilities	
No. of Farm Families	55	Rice Fields	24 ha	Water Pumps	4
Population	260	Upland Fields	12 ha	Rice Mills	3
Labor Force/Family	2.5	Rice Cropped Area/Yield/ Production			
Rice Field Holding/Farm F.	0.44 ha	Year	Cropped Area	Avg. Yield	Avg. Yield 1/
Cattle Population	79	2003	28 ha	1.0 t/ha	1.2 t/ha
Pig Population	37	2004	28 ha	0.2 t/ha	1.2 t/ha
No. of Hand Tractors	0	2005	28 ha	2.0 t/ha	1.8 t/ha
No. of Threshers	0	2006	28 ha	1.7 t/ha	

1/: Yield level of Roleang Chak commune (SEILA Data Base) Source: SEILA Data Base 2005 & village chief

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

**Prevailing Rice Farming Practices in Banla S'et Village**

Practices	
Nursery	Common variety: Chmar Laet; Chung Kong Mon; seeding rate: avg. 84.5 kg/ha Seed source: own products; Seed replacement: seldom replaced with quality seed
Land Preparation	Draft animals; 2 plowing & 1 harrowing or 2 plowing & 2 harrowing
Transplanting	Random planting; density: 20 ~ 25 cm, avg. 5.8 plants/hill, seedling age: avg. 45 days
Fertilization	Manure: 0.9 ton/ha; chemical fertilizer: DAP & urea; doses depending
Irrigation	Almost under rainfed conditions
Harvesting	Harvesting: manual 100%; manual threshing; engine winnower; threshing at home yard
Paddy Yield	Avg.: 0.9 ~ 1.3 t/ha (2003 ~ 2006)

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

Soils distributed in the verification test and small scale adaptability trial plots were classified as Plinthic Acrisol (PA). Their chemical properties are as follows;

**Soil Chemical Properties of Verification Test and Adaptability Trial Plots in Zone-3**

Soil Depth	Texture 1/	pH (H <sub>2</sub> O)	Total C (%)	Total N (%)	Total P P <sub>2</sub> O <sub>5</sub> (%)	Available P <sub>2</sub> O <sub>5</sub> (ppm)	CEC	Exchangeable Cation		
								Ca	Mg	K
								(meq/100g soil)		
0-15cm	SL~CSL	5.7	0.43	0.04	0.01	16.5	8.5	3.3	1.8	0.1
15-30cm	CSCL	6.3	0.39	0.05	0.01	17.5	10.5	4.3	2.3	0.2

1/: CSL = coarse sandy loam; CSCL = coarse sandy clay loam Source: JICA study team

As shown, the surface layers of the major soils have: i) slightly 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 high content of available P<sub>2</sub>O<sub>5</sub> in both surface and sub-surface layers of all the soils.

### BII-4.3.5 Identified Constraints for Farming Practices Improvement

The primary agronomic constraints in the drought prone project area identified through the baseline survey and field survey are: i) low and unstable yield of paddy attributed to limited and unstable rainfall and closely related to limited availability of water resources for irrigation, ii) the same attributed to prevailing traditional or inadequate farming practices, iii) low land use intensity in early rainy season and iv) limited coverage of extension services.

### BII-4.4 Strategies Established for Pilot Project and Overall Framework for Pilot Project

#### BII-4.4.1 Strategies Established for Pilot Project

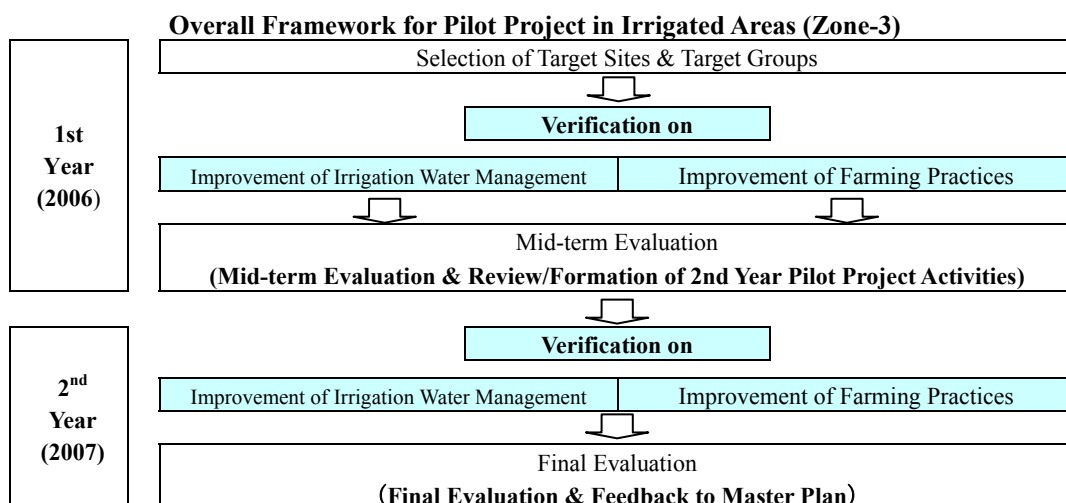
The strategies for the agricultural pilot project for Zone-3 established in accordance with the overall objectives and proposed agricultural development plans are presented in the followings.

**Objectives of and Strategies Established for Agricultural Pilot Project**

Zone	Objectives	Strategies
3	- Verification of proposed agricultural development Plans	1 <sup>st</sup> year (2006) - Verification of improved rice farming practices under ordinal irrigation in rainy season - Implementation of small scale adaptability trial
		2 <sup>nd</sup> 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 <sup>st</sup> year (2006) - Selection of demonstrators & formation of a farmer group - Provision of technical guidance to demonstrators & group members
		2 <sup>nd</sup> year (2007) - Selection of demonstrators - Provision of technical guidance to demonstrators & group members

#### BII-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.



#### BII-4.5 Programs and Program Descriptions

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

### Program Descriptions of Programs in 2006

Verification on	Program	Objectives	Target Area
Improved Irrigated Medium Rice Farming Practices	Small Scale Adaptability Test on Medium Variety	Simple trial on alternative farming practices (variety, planting method etc.)	Zone-3
	Verification Test on Medium Variety	Verification/demonstration of improved farming practices	Zone-3
Farmer Training & Extension Activities	Training Course, Workshop & Mass Guidance, Formation of Farmer Group, Extension Activities (by PDA etc.)		All zones

#### BII-4.6 Implementation Arrangement

The demonstrators, operators, provision of farm inputs and other arrangements for the implementation of the programs under the agricultural pilot project are explained in the following table.

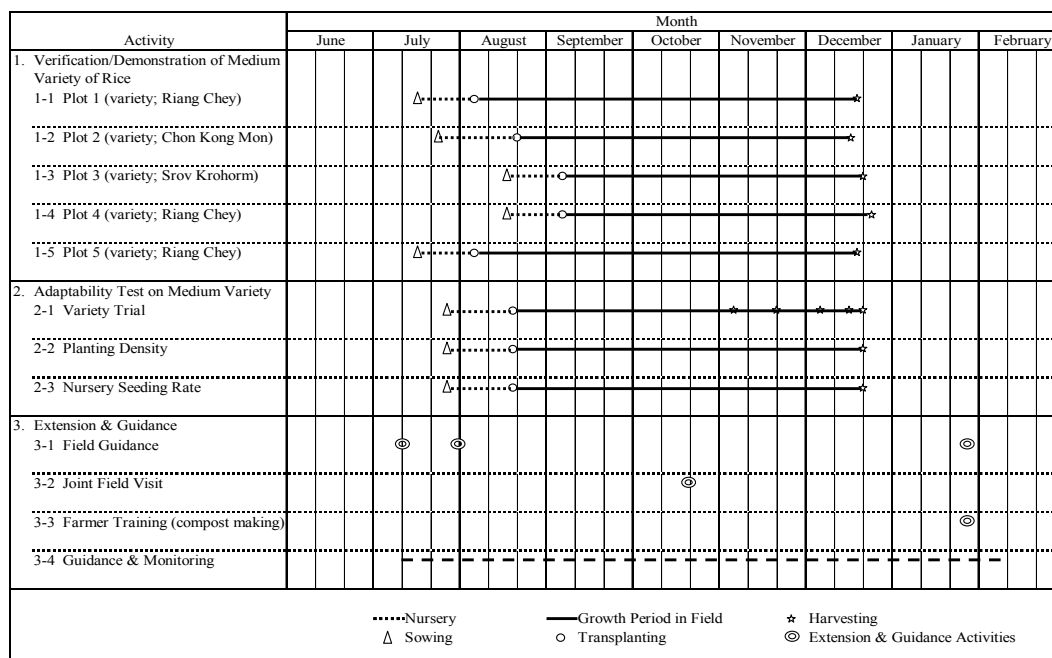
#### Arrangements for Programs Implementation

Program	Operator	Seed Supply 1/	Fertilizer Supply 1/	Land Prep. 1/
Verification Test	Farmer	Improved variety: by project Local variety: by farmer	Compost: by farmer Fertilizer: by project	Final prep. by project
Adaptability Test	IP Team	By project	By project	By project

1/: By whom costs are born

#### BII-4.7 Pilot Project Activities in 2006/07

The pilot project activities in 2006/07 in Zone-3 are composed of: i) verification test, ii) small scale adaptability test (simple trial), iii) farmers' acceptability survey and iv) field guidance activities. In addition, Implementation Team Technical Meetings were held for guidance and managerial purpose of the activities. The overall features and schedules of the activities are illustrated in the following figure.



#### BII-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 2006/07 in Zone-3

Category of Variety	Plot No.	Plot Size	Variety	Demonstrator
Medium Variety	Plot 1	12.7 a	Riang Chey	Sat Vuth
	Plot 2	19.0 a	Chung Kong Mon	Men Sambut
	Plot 3	16.9 a	Srov Krohorm	Nov Chany
	Plot 4	17.3 a	Riang Chey	Men Chan Tha
	Plot 5	7.5 a	Riang Chey	Long Beoun

#### BII-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 as shown in the following table.

#### Trial Activities Implemented in 2006/07 in Zone-3

Activities	Trial Components	Period
Small Scale Adaptability Test - Adaptability Test on Medium Variety	- Variety trial	July ~ Dec.
	- Planting density	
	- Seeding rate & planting method	

#### BII-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.

#### BII-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; 1<sup>st</sup> and 2<sup>nd</sup> guidance for demonstrators and a simple trial cooperators and the 3<sup>rd</sup> and 4<sup>th</sup> 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 <sup>st</sup> Guidance July 11 Participants: 6	- 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 <sup>nd</sup> Guidance July 31 Participants: 6	- Providing practical guidance on improved farming practices (from land preparation to harvest)	- Providing guidance to demonstrators using guidance materials
	- Scheduling for land preparation & Transplanting	- Scheduling for land preparation & transplanting - Provision of fertilizer
3 <sup>rd</sup> Guidance Jan. 26 Participants: 23	- Explanation of results of the pilot project activities	- Presentation & discussion
	- Discussion on improved farming practices - Discussion on next year activities	- Exchange opinion (program needs, farmers interests etc.)
4 <sup>th</sup> Guidance Feb. 14	- Explanation of programs in 2007	- Providing guidance to group members
	- Selection of target farmers & fields for	- Selection of target farmers among



Participants: 20	verification/demonstration activities in early rainy season in 2007	members - Field check of candidate fields
---------------------	--	--

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

At the 3<sup>rd</sup> 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 as discussed in sub-section BI-4.7.4 and as follows;

#### Objectives and Activities of OJT on Farming Practices

Guidance	Objectives/Subject Farming Practices	Activities
OJT on Raised Seed Bed Preparation July 15 - Aug. 19	- 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 5 - Sep. 6	- Providing practical guidance on: - uprooting seedlings by shovel - regular planting using planting line	Providing guidance to demonstrators & assisting their practices

### (3) 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

### (4) 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. 26 -27 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: 63 & 87 in Zone-1.

Major results or findings of the guidance are similar to the same discussed in the sub-section BI-4.7.4. However, a Farmer Group member in the zone constructed a compost yard by his own expenses soon after the training course. The news pleased the Implementation Team a lot.

(5) 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.

**BII-4.8 Verification Test**

**BII-4.8.1 Objective**

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

Rainy Season Rice	Medium variety: average 2.8t/ha 3.0 t/ha & 2.5 t/ha at 1/2 dependability
-------------------	---

**BII-4.8.2 Verification Plots**

The verification tests were implemented at 5 plots in the zone as follows;

**Verification and Trial Activities Implemented in 2006**

Category of Variety	Plot No.	Plot Size	Variety	Demonstrator
Medium Variety	Plot 1	12.7 a	Riang Chey	Sat Vuth
	Plot 2	19.0 a	Chung Kong Mon	Men Sambut
	Plot 3	16.9 a	Srov Krohorm	Nov Chany
	Plot 4	17.3 a	Riang Chey	Men Chan Tha
	Plot 5	7.5 a	Riang Chey	Long Beoun

**BII-4.8.3 Growth History and Key Farming Practices**

(1) Overall Features

The progress reporting and farming records of the pilot project for each plot are briefly explained 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	July 15 - Aug. 19	- Basal dressing	Aug. 5 - Sep. 6
- Sowing	July 16 - Aug. 19	- 1st Top dressing	Sep. 4 - Sep. 29
Final land preparation	Aug. 5 - Sep. 6	- 2nd Top dressing	Sep. 27 - Nov. 18
Transplanting	Aug. 5 - Sep. 6	Panicle Initiation	± Sep. 11 - Oct. 22
Irrigation in Field	(pumping) 2 to 4 times	Flowering	± Oct. 15 - Nov. 25
Weeding	2 times	Harvesting	Nov. 6 - Dec. 22
		Threshing	Dec. 13 - Dec. 23

*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) Rainfall Distribution in Year 2006

The rainfall distribution during the period of field activities is shown in comparison with the same in Prey Nheat village in Zone 4, rainfed area, as follows;

**Rainfall Distribution in 2006 in Banla S'et Village**

Zone	Unit	July	Aug.	Sep.	Oct.	Nov.	Total
Banla S'et (3)	mm	45	182	184	65	45	521
	%	9	35	35	12	9	100
Prey Nheat (4)	mm	60	309	325	88	20	802
	%	7	39	41	11	2	100
Difference (3 – 4)	mm	- 15	- 127	- 141	- 23	25	- 281

As shown, the rainfall distribution in Zone-3 was far lower than that in Zone-4 and such differences are mostly explaining differences in rice growth in the two areas.

(3) Growth History

As stated earlier, Zone-3 is a drought prone area. The year 2006 was a drought year and the Prey Lobong reservoir dried up at around middle of November and irrigation water supply after flowering stage was impossible. All the verification plots in the zone suffered from drought or water shortage from nursery to maturing stage to different degrees.

(a) Plot 1

Variety	Sowing	Transplanting	Panicle Initiation	Flowering	Harvesting
Riang Chey	July 16	Aug. 5	± Oct. 14	Nov. 17	Dec. 17-18

The plot had fairly good growth throughout a growing period although suffered from water shortage occasionally.

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 fairly even but damaged by poultry. Nursery management was not proper and sometimes seedlings suffered from water shortage. However, finally fairly good seedlings were raised in more than sufficient number. Remaining seedlings were used for transplanting in Plot 5. 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. The initial growth of rice in the plot was excellent attracting attention of villagers. However, uneven growth of rice plants due to poor leveling, water shortage and different soil conditions became marked from the middle of vegetative stage. Panicle initiation started around October 14 (DAT 71). The final irrigation was done on November 11



Some infestation of brown spot was observed, but not serious. 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 the plot was around November 17 (105 DAT). At around the flowering stage, plant growth became vigorous. Harvesting was done from December 17 to 18 (135 DAT) in the



plot. The plot attained the highest yield in the zone.

The number of pump irrigations in the plots was only 3 times after transplanting.

(b) Plot 2

Variety	Sowing	Transplanting	Panicle Initiation	Flowering	Harvesting
Chung Kong Mon	July 22	Aug. 20	± Oct. 7	Nov. 10	Dec. 6-11

The plot suffered from water shortage from the beginning to the end, seed bed preparation to harvest.

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 poor due to insufficient watering and seedlings suffered from water deficiency almost an entire nursery period. However, finally, seedlings sufficing requirements for transplanting were raised. The age of seedling at transplanting was 30DAS (days after sowing). Transplanting delayed because of deferred growth of seedling and waiting for rain.



Transplanting ~ Flowering

Regular planting by using planting lines was adopted under water shortage condition. The initial growth of rice in the plot was good but growth differences between leveled part and elevated part was clear from the beginning. The plot suffered from water shortage or drought during almost the entire growth period. Panicle initiation started around October 7 (DAT 49). The final irrigation was done on November 11



Some infestation of brown spot was observed, but not serious. 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 the plot was around November 10 (83 DAT). At around the flowering stage, plant growth in leveled part became vigorous. The final irrigation was applied on November 17. Harvesting was done from December 6 to 1 (109 DAT or 138 DAS) in the plot. Maturing appears to have become earlier than usual due to drought.



The number of pump irrigations in the plots was only 2 times after transplanting.

(c) Plot 3

Variety	Sowing	Transplanting	Panicle Initiation	Flowering	Harvesting
Srov Krohorm	Aug. 17	Sep. 6	± Oct. 22	Nov. 25	Dec. 20-22

The plot showed excellent growth up to flowering, however, suffered from water shortage after flowering due to dried up of the reservoir and limited rainfall.

Nursery (Sowing ~ Transplanting)

Nursery preparation for this plot delayed because of withering up of own seedlings prepared separately for the plot. Rather flat seed bed was prepared by a demonstrator himself and successfully prepared seedlings for transplanting in the plot. The age of seedling at transplanting was 21DAS.

### Transplanting ~ Flowering

Regular planting by using planting lines was adopted. The growth of rice in the plot was good to excellent without suffering mush from water shortage. Panicle initiation started around October 22 (DAT 44). The final irrigation was done on November 17.



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 November 25 (81 DAT). The final irrigation was on November 17 before flowering and the plot might have experienced drought condition at maturing period. One more irrigation would have improved paddy yield substantially in the plot. Harvesting was done from December 20 to 22 (106 DAT or 126 DAS) in the plot. Maturing appears to have become earlier than usual due to drought.



The number of pump irrigations in the plots was 3 times after transplanting.

#### (d) Plot 4

Variety	Sowing	Transplanting	Panicle Initiation	Flowering	Harvesting
Riang Chey	Aug. 19	Sep. 6	± Oct. 19	Nov. 22	Dec. 22-23

In Plot 4, we had worst result of the verification activities in 2006 caused by drought and nutritional disorder in newly reclaimed portion of the plot.

### Nursery (Sowing ~ Transplanting)

Raised seed bed by using draft animal was prepared by a demonstrator by himself without a support of the Implementation Team and seedlings were successfully prepared. The adoption of such simplified method will be adopted in the next verification activities. However, nursery preparation for the variety should better be started a bit earlier. The age of seedling at transplanting was 19 DAS.



### Transplanting ~ Flowering

Regular planting by using planting lines was adopted. The growth of rice in the plot was good to excellent in the initial stage. However, symptoms of nutritional disorder like brown spot and leaf blast became remarkable at the end of October. It appears that the symptoms became serious with the occurrence of drought. Panicle initiation started around October 19 (DAT 44). The final irrigation was done on November 7.



### Flowering ~ Harvest

Flowering date in the plot was around November 22 (78 DAT). No harvested obtained in the newly reclaimed portion and yield was low affected by drought seriously in the rest of the plot. Reportedly, heavy leakage of pumped water occurred in the plot after the final irrigation. The number of pump irrigations in the plots was 3 times after transplanting.



(e) Plot 5

Variety	Sowing	Transplanting	Panicle Initiation	Flowering	Harvesting
Riang Chey	July. 16	Aug. 5	± Oct. 14	Nov. 17	Dec. 17-18

The plot is located far from the reservoir and suffered from water shortage almost throughout a growing season.

Nursery (Sowing ~ Transplanting)

Seedlings raised in Plot 1 were used for transplanting in the plot. The age of seedling at transplanting was 21 DAS.

Transplanting ~ Flowering

The demonstrator carried out preparatory works for regular planting by himself, setting leading lines for regular planting learned from participating in line planting in Plot 1. The growth of rice in the plot was good in the initial stage. However, the plot became suffered from water shortage in the later stage, especially slightly elevated portions in the plot. Panicle initiation started around October 14 (DAT 71). The final irrigation was done on November 9.



Flowering ~ Harvest

Flowering date in the plot was around November 17 (105 DAT). Stunted growth was obvious in portions suffered from drought in the plot. The number of pump irrigations in the plots was 3 times after transplanting.

(4) 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 below.

### Rice Farming Records in Verification Test Plots: Zone-3

Practices	Farming Practices Adopted	Current Prevailing Practices in the Zone 1/
1. Nursery - Seed/variety  - Seed source  - Seed selection - Incubation - Seedbed preparation - Seeding rate - Seeding density	- medium variety (demonstrators option) - self multiplied seed - commercial seed ( in case of improved variety; (Study Team provided) - selection with salt water - 1 day - raised semi-wet bed - 40kg/ha - 40 g/m <sup>2</sup>	- medium variety (local) - medium variety (improved) - self multiplied seed  - not practiced - 1 - 2 days - flat semi-wet to wet bed - 84.5 kg/ha - denser than 60 g/m <sup>2</sup> 2/
2. Land Preparation	- 2 times 2 plows + 2 harrowing/leveling	- 2 times 2 plows + 2 harrowing/leveling 2 plows + 1 harrowing/leveling
3. Transplanting - Planting density - No. of plants/hill  - Age of seedling - Planting method	- 25 x 25 cm ( or 30x30cm) - 2 ~ 3 plants/hill (comparison 1 plant/hill) - ±20 days - regular planting	- 25 x 25 cm ~ 20 x 20 cm - 5.8 plants/hill  - 45 days - random planting
4. Fertilization - Basal: compost/manure  - Basal: chemical fertilizer  - 1st top dressing - 2nd top dressing - Total doses (kg/ha)	- applied (depending on farmers practice) - applied: 15-15-15 & DAP (15-15-15 75kg & DAP 25kg) - applied: urea (40kg) - applied: urea (30kg) - Basic:170 kg/ha	- applied   - applied: urea or DAP or both - seldom applied - depending (avg. 111; 10 ~ 334kg/ha)
5. Weeding	- 2 times/season	- 2 times/season
6. Irrigation	- pumping irrigation fields under prolonged dry conditions due to limited rainfall	- pumping irrigation fields under prolonged dry conditions due to drought & shortage of fund for pumping
7. Harvesting/post harvesting - Harvesting  - Threshing  - Winnowing  - Drying	demonstrators current practices demonstrators current practices demonstrators current practices - sun drying	- manual  - manual threshing (threshing board or table) - engine winnower  - drying in field

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

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

#### (a) Nursery

Similar farming practices as Zone 3 were adopted in the zone as follows;

#### Improved Farming Practices Adopted in Verification Plots in Zone-3

Practices	Practices Adopted	Current Prevailing Practices
Variety & Seed Source	Medium variety (improved or local) Commercial or self-multiplied seed 1/	Self-multiplied local seed (medium)
Seed Bed	Raised semi-wet seed bed	Flat semi-wet to wet seed bed
Seeding rate/density	40 kg/ha & 40 g/m <sup>2</sup>	85 kg/ha & > 60 g/m <sup>2</sup>

1/: In case, farmers wanted to grow improved variety, commercial seed supplied..

		
Plot 1 raised seed bed prep.	Plot 4 prepared by farmer	Plot 4 nursery (18 DAS)

(b) Transplanting

Transplanting methods adopted in the zone are same as those in Zone-3 as follows;

**Transplanting Method Adopted in Verification Plots in Zone-3**

Practices	Practices Adopted	Current Prevailing Practices
Medium Variety	Regular planting, 25 x 25cm	Random planting
	2-3 plants/hill & 20 days seedling	5.8 plants/hill & 45 days seedling

		
Up rooting by a shovel	Plot 1 Transplanting	Plot 5 after planting (19 DAS)

(c) Fertilization

The proposed fertilizer doses for the Zone-3 were designed assuming that the zone is an irrigation area. However, since rainfall distribution and water reserves were limited and conditions were similar to rainfed areas, fertilizer doses in the test plots were reduced. The basic fertilization is basal dressing and 2 top dressings. According to the results of interview survey with the demonstrators, 3 out of 5 demonstrators reported decrease of fertilizer doses from the last year.

(d) Irrigation

Zone 3 is a drought prone area and irrigation water supply is essential for the attainment of stable and improved production. However, because of financial constraint and water shortage at a reservoir, water pumping for irrigation was limited even in the verification plots. Further, due to drying up of the reservoir, no irrigation was possible after the middle of November, at around flowering or booting stage of medium variety. The numbers of pumping in field were as follows;

**Number of Pumping for Irrigation in the Verification Plots in Zone-3 1/**

Indicator	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5
Pumping/Season	3	2	3	3	3

1/: Pumping for field only; pumping for nursery was 1 to 3 times/plot

**BII-4.8.4 Yield and Production of Verification Test Plots**

In the project area, 2 demonstrators reported production increase, 2 demonstrators reported production decrease and 1 demonstrator reported no difference in production from the last year. The results of crop cut survey and yield survey of whole plots are presented in Table BII-4.1 and discussed by plot in the followings.



(a) Plot 1

Variety	Crop Cut Survey (t/ha)		Whole Plot		Demonstrators Assessment 1/	
	Range	Average	Field Yield	Production	Production	Assessment
Riang Chey						
2-3 plants/hill	3.0 – 4.7	4.1	3.2 t/ha	410 kg	192 kg	increased
1 plant/hill	5.2 – 5.3	5.2				

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

The plot attained the highest yield in the zone although suffered from occasional water shortage or slight drought throughout a growing season. Some infestation of brown spot was noticed from around the middle of growth stage, but not serious. Plant growth became vigorous from around booting stage. One more pumping at the early maturing stage might have increased a yield level of the plot. 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) 2/		Whole Plot		Demonstrators Assessment 1/	
	Range	Average	Field Yield	Production	Production	Assessment
Chung Kong Mon						
2-3 plants/hill	3.8 – 4.1	3.9	2.5 t/ha	475 kg	466 kg	no change
1 plant/hill	3.7 – 3.9	3.8				

1/: Assessment by a demonstrator; production is rough estimate 2/: Crop cut at points with normal growth

The plot suffered from water shortage from seed bed preparation to harvest. Because of poorly leveled field condition, higher portions in the plot suffered from drought and resulted in very limited yield or no production. Some infestation of brown spot was noticed from around the middle of growth stage, but not serious. The primary cause for rather lower yield was drought in the higher portions in the plot.



(b) Plot 3

Variety	Crop Cut Survey (t/ha)		Whole Plot		Demonstrators Assessment 1/	
	Range	Average	Field Yield	Production	Production	Assessment
Srov Krohorm						
2-3 plants/hill	2.9 – 3.2	3.0	3.2 t/ha	538 kg	240 kg	increased
1 plant/hill	3.6 – 5.0	4.3				

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

The plot showed an excellent growth of rice plants up to flowering stage attained and attained the highest yield in the zone although suffered from water shortage or slight drought after flowering due to dry-up of the reservoir. Some infestation of brown spot was noticed from around the middle of growth stage, but not serious. One more pumping after flowering might have increased a yield level of 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) 2/		Whole Plot		Demonstrators Assessment 1/	
	Range	Average	Field Yield	Production	Production	Assessment
Riang Chey						
2-3 plants/hill	-	3.1	0.7 t/ha	127 kg	500 kg	decreased
1 plant/hill	-	-				

1/: Assessment by a demonstrator; production is rough estimate 2/: Crop cut at points with normal growth

The plot suffered from drought due partly to high percolation rate of soils. Nutritional disorder in newly reclaimed portions is another reason for poor yield. The improved variety, Riang Chey, appears to be not tolerant to such an adverse condition. According to the demonstrator, a local variety grown in 2005 did normal growth without showing symptom of nutritional disorder.



(e) Plot 5

Variety	Crop Cut Survey (t/ha) 2/		Whole Plot		Demonstrators Assessment 1/	
	Range	Average	Field Yield	Production	Production	Assessment
2-3 plants/hill	2.3 – 3.3	3.0	1.6 t/ha	120 kg	250 kg	decreased
1 plant/hill	-	2.2				

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

2/: Crop cut at points with normal growth

Because of the location of the plot located farm from the reservoir, the plot suffered from water shortage throughout a growing period. Adverse effects of water shortage were boosted by poor leveling in the plot. Infestation of brown spot was observed in the plot, but it was not so serious to explain lower yield.

#### BII-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	2.8	3.2	+0.4
	Chung Kong Mon	Plot 2	2.8	2.5	- 0.3
	Srov Krohorm	Plot 3	2.8	3.2	+0.4
	Riang Chey	Plot 4	2.8	0.7	- 2.1
	Riang Chey	Plot 5	2.8	1.6	- 1.2
	Average			2.8	2.2

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

Because of drought and nutritional disorder of plants (soil problems), paddy yield in 2 verification plots were lower than last year. However, in 2 plots (Plot 1 & 3), the yield of verification plots nearly doubled those of the last year.

#### BII-4.9 Small Scale Adaptability Trials

##### BII-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, 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-3 in 2006/07

Trial	Objective
Simple Trial on Medium Variety	
- Variety Trial	To test adoptability of 6 varieties
- Nursery seeding rate	To test effects of seeding rate on growth & yield
	To test effects of planting density on growth & yield
Planting Density	To test effects of water saving rice culture on growth & yield
	To test adaptability of water saving rice cultivation

#### BII-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-3 in 2006/07

Trial	Treatment
Simple Trial on Medium Variety (RT-2)	
- Variety Trial	6 variety (Riang Chey, Phka Rumchang, Phka Rumduol, Chung Kong Mon, Chma Prom, Sem Pidao)
- Seeding Rate	Seeding rate: 40 & 60 g/m <sup>2</sup>
- Planting Density	20 x 20, 25 x 25 & 30 x 30 cm

#### BII-4.9.3 Adaptability Test on Medium Variety

In Zone 3, an adaptability test (herein after called simple trial) on medium variety and was conducted. Similar to the verification plots, the trial plot also suffered from drought in the zone as the implementation of the trial under the prevailing condition in the zone was envisaged and the number of pumping irrigation was limited to 4 times. Further, the plot infested with brown spot from around panicle initiation stage to a slight to moderate degree depending on variety. The trials were carried out with input level (fertilizer doses) higher than the verification plots aiming at obtaining data on potential yields. Key farming practices were same as those for verification test shown in the section BII-4.8.

#### BII-4.9.4 Results

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

#### Results of Simple Trial for Medium Variety in Zone-3

Trial/Variety	Treatment	Crop Cut Yield 1/	Whole Plot Yield
Variety Trial	Phka Rumchang	3.9 t/ha	2.9 t/ha
	Phka Rumduol	2.4 t/ha	2.3 t/ha
	Sen Pidao	4.0 t/ha	-
	Chung Kong Mong	4.3 t/ha	3.4 t/ha
	Chma Prom	4.1 t/ha	3.4 t/ha
Planting Density (Riang Chey)	20 x 20 cm	2.9 t/ha	-
	25 x 25 cm	3.7 t/ha	-
	30 x 30 cm	4.0 t/ha	-
Seeding Rate & Planting Method (Riang Chey)	40 g/m <sup>2</sup> & 2-3 plants/hill	3.7 t/ha	-
	60 g/m <sup>2</sup> & 2-3 plants/hill	4.9 t/ha	-

1/: Samples taken at point showing normal growth

##### (a) Variety Trial

A moderate potential yield of Sen Pidao was attained in the trial, however, the treatment plot suffered from rat attack due to maturing in isolation. The introduction of the early variety will present chances to avoid drought occurred in November in the zone. Further trial and demonstration will have to be carried out to promote cultivation of the variety in the area.

Chung Kong Mon (variety common in the project area) and Chma Prom (variety common in Zone-4 and high value rice) showed good growth at the initial growth stage and

indicated adaptability to the conditions in the area. On the other hand, Riang Chey suffered more from brown spot and blast compared with other varieties.

(b) Planting Density and Seeding Rate

No clear differences among treatments were observed except for a treatment of planting density 20 x 20cm. In the plot, heavy land leveling works was done before planting in order to ensure the uniformity in inundation depth of the whole plot. Affected by such works, initial growth of Riang Chey was poor compared with other varieties.

**BII-4.10 Farmers’ Acceptability Survey**

**BII-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.

**BII-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	

**BII-4.10.3 Results**

Most demonstrators in the area assessed as “good” or “proper rate” all main proposed farming practices except for fertilizer doses, which were lower than their practices in last year. However, all the demonstrators accepted the regular transplanting method, one of the most important practices of which adoptability to be verified.

Because of drought and nutritional disorder of plants (soil problems), paddy yield in 2 verification plots were lower than last year. However, in 2 plots (Plots 1 & 3), the yield of verification plots nearly doubled those of the last year.

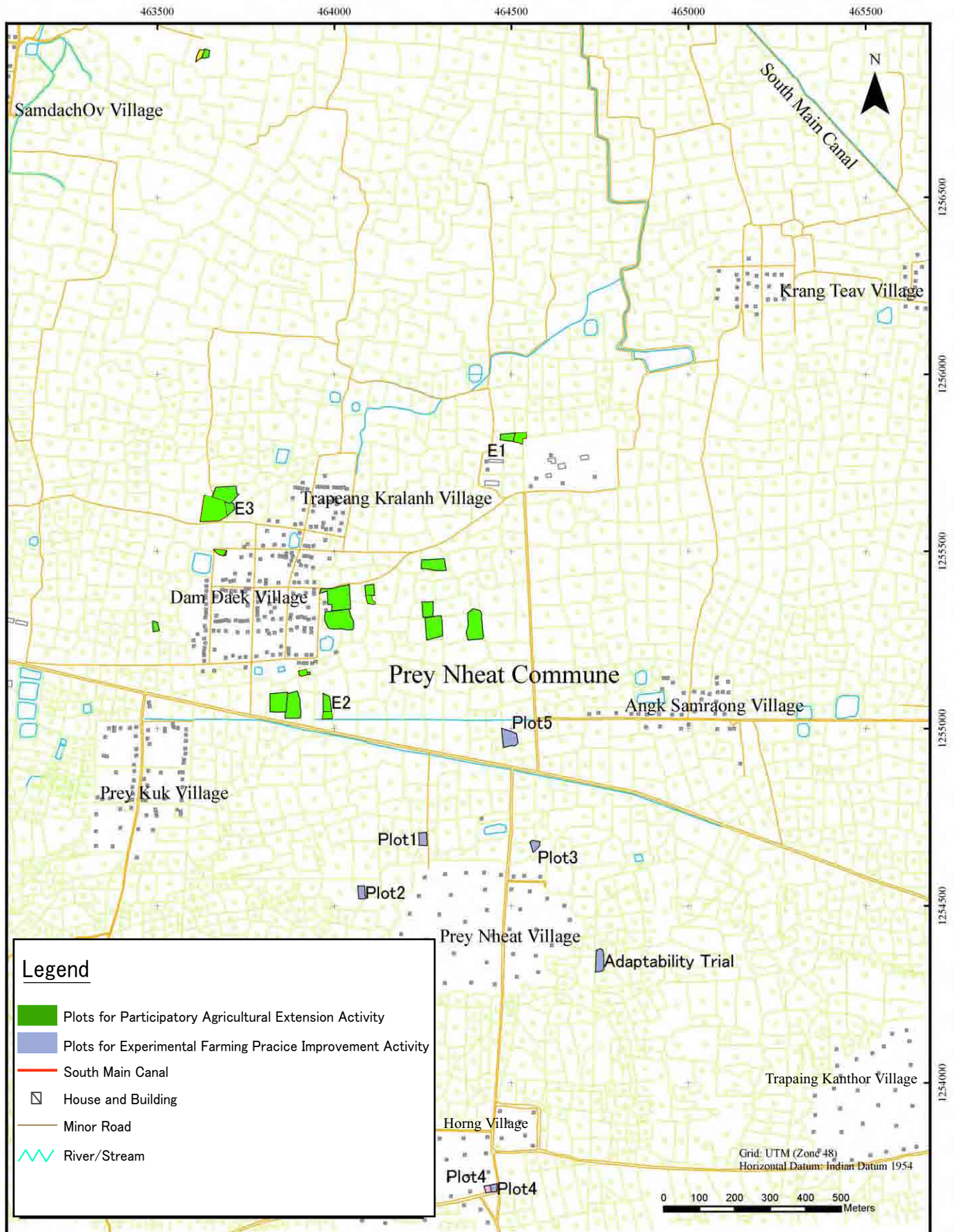
For questioning whether they follow the proposed practices in the next season, their intentions are mostly to follow all the practices except for variety, seeding rate and fertilizer doses. Variety was refused by 2 demonstrators, seeding rate by 1 demonstrator and fertilizer doses by 3 due to insufficient volume.

**PART-B**  
**PILOT PROJECTS (2006/2007)**

***Section-III***  
***Rainfed Agriculture Improvement***  
***Pilot Project in Zone-4***



*SRI Comparison Plot and Farmers' Group Members in Dam Daek Village  
(Participatory Agricultural Extension Activities in Zone-4)*



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

Japan International Cooperation Agency

Location Map of Zone-4 Pilot Project

## **PART-B: PILOT PROJECTS (2006/2007)**

### **Section-III**

## **Rainfed Agriculture Improvement Pilot Project in Zone-4**

### **Chapter BIII-1 Framework of the Project**

#### **BIII-1.1 Objective**

Objective of the “Rainfed Agriculture Improvement Pilot Project” is to establish a good model of rainfed agriculture improvement in Zone-4 (rainfed agriculture area). The model has to reveal the two-step development process with the following two components working well.

Component-1	Participatory Agricultural Extension
Component-2	Experimental Farming Practice Improvement

#### **BIII-1.2 Project Area**

Locations of the project components are as follows. Also see the location map of the pilot project area in Zone-4.

##### **BIII-1.2.1 Area for Participatory Agricultural Extension Activities**

Prey Nheat commune in Kong Pisei district was selected as a pilot project target commune in Zone-4, since its natural condition and farming practice were most typical for Zone-4. Based on the discussions with commune and village leaders, the pilot project implementation team decided to conduct participatory agriculture extension activities in Dam Daek village.

##### **BIII-1.2.2 Area for Experimental Farming Practice Improvement Activities**

Based on the discussions with commune and village leaders, Prey Nheat village was selected as a pilot project area for experimental farming practice improvement activities.

#### **BIII-1.3 Kick-off Seminar**

Kick-off seminar for Prey Nheat commune was held at Pery Nheat commune office on June 09 of 2006. The Commune council and village leaders in the commune were invited. In the seminar, the JICA study team expert explained the purpose and schedule of the pilot project. After the explanation, several questions were raised by the participants. They said they can not follow new farming practices without seeing the results. According to them, several agencies, including PDA, tried to introduce new varieties or new farming practices in the commune but many of those innovations could not produce good results. It was also requested by the commune people that they need one demonstration plot for each village even though the JICA study team expert had explained that only a few villages will be selected as target villages for the pilot project. Eventually, the participants welcomed the pilot project activities and the seminar was closed.



Kick-off seminar for Prey Nheat commune

After the seminar, candidate villages were selected by the pilot project implementation team. Dam Daek village was selected for participatory agricultural extension activities and Prey Nheat village was selected for experimental farming practice improvement activities.

#### BIII-1.4 Schedule

The project started in May 2006 and will be completed in February 2008. First half of the pilot projects were executed through February 2007 as shown below. Second half of the project will start again in May 2007 and run to February 2008.

**Implementation Schedule of the Pilot Project in Zone-4**

Activities	2006												2007												2008													
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3														
(1) Baseline Survey			■																																			
(2) Kick-off Seminar			■																																			
(3) Participatory Agriculture Extension					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
(4) Experimental Farming System Improvement					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
(5) Evaluation																																						■

#### BIII-1.5 Project Design Matrix (PDM)

The Project Design Matrix (PDM) for the project which was improved from the proposed one in the master plan was prepared as follows.

(Target Group: Farmers in Zone-4 pilot project area)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<b>Overall Goal</b> Agricultural productivity centering on rice is improved in the target area	1-1 Agricultural productivity in the target area is improved as proposed in the master plan by year 2015	1-1 Agricultural statistics	
<b>Project Purpose</b> Good model of rainfed agriculture improvement in Zone-4 is established	1-1 Result of the pilot project is evaluated as applicable model for Zone-4 by stakeholders by year 2007	1-1 Questionnaire to the stakeholders	- All the proposed activities in the master plan in post-project stage are implemented as scheduled - No significant climatic change
<b>Outputs</b> 1 Low inputs SRI information is disseminated by farmer-to-farmer extension  2 Target yields of the Mater Plan are achieved by applying SRI based improved farming practice	1-1 Fifty farmers in the model villages apply low inputs SRI by farmer-to-farmer extension by year 2007 2-1 Yields of improved SRI in experimental plots is higher than the target yields of the master plan	1-1 Monitoring surveys  2-1 Crop yield surveys	- Responsibility of each stakeholder in water management is not changed within the project period
<b>Activities</b> (1. Participatory Agriculture Extension) 1-1 To organize study tours 1-2 To conduct village training 1-3 To carry out inter-village training 1-4 To hold farmers' field days (2. Experimental Farming Practice Improvement) 2-1 To conduct verification tests to confirm effectiveness of SRI based improved farming practices 2-2 To conduct small scale adaptability trials for further improvement of the farming practices	<b>Input</b> Donors  Experts Transportation Cost of study tours	<b>Means of Verification</b> Cambodia  <u>Provincial government</u> Counterparts from PDA  <u>Central government</u> Counterparts from MAFF  <u>NGO</u> Facilitators	- Continuous involvement of related government agencies and model farmers during the project period - No severe natural disaster within the project period <b>Precondition</b> - High need for rainfed agriculture in the target area



## Chapter BIII-2 Participatory Agricultural Extension Activities

### BIII-2.1 Objective

Objective of the participatory agricultural extension activities is as follows.

#### Objective

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

Strategy-4  
Minimum material and equipment input  
from the farmers

Strategy-5  
Consideration of farmer-to-farmer  
extension in the future

The detailed explanation of Strategy-4 and Strategy-5 is given in section BI-3.1.

### BIII-2.2 Institutional Set-up

Institutional set-up for participatory agricultural extension activities was chosen 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 of the pilot project, participatory agriculture extension activities were implemented mainly by CEDAC (Cambodian NGO) under the support of the JICA study team.

### BIII-2.3 Situation before Starting Pilot Project Activities

#### BIII-2.3.1 Area for the Activities

As mentioned in sub-section BIII-1.2.1, Dam Daek village in Prey Nheat commune was selected for the area of participatory agricultural extension activities in Zone-4.

#### BIII-2.3.2 Method of Baseline Surveys

Baseline surveys were conducted to determine 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 the sampled farmers, and site inspections by experts.

#### BIII-2.3.3 Agriculture

Agricultural conditions in the area were similar to those of neighboring Prey Nheat village. The area did not have an irrigation system but farmers could pump water from the small pond using a portable pump if it was really necessary and water in the pond was available. The exclusive crop in the area was paddy. Farmers in the area cultivated paddy using traditional farming practices. Under the traditional farming practices, farmers transplanted seedlings about 50 days old with more than 5 plants per hill.

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

#### BIII-2.3.4 Organizations

##### BIII-2.3.4.1 Farmers' Group

There was one unique farmers' group in Dam Daek village for pottery production. The table below indicates the description of the group.

### Farmers Group in Dam Daek Village

Item	Explanation
(a) Type of Group	Pottery production
(b) Year of establishment	2005 (JICA)
(c) No. of members	12 (Male:3, Female: 9)
(d) Purpose	To increase the price and quality of the products
(e) Activities	To produce clay pots
(f) Strengths	To get revenue
(g) Problems	- There is only a small market for clay pots - The price of clay pots is low.

Compared with the pilot project Areas of Zone-1, there were fewer farmers' organizations. It was observed that the farmers of the village had not received sufficient agricultural extension service, and did not have convenient access to rural micro finance either in cash or in-kind. This condition resembles that in the pilot project areas of Zone-3.

#### BIII-2.3.4.2 Community Organizations

##### (1) Commune Council

Dam Daek village is located in Prey Nheat Commune, Kong Pisei District. The latest election of the Commune Council was conducted in 2002, according to the village chiefs of the Commune. The number of Commune Council members was 7 and all of them are males. Its main roles were i) dissemination of information on village development, and ii) intermediation with donor agencies.

##### (2) Village Development Committee (VDC)

Dam Daek village had established a VDC in their village. The number of VDC members was 5 persons. The features of the VDC were i) both the village chief and deputy village chief were members of the VDCs, and ii) gender balance was good (male 3: female 2). The income source of Dam Daek VDC members varied; besides farming, they engaged in pottery (2 persons), taught at a kindergarten (1 person), and worked as a RAC (NGO) health agent.

#### BIII-2.4 Identified Constraints on Agricultural Extension Activities

##### BIII-2.4.1 Agriculture

The following problems in agriculture were identified by the baseline survey.

- Innovations in paddy farming, such as SRI, had not been disseminated because the similar ones by other donors/government agency were failed in the past.
- No agricultural extension program was provided to the farmers in the village.

##### BIII-2.4.2 Organizations

Reasons that there were no farmers' groups in Dam Daek village were supposed to be as follows.

- There were few opportunities for farmers to consider formation of self-reliant farmers' groups in order to obtain the collective benefits. There might be two reasons; i) tragic memory of collective works during the past regimes, and ii) inadequate intervention of domestic and international support agencies.
- The farmers did not have the opportunity to organize a group, even merely for receiving the agricultural extension service.

(The constraints mentioned above are similar with those of the farmers' groups in Mohaleph village in Zone-3)

## BIII-2.5 Activities Conducted for Improvement

### BIII-2.5.1 Preparation of an Improvement Plan

The same system for the farmer-to-farmer agriculture extension system as was used in the Zone-1 pilot project was chosen for Zone-4 as well. For the farmer-to-farmer agricultural extension framework, see sub-section BI-3.5.1.

### BIII-2.5.2 Farmer-to-farmer Low Inputs SRI Extension Practice

#### BIII-2.5.2.1 Initial Guidance

Initial guidance on low inputs SRI extension was held at Dam Daek village on July 07, 2006. A total of 36 farmers, including 15, women joined the guidance (there were 137 families in the village according to SEILA Commune Database in year 2004). In the guidance, the 12 principles for low inputs SRI which were mentioned in clause BI-3.5.2.1, were explained to Dam Daek villagers by CEDAC and also by the farmer promoters from Kayiev village of Chongruk commune. The farmers who were interested in SRI were motivated to apply the principles as much as possible considering their field situation.

In the initial guidance, the 3 points which were mentioned in clause BI-3.5.2.1, were explained by CEDAC staff to address the farmers' concerns regarding introduction of SRI.

Most of the participants were interested in SRI and 10 farmers said that they want to apply SRI this season. Three farmers who showed strong willingness were selected from among the villagers as experimental farmers.

#### BIII-2.5.2.2 Study Tour

A study tour to Ang and Khtom village, Cheng Prey and Ba Theay districts, Kampong Cham province was organized by CEDAC on July 10-11, 2006 for the purpose of learning SRI practice on site. From three pilot project target villages, 27 experimental and interested farmers joined the tour. For details of the study tour, see clause BI-3.5.2.2.



Participants were exchanging opinions after coming back from the study tour

#### BIII-2.5.2.3 Village Training

Village training was given to the farmers' group of Dam Daek village at their village basically once a month. The following issues related to SRI were discussed in the village training. Attendance rate to the training was average of the three target villages (there were 137 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 of the Study Tour - 12 principles of SRI	22
2	August 08	- Problems in agriculture and livelihoods	17
3	October 09	- Sharing experiences of SRI	5
4	November 23	- Selection of good seeds	7

Major concern for the farmers' group members in Dam Daek was drought. Especially in the beginning, experimental farmers said it was difficult for them to transplant younger seedlings, since the seedlings already grew big while they were waiting for rain and transplanting. Some farmers even mistakenly believed that they could not continue SRI because their seedlings had already grown big. The pilot project implementation team

explained to them that they can continue SRI by applying other principles. Finally, they agreed to continue testing SRI. It was also recommended to pump water from a pond if there was a suitable one near their plots.



Extension of SRI using photos by CEDAC facilitator



Farmer promoter was explaining his experience

#### BIII-2.5.2.4 Inter-village Workshops

Inter-village workshops were held at CEDAC Kampong Speu office basically once a month by inviting experimental farmers and farmer promoters for the three villages. Major issues discussed regarding SRI in the inter-village workshops are as follows. See clause BI-3.5.2.4 for details of the discussions in the inter-village workshops.



Inter-village Workshop

#### Major Issues regarding SRI in the Inter-village Workshops

No.	Date	Major Issues
Activities in Year 2006		
1	August 18	- Confirmation of damage from the flood in August - 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)

#### BIII-2.5.2.5 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	Nos. of Participants
Activities in Year 2006			
1	September 18	- Answering questions from farmers who did not apply SRI - Confirming the effects of SRI in the field	22
2	December 20	- Comparing yields of SRI and traditional farming practices	18

(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 did you get the rice seeds?
- How old are your seedlings?
- How did you transplant?
- What kind of fertilizer do you use?

Then, the experimental farmers took all the participants to their fields. The participants compared root systems of paddy grown by SRI and traditional farming practices by pulling out samples from the paddy. As a result, the participants understood that the SRI paddy was 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, the paddy yields of SRI and traditional farming practices were confirmed by the farmers themselves. The participants confirmed that they can obtain higher yields with fewer inputs if they apply low inputs SRI.



Farmers were comparing paddy root systems of SRI (right) and traditional farming practice (left) in farmers' field day in September 2006



Farmers were participating in yield comparisons with SRI and traditional farming practices in farmers' field day in December 2006

BIII-2.5.2.6 Results

The results could be evaluated basically in a participatory manner. This means that the farmers decide whether they want to continue to apply SRI or not by themselves. 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 judged the innovation to be useful. They did not receive any physical incentives such as fertilizers, seeds, etc. but they evaluated that the innovations 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 innovations. Yields obtained from SRI are also an important evaluation factor but they are easily affected by weather or soil conditions, so they are only used as the supporting factor of the evaluation. Finally, the indicators of the result could be summarized as follows.

- Number of farmers who applied SRI (the most important indicator)
- Total Area of SRI applied paddy plots
- Number of cooperative farmers or member of farmers' groups (indicator for possibility of future dissemination of information regarding the innovations)
- Participatory yield comparisons between SRI and traditional farming

(1) Number of Farmers who Applied SRI

It was decided that if the farmers apply more than three principles of low inputs SRI, those farmers are recognized to be applying SRI. This criterion is commonly used by CEDAC, so that we can compare the situation with other areas. A total of 18 farmers (there were 137 families in the village according to SEILA Commune Database in year 2004) including three experimental farmers, applied low inputs SRI in Dam Daek village. A total of 7 of the 18 farmers (including 3 experimental farmers) tested SRI by comparing SRI and traditional farming practices but the other 11 farmers applied SRI without any comparison tests.

(2) Total Area of SRI Paddy Plots

Areas of the SRI paddy plots were preliminarily surveyed by handheld GPS under assistance of the JICA study team. In Dam Daek village, SRI was applied on 2.99 ha in total for 17 paddy plots. Among them 0.26 ha for 3 plots were cultivated by the 3 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 was adequate to get an overview of the extent of SRI in the village.

**Total Area of SRI Paddy Plots in Dam Daek Village**

	<b>Experimental farmers</b>	<b>Cooperative farmers</b>	<b>Total</b>
Number of Plots	3	15	18
Total Area (ha)	0.26	2.73	2.99
Average Area (ha)	0.09	0.18	0.18

(3) Number of Cooperating Farmers (Members of a Farmers' Group)

All three experimental farmers said that they want to continue SRI in the next season. They also replied that they want to enlarge their SRI area and reduce their area for traditional practice. The reasons for their strong acceptance of 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 see the result of the experimental farmers. Since 58 farmers attended the village training (there were 137 families in the village according to SEILA Commune Database in year 2004) at least for one time this season, some of them may apply SRI next season.

(4) Farmer-based Yield Comparison of Traditional Farming with SRI

The project implementation team instructed the experimental farmers to divide their paddy plot 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 farmers understand the effects of SRI. To make them confident in SRI, crop cutting and comparisons were carried out by the experimental farmers themselves.

As a result, the experimental farmers confirmed that the yield of SRI was higher than that of traditional farming. So, none of the experimental farmers complained about their yield or requested the project to compensate them for any losses. Even though some plots had low yields, the farmers understood that such low yields did not happen because of introduction of SRI. The yields of SRI were higher than the traditional yields even in these cases. 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 the yields of SRI are always higher than those of traditional practices, since the same

farmer conducted crop cutting for both the plots.

#### Farmer-based Yield Comparisons of Traditional Farming with SRI in Dam Daek

No.	Fictitious Name	Sex	Variety	Yield (ton/ha)		Balance
				SRI	Traditional	
E1	Farmer-A	Male	Stov Pesort	3.7	3.1	+0.6
E2	Farmer-B	Male	Riang Chey	3.7	2.7	+1.0
E3	Farmer-C	Female	Chma Prom	5.0	3.4	+1.6
Average				4.1	3.1	+1.0

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

As compared with the other two pilot project areas in Zone-1 and Zone-4, Dam Daek had the highest yields. The reason might be that Zone-4 received more water than Zone-3 and the plots were not damaged by flood (Zone-1 plots were damaged by severe flood). It should also be noted that Dam Daek village has a small pond for emergency use so that they could pump water from the pond.



Experimental farmer was showing his SRI plot

SRI plot in Dam Daek village in October 2006

#### (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.

All the four experimental farmers did not apply any chemical fertilizer to their SRI plots. They applied 5.8 ton/ha of organic fertilizer such as cow manure instead of chemical fertilizer without any cost.

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 Dam Daek

Farming Practice	Traditional (comparison plot)			SRI		
	Chemical	Organic	None	Chemical	Organic	None
Fertilizer						
No. of Farmers	3	0	0	0	3	0
Average Amount	190kg/ha	-	-	-	5.8ton/ha	-

### BIII-2.5.3 Farmer-to-farmer Ecological Chicken Raising Extension Practice

#### BIII-2.5.3.1 Trigger of Starting the Activities

After harvesting the rainy season paddy there are no intensive activities relating to SRI except training in compost preparation. However, it is very important for the farmers' group to continue some activities; otherwise their interest in the activities would become weak. During the village training in October the farmers' group in Dam Daek 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 farmers were not interested in these things because of the following reasons.

#### Reasons for farmers' lack of Interested in Bean or Vegetable Cultivation in the Paddy Fields during the Dry Season

- There is not enough labor in the dry season (Farmers in the village are busy in cultivating other crops, such as water melon, cucumbers, leafy vegetables, and other cash crops. They don't grow such crops in their paddy fields but rather in other plots for upland crops 3-4 km from their village)
- There is not enough rainfall

Then the farmers were asked by the facilitator if there is any other agricultural improvement which can be carried out in their village. The facilitator gave some ideas to the farmers and some farmers answered that they wanted to improve their chicken raising practice. The facilitator explained that they can teach the advanced activities of farmers in other areas but farmers who want to introduce chicken raising have to buy chicks at their own expense.

#### BIII-2.5.3.2 Study Tour

For the purpose of learning about chicken raising and other activities on site, 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. For details of the study tour, see clause BI-3.5.3.2.



Participants were also learning about home garden vegetable cultivation in the study tour

#### BIII-2.5.3.3 Village Training

Village training is given to the farmers' group of Dam Daek 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	Nos. of Participants
Activities in Year 2006			
1	October 09	- Farmers plans for the dry season (ecological chicken raising etc.)	5
2	November 23	- Sharing experiences of the study tour	7
3	December 6	- 13 principles of ecological chicken raising	16



In the village training in December, the farmer promoter invited from Prey Veng province shared his knowledge and experience and the 13 principles which were mentioned in clause BI-3.5.3.3, were explained to the participants.

#### BIII-2.5.3.4 Result

In Dam Daek village, one farmer started to improve the feed for his chickens.

### BIII-2.5.4 Farmers' Group Strengthening Practice

#### BIII-2.5.4.1 Importance of a Farmers' Group

An active farmers' group is the key for successful farmer-to-farmer agricultural extension. It is also important to strengthen farmers' capacity in planning and management on 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 gain knowledge from advanced farmers in the farmers' group.
- By enhancing farmer-to-farmer extension in the group, the government can reduce the cost for extension.
- Existence of a farmers' group motivates farmers to think and improve the situation by themselves. Farmers who can think, decide, and improve by themselves would further improve SRI practice by themselves. This means that the farmers' group has a strong relationship with empowerment of the farmers.
- Farmers' group activities may potentially be expanded in the future and further benefit the group members. For example, the group might start group procurement and group shipping activities in the future.

#### BIII-2.5.4.2 Study Tour

During the two study tours for SRI and chicken raising, the Dam Daek 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' Groups - Village Regulations

#### BIII-2.5.4.3 Village Training

Village training is given to the farmers' group of Dam Daek 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	Nos of Participants
Activities in Year 2006			
1	November 23	- Necessity of internal regulation - Formation of a savings sub-group - Importance of village based regulations for natural resources conservation	5

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

#### BIII-2.5.4.4 Results

(1) Formation of a Farmers' Group

As a result, a farmers' group was organized in Dam Daek village with 58 farmers. The expected activity of the farmers' group is the dissemination of information regarding SRI to other farmers in the village. Effects of farmers' group in SRI dissemination will be evaluated next rainy season.

(2) Formation of a Savings Sub-group

Seven members of the farmers group agreed to join the savings sub-group in Dam Daek village. They started to save 140,000 Riels of money in February 2007.

#### **BIII-2.6 Specific Findings in Zone-4 Participatory Agriculture Extension Activities**

The following are the findings from the participatory agricultural extension activities in Zone-4.

(1) Sharing Knowledge on Cultivating Crops other than Paddy

In the village training in November 2006, farmers' group members in Dam Daek village shared their knowledge on cultivating water melons. Even though cultivation of water melons was not the direct target of the pilot project, they shared their knowledge. This fact shows the effectiveness or necessity of farmers' groups in agricultural extension. If they gather together and are motivated to share their knowledge, they can improve their farming practices by themselves.

## Chapter BIII-3 Experimental Farming Practice Improvement Activity

### BIII-3.1 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 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 inputs 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 the Master Plan

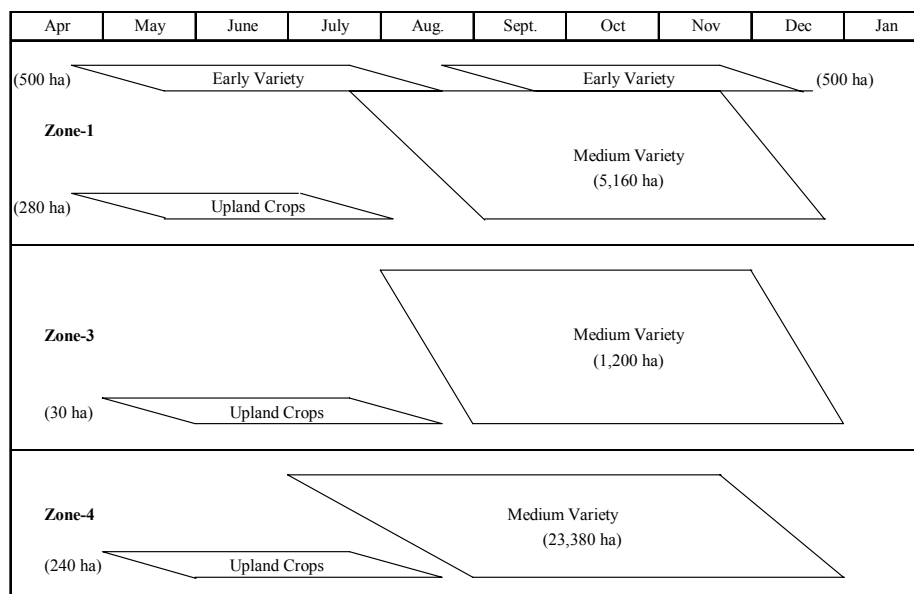
The proposed agricultural development plan formulated in the master plan for Zone 4 is as follows;

#### Proposed Agricultural Development Plan for Zone-4

Zone	Cropping Pattern		Cropping Intensity (%)			Target Yield (paddy ; ton/ha)
	Early Rainy	Rainy	Early Rainy	Rainy	Annual	
Zone 4	upland crops	Rice	1	100	101	2.0

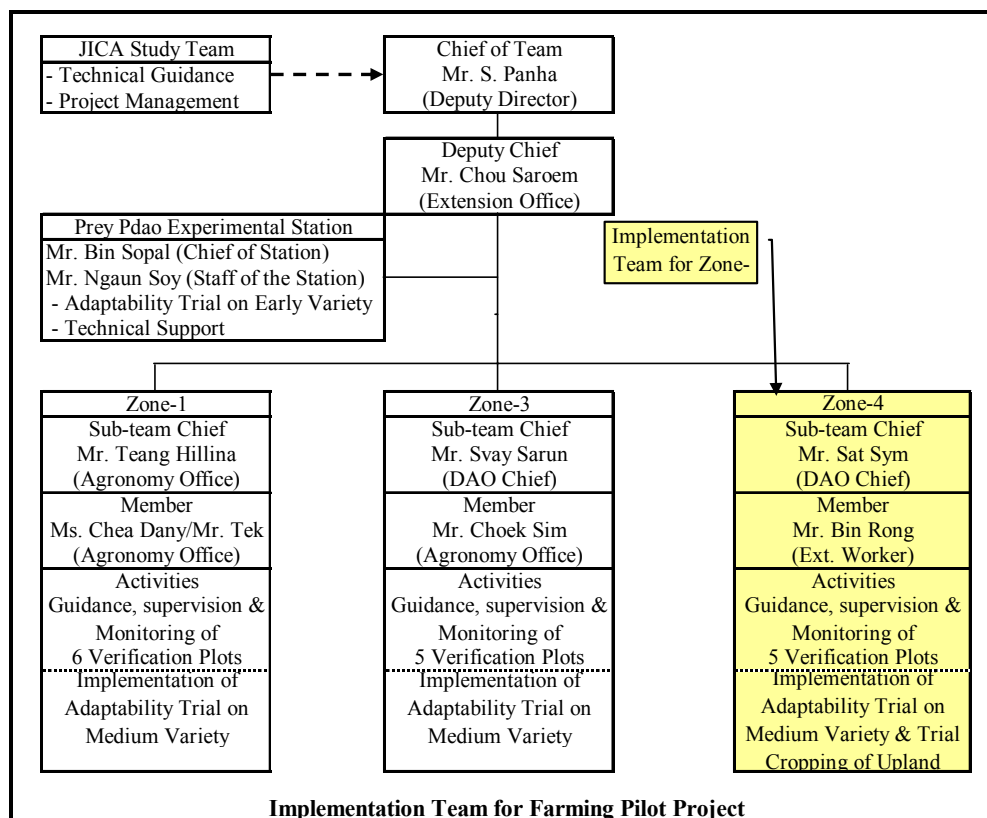
Source: Interim Report of the Master Plan, 2006

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



### BIII-3.2 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.



### BIII-3.3 Situation before Starting Pilot Project Activities

#### BIII-3.3.1 Area and Demonstrators for Activities

##### (1) Selection of Area for the Activities

A consultation meeting with PDA was held for the selection of a target commune on June 1, 2006. The criteria applied for the selection was:

- A commune located in a typical rainfed area in Kampong Speu province.
- A commune located within the Target Area of the master plan.

As a result of the consultation, Prey Nheat commune was selected as a target commune.

##### (2) Selection of Demonstrators for the Activities

The selection of a target village for the project was made at a commune level socialization workshop held on June 9, 2006. The criteria for the selection of a target village presented at the workshop by the JICA study team were:

- A village located in a typical rainfed area and having no irrigation system.
- A village located within the Target Area of the master plan.

Based on the discussions at the workshop, Prey Nheat village was selected as the target village.

##### (3) Selection of Demonstrators for the Activities

At the preparatory workshop at the village level held on June 9, 2006, paddy plots for the

verification tests and small scale adaptability tests were selected with the following basic criteria for the selection.

- Target fields should be free from flooding, and
- Target fields should not be newly reclaimed (more than 10 years after development)

Five verification test plots and one adaptability test plot in the project area were selected and five owners of the verification plots were recognized as demonstrators.

### BIII-3.3.2 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.

### BIII-3.3.3 Farming Practices in Bos Ta Ney Village

In Prey Neheat village, which was selected as the site for the project in Zone-4, rice cultivation almost solely relying on rainfall is practiced (fields close to small ponds are irrigated in case of drought). The village usually has fairly blessed rainfall distribution and rice yields in the village are higher than those of Banla S'et village (the project area in Zone-3).

Rice production is an almost exclusive crop sub-sector activity in the village. However, vegetable cultivation in the upland fields is practiced to a considerable extent in the rainy season. Major vegetables grown include water melons, wax gourds and pumpkins. Present agricultural conditions of the village are briefed in the following table.

**Agricultural Profiles of Prey Nheat Village**

No. of Families	136	Land Use		Farm Machinery/Facilities	
No. of Farm Families 1/	107	Rice Fields	70 ha	Water Pumps	8
Population	685	Upland Fields	5 ha	Rice Mills	8
Labor Force/Family	3.5	Rice Cropped Area/Yield/ Production			
Rice Field Holding/Farm F.	0.65 ha	Year	Cropped Area	Avg. Yield	Avg. Yield 2/
Cattle Population	215	2003	70 ha	2.0 t/ha	1.2 t/ha
Pig Population	about 46	2004	70 ha	2.0 t/ha	0.3 t/ha
No. of Hand Tractors	0	2005	70 ha	2.2 t/ha	2.0t/ha
No. of Threshers	0	2006	70 ha	2.2 t/ha	-

1/: Crop growing families 2/: Yield level of Prey Nheat commune, SEILA Data Base  
Source: SEILA Data base 2005 & village chief

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

**Prevailing Rice Farming Practices in Prey Nheat Village**

Practices	Description
Nursery	Common variety: Chma Prom, Rieng Chey; seeding rate: avg. 84 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. 5.7 plants/hill, seedling age: avg. 52 days
Fertilization	Manure: 3.2 ton/ha; chemical fertilizer: DAP, urea, 16-16-8 ; doses depending
Harvesting	Harvesting: manual 100%; manual threshing; engine winnower; threshing at home yard
Paddy Yield	Avg.: 1.8 ~ 2.1 t/ha (2003 ~ 2005; source village chief)

### BIII-3.3.4 Soil Conditions of Verification Test and Small Scale Adaptability Trial Fields

Soils distributed in the target fields are classified as Gleyic Acrisol Medium Textured Phase. Their chemical properties are as follows;

### Soil Chemical Properties of Verification Test and Adaptability Trial Plots in Zone-4

Soil Depth	Texture	pH (H <sub>2</sub> O)	Total C (%)	Total N (%)	Total P P <sub>2</sub> O <sub>5</sub> (%)	Available P <sub>2</sub> O <sub>5</sub> (ppm)	CEC	Exchangeable Cation		
								Ca	Mg	K
0-15cm	SL~SCL	5.7	0.29	0.03	0.02	43.5	7.5	2.3	1.8	0.1
15-30cm	SCL~SC	6.8	0.20	0.04	0.01	30.0	5.0	3.8	1.5	0.1

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 high content of available P<sub>2</sub>O<sub>5</sub> in both surface and sub-surface layers of all the soils.

#### BIII-3.3.5 Identified Constraints for Farming Practices Improvement

The primary agronomic constraints in the project area identified through the baseline survey and field survey are similar to those found in Zone 3 and include: i) low and unstable yield of paddy attributed to prevailing traditional or inadequate farming practices and unstable rainfall, ii) low land use intensity in the early rainy season and iii) limited coverage of extension services.

#### BIII-3.4 Strategies Established for Pilot Project and Overall Framework for Pilot Project

##### BIII-3.4.1 Strategies Established for Pilot Project

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

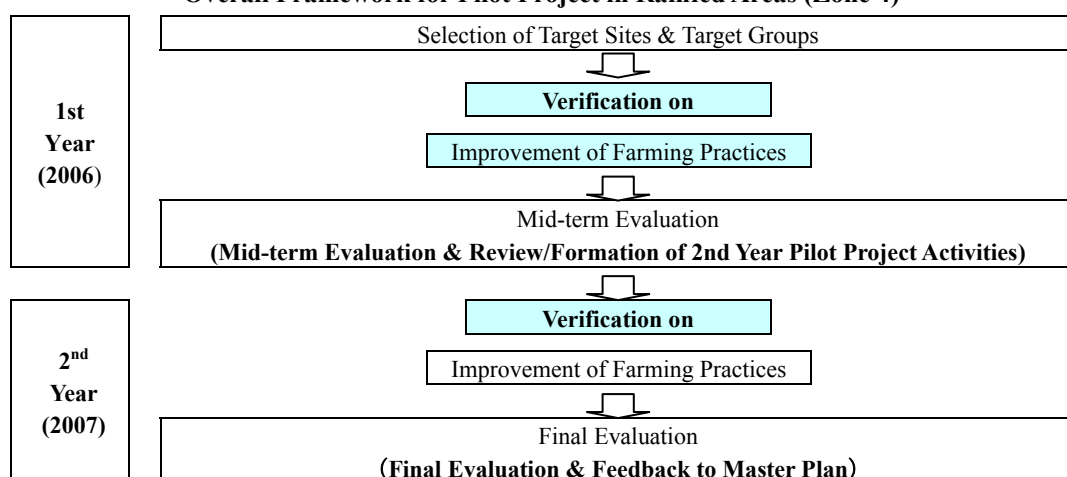
##### Objectives of and Strategies Established for Agricultural Pilot Project

Zone	Objectives	Strategies
4	- Verification of proposed agricultural development Plans	1 <sup>st</sup> year (2006) - Verification of improved rice farming practices under rainfed - Implementation of small scale adaptability trial
		2 <sup>nd</sup> year (2007) - Verification of improved rice farming practices under rainfed - Implementation of small scale adaptability trial
	- Assessment of sustainability through examining adoptability of the improved farming practices of rice	1 <sup>st</sup> year (2006) - Selection of demonstrators & formation of a farmer group - Provision of technical guidance to demonstrators & group members
		2 <sup>nd</sup> year (2007) - Selection of demonstrators - Provision of technical guidance to demonstrators & group members

##### BIII-3.4.2 Overall Framework for Pilot Project

The pilot project is scheduled to be implemented in 2 years from 2006/2007 to 2007/2008 in the zone. The overall framework for the pilot project is presented in the following figure.

### Overall Framework for Pilot Project in Rainfed Areas (Zone 4)



### BIII-3.5 Programs and Program Descriptions

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

#### Program Descriptions of Programs in 2006/07

Verification on	Program	Objectives	Target Area
Improved Rainfed Rice Farming Practices	Small Scale Adaptability Test on Rainfed Rice	Simple trial on alternative farming practices	Zone-4
	Verification Test on Rainfed Rice	Verification/demonstration of improved farming practices	Zone-4
Trial Cultivation of Upland Crops	Trial Cropping of Upland Crops	Trial cultivation of upland crops	Zone-4
Farmer Training & Extension Activities	Training Course, Workshop & Mass Guidance, Formation of Farmer Group, Extension Activities (by PDA etc.)		All zones

### BIII-3.6 Implementation Arrangement

The demonstrators, operators, provision of farm inputs and other arrangements for the implementation of the programs under the agricultural pilot project are explained in the following table.

#### Arrangements for Programs Implementation

Program	Operator	Seed Supply 1/	Fertilizer Supply 1/	Land Prep. 1/
Verification Test	Farmer	Improved variety: by project Local variety: by farmer	Compost: by farmer Fertilizer: by project	Final prep. by project
Adaptability Test	IP Team	By project	By project	By project

1/: By whom costs are born

### BIII-3.7 Pilot Project Activities in 2006/07

The pilot project activities in 2006/07 in Zone 4 are composed of: verification test, ii) small scale adaptability test (simple trial), iii) farmers' acceptability survey and iv) field guidance activities. In addition, Implementation Team Technical Meetings were held for guidance and managerial purpose of the activities. The overall features and schedules of the activities are illustrated in the following figure.

Activity	Month									
	June	July	August	September	October	November	December	January	February	
1. Verification/Demonstration of Medium Variety of Rice										
1-1 Plot 1 (variety; Chma Prom)			Δ.....○	—————	—————	—————	—————	—————	—————	—————
1-2 Plot 2 (variety; Rieng Chey)			Δ.....○	—————	—————	—————	—————	—————	—————	—————
1-3 Plot 3 (variety; Chma Prom)			Δ.....○	—————	—————	—————	—————	—————	—————	—————
1-4 Plot 4 (variety; Chma Prom)			Δ.....○	—————	—————	—————	—————	—————	—————	—————
1-5 Plot 5 (variety; Rieng Chey)			Δ.....○	—————	—————	—————	—————	—————	—————	—————
2. Adaptability Test on Medium Variety										
2-1 Nursery Preparation			Δ.....							
2-2 Variety Trial			Δ.....○	—————	—————	—————	—————	—————	—————	—————
2-3 Direct Sowing			Δ.....	—————	—————	—————	—————	—————	—————	—————
3. Trial Cropping of Upland Crops 1/										
3-1 1st Trial			Δ.....	—————	wet injury	—————	—————	—————	—————	—————
3-2 2nd Trial			Δ.....	—————	—————	—————	—————	—————	—————	destroyed by cattle
4. Extension & Guidance										
4-1 Field Guidance		⊙	⊙							⊙
4-2 Farmer Field Day				⊙						
4-3 Joint Field Visit					⊙					
4-4 Farmer Training (compost making)										⊙
4-5 Guidance & Monitoring										
1/: Trial cropping of mungbeans, soybeans & corn; 1st trial cancelled due to wet injury; 2nd trial crops destroyed by cattle & pig ..... Nursery      Δ Sowing      ——— Growing in Field      ○ Transplanting      ☆ Harvesting      ⊙ Extension & Guidance Activities										

### BIII-3.7.1 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 2006/07 are as shown in the following table.

**Verification and Trial Activities Implemented in 2006/07 in Zone-4**

Category of Variety	Plot No.	Plot Size	Variety	Demonstrator
Medium Variety	Plot 1	7.8 a	Chma Prom	Roth Yarv
	Plot 2	8.1 a	Riang Chey	Touch Sava
	Plot 3	4.5 a	Chma Prom	Tes Leoung
	Plot 4	3.0 a	Chma Prom	Pang Sa Eoun
	Plot 5	17.0 a	Riang Chey	Luy Pov

### BIII-3.7.2 Small Scale Adaptability Test

The trial activities carried out in the zone include a small scale adaptability test (simple trial) on medium variety as shown in the following table.

**Trial Activities Implemented in 2006/07 in Zone-4**

Activities	Trial Components	Period
Small Scale Adaptability Test		
- Adaptability Test on Medium Variety	- Variety trial: transplanting	July ~ Dec.
	- Variety trial: direct sowing	
	- Nursery trial	Aug.

### BIII-3.7.3 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.

### BIII-3.7.4 Field Guidance Activities

The guidance and extension activities provided to demonstrators and farmer groups 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 in the zone; 1<sup>st</sup> and 2<sup>nd</sup> guidance for demonstrators and a simple trial cooperators and the 3<sup>rd</sup> and 4<sup>th</sup> 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 <sup>st</sup> Guidance July 12 Participants: 6	- Providing practical guidance on improved farming practices (seed bed preparation to transplanting) Scheduling seed bed preparation/sowing	- Demonstration of seed selection - Scheduling seed bed preparation - Field check of target fields - Provision of seeds
2 <sup>nd</sup> Guidance Aug. 1 Participants: 6	- Providing practical guidance on improved farming practices (from land preparation to harvest) - Scheduling for land preparation & Transplanting	- Providing guidance to demonstrators using guidance materials - Scheduling for land preparation & transplanting - Provision of fertilizer
3 <sup>rd</sup> Guidance Feb. 3 Participants: 21	- 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 <sup>th</sup> Guidance Feb. 20 Participants: 19	- 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

### (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 as discussed in sub-section I-4.7.4 and as follows;

**Objectives and Activities of OJT on Farming Practices**

Guidance	Objectives/Subject Farming Practices	Activities
OJT on Raised Seed Bed Preparation July 20 - July 25	- 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 Aug. 16 - Aug. 19	- 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 day was carried out only once in the zone as shown below.

**Objectives and Activities of Farmer Field Day**

Field Day	Objectives/Subject Farming Practices	Activities
1st Field Day Aug. 22	- 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

(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 Feb. 3 - 4 Participants 21
		Material: How to Make Compost (PDA)

The results of pre- and ante- test are: 63 and 88 in Zone-4. Major results or findings of the guidance are similar to the same discussed in sub-section I-4.7.4.

(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.

**BIII-3.8 Verification Test**

**BIII-3.8.1 Objective**

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

Rainy Season Rice	Medium variety: 2.0t/ha
-------------------	-------------------------

**BIII-3.8.2 Verification Plots**

The verification tests were implemented at 5 plots in the zone as follows;

**Verification and Trial Activities Implemented in 2006**

Category of Variety	Plot No.	Plot Size	Variety	Demonstrator
Medium Variety	Plot 1	7.8 a	Chma Prom	Roth Yarv
	Plot 2	8.1 a	Riang Chey	Touch Sava
	Plot 3	4.5 a	Chma Prom	Tes Leoung
	Plot 4	3.0 a	Chma Prom	Pang Sa Eoun
	Plot 5	17.0 a	Riang Chey	Luy Pov

### BIII-3.8.3 Growth History and Key Farming Practices

#### (1) Overall Features

The progress reporting and farming records of the pilot project for each plot are briefly explained 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	July 20 - Aug. 3	- Basal dressing	Aug. 16 - Aug. 18
- Sowing	July 23 - Aug. 4	- 1st Top dressing	Sep. 13 - Sep. 18
Final land preparation	Aug. 3 - Aug. 18	- 2nd Top dressing	Sep. 29 - Oct. 3
Transplanting	Aug. 16 - Aug. 19	Panicle Initiation	± Sep. 11 - Oct. 27
Irrigation in Field	1 pumping if possible	Flowering	± Oct. 15 - Nov. 28
Weeding	2 times	Harvesting	Nov. 6 - Dec. 21
		Threshing	Dec. 22 - Jan. 1

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) Rainfall Distribution in Year 2006

The rainfall distribution during the period of field activities is shown in comparison with the same in Prey Nheat village in Zone-3, rainfed area, as follows;

**Rainfall Distribution in 2006 in Banla S'et Village**

Zone	Unit	July	Aug.	Sep.	Oct.	Nov.	Total
Banla S'et (3)	mm	45	182	184	65	45	521
	%	9	35	35	12	9	100
Prey Nheat (4)	mm	60	309	325	88	20	802
	%	7	39	41	11	2	100
Difference (3 - 4)	mm	- 15	- 127	- 141	- 23	25	- 281

As shown, the rainfall distribution in the project area was favorable for rice production except for the same in the later growth stage of October/November.

#### (3) Growth History

In Prey Nheat village, good crop of paddy was attained in 2006 and the performances of all the verification plots in the area were satisfactory blessed with favorable rainfall distribution from transplanting to early maturing stage, although all the plots suffered from water shortage during nursery stage and transplanting practices in the test plots were postponed for about a week waiting for heavy rain.

##### (a) Plot 1

Variety	Sowing	Transplanting	Panicle Initiation	Flowering	Harvesting
Chma Prom	July 24	Aug. 16-17	± Oct. 16	Nov. 19	Dec. 19

The plot had good growth throughout a growing period and attained highest yield in the zone.

##### Nursery (Sowing ~ Transplanting)

Seedlings were raised in semi-wet to semi-dry raised seed bed. Seed bed was prepared well but nursery seriously damaged by poultry as the plot located close to the village and affected by water shortage. However, seedlings enough to cover the plot were



raised. The age of seedling at transplanting was 24DAS (days after sowing).

Transplanting ~ Flowering

Regular planting by using planting lines was adopted under the guidance of the Implementation Team. The growth of rice plants in the plot was good without any serious problems. Panicle initiation started around October 16 (DAT 62).



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 November 19 (96 DAT). At around the flowering stage, plant growth became vigorous. Harvesting was done on December 19 (126 DAT) in the plot. The plot attained the highest yield in the zone.



(b) Plot 2

Variety	Sowing	Transplanting	Panicle Initiation	Flowering	Harvesting
Riang Chey	July 23	Aug. 17	± Oct. 21	Nov. 24	Dec. 21

Some difficulties experienced for watering nursery because the plot is located away from water source.

Nursery (Sowing ~ Transplanting)

Seedlings were raised in semi-dry seed bed. Seedlings sometimes withered nearly to dry up due to insufficient watering. However, seedlings barely enough to cover the plot were raised. The age of seedling at transplanting was 25DAS (days after sowing).



Transplanting ~ Flowering

Regular planting by using planting lines was adopted under the guidance of the Implementation Team. The growth of rice plants in the plot was fairly good although suffered from some infestation of brown spot and occasional water shortage. Panicle initiation started around October 21 (DAT 67).



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 November 24 (101 DAT). At around the flowering stage, plant growth became vigorous, (might be drained or dry condition prevailed after that time in the field). Harvesting was done on December 21 (128 DAT) in the plot. Complete lodging occurred at harvesting time in the plot (appeared to be characteristic of the variety).



(c) Plot 3

Variety	Sowing	Transplanting	Panicle Initiation	Flowering	Harvesting
Chma Prom	July 23	Aug. 17	± Oct. 20	Nov. 23	Dec. 20

Some difficulties experienced for watering nursery because the plot is located away from water source.

### Nursery (Sowing ~ Transplanting)

Seedlings were raised in semi-dry seed bed. Seedlings sometimes withered nearly to dry up due to insufficient watering. However, seedlings more than enough to cover the plot were prepared. The age of seedling at transplanting was 23DAS.

### Transplanting ~ Flowering

Regular planting by using planting lines was adopted. The growth of rice plants in the plot was good although suffered from some infestation of brown spot and occasional water shortage. Panicle initiation started around October 20 (DAT 65).

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 November 23 (99 DAT). At around the flowering stage, plant growth became vigorous up to harvesting without any serious problems. Harvesting was done on December 19 - 20 (125 DAT) in the plot. Complete lodging occurred at harvesting time in the plot (appeared to be characteristic of the variety).



### (d) Plot 4

Variety	Sowing	Transplanting	Panicle Initiation	Flowering	Harvesting
Chma Prom	July 23	Aug. 17	± Oct. 16	Nov. 19	Dec. 19

### Nursery (Sowing ~ Transplanting)

Seedlings were raised in semi-dry seed bed, but seedlings damaged by poultry and rat. Further, seedlings sometimes withered nearly to dry up due to insufficient watering. However, seedlings barely suffice requirements for the plot were prepared. The age of seedling at transplanting was 26DAS.



### Transplanting ~ Flowering

Regular planting by using planting lines was adopted. The growth of rice plants in the plot was rather poor up to flowering suffering from water shortage and infestation of brown. Panicle initiation started around October 16 (DAT 61).

### Flowering ~ Harvest

Flowering date in the plot was around November 19 (95 DAT). At around the flowering stage, plant growth became vigorous up to harvesting. Harvesting was done on December 18-19 (124 DAT) in the plot.

### (e) Plot 5

Variety	Sowing	Transplanting	Panicle Initiation	Flowering	Harvesting
Riang Chey	July 26	Aug. 18-19	± Oct. 21	Nov. 24	Dec. 21-22

The plot is the largest plot and its field leveling condition was worst among the plots in the zone.

### Nursery (Sowing ~ Transplanting)

Seedlings were raised in semi-dry seed bed. Seedlings were raised fairly well although suffered from water shortages as other plots. However, seedlings suffice requirements for the plot were successfully prepared. The age of seedling at transplanting was 24DAS.



### Transplanting ~ Flowering

Regular planting by using planting lines was introduced by the Implementation Team in the 1st day and continued by a family of demonstrator for another 2 days. The growth of rice plants in the plot was fairly good but uneven growth within the plot was remarkable due mainly to poor leveling. Infestation of brown spot noticed, but not so serious. Panicle initiation started around October 21 (DAT 65).



### Flowering ~ Harvest

Flowering date in the plot was around November 24 (99 DAT). At around the flowering stage, plant growth became vigorous up to harvesting and ununiformity in growth became less marked. Harvesting was done on December 21-22 (127 DAT) in the plot.



### (4) 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 below.

#### Rice Farming Records in Verification Test Plots: Zone-4

Practices	Farming Practices Adopted	Current Prevailing Practices in the Zone 1/
1. Nursery		
- Seed/variety	- medium variety (demonstrators option)	- medium variety (local) - medium variety (improved)
- Seed source	- self multiplied seed - commercial seed ( in case of improved variety; (Study Team provided)	- self multiplied seed
- Seed selection	- selection with salt water	- not practiced
- Incubation	- 1 day	- 1 - 2 days
- Seedbed preparation	- raised semi-dry bed	- flat semi-dry bed
- Seeding rate	- 40kg/ha	- 84 kg/ha
- Seeding density	- 40 g/m <sup>2</sup>	- denser than 60 g/m <sup>2</sup> 2/
2. Land Preparation	- 2 times 2 plows + 2 harrowing/leveling	- 2 times 2 plows + 2 harrowing/leveling 2 plows + 1 harrowing/leveling
3. Transplanting		
- Planting density	- 25 x 25 cm ( or 30x30cm)	- 25 x 25 cm ~ 20 x 20 cm
- No. of plants/hill	- 2 ~ 3 plants/hill (comparison 1 plant/hill)	- 5.7 plants/hill
- Age of seedling	- ±20 days	- 52 days
- Planting method	- regular planting	- random planting
4. Fertilization		
- Basal: compost/manure	- applied (depending on farmers practice)	- applied
- Basal: chemical fertilizer	- 15-15-15 & DAP (15-15-15 75kg & DAP 25kg)	- urea, DAP & 16-16-8
- 1st top dressing	- applied: urea (30 kg)	- urea, DAP & 16-16-8
- 2nd top dressing	- applied: urea (20 kg)	- applied: urea
- Total doses (kg/ha)	- Basic:150 kg/ha	- depending (avg. 293; 88 ~ 500kg/ha)
5. Weeding	- 2 times/season	- 2 times/season
6. Irrigation	- 1 pumping irrigation at booting stage to avoid crop losses due to drought	- in fields close to ponds, pumping is done when water shortage is serious
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/: Interview survey with Agricultural Pilot Project Farmer Group members (20 farmers) in the zone

2/: field observation

The key proposed farming practices of nursery preparation, transplanting and fertilization

adopted in the verification tests are explained in the followings.

(a) Nursery

Similar farming practices as Zone 3 were adopted in the zone as follows;

**Improved Farming Practices Adopted in Verification Plots in Zone-3**

Practices	Practices Adopted	Current Prevailing Practices
Variety & Seed Source	Medium variety (improved or local) Commercial or self-multiplied seed 1/	Self-multiplied local seed (medium)
Seed Bed	Raised semi-wet seed bed	Flat semi-wet to wet seed bed
Seeding rate/density	40 kg/ha & 40 g/m <sup>2</sup>	85 kg/ha & > 60 g/m <sup>2</sup>

1/: In case, farmers wanted to grow improved variety, commercial seed supplied.

		
Plot 4 sowing	Plot 2 for planting (21DAS)	P5 Seedlings (18 DAS)

(b) Transplanting

Transplanting methods adopted in the zone are same as those in Zone-1 and-3 as follows;

**Transplanting Method Adopted in Verification Plots in Zone-3**

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

(c) Fertilization

The fertilizer doses adopted in Zone-3 were determined according to the proposed practices, however, in order to improve growth of rice, limited amount of fertilizers were applied at around booting stage. According to the results of interview survey with the demonstrators, all 5 demonstrators reported decrease of fertilizer doses form the last year.

**BIII-3.8.4 Yield and Production of Verification Test Plots**

In the project area, all the demonstrators reported production increase from the last year. One water pumping was practiced in the zone at around flowering stage to ensure a good crop and to increased income of the demonstrators, which might results in good yields in the zone. However, judging from growth of rice plants up to the stage in all the plots, yield level of higher than 2.5 ton/ha could have been attained, even if no pumping was done. Results of crop cut survey and yield survey of whole plots are presented in Table BIII-3.1. The results (yield and production) of the verification activities in 2006 are discussed by plot in the followings.

(a) Plot 1

Variety	Crop Cut Survey (t/ha)		Whole Plot		Demonstrators Assessment 1/	
	Range	Average	Field Yield	Production	Production	Assessment
Chma Prom	4.4 – 5.7	5.1	4.4 t/ha	352 kg	230 kg	increased
2-3 plants/hill	4.8 – 5.1	5.2				
1 plant/hill						

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

The plot attained the highest yield in the zone. The plot has finer surface soil texture

compared with other plots and located at a slightly depressed site collecting more water after rain. The growth of rice plant was good throughout a growing period, although plant became vigorous after flowering. At final stage of maturing, complete lodging occurred in the plot, but no adverse effects to yield might have been brought about.



(b) Plot 2

Variety	Crop Cut Survey (t/ha)		Whole Plot		Demonstrators Assessment 1/	
	Rating Chey	Range	Average	Field Yield	Production	Production
2-3 plants/hill	4.0 – 4.7	4.5	3.9 t/ha	279 kg	238 kg	increased
1 plant/hill	4.0 – 4.3	4.1				

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

The growth of rice plant was fairly good throughout a growing period with suffering from occasional water shortage. Plant became vigorous after flowering as was the case in other plots. Some infestations of brown spot were observed, but not so serious. 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/	
	Chma Prom	Range	Average	Field Yield	Production	Production
2-3 plants/hill	4.1 – 4.5	4.4	3.3 t/ha	275 kg	170 kg	increased
1 plant/hill	4.0 – 4.4	4.2				

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

The growth of rice plant was good throughout a growing period without any serious problems, except for occasional water shortage because of rainfed field. Plant became vigorous after flowering, which appeared to be a characteristic of the variety planted. At final stage of maturing, complete lodging occurred in the plot..

(d) Plot 4

Variety	Crop Cut Survey (t/ha)		Whole Plot		Demonstrators Assessment 1/	
	Chma Prom	Range	Average	Field Yield	Production	Production
2-3 plants/hill	3.1 – 3.6	3.4	3.3 t/ha	98 kg	34 kg	increased
1 plant/hill	4.0 – 4.4	4.2				

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

The growth of rice plant was rather poor up to the booting stage, but it recovered and plant became vigorous after flowering. No serious problems observed except for occasional water shortage during a growth period.



(e) Plot 5

Variety	Crop Cut Survey (t/ha)		Whole Plot		Demonstrators Assessment 1/	
	Riang Chey	Range	Average	Field Yield	Production	Production
2-3 plants/hill	3.1 – 3.9	3.6	3.2 t/ha	543 kg	340 kg	increased
1 plant/hill	2.7 – 5.0	3.8				

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

The growth of rice plant was fairly good throughout a growing period, although ununiformity of plant growth continued up to harvest. Such uneven growth can be



explained by differences in micro relief in the field and, therefore, by water supply conditions. Plant became vigorous after flowering. No clear differences was observed between 2-3 plants/hill and 1 plant/hill after around the middle of vegetative growth stage because of uneven growth in each treatment sub-plot.



### BIII-3.8.5 Results

Yield of five 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	Chma Prom	Plot 1	2.0	4.4	+2.4
	Riang Chey	Plot 2	2.0	3.7	- 1.7
	Chma Prom	Plot 3	2.0	3.9	+1.9
	Chma Prom	Plot 4	2.0	3.3	- 1.3
	Riang Chey	Plot 5	2.0	3.2	- 1.2
	Average		2.0	3.7	- 1.7

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

### BIII-3.9 Small Scale Adaptability Trials

#### BIII-3.9.1 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, 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-4 in 2006/07**

Trial	Objective
Simple Trial on Medium Variety	
- Variety Trial: transplanting	To test adaptability of 6 varieties under transplanting
- Variety Trial: direct sowing	To test adaptability of 6 varieties under direct sowing
- Nursery Trial	To test dry~semi dry seedbed preparation

#### BIII-3.9.2 Trial Design

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

**Design of Adaptability Test in Zone-4 in 2006/07**

Trial	Treatment
Simple Trial on Medium Variety	
- Variety Trial: transplanting	6 variety (Riang Chey, Phka Rumchang, Phka Rumduol, Chung Kong Mon, Chma Prom, Sem Pidao)
- Variety Trial: direct sowing	
- Nursery Trial	Soaking 1 day + with or without incubation, direct seeding; Covering with soil & grass or without cover

#### BIII-3.9.3 Growth History and Key Farming Practices

An adaptability test (simple trial) on medium variety and on seed bed preparation was conducted in the zone. The trials were carried out with input level (fertilizer doses) higher

than the verification plots aiming at obtaining data on potential yields. However, the plot suffered from water shortage occasionally during a growth period. Key farming practices were same as those for verification test shown in section BIII-3.8.

### BIII-3.9.4 Results

The results of the small scale adaptability test are summarized in the following table.

**Results of Simple Trial for Medium Variety in Zone-4**

Trial/Variety	Treatment	Crop Cut Yield 1/	Whole Plot Yield
Variety Trial: Transplanting	Phka Rumchang	4.1 t/ha	-
	Phka Rumduol	4.9 t/ha	-
	Sen Pidao	3.0 t/ha	2.4 t/ha
	Chung Kong Mong	3.3 t/ha	-
	Chma Prom	3.0 t/ha	2.9 t/ha
	Riang Chey	2.5 t/ha	2.2 t/ha
Variety Trial: Direct Sowing	Phka Rumchang	3.4 t/ha	-
	Phka Rumduol	3.4 t/ha	-
	Sen Pidao	2.8 t/ha	-
	Chung Kong Mong	2.5 t/ha	-
	Chma Prom	1.9 t/ha	1.7 t/ha
	Riang Chey	1.7 t/ha	2.1 t/ha
Nursery Trail	10 treatments	3.7 t/ha	-

1/: Samples taken at point showing normal growth

#### (1) Variety Trial

Growth of rice plants in the plot was good during the vegetative growth stage, although the plot suffered from occasional water shortage during a growth period. Fairly good performance in Phka Rumchang and Phka Rumduol was attained, which matured earlier and less affected with limited rainfall distribution in November in the zone. Other medium varieties might have suffered from water shortage during the maturing stage.



#### (2) Direct Sowing

The trial on direct sowing was conducted aiming at examining possibility of introduction of direct sowing to mitigate drought in the zone. All varieties grown showed excellent growth at vegetative stage, however, their growth became poor from panicle initiation to flowering (because of continuous inundation?). At maturing stage, their growth recovered (under drained soil conditions). The possibility of the introduction of direct sowing was confirmed but farmers interests on the practice were not high. Further, efficiency of direct sowing in line should be improved for the practice to be adopted by farmers. The distance of planting rows in the trial was 50cm and, therefore, yields of the trial were rather low.



#### (3) Nursery Trial

In the area, all the nurseries for the verification plots suffered from water shortage due to

insufficient watering. In order to examine growth of seedlings under sufficient watering, nursery trial (dry to semi-dry seed bed) was conducted both in a rice field (simple trial plot) and upland field.

The results or findings of the trial were simple as follows;

- When seed bed is covered with  $\pm 0.5$  cm of soils (to a depth seeds not to be exposed by watering) good germination and growth of seedlings are ensured with sufficient watering,
- In case when water supply to nursery solely rely on rainfall, dry seeds without incubation can be sown with soil cover to raise seedlings, although it takes more time to have seedlings ready for transplanting, and
- With the practices developed through the trial, with sufficient watering, seed bed preparation in July, short dry spell during the rainy season, can be made successfully and younger seedlings can be transplanted in August, in stead of current prevailing practices in which farmers prepare nursery in June and transplanting aged seedling in August waiting for the start of main rainy season.



Nursery trial in an upland field was a trial on upland nursery (dry seed bed). In the trial, healthy and stout seedlings with dense roots were grown successfully with sufficient watering. The result of the trial indicates the adaptability of upland nursery in rainfed area if farmers accept practice of sufficient watering to seed bed for about 7 to 10 days after sowing.

### BIII-3.10 Farmers' Acceptability Survey

#### BIII-3.10.1 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.

#### BIII-3.10.2 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	

#### BIII-3.10.3 Results

In the area, rice productions in all the verification plots were satisfactory and most of the proposed practices were supported by the demonstrators except for fertilization practices. Fertilizer doses adopted in the verifications were lower than their last year practices.

Practices not accepted by some of them include seeding rate, seeding density, raised seedbed and fertilizer doses.

In all the plots, paddy yield increased compared with the same of the last year. Their reasoning for the improvement are: improved farming practices, favorable rainfall and top

dressing timing.

For questioning whether they follow the proposed practices in the next season, their intentions are mostly to follow all the practices except for fertilizer doses and a planting method of 1 plant/hill.

**PART-B**  
**PILOT PROJECTS (2006/2007)**

***Section-IV***

***Technology Transfer, Sharing of Experiences  
and Lessons Learned***



*Percolation Test by PDOWRAM Staff with Simple Equipment  
(Participatory Irrigation Management and Development Activities in Zone-1)*

## **PART-B: PILOT PROJECTS (2006/2007)**

### **Section-IV**

## **Technology Transfer, Sharing of Experiences and Lessons Learned**

### **Chapter BIV-1 Technology Transfer**

#### **BIV-1.1 Importance of Technology Transfer in Pilot Project**

It is obvious that achievement of the targets within the pilot projects is not the goal of development. Knowledge of the effects of the pilot projects need to be disseminated to other areas, since the sizes of the pilot project areas are very small. The organizations most expected to carry out this dissemination are PDOWRAM and PDA. Their duty is to support the farmers in Kampong Speu province continuously. In this connection, it is so important for the pilot projects to empower PDOWRAM and PDA staff, so that they can continue their activities even after the pilot projects end.

#### **BIV-1.2 Technology Transfer to PDOWRAM Staff**

##### **BIV-1.2.1 General Problems of PDOWRAM before Starting Pilot Project Activities**

Actual situation and problems of PDOWRAM were investigated by the JICA study team. The following general problems were found as a result of a survey.

- Many of PDOWRAM officers were lowly motivated and did not have any incentive for their work. The main cause of this situation was low salary; for example, the minimum was R 53,100 (about US\$ 13)/ month for a high school graduate. Therefore; they constantly sought better posts and working environment. They made a living through having a side job such as a motorbike taxi driver or a farmer.
- The budget provided to PDOWRAM was so limited that it was hard for them to complete their tasks such as regular monitoring of irrigation facilities.
- PDOWRAM officers did not have much opportunity to build capacity for water resource management or administration of their organization through training, study tours or OJT (on-the-job-training).

##### **BIV-1.2.2 Technology Transferred to PDOWRAM Staff**

It was decided to involve PDOWRAM staff with the pilot project implementation team since sustainable development could not be achieved without them. Besides, it was agreed by JICA to subsidize the government regulated amount of allowance for the field works, which could not be paid by the Government due to less budget.

Throughout the pilot project period in the first season, the following technologies were transferred to PDOWRAM pilot project implementation team members by MOWRAM counterparts and the JICA study team.

- Use of handheld GPS
- Transferring GPS data to GIS software
- Digitizing paddy plot boundaries in the GIS software
- Measuring canal discharge in a simple way
- Interviewing farmers using questionnaires
- Facilitation of farmers in the village meetings
- Empowerment of FWUC leaders
- Skill of facilitation in the meetings
- Understanding the proper operation of FWUC through study tours

In the training, not only “how to do” but also “why the work is necessary” and “how to

use the data” were carefully explained. Without such explanations, PDOWRAM counterparts could learn the technology only in fragments without seeing the overall picture.

Among the above, empowerment of FWUC leaders is a crucial task for PDOWRAM. They have to continue to empower FWUC leaders in the areas surrounding the pilot project areas. To understand how to empower FWUC leaders, the JICA study team employed the experienced local expert who has experience in strengthening advanced Sdau Kaong FWUC. He shared his experience in strengthening Sdau Kaong FWUC with PDOWRAM counterparts. Then PDOWRAM organized training for Ou Veang FWUC leaders. The following positive effects of this process were observed.

- PDOWRAM staff who hesitated to explain something in front of farmers started to train the FWUC leaders by using charts, etc.
- PDOWRAM staff changed their methods of training the FWUC leaders. Previously, they tended to just read the contents of the government policies or manuals, but after listening to the local expert, they started to organize group discussions and presentations by the groups.
- PDOWRAM staff tried to improve on the procedures given by the experienced local expert and explain them to the FWUC leaders.

In conclusion, PDOWRAM staffs worked hard supporting Ou Veang FWUC, even though they were still suffering from many problems. Their efforts supporting the FWUC are highly appreciated.



PDOWRAM counterparts set a current meter for canal discharge measurement.



JICA study team explained why canal discharge measurement and irrigation diagrams were needed.



MOWRAM counterpart trained PDOWRAM counterpart how to prepare a land holding map by GIS



PDOWRAM staff provided training to the FWUC leaders

### BIV-1.3 Technology Transfer to PDA Staff

#### BIV-1.3.1 General Problems of PDA before Starting Pilot Project Activities

Actual situation and problems of PDA were investigated by the JICA study team. The

following general problems were found as a result of the survey.

- Some PDA officers who held Bachelor's or Master's degrees worked for NGOs as full-time staff. They felt that they had sacrificed themselves to the government; however, most of them would be reinstated in PDA due to their reputations and social status.
- The middle-level officers who stayed at the offices were in charge of several agricultural and rural development projects sponsored by the Government and donors simultaneously. Therefore, they were always busily occupied. Nevertheless, many of them were highly motivated and contributed to the success of the projects.
- It should be noted that many of the low-level officers had already lost their incentive to devote themselves to their work because of their low salary and unstable working schedule.

#### **BIV-1.3.2 Technology Transferred to PDA Staff**

PDA staff also needed to be involved with the pilot project implementation team since sustainable development could not be achieved without them. In addition, JICA agreed to subsidize the government regulated amount of allowance for the field works, which could not be paid by the Government due to financial constraint.

Throughout the pilot project period in the first season, the following technologies were transferred to PDA pilot project implementation team members by MAFF counterparts and the JICA study team.

- Improved farming practices: learning through doing from seed bed preparation to transplanting & fertilization
- Growth survey of rice plants from nursery to maturing
- Yield surveys (yield components)
- Monitoring methods of farming practices & labor requirements
- Production cost monitoring methods
- Agro-economic surveys (farmer interview surveys)

PDA staffs also eagerly worked supporting local farmers, even though they are still suffering from many problems. Their efforts supporting the farmers were highly appreciated.



## Chapter BIV-2 Sharing of Experiences and Lessons Learned

### BIV-2.1 Joint Meetings

Based on the basic strategy for pilot project implementation, which is “Strategy-3: Government agencies collaborating in irrigated agriculture related activities”, it was decided to hold joint meetings to share the experiences between organizations.

#### Joint Meetings Conducted in 2006/07

No.	Date	Location	Experiences Shared by Participants	Organizations Attending
1	June 01	PDOWRAM office PDA office	Organizational set-up	PDOWRAM PDA MOWRAM MAFF JICA Study Team
2	June 05	PDA office	Initial guidance on the pilot projects	PDOWRAM PDA JICA Study Team
3	June 06	CEDAC office	Organizational set-up and initial guidance on the pilot projects	CEDAC JICA Study Team
4	July 07	PDA office	<ul style="list-style-type: none"> <li>- Preparation of cadastral maps</li> <li>- Selection of farmers who cooperate with the projects</li> </ul>	PDOWRAM PDA Prey Pda Experimental Station MOWRAM JICA Study Team
5	August 12	PDA office	<ul style="list-style-type: none"> <li>- Preparation of water use maps</li> <li>- Canal discharge measurements</li> <li>- Progress of transplanting</li> <li>- Study tour for SRI</li> </ul>	PDOWRAM PDA CEDAC MOWRAM JICA Study Team
6	August 23	PDA office	<ul style="list-style-type: none"> <li>- Study tour for FWUC strengthening</li> <li>- Difficulties in transplanting</li> <li>- Selection of seeds</li> </ul>	PDOWRAM PDA Prey Pda Experimental Station CEDAC MOWRAM JICA Study Team
7	September 15	PDA office	<ul style="list-style-type: none"> <li>- Progress of experimental farming practices improvement</li> <li>- Progress of participatory agricultural extension</li> <li>- Necessity of GPS and GIS training for PDA</li> </ul>	PDOWRAM PDA Prey Pda Experimental Station CEDAC MAFF JICA Study Team
8	October 12	PDA office	<ul style="list-style-type: none"> <li>- Problems in proper water management</li> <li>- Core problems of farming practice</li> <li>- Progress of SRI extension</li> <li>- Site visit</li> </ul>	PDOWRAM PDA Prey Pda Experimental Station CEDAC MOWRAM MAFF JICA Study Team
9	December 15	PDA office	<ul style="list-style-type: none"> <li>- Collection and utilization of irrigation service fees</li> <li>- Varieties and yields of experimental farming</li> <li>- Farmers intention to upland crop cultivation in the dry season</li> </ul>	PDOWRAM PDA Prey Pda Experimental Station CEDAC MOWRAM MAFF JICA Study Team

In the joint meetings organized by the JICA study team, the experiences of each organization were shared by all. Some effects of the joint meetings were identified. PDOWRAM proposed that they, PDA and CEDAC conduct village meetings together. In the joint village meetings, PDOWRAM will provide training for the FWUC and PDA and CEDAC will give technical guidance to the farmers' groups. It is expected that they will recruit more farmers since the farmers can learn a lot from the meetings. Another idea was proposed by PDA. After they saw the effectiveness of landholding mapping using a handheld GPS, they proposed to establish a provincial agricultural database using GPS. They requested that the JICA study team to support them technically and financially. The idea was supported by the MAFF counterpart, since MAFF was promoting the establishment of an agricultural database.



## **BIV-2.2 Lessons Learned**

### **BIV-2.2.1 General**

As mentioned in the previous chapters, various activities were taken in the two pilot projects: Irrigated Agriculture On-farm Technology Improvement Pilot Project and Rainfed Agriculture Improvement Pilot Project. Through these activities, the following lessons learned were obtained. These lessons learned are mentioned in consideration of 6 categories, that is 5 basic strategies of pilot projects and others.

#### **BIV-2.2.2 Participatory Irrigation Management and Development**

(1) Strategy-1: Learning from good farmers' practices in Cambodia

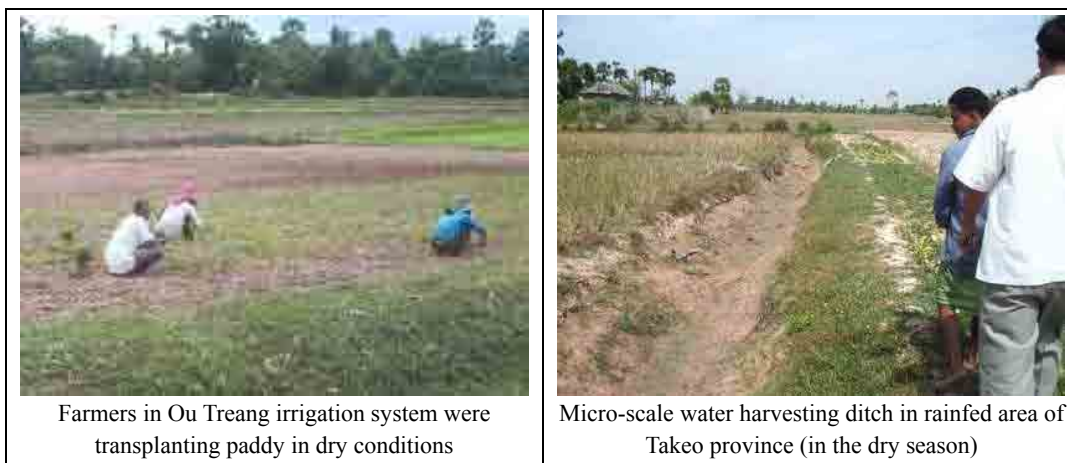
(a) Necessity of Development of Water Resource Scarce Areas

It was found that water resources in Zone-3 are extremely limited. Especially this season, the area was struck with severe drought. Even the Ou Treang irrigation system, which is an irrigation system with a large reservoir, faced a water shortage in 2006.

Since water resources are very limited, development of this area only by irrigation might not work well. It was confirmed that SRI could improve productivity even in this drought condition, so intensive agricultural extension could save farmers in this area. Nevertheless, in reality, there is a tendency for many agricultural extension projects to be conducted only in water available areas such as Zone-1, so this tendency needs to be changed.

It might be possible to develop these areas with a multi-sector approach. The areas might not have enough potential for irrigation development but water is all the more precious and a vital issue. Water saved in the reservoir could be used not only for irrigation but also for livestock and domestic uses. In this sense, it is important to motivate villagers to establish a proper village level water use strategy and regulations.

Another possibility for development would be promotion of micro-scale water harvesting systems. If farmers in the area rely too much on the water harvesting irrigation system, they might be severely damaged in drought years. To mitigate such damage, the effectiveness of micro-scale water harvesting should be researched.



Farmers in Ou Treang irrigation system were transplanting paddy in dry conditions

Micro-scale water harvesting ditch in rainfed area of Takeo province (in the dry season)

#### (b) Importance of a Quick Plan-Do-See Cycle in Project Operation

Four study tours were conducted in the first year. Two of them were carried out for FWUC strengthening and the other two were related to agricultural extension. Each study tour was organized by the pilot project implementation team with specific topics to learn from the hosting advanced farmers' group. However, it was found that when visitors spoke with the hosting farmers' group members, they learned not only specific topics but more. The visitors were interested in various activities in the advanced area. For example, the first study tour for agricultural extension was designed to learn about SRI, but the visitors also learned about savings activities. Some participants of the study tour started savings activities immediately after they came back from the study tour. After they started the savings activities, it was found to be important because it could contribute to farmer-to-farmer agricultural extension. It can be said that learning of savings activities was an important windfall effect for the objective of the project.

Importance of a quick plan-do-see cycle in the project operation was confirmed through this experience. Once a project finds an important windfall effect, the activity which can derive such windfall effect should be included in the project design; otherwise the project misses a chance to receive the good influence from the windfall effect.

#### (c) Necessity of Empowering Farmers by Confirming Their Behavioral Change

It was observed that there are several turning points for farmers to change their minds and attitudes. The first point is when they realize the necessity of improvement. At this point, it is crucial that they feel their target is reachable. The most effective way to make them reach this turning point is to organize a study tour and show them an advanced model. The advanced model needs to be a model established by Cambodian farmers in a similar situation, otherwise the farmers can not believe the target is reachable. The second turning point is when they start to believe that they themselves can do it. Even if they realize that they need to change, there is a tendency for them to hesitate to take action if they feel it is not easy. Proper training should be given to them at this point. When they believe they can do it, they start to move forward.

#### (d) Necessity of Incentives for FWUC Committee Members

It was confirmed that FWUC committee members of advanced FWUCs such as Ou Treang FWUC and Sdau Kaong FWUC, are receiving incentives for their duties. Though irrigation service fees should be mainly used for operation and maintenance of their

irrigation system, FWUC committee members might not be willing to sacrifice too much for FWUC work if they are not rewarded for doing so. If they are asked to sacrifice too much with no recompense, they would not continue to work for the FWUC. Thus, the necessity of incentives for FWUC committee members should be carefully considered and discussed by FWUC members.

(e) Identified Keys for Proper Collection of Irrigation Service Fee

The JICA study team visited several advanced FWUCs to understand the situation of Ou Veang FWUC deeply, by comparing their situations. Through this comparison, it was found that there were some points in common in their irrigation service fee collection systems as follows.

- FWUC members request water supply from the FWUC by request form.
- FWUC members can request FWUC leaders to check their actual water supply in the field. If the leaders admit that the members are not able to take water from canals, the leaders will decrease the amount of irrigation service fee.
- FWUC committee keeps accounting records and reports the result to FWUC members.



Water supply request form used by Sdau Kaong FWUC

From these points in common, it could be said that the keys for proper irrigation service fee collection are i) conceptual demand base supply and ii) transparency.

a) Conceptual Demand Base Water Supply

It should be noted that actual water distribution by the advanced FWUC is not demand basis in the field, even farmers request water supply by request form. Since their irrigation system does not have on-farm irrigation facilities, they can not distribute or stop water flow to each plot. But even actual water distribution by the FWUCs is not demand basis, the FWUC members seemed to accept the situation and pay irrigation service fee. Demand base water supply would be mentally important for the FWUC members. Introduction of demand base water supply would make farmers feel that they have to pay irrigation service fee, even it is just a conceptual.

b) Transparency

There are two important things that must be accomplished to raise transparency of the irrigation service fee collection system. One is on-site checking. With this system, farmers can ask FWUC leaders to come and see the actual condition of the water distribution. If the FWUC leaders admit that the farmers are not receiving water properly, they will discount the irrigation service fees. The other important point is a transparent accounting system. The advanced FWUCs are opening their accounting records to the FWUC members so the members can understand how their irrigation service fee was used and why it is necessary.

(2) Strategy-2: Project Operation by United Farmer-Government-NGO Project Team

(a) Related Institutions to be involved in the Project Activities

In the beginning of the pilot projects, the JICA study team stressed the importance of involving not only the Commune Council and Village Chiefs but also the Village Development Committee (VDC) into the project activities. VDC which is the institution in the village supported by the Ministry of Rural Development, aims to be an instrument

of both the government and the people and also to be a facilitator of village-wide community organization. According to the original concept of VDC, it needs to be independent from existing village institutions to avoid political, religious, and racial influences.

However, the idea of involving VDC was not fully understood by the pilot project implementation team members. They thought that involvement of Commune Council and Village Chief into the project is good enough.

The situations of VDCs in and around the pilot project target villages were then surveyed. It was finally found that Village Chiefs or Deputy Village Chiefs were elected as members of VDC as well. This means that villagers did not understand the concept or necessity of VDC clearly and VDCs are not working properly as planned. It could be concluded that involvement of VDC is necessary only if it is recognized as important by the local people.



Kandaol Dom Commune Chief was invited to the village meeting in Pongro village

On the other hand, the importance of involving the Commune Council and Village Chief into the project activities was revealed to be indispensable throughout the pilot project activities because villagers heavily rely on them.

#### (b) Necessity of Implementing Formal Processes in FWUC Activities

The farmers' groups as proposed in the pilot projects could be said to be private organizations. This means that the group is operated only by farmers in a village who voluntarily join the group. The group can function well without involving all the farmers in the village. The group is not necessarily admitted as an official organization, especially at the initial stage.

On the other hand, an FWUC has to involve all water users in the management area spreading over the several villages. If some water users in the area do not join the FWUC and waste water, the FWUC members would be cheated and the FWUC would not function well. To involve all the water users into the FWUC, a kind of official power needs to be given to the FWUC committee. The necessity of employing formal processes in FWUC activities is therefore obvious. By employing formal processes, farmers feel that the FWUC is an official organization to be involved in. For example, it is important for the FWUC to invite local authorities, such as the Commune Council, to their meetings. The relevant water users would realize that the meeting is an official one since the local authority attends the meeting.



Kahaeng Commune Chief is explaining importance of FWUC to Ou Veang villagers

However, it was also found that the Ou Veang FWUC committee faces the difficulty in inviting Commune Council members to the meeting, because the Ou Veang FWUC committee does not know how to invite them. It is thus indispensable for training the committee members about an official process to invite them.

#### (3) Strategy-3: Government Agencies Collaboration in Integrated Agriculture Related Activities

(a) Finding of Proper Timing of Integration of FWUC Strengthening Activities and Agricultural Extension Activities

The master plan proposed the well harmonization of three pillars of irrigation and drainage, agriculture and institution development. FWUC strengthening activities were carried out following this proposal, and then the proper timing to integrate the FWUC strengthening activities and agricultural extension activities was found from the following facts:

- FWUC should prepare water distribution schedule based on the cropping calendar.
- More farmers would join the village meeting if strengthening of FWUC and agricultural extension were conducted at the same time.

FWUC strengthening activities and agricultural extension activities in the second year of the pilot project should be conducted keeping such timing in mind.

(b) Effectiveness of Utilizing the Existing Social Capital of the Local Communities

Throughout the pilot project activities, it was observed that the local authority consisting of a Commune Council and village leaders is functioning well in the project areas. This means that villagers have already created good social capital in their villages and have the capacity to form active farmers' groups. It could be said that forming farmers' groups in this area is not as difficult as generally believed due to tragic history, if the existing social capital is effectively utilized in the project activities.

(c) High Capability of Provincial Government Staffs in Communicating with Local Inhabitants

It was confirmed that provincial government staffs (PDOWRAM and PDA) have high capacity in communicating with local inhabitants. The provincial government staffs are thought to be reliable by the local people and the staffs are trying their best to prove worthy of their trust. They explained the purpose of the project activities properly and motivated farmers to improvement. Furthermore, they presented their activities nicely with their own presentation material in various opportunities such as joint meetings, etc.



PDOWRAM staff speech

It is expected that the provincial government staff will improve their technical skills more and obtain proper budget so they can work for the local people.

(d) Necessity of Applying Different Approaches to Empowering FWUC or Irrigation Management Groups in Different Zones

It was confirmed that different approaches need to be taken in Zone-1 and Zone-3 to empower FWUC or irrigation management organizations. In Zone-1, farmers can receive water properly from the irrigation system, so that they trust their irrigation system. The farmers have to pay irrigation service fees since they have to cooperate with each other and maintain the irrigation system by themselves.

On the other hand, in some water harvesting systems in Zone-3, water supply is not reliable due to limited water resources. In this case, it may be impossible to organize an FWUC in complete form. Obviously, farmers in unreliable water harvesting irrigation areas can not work hard for irrigation management and can not pay irrigation service fees. It is necessary to find another way to form an FWUC to manage their irrigation system. It might be a good idea to organize a lower branch group for irrigation management under

the existing village leader's group. This form of organization was referred to as an irrigation management group in this report to understand the difference between such a group and completely formed FWUC.

(4) Strategy-5: Introduction of Farmer-to-Farmer Extension

(a) Effectiveness of Group Discussions in Meetings and Training sessions

It was found difficult to get farmers to express their opinions directly in the meetings. Some farmers hesitated to express their opinions in front of so many people. Some farmers complained about his or her personal problems without thinking of other participants. Introduction of group discussions was confirmed to be effective to solve this problem. When they were divided into small groups, almost all the participants could express their opinions in the group discussions. Furthermore, since they had to present their opinions as a group at the end of meetings, none of the groups started to discuss somebody's personal problems.



Ou Veaeng FWUC leaders discussing in small groups in training

(5) Others

(a) Importance of Providing Non Formal Education to Farmers

During the training for Ou Veaeng FWUC leaders, it was observed that farmers' capacity for administration or operation is very limited. This must be because that they did not receive proper education after they completed formal education in schools. They must have learned basic subjects such as mathematics in schools but never learned about practical skills for administration such as accounting or filing of letters. It was revealed that such practical skills for administration need to be provided to them, probably through non formal education. It should be noted that such skills are essential for FWUC activities and for all the kinds of activities to improve their lives by themselves.



Ou Veaeng FWUC leaders were learning importance of filing documents

(b) Empowerment of Farmers and Local Government Staff Taking Their Mentalities into Account

When the project tries to empower farmers or local government staff, the appropriate method for empowerment should take their mentalities into account. The following problems in empowering farmers or local government staff were found through training programs conducted in the pilot projects.

- a) Farmers are sensitive about how much of an explanation they can understand and farmers who could not fully understand the explanation might be ashamed of it.
- b) It seemed difficult for farmers or local government staff to step forward if they are not confident in their abilities.
- c) There is a tendency for farmers or local government staff to use the fact that they do not have enough funds as an excuse even if there are several points they can improve without funds.

To combat these situations, the following policies should be put into the training programs.

- a) Trainers have to clearly explain to trainees that what they are explaining is difficult to understand immediately and trainers are going to provide the same kind of training repeatedly.
  - b) Trainers must not prepare all the output instead of the trainees. The trainers can provide blank format to the trainees but should not prepare it all for them. It is common that trainers prepare all the output (such as reports, letters, and presentation material) instead of the trainees. However, this destroys any positive attitude of the trainees and they can never be confident in their ability. Even if they can not prepare their output well, it should be accepted, at least in the initial stage, as far as their mistake is not critical.
- (c) Proper Use of Scientifically Obtained Data and Data Collected in a Participatory Manner

Two types of data were acquired in the pilot project. One was scientifically obtained data which was measured by experts. The other was participatory collected data which farmers tried to measure under guidance of the experts. Especially for the crop yield surveys, accuracy of these two types of data was argued. Finally, it was understood that both types of data are important for the project.

Needless to say, scientifically obtained data is important to objectively present results of the project to the professional experts working for the government, donor agencies, etc. It is obvious that they believe accurate data which was obtained by professional experts in scientific manner.

Data collected using a participatory approach was also revealed to be important. Such data are apt to be ignored by the experts because the data was not collected in scientific manner and sometimes included some errors. But it was found that farmers would believe such data more strongly because they measured it by themselves. Farmers might not be able to properly understand the numerical data shown by professional experts but they can easily believe what they measured. The focal point to use the data collected using a participatory approach in the project is to compare two situations using the same measuring procedure. This means that they can compare both situations, even if their data contains some errors. In participatory agriculture extension activities, farmers compared yield of SRI with that of traditional farming practices. They also compared both farming practices and came to be confident in their results. The fact that farmers believe what they see rather than numerical data, shows the importance of data collected using a participatory approach.



Farmers were comparing yield of SRI with traditional farming practice by their hands

In conclusion, it could be said that scientifically obtained data are useful for professional experts and data collected using a participatory approach are important for farmers. Both types of data need to be used in the proper situations.

- (d) Necessity of Paying Careful Attention to Sustainable Development

Necessity of supplying snacks to participants of the group activities such as meetings was always lively discussed. PDOWRAM staff stated that before donors and NGOs started their activities in Kampong Speu province, serving snacks to the participants was not common. However, at present, local people are used to such habits and always expect



some physical incentives in their group activities. This makes it difficult for PDOWRAM staff to organize meetings, since they do not have enough budget to prepare snacks for participants. PDOWRAM staff said they want to stop this habit, if all the donors and NGOs stop doing it together.

Ou Veang FWUC committee members also said that they want to serve snacks to farmers when the pilot project implementation team proposed to clear canals by farmers. Then, the implementation team asked the FWUC committee whether they can serve snacks next year by themselves. They promptly answered that they can not. Then it was decided that the implementation team should not supply snacks to farmers to avoid creating too much expectation in the canal clearing work in the future. It was feared that the FWUC committee will not be able to ask farmers to clear canals without serving snacks once it comes to be a habit. As a matter of fact, one of the Village Chiefs (he had been elected as village leader of the FWUC as well) served local fruits to farmers after the canal clearing work. It was found that this kind of arrangement could be made by local people.



Bos Ta Ney Village Chief served local fruits to farmers after the canal clearing

From the above experiences, it could be concluded that snacks should not be served for the routine works of PDOWRAM and FWUC, since it might be an obstacle for their sustainable routine works. Serving snacks does not require a lot of money for outsiders but outsiders should pay careful attention to this matter, otherwise it might affect sustainability of the project activities.

(e) Necessity of Proper Understanding of the Necessary Conditions and Requirements for an Active FWUC

Through PIMD activities in Zone-3, it was confirmed that without proper access to irrigation water, an FWUC (or irrigation management group) could not be active. If there is no water flowing in the canal, farmers will not work for an FWUC. This means that proper access to irrigation water (engineering aspect) is a necessary condition for an active FWUC.

However, this does not mean that FWUCs which can receive water properly always function well. A comparison of four FWUCs (Ou Treang FWUC, Sdau Kaong FWUC, Phoum Rong FWUC, and Ou Veang FWUC) shows this fact. Among the four FWUCs, Ou Veang FWUC has the easiest access to irrigation water. Some farmers in Ou Veang FWUC are enjoying double cropping by gravity irrigation, which is a dream for other FWUCs. Nevertheless, the function of Ou Veang FWUC is the weakest of the groups.

The same situation was observed in Ou Veang FWUC. A comparison of five villages in the PIMD activities area showed that the most upstream village where double cropping is conducted is paying the lowest irrigation service fees even in the rainy season. They never pay irrigation service fees in the dry season.

From these facts, it could be concluded that proper access to water is not enough for an active FWUC. Providing access to irrigation water by constructing irrigation facilities could meet the necessary conditions but could not meet all the requirements for an active FWUC. Proper training should be given to such FWUC; otherwise the FWUC does not function well and wastes the precious irrigation water.

(f) Necessity of Understanding the Nature of FWUCs and Providing a Proper amount of Time for Strengthening

It is obvious that strengthening of FWUC is more difficult in nature as compared with farmers' groups. The differences between the organizations in their nature were confirmed to be as follows in the pilot project.

**Identified Natures of FWUC and Farmers' Groups in the Pilot Project**

	<b>FWUC</b>	<b>Farmers' Group</b>
Joining the organization	compulsory	voluntary
Scale of activities	Large (larger than village boundary)	Small (within their village)
Number of members	Large (more than 150 members in the PIMD activities area in Zone-1)	Small (about 30 members, only around 15 core members who joined a savings sub-group)
Required cost for activities	High (transportation to other villages, etc.)	None
Necessity of cooperation with the Commune Council	High (because FWUC needs a trans-village network)	Low (a trans-village network is not required)

It can be easily understood from the above comparison table that strengthening of an FWUC is more difficult and needs more work as compared with a farmers' group. However, strengthening of an FWUC should not be conducted hurriedly. When the pilot project implementation team provided training to FWUC leaders, the leaders confessed that they could not understand all of the explanations in the training. Especially, if the FWUC is not matured enough, the leaders are not used to work for the FWUC, so it might be difficult for them to understand all the explanations in a short time. In this case, trainings should be provided unhurriedly, otherwise it is possible that the FWUC leader will come to dislike working for the FWUC. Through this experience, the necessity of providing a proper amount of time for FWUC strengthening was really realized. In the irrigated agriculture development planning, proper time should be given to FWUC strengthening considering the maturity level of the target FWUC. Without an FWUC strengthening plan and proper time, the FWUC would not function as it is expected.

One idea to minimize the required time for FWUC strengthening is farmer-to-farmer strengthening. When the FWUC committee becomes fully developed in the future, they would be able to train sub-group leaders by themselves.

(g) Necessity of Improving Administration of FWUC Prior to beginning Water Management

It was found to be important to strengthen administration of FWUC prior to water management training because the most important activity for FWUC is to make FWUC members consent to the irrigation management plan through holding meetings. If the FWUC can not organize meetings and fails to obtain consent from the members, skill in water management will never be used. The FWUC committee can not or should not operate irrigation facilities without FWUC members' consensus. It was clearly understood that administration of FWUC should be strengthened first. By strengthening the administration, the FWUC members would be able to organize meetings by themselves. Then training on water management should be provided so that they can properly operate irrigation facilities based on the FWUC members' consensus.



Ou Veaeng FWUC leaders were learning how to prepare a meeting agenda

(h) Difficulties in Establishing Trans-village Networks for FWUC Activities

Since the management area of the FWUC can spread over several villages, it is essential

to establish a trans-village network. Without a trans-village network, FWUC leaders living in different villages can not work together. However, establishment of trans-village networks was found to be difficult. Villagers did not have channels of communication with other villages except through the Commune Councils. The importance of involving the Commune Councils into FWUC activities was again confirmed. In particular in the initial stage, FWUC leaders should communicate with each other with the support of the Commune Council.



Kandaol Dom Commune Chief was advising FWUC leaders in the training

(i) Effectiveness of Utilizing Various Village Events in FWUC Activities

After establishing village sub-groups, the pilot project implementation team asked village leaders to distribute FWUC magazines in their village. According to the village leaders, they distributed the magazines when they held a village festival to celebrate harvesting. It was also reported by village leaders, their Village Chief always reports their annual activities and financial condition to the villagers in this festival. It might be a good idea for FWUC sub-groups to present their annual activities in this festival together with the Village Chief. By doing so, the activities of the FWUC will be widely known.

(j) Importance of Preparing Preliminary Land Holding Map in FWUC Strengthening Activities

Importance of preparing a preliminary land holding map in FWUC strengthening activities became clear from the following two aspects.

The first aspect is irrigation service fee collection. Chief of Ou Veang FWUC (an FWUC which can not collect irrigation service fees properly) confessed that the FWUC committee always argues with the FWUC members about the amount of the irrigation service fees. The FWUC had prepared a cadastre (list of water users) under support of PDOWRAM. However, the cadastre only showed land sizes estimated by farmers. Actual land sizes had never been confirmed at the site. Since actual land sizes were unknown, FWUC members complained to the FWUC committee that the committee overestimated land sizes when the committee asked members to pay irrigation service fees. As a result, many FWUC members did not pay the proper amount of irrigation service fees. The FWUC committee could not convince them because they did not know the actual size of their paddy plots. This experience shows the importance of preliminary land holding maps in collecting irrigation service fees in a transparent way.



Participatory survey and planning based on the preliminary land holding map

The other aspect is establishment of a canal layout based sub-group. To form a canal layout based sub-group, it is essential to identify the locations and water sources of each paddy plot. The cadastre prepared by Ou Veang FWUC is not sufficient for this work, since location of paddy plots could not be identified from the cadastre. If the irrigation area is relatively small and the Government can provided intensive support to farmers on site, the location and water source of each paddy plot could be confirmed without a preliminary land holding map. In fact, one of the advanced FWUC, Ou Treang FWUC, did not prepare a preliminary land holding map but they succeeded in establishing canal layout based sub-groups. Their irrigation system is not very big and MOWRAM provided

intensive support to them. Though Ou Treang FWUC succeeded in creating canal based sub-groups without a preliminary land holding map, it is generally quiet difficult to establish canal layout based sub-groups without a preliminary land holding map.

(k) Necessity of Developing a Rapid and Low Cost Land Holding Map Preparation Method

As mentioned above, preparation of preliminary land holding maps is crucial for FWUC strengthening. In fact, the necessity of preparing the maps was already understood by PDOWRAM and Ou Veang FWUC even before starting the pilot projects. But they face difficulty in how to prepare it with their limited budget. The necessity of developing rapid and low cost preliminary land holding map preparation method was then realized.



Ou Veang FWUC committee explaining the paddy plots resource map to PDOWRAM

In the PIMD activities in Zone-1 and Zone-3, preliminary land holding maps were experimentally prepared in simple way using local peoples' knowledge (resource map), handheld GPS, and GIS software. It worked well in Zone-1 but failed in Zone-3. In Zone-3, local people did not prepare the resource map well since they were not very interested in their unreliable water harvesting irrigation system. Even if preparation of a preliminary land holding map in a simple way failed in Zone-3, it is still believed that the procedure has high possibilities. Generally preparation of resource maps and procurement of a handheld GPS do incur much cost, but this procedure needs minimum funding only if GIS software is available. The preliminary land holding maps prepared in this way have limitations in accuracy, because a handheld GPS can not survey the position so accurately. In the PIMD activities area in Zone-1, the GPS showed accuracy less than 8-11m. The error seemed to be big for measuring very small paddy plots but the majority of farmers accepted the result. Probably they did not understand well about the accuracy but it seemed that they were satisfied with the availability of the map. They could compromise with the accuracy of the map, because it is far better than the estimations that had been made by the farmers.

Through the above mentioned experience, the possibility of applying the same procedure to other areas was suggested. However, the procedure should be tested more and standardized. It is expected that this procedure will be improved and standardized by MOWRAM. The experience of PIMD activities in Zone-1 could contribute to development of the procedure.

(l) Necessity of Establishing a Simple Method for Updating Preliminary Land Holding Maps

It is essential to keep updating the preliminary land holding maps, since land owners will change in the future. The FWUC has to understand how to update their map. It is proposed to establish manual updating procedures by MOWRAM, which can be conducted by the FWUC, so that they can keep updating their preliminary land holding map.

(m) Effectiveness of Introducing FWUC Initiated Training Systems

At the each end of the training for FWUC leaders, all the trainees were asked to express their impressions of the training. As a result, it was found that they completely lost their initiative when the pilot project implementation team arranged everything. In fact, in the initial stage of training, many trainees complained about the arrangements made by the

pilot project implementation team, such as the location, snacks, food, transportation cost and so on. Then, the implementation team changed their perspective. The implementation team asked the FWUC leaders to choose the location, date and time of the training and invite PDOWRAM staff as trainers. The training was held with this system on February 8, 2006 and no complaints from the participants were heard on the day.



Ou Veaeng FWUC chief was discussing the schedule of next the training with FWUC leaders

(n) Importance of Publicizing Information regarding the FWUC

It was found that many farmers considered the FWUC to be only a recipient organization for irrigation facilities improvement. When donor agencies improved irrigation facilities, the agencies requested farmers to form an FWUC and agreed to their facilities improvement plan by FWUC. This means that trigger for forming FWUC was improvement of irrigation facilities. It was also observed that many donor agencies stopped their assistance after they improved the irrigation facilities. This type of assistance seemed to be repeated several times. Then farmers in the area came to think that



Farmers were enjoying an FWUC magazine

FWUC was only a recipient organization for irrigation facilities improvement. This means that farmers understood that the role of FWUC was to obtain consensus on irrigation facilities improvement plans but not irrigation management. This kind of misunderstanding on the role of FWUC should be rectified as soon as possible; otherwise farmers will never realize their duty, which is on-farm irrigation system management. Thus, the importance of publicizing information regarding FWUC was revealed. Publishing pictorial FWUC magazines could be one of the most effective solutions since it was confirmed that farmers in the area eagerly read such kind of publications.

(o) Necessity of Providing Technical Information to PDOWRAM

It was found that there was no technical reference book in the Kampong Speu PDOWRAM office. Lack of technical books hindered PDOWRAM staff from improving their capacity by themselves. It is necessary to provide technical reference books so they can develop their capacity more.

**BIV-2.2.3 Participatory Agriculture Extension**

(1) Strategy-2: Project operation by united farmers-government-NGO project team

(a) Importance of Showing Various Types of Farming Practices in Agricultural Extension

It was observed that agricultural extension has many similarities with trading businesses. Using a metaphor, an extension worker could be considered as the owner of a shop and farmers could be customers of the shop. It is obvious that if the shop owner displays only one commodity in the shop, not many customers will buy it because the demands of customers are various. Some customers put importance on price and some customers think quality is preference. Similarly, if the extension worker shows only one fixed way to

cultivate a given crop, not many farmers can follow it because the situations of the farmers varies. Some farmers can apply a lot of fertilizer but some farmers can not. Some farmers might think that use of a lot of fertilizer is too risky because they are always facing drought and crops are easily damaged. It was confirmed to be important that the facilitator should show various types of farming practices to farmers and ask them to choose the most suitable one for them considering their natural and financial conditions.

(2) Strategy-5: Introduction of Farmer-to-Farmer Extension

(a) Identified Key Points for Effective Participatory Agricultural Extension

Effectiveness of participatory agriculture extension was confirmed in the first season. Identified key points of the participatory agriculture extension are as follows.

- Guide farmers to compare innovation with traditional practices on site by themselves
- Lead farmers to start at a micro-scale
- Explain that no additional inputs such as fertilizer or seeds are required
- Instruct farmers to share their ideas
- Provide chances for farmers to learn from experienced farmers (introduction of farmer promoter system or study tours)

Especially, comparison tests by farmers themselves were found to be so important and effective. In Mohaleaph village in Zone-3, farmers who introduced ecological SRI, said yield of SRI plots was lower than that of traditional practices in the previous year. But they also said the yield of traditional farming practices in 2006 was lower than SRI, so they could understand that reason for low yield was not introduction of SRI but the drought. If they did not conduct their own comparison test, they might think that the yield decreased due to the introduction of SRI.



(b) Importance of Sharing Experiences through Lateral Farmers' Networks

Effectiveness of sharing experiences among farmers was confirmed. In the participatory agricultural extension activities, experiences and/or knowledge of advanced farmers in other areas were shared with farmers in the project areas. In the study tours, the farmers in the project areas visited and saw the activities of the advanced farmers directly. In inter-village workshops or village training sessions, farmer promoters, who were invited from outside of the project areas, shared their experiences with experimental farmers in the project areas. This



Farmer promoter from outside the project area was sharing his experiences with experimental farmers in the project areas

kind of lateral networking among farmers was revealed to be very important. Farmers tended to imitate the activities of the advanced farmers. Probably, they thought that they also could improve themselves in the same manner. It was also found that if villagers of the same development status gathered together, they were highly motivated and competed in improving their villages. In the inter-village workshops, experimental farmers from Zones-1, 3, and 4 compared their progress and tried to improve more. By creating lateral farmers networks, such effects could be expected.

(c) Importance of Farmers' Groups in Agricultural Extension and Further Development

Importance of active farmers' groups was confirmed through the pilot project activities from the following two reasons.

- Farmers' groups contribute to farmer-to-farmer extension, since group members can share their knowledge.
- Farmers' groups have potential to be developed into farmers' cooperatives in which farmers can gain more profit and alleviate their poverty.

It was observed in Dam Daek village (Zone-4) that knowledge regarding cultivating water melons was shared by farmers' groups by themselves even it was not strongly motivated by the pilot project implementation team. Probably, they learned the importance of sharing knowledge through activities for dissemination of SRI information. From this fact, it can be said that farmers' groups are important in agricultural extension.

Farmers' groups are also important for future development since they have the potential to be developed into farmers' cooperatives. Formation of farmers' cooperatives is a future target of the development but it is proposed to organize farmers' groups when the projects start the agricultural extension work. It was observed that organizing farmers' group needs a trigger; otherwise no farmers are interested in the group activities. In the pilot projects, farmers started to form farmers' groups by introducing SRI. In this case, introduction of SRI was a trigger for farmers to start working together. Also, it is important to keep the farmers' groups sustainable. Farmers might lose the chance for further development in the future if the farmers' group comes to be inactive.

(3) Others

(a) Importance of Farmers' Self-reliance in Improving Farming Practices

It was confirmed that self-reliance of farmers is crucial to improve agricultural productivity. Throughout the pilot project activities, the natural conditions, especially weather conditions in the master plan target area were found to be extremely tough for farming. The weather is unstable and draught frequently distresses the farmers. Because of this, it is impossible for the Government to establish fixed farming practices or farming calendars, which all the farmers can easily follow year after year. To tackle the unstable weather condition, farmers have to improve their management capacity to consider and decide suitable farming practices by themselves. In this connection, the importance of farmers'



Farmers' group members in Dam Daek village (Zone-4) in the training



Farmer in Mohaleaph village (Zone-3) was learning about SRI by himself

self-reliance was recognized.

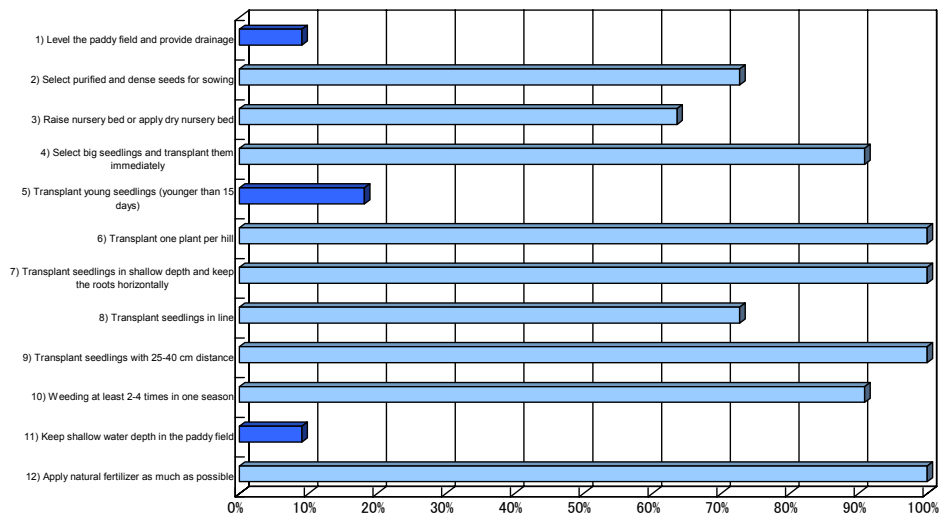
(b) Assessment of Ease or Difficulties of Implementing Ecological SRI Principles by Farmers

Experimental farmers in three villages (four farmers from Rumleang village in Zone-1, four farmers from Mohaleaph village in Zone-3, and three farmers from Dam Daek village in Zone-4) were asked how many ecological SRI principles they followed in this rainy season. The result is illustrated below. It was reported that they had observed that three of the principles were difficult to follow, i) land leveling and drainage, ii) transplanting young seedlings, and iii) keeping the water depth shallow in the paddy.

Reasons for the difficulties in applying those three principles were supposed as follows.

- Unreliable irrigation water supply forced farmers to store a lot of water in the paddy field rather than maintain a shallow water depth.
- Lack of a drainage system prevented them from draining water.
- Delay in start of rainy season obstructed transplanting with young seedlings

The remaining 8 principles seemed to be easy for the experimental farmers to implement, since more than 70% of them followed all those 8 principles as instructed.

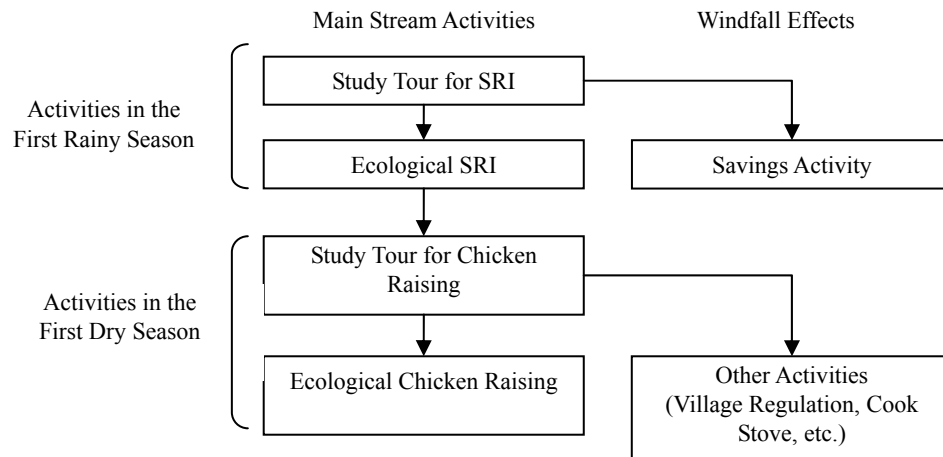


**Application of Ecological SRI Principles by Experimental Farmers in Year 2006**

(c) Possibility for Applying Similar Extension Processes in All Zones

In the first year of the pilot project activities, processes similar to the participatory agriculture extension were applied to three target villages as shown below. In general, progress of the activities was good and there should be no major problems in applying similar processes in all zones. It could be said that the process of participatory agriculture extension could work for all zones in the master plan target area.





**Process of Participatory Agriculture Extension in the First Year**

(d) Necessity of Guiding Farmers toward Flexible Application of New Farming Practices

There is a tendency for farmers to try to apply the new practices rigidly, so they easily gave up when they encountered some difficulties. In this case, proper guidance from the extension workers should be given. The facilitator has to explain to the farmers that they do not have to follow all the principles at once and the most important thing is to continue their trials with some modification. For example, when farmers faced serious drought in the pilot project, they almost quit SRI. They mistakenly believed that they could not follow SRI, because their seedlings had grown for more than the recommended period (15 days) but they still could not transplant them due to the drought. The pilot project implementation team explained that farmers should use seedlings younger than 15 days as much as possible. However, even if this is not possible, farmers still can try SRI by applying the other principles. Then farmers agreed to keep trying SRI. It was found to be important to make farmers understand the importance of flexibility. The farming practices must not be disseminated without teaching such flexibility.



Nursery prepared by an experimental farmer in Mohaleph village (Zone-3)

(e) Necessity of Continuing Activities in the Dry Season

It was confirmed that existence of an active farmers' group is very important for the participatory (farmer-to-farmer) agricultural extension. To keep a farmers' group active, the group has to continue their activities even in the dry season. If the group works only for SRI, their activities might become very weak in the dry season and they will miss the chance to learn about proper selection of seeds or preparation of compost. In this connection, the necessity of choosing proper activities in the dry season arose. Activities in the dry season can be any kind as long as they can be executed in the dry season. According to the experience of the pilot projects, i) savings activities and ii) ecological chicken raising could be possible activities. Beans or vegetable cultivation in paddy fields in the dry season was not found to be attractive for



Farmers in the area were interested in chicken raising as an activity in the dry season (Cage for chickens in Rumleang village, Zone-1)

farmers in the pilot project areas due to lack of water and damage by grazing cattle at field.

(f) Importance of Testing SRI without Applying New Seeds

The experimental farmers reported that farmers who did not introduce SRI questioned them to learn how they obtained new seeds when they saw good growing paddy in the SRI plots. This means that farmers in the area tend to think that only new seeds can grow their paddy better. Considering this situation, it was revealed to be important that SRI should be tested without applying new seeds at least in the first year. If farmers test SRI and apply new seeds, the effectiveness of SRI could not be understood by them. It is feared that they will think that the reason for the improved paddy growth is not SRI but new seeds.

(g) Strong Demand of Farmers for Saving Activities

It was observed that many farmers were highly interested in savings activities. Reasons for this strong demand for savings activities in Mohaleaph village in Zone-3 and Dam Daek village in Zone-4 could be easily explained because they did not have access to any kind of savings or micro finance activities. In Rumleang village in Zone-1, even though AMRET (a formal micro finance institution) had already started to support the villagers, they started to form a savings sub-group. According to the members of the savings sub-group, the reasons for forming a new savings sub-group were as follows.

- Interest rates of the savings sub-group were low (in fact, the interest rate was the same as AMRET but farmers thought it was low enough)
- The savings sub-group was easy to access

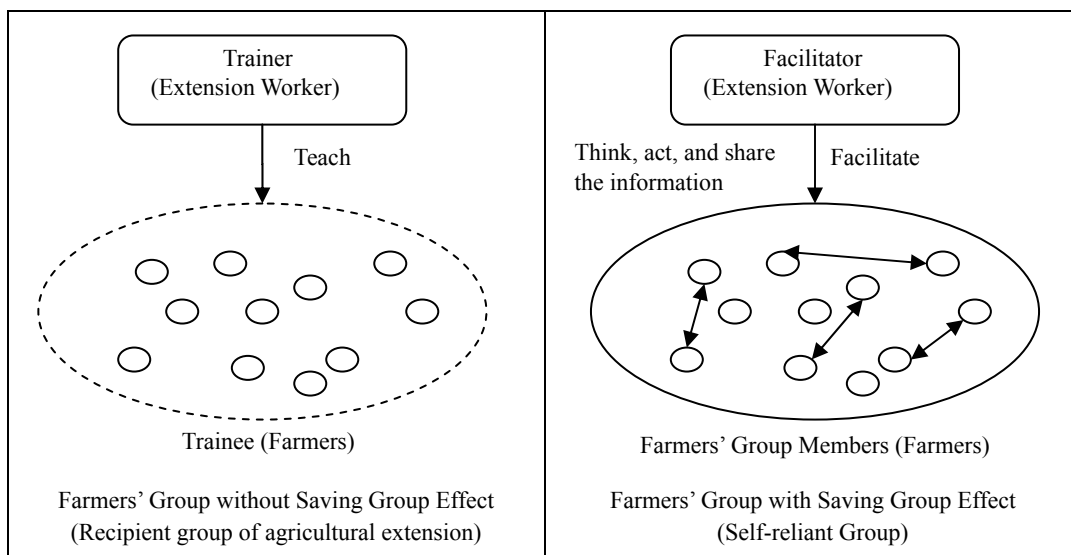
As compared with AMRET, the farmers felt that the savings sub-group was more convenient to approach. It is also supposed that the savings sub-group members felt that they wanted to manage their deposited funds by themselves rather than have it done by outsiders.

(h) Expected Effects of Savings Activities on Sustainable and Self-reliant Farmers' Groups

It was observed that farmers willingly joined the group activities if there was a savings sub-group. If there is a saving sub-group, farmers have to hold regular group meetings to operate the savings sub-group properly. They have to think, act, and share the information by themselves. It could be expected that they would not only share information about the savings sub-group but also information regarding agricultural innovations (SRI etc.) through chatting with participants in the savings sub-group meetings.

If there is not a savings sub-group, it is anticipated that some farmers who have already learned all about SRI will fail join in the extension activities. If such farmers do not join the extension activities, the experiences of those farmers will not be shared with other farmers. It is also anticipated that those farmers will lose their initiative to improve and always wait for somebody else to help them.

It is concluded that the existence of saving sub-groups makes farmers' groups more sustainable and increases the chances to disseminate information regarding SRI or other agricultural innovations. It should be noted that such effects might be obtained from activities other than savings sub-groups as well. For example, group purchasing shipping activities could have the same kind of effects.

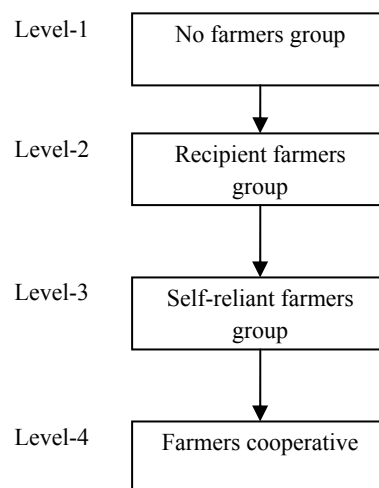


(i) Proposed Process of Establishing Farmers Cooperatives in the future

Establishment of farmers' cooperatives in the future would be advantageous to strengthen farmers' conditions. However, there are many difficulties which must be surmounted first. In the pilot project areas, there were several recipient groups in Zone-1 but very few or no farmers' groups in Zone-3 and Zone-4. In Zone-1, the existing FWUC was wrongly considered by the farmers to be only a recipient group for the sole purpose of receiving donor assistance in the construction or improvement of irrigation facilities.

Based on the experience of the pilot projects, a process for establishing farmers cooperative could be proposed as shown in the figure on the right. Before starting the pilot projects, target villages in Zone-3 and Zone-4 were in Level-1 in the figure. Target villages in Zone-1 were in Level-2.

Farmers' groups were established to disseminate information regarding ecological SRI in target villages in the pilot projects but these groups are also recipient farmers groups. The reason that farmers joined the group activities was mainly to learn about SRI from outsiders. However, the savings sub-groups that formed in the target villages could be said to be self-reliant farmers groups. Even without outsiders, the sub-group members discuss the management of their saved money amongst themselves. It was confirmed in the pilot projects that the savings sub-groups had the possibility to be developed into farmers' cooperatives in the future.



Conjectural Process of Establishing Farmers Cooperative in the future

**BIV-2.2.4 Experimental Farming Practice Improvement**

(1) Strategy-4: Minimum Material and Equipment Input from Farmers

(a) Easy Improvement by Farmers on Identified Farming Skills

Practices easily accepted by farmers in the verification tests included the reduced number of seedlings per hill, planting of younger seedlings and reducing seeding rates. These practices will be disseminated quickly throughout the project area with demonstrations and timely provision of guidance.

- (b) Need of Improvement on Farming practices that were identified as being difficult for Farmers

The demonstrators noticed that regular planting and raised seed bed preparation takes a long time. Such practices should be further improved.

- (2) Others

- (a) Necessity of Careful Consideration of Farmers' Financial Condition

Farmers are well aware of the economic importance (saving fertilizer cost) and agronomic impact (improve soil condition) of compost and manure. However, the compost and manure application level were lower than the recommended levels due to limited availability of such resources. Proper training on compost and manure preparation needs to be experimentally conducted together with the participants taking farmers' financial condition into account.

- (b) Importance of Improving Farming Practices to avoid Uneven Growth in the Plots

Uneven growth of rice plants that was observed in most of the verification and trial plots might be attributed to poor leveling, uneven spreading of manure or planting of heterogeneous seedlings. Such farming practices should be improved to avoid uneven growth of rice in the plots.

- (c) Necessity of Introducing Simple Comparison Tests that can be executed by the Farmers

Very simple trials that can be carried out by farmers themselves should be taught to them, so that they can compare the results that they get when growing 1 plant/hill or 2-3 plants/hill in their own fields because soil conditions in the individual fields differ substantially, affected at least partly by past fertilization history.

- (d) Necessity of Empowering PDA Extension Staff by Learning through Doing

Practical skills (such as seed bed preparation, seeding density, regular planting, timing of preparation & application of manure, pest & disease control, etc.) of extension staffs still appear to be limited; this might be attributed to the limited chances for them to be involved in practical extension activities or for them to operate extension activities individually. The empowerment of extension staffs by learning through doing and enhancement of their confidence should be seriously sought.

- (e) Necessity of Establishing a Practical Extension System

Farmers' motivation for the improvement of farming practices appeared to be high. Current extension services supported by donors with weak ownership of PDA appear to be less responsive to such needs. To meet such farmers' attitude, the deployment of extension staffs having sufficient practical skills should be implemented. The primary target of extension activities should be placed on improvement of rice productivity, currently the exclusive crop in the project area.

However, in reality, field activities of extension staffs are restricted due partly to the financial constraints of the extension agencies. Field activities of the extension staffs are important since problems and hints for solutions are often found in the fields. It is wished that field activities of the staffs will be intensified to the greatest extent possible.

Though it is desirable that the extension agencies obtain proper budget and conduct field activities by themselves, it is feared that this will be difficult. In this case, the limited budget for the extension work should be used very effectively; otherwise farmers will not

be able to receive any benefit. It is expected that practical extension systems with minimum cost will be established.