

**APPENDIX-H**  
**FARMER WATER USER COMMUNITY**  
**AND**  
**INSTITUTIONAL DEVELOPMENT/CAPACITY**  
**BUILDING**

**APPENDIX - H**

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AND  
INSTITUTIONAL DEVELOPMENT/CAPACITY BUILDING**

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## APPENDIX-H

### FARMER WATER USER COMMUNITY AND INSTITUTIONAL DEVELOPMENT / CAPACITY BUILDING

#### CHAPTER H-1 FARMER WATER USER COMMUNITY

##### H-1.1 Existing Farmer Water User Communities

There are several FWUCs in areas neighboring the Study Area. These FWUCs were established during the period from 1994 to 1999 and supported mainly by International Organization (IOs). The following table shows principal features of the existing FWUCs.

**Principal Features of the Existing FWUCs**

Name of FWUC	Area (ha)	Member Family	Committee Members				Mandate Year	Committee Meeting	
			Chairman	Vice Chair.	Account.	FWUG		General	Regular
Kantuot	1,500	1,028	1	2	1	13	3	2/year	1/month
Plovic	807	922	1	1	1	7	4	2/year	1/month
Sain Prea Ream	380	461	1	1	1	5	3	2/year	1/month
O treng	500		1	2	1	3	3	2/year	NA
Thnot Te	2,274	2,370	1	1	1	4	3	3/year	1/month

Note: NA means not available yet

As shown in above table, members of Committee range from 7 to 17 depending on their specific characters of the area. The mandate term ranges 3 to 4 years.

The general meeting is usually held twice a year before and after the cropping. The major subjects of the meeting and those items of decision are:

- Election of Committee Members, if needed,
- Determination of ISF,
- Confirmation and approval of auditing annual accounts,
- Approval of water distribution plans within the area of jurisdiction of FWUC,
- Approval of the construction and rehabilitation of irrigation works and facilities,
- Approval of annual budget and accounts.

Most of the FWUCs take full responsibility for above subjects after the implementation of the scheme. In 3 to 4 years after the project operation started, however, ISF collected has not been sufficient to cover the costs for maintenance and

repair of the irrigation facilities, resulting in deterioration of irrigation canal facilities. In case of gravity irrigation from reservoir, an embankment of dike is eroded in certain reaches which require urgent repair. The canal dike and off-take facilities are also damaged and canal bed silted. In case of pump scheme, parts of pump equipment are rather expensive for members and often not available in time, resulting in shortage of irrigation water. The following table shows the annual expenditures on O&M and administrative costs of the Kantuot pump irrigation scheme (300ha) in 1999.

**Annual O & M Costs of Kantuot Pump Irrigation Scheme**

Item	Riel Thousand	Riel/ha	% of Cost
Fuel and oil	10,180	33,933	43.86
Wages	1,250	4,167	5.38
Office expenses	988	3,293	4.26
Repairing pump	6,361	21,203	27.41
Canal repair	1,129	3,763	4.86
Allowance & others	3,302	11,007	14.23
Total	23,210	77,366	100

As shown above, O & M costs of pumping irrigation including repair cost cover about 71 % of annual total costs. On the other hand, wages for FWUC Committee members and staff are only about 5 %, and about Riel 73,500 /year (US\$ 18 /year). They were providing services almost voluntarily, causing little incentive to work. Furthermore, the canal repair costs were limited to only less than 5 %, which means insufficient maintenance costs used, resulting in shortage of irrigation water in the lower reaches of canal.

At present, paddy lands are not consolidated properly. Because neither tertiary canals nor watercourse are constructed, plot to plot irrigation is practiced. Therefore, people in the lower end of irrigation system often suffers from unequal water distribution, which results in problem to sanction against non-paying members in some schemes.

In the receding paddy cultivation areas, the paddy lands are usually flooded from July to November. Canal maintenance is limited in May to June after harvesting of paddy. Therefore, usual maintenance works are limited.

The following table shows the ISF in cash or kind (paddy) collected recently in the existing FWUCs.

### ISFs in the Existing FWUCs in the Takeo and Kampong Speu Provinces

Name of Scheme	Type of Irrigation	Year	Rainy Season (ha)	Dry Season (ha)	Paddy Yield (t/ha)	Planned ISF /ha		ISF Collected /ha		% of ISF Collected
						(Riel or kg)	US\$/ha	(Riel or kg)	US\$/ha	
Kantourt	Pumping	1999		300	3.50	110,000Riel	28.95	60,800Riel	16.00	55.3
Plovic	Gravity	1999		2,000	3.50	140kg	11.10	82kg	6.47	58.5
		2001		807	2.50	140kg	11.10	77kg	6.08	55.1
Sain Prea Ream	Gravity	2001	380	96	2.00	*80kg	6.32	71kg	5.58	88.3
O treng	Gravity	2001	300	# 200	2.20	*40,000Riel	10.53	20,000Riel	5.26	50
Thnot Te	Gravity	2000		2,274	3.50	30kg	2.37	27kg	2.13	90
<b>Average</b>							<b>8.28</b>		<b>5.10</b>	<b>68.5</b>

Note: \* shows that ISF was applied only for the dry season crops.  
# shows that the certain areas were cultivated with water melon.

As shown in above table, an average actual ISF collected was US\$ 5.10 /ha equivalent in case of the gravity irrigation system, and only about 68 % of the amount determined in the Statute of the Committee was collected, mainly due to the following:

- 1) The system is used for supplementary rainy season irrigation in the gravity irrigation schemes and water is required only during the dry spells.
- 2) Farmers are often reluctant to pay ISF because of:
  - Lack of clear procedures related to ISF collection,
  - Unequal water distribution to the field, and
  - Lack of accountability and trust between the members of FWUC.
- 3) Low yield of crops due to pests and diseases.
- 4) Price of paddy produced is very low, less than Riel 300 /kg resulting in extremely low net income of farmers.

ISF in case of Thnot Te FWUC is only 30 kg/ha which is considerably low even though 90 % of collection rate. Only routine maintenance works are carried out. Therefore, FWUC is asking MOWRAM to provide financial and technical support for rehabilitation of reservoir dike and canal facilities.

## H-1.2 The Statute of FWUC

### H-1.2.1 General

MOWRAM issued Prakas 306 (Regulation) in June 2000, which included Circular No.1 on the Implementation Policy for Sustainable Irrigation Systems, Policy for Sustainability of Operation and Maintenance Irrigation Systems and Steps in the Formation of a Farmer Water Users Community. The Statute of FWUC was issued as

the Appendix of the above Policy for Sustainability of Operation and Maintenance Irrigation System.

According to the said Policy, farmers who want to use water for cropping should pay a membership fee as set by FWUC if they meet the criteria set out in the Statutes of Community.

### **H-1.2.2 Summary of the Statute**

The Statute comprises 8 Chapters with 40 Articles. The essential points of the Statute are shown below:

- 1) Chapter 1 Name and Objective
  - Article 1 The community is named the Farmer Water User Community (FWUC).
  - Article 3 All decisions concerning the irrigation issues will be decided by the general meeting.
  - Article 4 The FWUC will have its statute and will be registered with the MOWRAM.
- 2) Chapter 2 Membership Criteria
  - Article 5 The Community member has to meet the following criteria:
    - to be a land owner or tenant whose land is located in the same irrigated area,
    - to be at least 18 years old of both sexes, and
    - to adhere to the internal regulations of the FWUC.
  - Article 7 Every farmer member of FWUC has the following duties:
    - to maintain and improve the irrigation system, and
    - to follow the guidelines and regulations of the Community.
- 3) Chapter 3 Organizational Structure
  - Article 9 The FWUC will be led by the Committee of the FWUC,
  - Article 10 The Committee of the FWUC shall have the following duties:
    - to prepare the work plan for the Committee,
    - to formulate the statutes, contracts, and internal regulations of the Community,
    - to maintain the regulation system in good condition to enable the provision of irrigation for whole production season,
    - to manage and distribute water to all members,
    - to strengthen the use, maintenance and improvement of the irrigation system in an efficient manner,
    - to resolve the problems occurring within the Community, and
    - to collect the ISF as determined by the Community.
  - Article 11 The role and duty of FWUC's Chairman of the Committee:
    - to invite the representatives of the FWUC and members to take part in the meeting,
    - to chair the meetings concerning the irrigation,
    - to direct and prepare annual irrigation plan including budgeting,
    - to implement the work programs which have been approved by the general meeting,

- to examine all activities of each group,
  - to coordinate and carry out public relations,
  - to control expenditure in accordance with the approved plan,
  - to submit the annual budget and work plan of the Community to the FWUC general meeting,
  - In the absence of the Chairman and both Vice-chairman, one of the members shall be appointed as the interim chairman,
  - to be a joint signatory along with the transfer in the matters related to finance,
  - to serve as an arbitrator for disputes among members, and
  - to discipline any member who fails to carry out the duties prescribed by the Community, or, to observe the regulations of the Community.
- Article 12 The role and duty of the First Vice-Chairman:
- to monitor the irrigation system regularly,
  - to define the scope of the work for farmers to maintain and repair the net work,
  - to prevent any individual from digging dikes for fishing purpose or letting loose cattle graze on the dike, etc.,
  - to report regularly on the repairs carried out to the irrigation system, and
  - to serve as the Secretary of the Committee of the FWUC.
  - In the absence of the Chairman, the Vice-chairman shall assume the chairman's role as acting chairman,
- Article 13 The role and duty of the Second Vice-Chairman:
- to prepare the irrigation water distribution program which shall be agreed by all members,
  - to give the heads of the FWUG the responsibility to implement the irrigation program,
  - to supervise the implementation of the irrigation programs, and
  - to report regularly to the Chairman of the Community about the activity of the irrigation work.
- Article 14 The role and duty of the Treasurer:
- to collect the ISF from the members through heads of the FWUGs,
  - to register and manage the immovable property of the Community,
  - to manage revenues and expenditures of the Community, and
  - to report about the status of the revenues and expenditures to the Committee.
- Article 16 The role and duty of the Head of the FWUG:
- to implement the work plan/time table of the Community,
  - to coordinate the work between FWUG and the Community, and
  - to collect the ISF from all members as determined by the Community.
- Article 17 The FWUG  
The FWUG is made up of the farmers who use water in the same irrigated area. Each group should be led by one head elected by all members or their representatives.



- 4) Chapter 4 Mandate and Procedures of the Community
- Article 18 The mandate of the Committee is 3 years.
- Article 19 The head of each FWUG or the member of FWUC Committee can register to be elected as the Chairman or Vice-chairman of the Community.
- Article 20 The election of the Committee shall be made through separate votes (the first vote for the Chairman, the second vote for the first Vice-chairman, the third vote for the second Vice-chairman, and the fourth vote for a treasurer). The official final election is made when the vote is the majority of the voted members. The vote can be conducted when the members present at least 2/3 of the total members. The result of the votes should be confirmed and acknowledged by the Chairman of the meeting and communicated to the institutions concerned.
- Article 21 The Meeting
- Every meeting should be attended by at least 2/3 of the members. If less than 2/3 the members present, the second meeting will be held 3 days later. All meetings should be led by the Chairman.
- The normal meeting should be held every month according to the association's need for monitoring the implementation of the work plan set up by the meeting.
- In case of the special need to be urgently solved, an extraordinary meeting should be held any time upon the request by 50 % of the members.
- There are three categories of meetings as follows:
- The meeting between the Committee of FWUC and FWUGs. This meeting will be held after the proposal of the FWUGs.
  - The meeting between heads of FWUG and its members should be conducted at least 3 days before the meeting between the Committee of FWUC and the FWUGs.
  - General Meeting; This meeting should be held before and after the cropping period for the following purposes;
    - to prepare the repair plan,
    - to prepare the cropping plan according to irrigation plan,
    - to make the plan of revenues and expenditures, and
    - to evaluate the crop yield.
- 5) Chapter 5 Revenue, Expense and Audit of the FWUC
- Article 22 Source of Revenue
- The sources of revenue of the FWUC are:
- ISF collected,
  - Assistance or credit from Government, IOs and NGOs,
  - Profit from the business operation of the Community,
  - Various levies and fines.
- Article 23 Expense
- Repair and maintenance of the irrigation system X1,
  - Fuel (I case of Pumping) X2,
  - Support to the Committee of FWUC X3,
  - Administration X4,
  - Miscellaneous X5.

Article 24 The principle of ISF  
$$Y = \frac{X_1 + X_2 + X_3 + X_4 + X_5}{\text{Irrigation Service Area}} + 20\% \text{ of Increased Production}$$

Where, Y = ISF per ha

- In the first year, the government takes responsibility 80 %, members 20 %,
- In the second year, the government takes responsibility 60 %, members 40 %,
- In the third year, the government takes responsibility 40 %, members 60 %,
- In the fourth year, the government takes responsibility 20 %, members 80 %,
- In the fifth year, the government takes responsibility 0 %, members 100 %,

For the practical reasons, the Committee of FWUC will collect 140 kg/ha of paddy as the share of 20 % increase in production. This will be collected at least for 5 years, following which this could be changed, but not less than 5 % of the increased production.

Article 25 The accounts of the FWUC shall be audited every year by Auditor. The statement of income and expenditure of FWUC along with an audit report shall be submitted to the general meeting of FWUC and get it ratified.

6) Chapter 6 Rules and Regulation

Article 26 All members of FWUC must attend meeting as scheduled.

Article 32 The Committee of FWUC shall assure the water distribution to all members to irrigate their crop in a fair manner.

Article 33 The committee of FWUC shall make a balance sheet and explain to all members about the revenue and expenditure in every meeting.

7) Chapter 7 Punishment

Article 37 Penalty will be put on any activity considered against the interest of the FWUC and the levels of fines are determined as follows:

- Absence from the meeting on 3 consecutive times shall be fined ....Riels.
- If some one does not contribute the labor or maintenance proposed by the group's members, the penalties are ....Riels.
- Illegal diversion of water from canal shall be fined ....Riels.
- Digging the dike or damaging canal system or its structure shall be fined.....Riels.
- Wasteful use of water for irrigation shall be fined...Riels.
- Blocking the canal and diverting water to irrigate without permission or for other purposes shall be fined...Riels.
- Any member who refuses to pay the fine or resorts to violence shall be sent to the Communal authority.

8) Chapter 8 Other Issues

Article 40 Measures and principles shall be supported and amended subject to the request of the Community and if the decision is made by the Committee of FWUC it shall be written down in the record, and

shall be retained as measures, principles, and regulations and be considered as part of the law. Any amendment to this statute could be made by general meeting of FWUC up to the extent that it is acceptable to the Royal Government of Cambodia.

### H-1.3 FWUC Activities

#### H-1.3.1 General

##### (1) FWUG and FWUC

In accordance with Article 17 of the Statute, an FWUG will be established, and Farmer Organizer (FO), and representative of FWUG, will be elected from among the members. Then SC FWUC Committee members consisting of one Chairman, one Vice-chairman (VC) and one Accountant will be elected among or by the FOs in the same secondary canal system. All FOs will be the members of FWUC Committee. The following table shows proposed number of FWUGs in each secondary canal and the details are shown in Table H-1. The location of FWUGs and those command area are shown in Fig. H-1 and Fig. H-2, respectively.

SC FWUCs of USP

Name of SC FWUC	Area (ha)	No. Blocks	No. FWUG
SC 24 (incl. Tumnap Lok & Canal 3U)	713.4	14	13
SC 23	773.6	23	16
SC 22	608.8	21	13
SC 21	489.8	19	12
SC 20 (incl. Canal 20S)	619.0	20	12
Canal 3D	295.4	9	6
Total	3,500	106	72

##### (2) SC FWUC Committee Meeting

SC FWUC Committee meeting will be held every month for the following subjects within the area of jurisdiction of SC FWUC:

- Preparation of rehabilitation and maintenance plan of the irrigation system,
- Maintaining the irrigation system in good condition,
- Preparation of water distribution plan to the all fields,
- Collection of ISF as determined by the Apex Committee, and
- Submitting the annual budget and work plan of the Committee to the Apex Committee.

##### (3) Apex Board Meeting

After the establishment of SC FWUCs, the Apex Board meeting consisting of 6 SC

Chairmen, 6 Vice-chairmen (VCs), 1 Secretary and 1 Accountant will be held for the following subjects:

- to elect one Apex Board Chairman, one Apex Board Vice-chairman, one Secretary and one Accountant,
- to prepare the statute of FWUC,
- to check and approve water distribution plan submitted by the SC FWUC Committee,
- to check and approve marketing activity plan prepared by the Marketing Unit;
- to determine ISF in cash and/or kind,
- to check and approve the maintenance plan and its cost estimate,
- to approve annual budget, and
- to resolve the problems occurred within the USP.

The regular Board Meeting will be held every month according to the needs for monitoring the implementation of the work plan set up by the meeting.

(4) The General Meeting

The general meeting of the Apex Committee will be held twice a year before and after cropping (June and January) for the following purposes:

- to adopt the statutes and internal regulations of the FWUC and of any amendments,
- to determine ISF based on O&M costs,
- to approve the water distribution plan,
- to approve the maintenance and repairing works,
- to approve the annual budget, and
- to approve the annual accounts including the marketing activities.

(5) Joint Management

Immediately after the establishment of FWUC, it is proposed to establish the Joint Management Committee (JMC) for a period of 5 years. The responsibilities of the JMC are:

- to prepare O&M manual and annual O&M plans,
- to manage irrigation water distribution from the reservoir to the tail end of fields at the right time,
- to maintain the USP properly,
- to strengthen FWUCs,
- to keep financial accountability, and
- to assist the farmers in agricultural extension.

JMC will consist of the Project Manager of Project Office (Senior Engineers/Experts of Technical Supervision & Assistance Unit), MOWRAM, Apex Board members and

the selected FWUG representatives. The JMC will have a meeting 2 times a year before and after the cropping, and if required, at any time.

(6) Administrative and Financial Management

The Secretary of Apex Committee is responsible for managing the entire office administrative aspects of FWUC, i.e. operating rules, office filing system, record keeping and book keeping, arrangement of the board meeting, etc. An Accountant of Apex Committee is responsible for the entire management of budgeting O & M irrigation system and marketing activities. He is also responsible for bank account and cash book, ISF in entire USP and report about the status of the revenues and expenditures to the Apex Committee. Accountant in each SC FWUC has responsibility for management of ISF collected, budgeting on O & M costs of irrigation system concerned, bank account and cash book for SC FWUC.

**H-1.3.2 Activities before Irrigation Period**

(1) Preparation of Annual Water Distribution Schedule (WDS)

Based on the cropping pattern and irrigation requirement of crop, the water distribution schedule (WDS) in the watercourse shall be prepared by the O & M Unit for which O & M manual is to be first prepared as shown below. Since the irrigation water available in the dry season is limited to only about 1/7 of the area, the rotation irrigation method for diversified crops will be applied.

Summing up irrigation requirement of water courses, each tertiary irrigation requirement is estimated. Since the command area in each tertiary block ranges from about 13 ha to about 83 ha, the rotation irrigation program should be carefully prepared. The following steps are suggested for preparation of WDS:

- 1) The O&M Unit directed by the Vice-chairman (VC) will initiate preparation of WDS for both rainy season diversified crops and paddy on April 15 and for dry season diversified crops on October 15 every year in consultation with the Engineers/Expert in Technical Supervision & Assistance Unit (TSAU), MOWRAM.
- 2) They will estimate unit irrigation requirement in due consideration of likely effective rainfall during the coming rainy season. This exercise will not be needed for dry season crops.
- 3) They will determine the diversion water requirement of MC and SCs.
- 4) In the diversified crops, they will determine rotation irrigation groups (operation canal groups) and irrigation time and period in respective month of the crop season.
- 5) The operation plan, thus finalized will be used as WDS for running of every SCs.

These schedules will be prepared separately by SC FWUC and they will indicate the names of canals (names of irrigation block) served by them, their head discharge, time of opening and closing from the head, and the dates of their running or being kept closed for the entire crop season.

- 6) Based on above WDS, SO and FO in each field shall strictly operate water distribution to the respective block and water course.
- 7) These schedules would then be discussed in detail with the Agriculture Officer in DAFF Takeo and as far as possible his suggestions may be incorporated therein. The schedules will then be approved from the Engineer of TSAU, MOWRAM.

(2) O & M Manual

In order to properly operate and maintain the irrigation system, an O&M manual needs to be prepared for the system to make possible equitable and timely distribution of irrigation water based on actual irrigation requirement. The manual will be prepared by the JMC assisted by the Foreign/local Experts before the completion of USP. After one or two cropping seasons, the Manual will be updated based on actual practices. Since the reservoir water and river flow in USP are limited, particularly in the dry season, effective use of water and distribution are essential for the diversified crops. The following are major points to be emphasized in the manual.

1) Operation

The WDS is to be prepared for each crop according to the cropping pattern, irrigation water requirement and climatic conditions. During the rainy season paddy cropping, irrigation is mainly supplemental to the rainfall, while during the dry season, full irrigation is required. For the diversified crop irrigation, rotation water supply is proposed to be applied.

SOs and FOs should have a clear understanding of the principles of formulating the WDS and real time adjustment at actual water management. They should keep a regular watch on the rainfall pattern obtaining in the area. Accordingly, they should turn “On” or “Off”, part or whole of the system as and when suitably modifying the WDS is required.

Based on the effective storage of the reservoir, the intake gate is operated according to the WDS prepared. The WDS has to show the discharges at each SC off-take of MC where the water supply management will be carried out. The hydraulic conditions of MC at each SC off-take are to be shown in a table. The gate dimensions of cross regulators and off-take regulators on MC are also to be shown in a table. It is suggested that the water distribution by SO and FO is to be operated as simple as possible.

The discharge capacities of MC, SCs and TCs should be checked by SOs and FOs twice every year, at both the beginning of the rainy season and dry season crops. In cases where some dispute arises about the discharge delivered to the lower area, SOs and FOs in charge will have to check and adjust the discharge at the delivery point in collaboration with the Vice -chairman of FWUC.

## 2) Maintenance

Maintenance works can be classified into three categories:

- Routine maintenance,
- Normal (periodic) maintenance & repairs, and
- Emergency maintenance and repairs.

Routine maintenance is carried out by SOs and FOs on a day to day basis, as and when/where required. It should be a low-cost activity carried out on local basis, but it is to be very effective for preventing further damages.

Periodic maintenance is a planned activity and its aim is to restore the designed conveyance capacity of irrigation system for keeping its original function related to cropping calendar. Desilting of channels before the start of both rainy and dry seasons, strengthening and rising of banks after monsoons, restoring the inspection roads after rains etc., fall in this category.

Emergency maintenance and repairs are carried out to restore a sudden and/or unexpectedly serious damage, which has caused, or may cause, interruption to irrigation. Canal breaches or damages to discharge-regulating structures come under such calamities which call for emergency maintenance and repairs. It requires quick decisive measures, which firstly aim to cope with the damage by temporary repairs and then consolidate it by permanent repairs followed by its maintenance.

SO/FO in collaboration with Technicians in O&M Unit should be responsible for timely and careful field survey, investigation and preparation of plans and estimates as well as for timely and efficient execution of works. Based on the field inspection, the inspection note (IN) should be prepared by SO/FOs in compliance with the Vice-chairman of SC FWUC. The IN should be in sufficiently detail, indicating the defects and/or shortcomings, and should suggest the remedial measures clearly. The time frame for these measures, requirement of labour, materials and equipment should also be spelled out.

The VC should check the maintenance and repair (M&R) requirement submitted by SO and FOs and should prioritize them in order of their urgency. He will also

evaluate them as per the normal budget provisions. The VC will then compile a normal estimate and separate estimates for special works. He will submit them to FWUC Committee meeting for sanction and allotment of funds.

Estimate of the maintenance work will consist of a report of detailed particulars, specifications and a detailed statement of measurements, quantities and rates, quantity of materials and their rates / cost with an abstract showing the total estimated cost of each item. The quantities in M&R estimate are based on actual assessment by the SO/FO in collaboration with Technicians in O&M Unit and verified by the VC. The rates will be based on the sanctioned schedule of rates for the area.

After the sanction of M&R estimates is received by the FWUC Committee, along with the allotment of funds, the VC can frame the annual M&R program. The M&R works then can be carried out accordingly.

### **H-1.3.3 Activities during Irrigation Period**

#### **(1) Routine Operation and Patrol**

The effective storage should be checked and the intake gate is operated according to the WDS. It is essential to establish a discharge (Q) and head over the crest (H) relation in order to operate the head regulator as per water requirement in the canal. This Q-H relation will be derived from theoretical formula but the verification of the formula with actual observation of discharges at various gate openings and under different heads over the crest will provide reliable data. The operation tables prepared are to be kept with all SOs and FOs. WDS may need revision especially for the rainy season paddy due to sudden and drastic changes in climatic condition. The following are responsible persons in charge of respective facility:

- 1) SO in charge of reservoirs: Responsible for operation of head gates of MC and SC 24, spillway gates, and intake gates for Tmnup Lok tertiary blocks.
- 2) SO in charge of MC: Responsible for offtake gate operation of SC 23, SC 22, SC 21, SC 20, Canal 3D and Canal 3U.
- 3) SO in charge of respective SC: Responsible for gate operation of respective offtake for TC and regulator.
- 4) FO in charge of respective TC: Responsible for gate operation of respective offtake for WC and field outlet.

Since the rotation irrigation system will be applied for the dry season crops, WDS for TC and WC should be prepared according to the irrigation requirement and irrigation



area in respective tertiary block. Required discharges should be released from off-taking canals as per the discharge tables. The following are the principles of on-farm irrigation operation:

- 1) The O&M Unit will carry out crop planning at their command area and assess their irrigation requirement. Technical and agronomic guidance will be provided by the TSAU/DAFF, as and when required.
- 2) Since the area of each tertiary block ranges largely from block to block, irrigation area in SC will be divided into 2 groups. SO will then operate TC offtake to issue full discharge to TC for first group for first day and the other half will remain off and vice-versa.
- 3) FO will accordingly operate the WC outlet. All outlets are opened during the operating time of the WC. The basic principle of outlet operation is to run each offtake with full discharge at FSL.
- 4) The rotation of outlet will conform to the running of its parent channel of TC.

(2) Monitoring and Measuring Discharge

Actual discharge observation at regular intervals is very essential for correct operation. During the operation of water supply, the canal flow capacity will be changed due to silt load, weed growing, side slope erosion, etc. after long operational periods.

The discharges of MC, SC, TC and WC should be observed twice every year, at the beginning of the rainy season and dry season crops. These discharges will be observed at the heads of these channels.

The following staff should be responsible for discharge observations:

- 1) SO should observe the discharges of MC and SC of his in charge and FO for TC and WC twice a year as indicated above.
- 2) The normal Q-H relation table for head of MC, SC and TC should be prepared, and they should be approved for operation by VC of Apex FWUC or SC FWUC and the Engineer in charge of TSAU.
- 3) The discharge measurements should be recorded in measurement books issued specifically for this purpose, and signed by the person observing the discharge. Discharge registers should be maintained in the FWUC offices wherein the results of discharge observations should be promptly recorded with date, gauge and the name of observer. These discharge observation measurement books and registers should be closely examined by the Engineer, TSAU and VC of FWUC, which would be utilized for the dispute resolution as the evidence in case of

conflicts among farmer members.

(3) Dispute Resolution

In the lower reach of the TC and WC, there would be some problems and conflicts with regard to water distribution, particularly for the diversified crops among the farmers, affecting on yield of crops. The excessive water would flow down from the upper farm to the lower land without consent of lower farmer, resulting in over irrigation or drainage problem in the lower reach. Those disputes should be settled first by the Dispute Resolution Unit in consultation with the Chairman of SC FWUC in the manner determined by the Statutes. The disputes that are not settled by the Apex Board, are referred to the MOWRAM and thereafter, to the competent court, if needed.

#### **H-1.3.4 Activities after Irrigation Period**

(1) Routine and Periodic Maintenance Works of Reservoirs and Canals

Routine maintenance is carried out by SOs and FOs on a day to day basis. It is essentially a low-cost activity carried out on piece work basis after the approval obtained from either the Apex Committee Chairman or SC FWUC Chairman in respective canal.

As the periodic maintenance, the desilting of channels and restoring their conveyance capacity for MC and SCs are to be carried out on piece work contract basis before the start of both rainy and dry season seasons for strengthening and heightening of banks. The cost estimates prepared by SOs and FOs in collaboration with the Technician in O&M Unit should be checked and approved by the Apex Board meeting.

1) Dikes and Reservoirs

Items to be watched in two reservoirs and appurtenant works are i) leakage through the downstream slope of the dike and floors of spillway, ii) sliding and erosion of dike and slope of dike, iii) scouring or uplifting of floor of spillway, iv) floating debris in the reservoir, and v) damages to the gates. SO in charge of the reservoir should carefully observe the phenomena of above. If it is considered serious for dike safety, SO/Technician in consultation with VC should refer to the Engineer in charge, MOWRAM for advising on necessary remedial measures. The following maintenance requirements for reservoirs are indicated:

i) Leakage:

If the leakage rate into the seepage drains increases, it is judged to be unusual and requires careful observation. If turgidity is observed in the leakage water, it may indicate some damage inside the body or foundation of the dike and would

require urgent measure such as releasing water through the spillway and then investigating the weak or damaged zone and repair thereof. If, the particle movement along with the seepage is confirmed the water level in the reservoir should be brought down as far as possible and the matter may be referred to Design Specialist (MOWRAM) on dike safety for advising on necessary remedial measures.

In cases of leakage or seepage from the floors or any other part of structure of spillway or heads of MC, proper measures such as foundation grouting and/or drilling of drain holes and plugging the affected portion with concrete should be taken immediately to eliminate leakage in consultation with Engineer in charge, MOWRAM.

ii) Abrasion and Scouring:

When the concrete or masonry surface is damaged or scoured due to high water velocity and impact, it should be repaired before the damages are largely developed. This work, unless of emergent nature, should be carried out during the dry season.

iii) Seepage Drains:

The seepage drains, which run along the toe of the dike and outfall into river, should be kept under regular observation and their discharge should be observed regularly so as to notice any major variation. They should be cleaned regularly and their sides and bed should be kept free from any weeds etc.

iv) Erosion of Dike

The surface and slope of dike eroded by heavy rain should be refilled to the design level and should be compacted well.

v) Oiling, Greasing and Repainting:

Oiling and greasing for the spindle and hoists of the intake gates, regulating gates and spillway gates should be carried out at least once in a month. Repainting of metal works such as gates, handrails, step and hoisting should be done regularly. The metal works, which remain under water for most of the time such as the gates, should be repainted once a year after thoroughly cleaning their surface. The metallic super structures will be repainted once in every four years.

2) MC, SC and Structures

The major works for maintenance of the MC, SC and those structures will be as follows:

- i) Periodical removal of sand and silt, for restoring the conveyance capacity of the internal section.
  - ii) The slopes eroded by heavy rain should be repaired. Where silted cross section observed, the canal beds should be desilted to the design level. The aquatic weeds should be removed periodically.
  - iii) Canal banks eroded heavily must be refilled to the designed level and should be compacted well.
  - iv) Removal of aquatic weeds and floating material, which be, get entangled in the piers of the structures and reduce the flow capacity. Attention should be given to periodic clearance of such floating weeds from piers and gates.
  - v) Attention should be given to repairs of upstream and downstream transitions of the structures, which are usually made of masonry or stone riprap. Such portions must be refilled with stones. The damaged part of masonry, or even the cracked portion must be removed and repaired.
  - vi) The cracks, bulges or other signs of movement will indicate possible failure of the structure. These will be repaired carefully.
  - vii) Cleaning, greasing, and oiling of all moving parts of the gate structures should be regularly carried out.
- 3) TC and WC

Main items of maintenance are to the restoration of internal section in order to restore the designed conveyance capacity. Before the start of a crop season, particularly rainy season, the clearance of internal sections of all TCs and WCs becomes essential. The following procedure will be adopted for this clearance work:

- i) FOs will observe the silted cross-sections at every 100 meters in case of TCs, and depth of silt at every 50 meters in case of WCs. These observations will be completed by mid of April.
- ii) On the basis of these observations, silted L-sections of each channel will be plotted, and quantities of silt to be cleared will be worked out. These L-sections will be examined, checked and submitted up to the VC.
- iii) On approval of the VC regarding the quantities of work, the silt clearance will be taken up after the prescribed formalities, so as to be completed and checked by the end of April. The schedule of silt clearance will be synchronised with the closure of MC.

- iv) The silt clearance and other maintenance activities of internal section in general should be carried out during a routine closure of canal.

(2) Emergency Repairs

Emergency maintenance and repairs are carried out to restore a sudden and/or serious damage, which has caused or may cause interruption to irrigation canal, breaches or damages to regulatory structures. It requires quick decisive measures by the Apex Board meeting after consultation with the Engineer of MOWRAM, which first aims to take the damage by temporary repairs and then consolidating it by permanent repairs followed by its maintenance.

A sudden breach in canal is a typical emergency. It may have been caused by failure of reservoir dike and canal bank, or by undermining of some regulator, or by damage to some cross drain. In all cases of such emergency, the following action to cope with the damage is specified:

- 1) Immediate and appropriate action to contain the damage and to prevent its aggravation should be taken by SOs, FOs, O&M Unit staff and VC. In case of breach in SCs and TCs, SO and FO in collaboration with Technician in O&M Unit should take swift action to shift the water of the damaged canal into such adjoining canals. Alternatively, the nearest upstream escape should be opened.
- 2) If the damage is so small that it can be repaired by maintenance staff or local contractors, such repairs should be carried out early in consultation with VC of FWUC.
- 3) If the damage is serious, then the water supply to the channel will have to be stopped for a considerable period. In that case, repairs should be undertaken after obtaining instructions from the VC FWUC and on the other hand, information should be sent to Apex Board Chairman as well as to the Engineer in charge, MOWRAM.
- 4) In case of stoppage of water supply, a time limit for completion of emergency repair must be set by VC after assessing the extent and magnitude of the damage, so that the repairs can be done expeditiously within the specified time frame and water supply is restored within a reasonable time.
- 5) If the rehabilitation of the damage needs more than 30 days during an irrigation period, the alternative to construct a temporary conveyance by-pass and/or pumping should be considered.
- 6) For such emergent repairs, the Chairman of Apex Committee of FWUC in collaboration with Engineer in charge, MOWRAM should immediately mobilise

necessary equipment and manpower from other SC FWUCs, if needed, of his jurisdiction and pool all resources to complete the rehabilitation work expeditiously.

- 7) In case, various emergency repairs are needed after a flood or heavy rainfall, the Chairman of Apex Committee in consultation with MOWRAM must determine an order of priority. As an accepted principle, repair of irrigation works takes precedence over drainage works.
- 8) It is essential to keep some provision in the budget for such unforeseen emergent situations. Immediate provision of funds to take up emergent repairs can be made by the Chairman of Apex Committee from their reserves. The Chairman will simultaneously move the Apex Board meeting to allot necessary funds for rehabilitation of damaged works. This demand must be accompanied by a detailed report from Chairman of SC FWUC about the extent of damage, program of rehabilitation, alternative arrangements made for supplying irrigation water, and item wise requirement of funds. The Apex Board meeting will decide and allot necessary funds from its contingency reserve.

### (3) Collection of ISF

It is essential that the ISF to be collected from the farmer members should be impartial. Actually, increased production of crops varies substantially from place to place, from varieties to varieties and depending on farming practices in each farmer. The Apex and SC FWUC Committees should monitor and evaluate the average yield of crops every year. Based on average yield and annual expenses of FWUC, ISF rate will be determined by the Board meeting.

It happened in the existing FWUC that members' yields of crops were lower than the average and those farmers did not pay full amount of ISF determined by FWUC. They said the following reasons for non-payment:

- 1) Uneven and untimely distribution of irrigation water to the field and
- 2) Low yield of crops due to pests and diseases.

The VC of SC FWUC in USP should carefully evaluate the actual situation of yield of crops, if raised by those member farmers, and the reasonable ISF rate should be determined in the Apex Board meeting.

## **H-1.4 Farmers' Understanding on FWUC**

### **H-1.4.1 General**

Since the farmers in the USP area have no experience on FWUC activities so far, the

meeting with the farmers was held in the USP area regarding the proposed FWUC formation and activities. The meetings were held at each Commune office in 5 communes. Attendants in the meeting were as follows:

Attendants of Meetings with the Study Team

Name of Commune	Command Area (ha)	Attendants (person)		
		Chief of Village	Farmers	Total
Trapeang Kranhung	15	1	13	14
O Saray	497	4	16	20
Trapeang Thum Khang Cheung	1,069	10	7	17
Cheang Tong	1,320	16	19	35
Ta Phem	599	19	20	39
Total	3,500	50	75	125

#### H-1.4.2 Description of Project Feature

The Study Team explained the salient feature of priority area in the USP so far studied in which development area listed above table will be included in respective communes. The major points of USP explained are as follows:

(1) Rehabilitation of reservoirs and irrigation system

As the priority project, two existing reservoirs will be restored and the existing one MC (Canal 33) and 5 SCs (Canals No.20, No.21, No.22, No.23 and No.24) will be rehabilitated and improved. TCs (106 tertiary blocks) and WCs will be newly constructed for which lands for canal should be offered by the member farmers.

(2) Cropping pattern and area developed

After the hydrological examination, irrigated agricultural development area will be limited to about 3,500 ha of paddy in the rainy season, about 500 ha of rainy season diversified crops and about 550 ha of dry season diversified crops.

(3) Organization structure of FWUC

In accordance with the Government Policy, it is proposed to establish an Apex FWUC consisting of 6 SC FWUCs in which 72 FWUGs will be involved. Average command area of FWUG will be approximately 50 ha. Total tertiary blocks are 106, which ranges from about 15 ha to 83 ha.

(4) Statute of FWUC

The essential points of statute prepared by MOWRAM were explained as follows:

- Every member of FWUC has to maintain irrigation system and obey the regulation of FWUC.
- Committee members will be elected through secret ballot.
- Member farmers have to pay a membership fee, ISF.
- ISF rate proposed is 140 kg/ha for rainy season paddy, 40,600 Riel/ha for rainy season diversified crops and 76,500 Riel/ha for dry season diversified crops respectively.

(5) Marketing Assistance Program

Proposed ISF collected can not cover the O&M costs including replacement costs. In order to balance the deficit, the marketing assistance activities of agricultural products produced by the member farmers in USP are proposed as FWUC activities and to get revenue from the assembling and marketing assistance to the farmers and buyers.

(6) Implementation Schedule

It will take about 4 years from the planning and design to the completion of rehabilitation work.

#### **H-1.4.3 Discussion and Comments of Farmers**

All the attendants in each meeting were keenly interested in USP and hoping its earliest implementation. The following points were raised from those attendants and their comments and understanding to USP development and FWUC formation.

- (1) ISF: 140 kg/ha of paddy for ISF are basically acceptable according to all attendants, but more than 140 kg/ha of paddy would be hardly possible to pay. Furthermore, it will be a question how they can pay 20 % of increased production for emergency repair and replacement. If irrigation water is not properly and timely distributed, particularly for diversified crops, the ISF rate should be adjusted and reduced.
- (2) Some farmers said, before the Kpob Trobek reservoir was destroyed, irrigation water was supplied to their paddy fields free of charge. They complained why they have to pay ISF after the rehabilitation under the priority project.

According to the Government new policy, the Study Team replied that the basic principles of implementation of the irrigation development are based on the involvement of FWUC in system development and obligation of farmers in paying the O&M cost.

- (3) Use of ISF: The farmers in O Saray have a suspicion on use of ISF (accountability) by the FWUC Committee. The Study Team replied that according to Article 25 of the Statute, a) the accounts of the FWUC shall be audited every year by the auditor approved by the Government and appointed by the majority of the Committee of the



FWUC, and b) the statement of income and expenditure of FWUC along with an audit report shall be submitted to the general meeting of FWUC every year and get it ratified. A copy of this report should be also submitted to Irrigation and Drainage Department of MOWRAM.

- (4) Lands for TC and WC: Except for Ta Phem Commune, all attendants agreed to provide the land for canals. When some troubles occur, the Chief of Commune will manage and guarantee to provide lands. In case of Ta Phem Commune, because of very small plots occupied by farmers, some period of times is needed for land acquisition for canal lands.
- (5) Some assistance for agricultural production program was provided by IOs and NGOs, but the results were not so fruitful and they were disappointed. For USP, the early implementation of irrigation facilities is eagerly expected by farmers.
- (6) Agricultural extension services: The existing extension services are not properly provided so far. Only some specific persons are benefited in some extent. The farmers in Trapeang Thum Khang Cheung Commune requested to provide the intensive agricultural extension services to the entire USP, particularly diversified crops and livestock.
- (7) Marketing activities: There were very low prices of cash crops in the past (Cheang Tong Commune). The farmers are still anxious about marketing of cash crops, particularly vegetables, so that the marketing activities to be operated by FWUC are keenly expected.
- (8) Credit services by FWUC for purchase of agricultural input was requested (Cheang Tong Commune).
- (9) Road improvement: Attendants from both Trapeang Kranhung and Osaray Communes strongly requested to include the existing road improvement of about 13 km long from Trapeang Thum Khang Cheung to Trapeang Kranhung. The Study Team replied that this road improvement is included in the Rural Road Improvement Program (RIP).

#### **H-1.5 Trial Calculation of ISF**

In order to cover the estimated annual O&M costs including replacement costs of gates and office equipment, trial calculation of cash flow was made for USP operation based on the cropping pattern proposed. As shown in Table H-2, in addition to the routine and periodic O&M costs, approximately Riel 3,042 million of replacement costs during 45 years (average 68 million/year) after the completion of irrigation facilities is needed additionally.

This means that about 1.55 times of the proposed ISF rate namely, 218 kg/ha of paddy

for rainy season paddy, Riel 63,103/ha for rainy season diversified crops and Riel 118,900/ha for the dry season diversified crops are required to cover the costs of replacement of irrigation facilities and office equipment. In addition, the emergency repair and maintenance costs are further required for sustainable USP.

In order to compensate the above deficit, it is considered to apply the revenue from the marketing services operated by Marketing Unit of FWUC, which would earn about Riel 182 million per year. Table H-3 shows the cash flow balance between the revenue of ISF plus marketing services and all expenditures including replacement costs. Even though 73 %of revenue rate of marketing operation is taken into account, the cumulative surplus would amount to approximately Riel 4,659 million (103 million/year) after 45 years from the irrigation service started. Such surplus would be utilized for the emergency repair and maintenance in the future.

## CHAPTER H-2 INSTITUTIONAL DEVELOPMENT/CAPACITY BUILDING

### H-2.1 Responsibility of Experts

#### H-2.1.1 General

In order to smoothly operate the USP, it is proposed that the following experts should be deployed for training the project office staff on sustainable management and operation of FWUC of USP, immediately after the project office is mobilized. Those experts will also assist the project office staff in training farmers and FWUC staff mobilized.

- FWUC Experts (Foreign and Local both for 24 M/M),
- Irrigation O&M Expert (Foreign) for 16 M/M,
- Irrigation O&M Expert (Local) for 36 M/M,
- Participatory On-farm Development Expert (Foreign) for 34M/M,
- Participatory On-farm Development Expert (Local) for 42M/M,
- Farm to Market Organizer (Foreign) for 12 M/M,
- Accountant (Local) for 24 M/M,
- Legal Officer (Local) for 4 M/M,
- Marketing Expert (Local) for 36 M/M, and
- Agronomist (Local) for 24 M/M.

The assignment schedule of the above experts is shown in Fig. H-3. The terms of reference of each expert to train the project office staff are described in H-2.1.2.

#### H-2.1.2 Responsibility of Experts

(1) FWUC Experts:

- to prepare materials necessary for awareness creation of farmers on significance and function of FWUC, FWUC formation process, obligation and rights of FWUC members, etc.,
- to prepare a guideline for FWUC formation,
- to advise and assist the project office staff, and farmers in forming FWUC,
- to enhance the capability of project office staff, farmers and FWUC in managing and safeguarding the irrigation system,
- to prepare a management manual of FWUC,
- to advise and assist the project office staff, and FWUC staff in preparing the work program of FWUC, and
- to advise and assist the project office staff, and FWUC staff in managing operation of FWUC, collecting ISF, resolving dispute, etc.

(2) Irrigation O&M Experts:

- to prepare criteria of annual water distribution schedule (WDS),
- to prepare an O&M manual of irrigation facilities,
- to advise and assist the project office staff, and FWUC staff in assessing irrigation water requirement based on the cropping pattern,
- to advise and assist the project office staff, and FWUC staff in preparing rotation irrigation program for diversified crops,
- to advise and assist the project office staff, and FWUC staff in conducting proper water distribution from MC through WCs,
- to prepare a manual for monitoring and inspecting the irrigation facilities of the reservoirs, MC and SCs,
- to advise and assist the project office staff, and FWUC staff in preparing annual maintenance and repair program including cost estimates for reservoirs, MC and SCs,
- to prepare draft bid documents of M&R works and supervision of construction of facilities,
- to advise and assist the project office staff, and FWUC staff in preparing emergency repair program, and
- to advise and assist the project office staff, and FWUC staff in conducting O & M of irrigation facilities.

(3) Participatory On-farm Development Experts:

- to prepare a guideline for on-farm development,
- to advise and assist the project office staff, and farmers in setting tertiary unit for FWUC formation, such as preparation of cadastor, alignment decision of tertiary canal and watercourse, land provision by beneficiaries, etc.,
- to advise and assist the project office staff, and FWUC staff in guiding and supervising watercourse construction works to be carried out by FWUGs,
- to advise and assist the project office staff, and FWUC staff in preparing irrigation water distribution plan in each water course,
- to advise and assist the project office staff, and FWUC staff in distributing properly irrigation water to the field in time,
- to advise and assist the project office staff, FWUC staff and FWUGs in evaluation of farm products for ISF, if necessary,
- to advise and assist the project office staff, and FWUC staff in monitoring and inspecting the TCs and WCs,
- to advise and assist the project office staff, and FWUC staff in preparing an annual maintenance and repair program of TCs and WCs and those cost estimates, and

- to advise and assist the project office staff, and FWUC staff in guiding and supervising the M&R works of TCs and WCs, and
- to advise and assist the project office staff, and FWUC staff in preparing emergency repair program.

(4) Farm to Market Organizer:

- to prepare a guideline for marketing services of FWUC,
- to advise and assist the project office staff, FWUC staff and farmers in storage of ISF paddy and assembling and shipping of agricultural product,
- to advise and assist the project office staff, and FWUC staff in O & M of equipment for marketing assistance services,
- to advise and assist the project office staff, and FWUC staff in preparation of annual cropping pattern and production schedule,
- to advise and assist the project office staff, FWUC staff and farmers in quality control of agricultural products,
- to prepare a quality grading manual of agricultural products, particularly vegetables,
- to prepare dissemination program to the farmer members on quality and quantity, and
- to advise and assist the project office staff, and FWUC staff in O & M of the equipment and facilities of marketing services to keep freshness and quality of products.

(5) Accountant:

- to prepare a manual of accounting,
- to advise and assist the project office staff, and FWUC staff in maintaining cash and petty cash book, bank account and cash book,
- to advise and assist the project office staff, and FWUC staff in setting the ISF comprising the capital costs (purchase and replacement of equipment) and the recurrent costs (staff costs, office running costs, routine maintenance and repair irrigation facility costs and contingency fund),
- to prepare a manual for ISF collection,
- to advise and assist the project office staff, and FWUC staff in operating credit services only for the weak of FWUC members,
- to prepare a manual for preparation of annual budget of FWUC, and
- to prepare a manual on how to prepare statement of income and expenditure to FWUC Committee and Apex Committee.

(6) Legal Officer:

- to prepare a manual for explaining the rules, regulations and laws related to FWUC

- to farmers for legal understanding of FWUC,
- to prepare a manual on legal procedure of FWUC formation including registration form to MOWRAM,
- to advise and assist the project office staff, farmers and FWUC staff in preparation of the Statute of FWUC, and
- to advise and assist the project office staff, farmers and FWUC staff in undertaking the marketing assistance services from legal viewpoint.

(7) Marketing Expert:

- to prepare a guideline for marketing services of FWUC,
- to advise and assist the project office staff, farmers and FWUC staff in storage of ISF paddy and assembling and shipping of agricultural product,
- to advise and assist the project office staff, farmers and FWUC staff in O & M of equipment for marketing assistance services,
- to get information on markets and prices of products in the terminal market,
- to advise and assist the project office staff, farmers and FWUC staff in marketing techniques,
- to advise and assist the project office staff, and FWUC staff in promoting trade with local and regional traders,
- to advise and assist the project office staff, farmers, and FWUC staff in negotiating the prices with buyers,
- to prepare a guideline for marketing agricultural products,
- to prepare the periodical dissemination paper to the farmers on market price determined by quality and quantity,
- to advise and assist the project office staff, and FWUC staff in developing sales at the terminal markets in Phnom Penh, and
- to advise and assist the project office staff, and FWUC staff in promoting scheduled production, assembling and shipping by producers' group according to the market situation.

(8) Agronomist :

- to advise and assist the project office staff, farmers and FWUC staff in conducting agricultural extension services to member farmers by using the Demo-plot,
- to prepare a manual on how to prepare annual cropping pattern under the irrigated conditions,
- to prepare annual cropping pattern under the irrigated conditions and select HYV paddy,
- to select suitable diversified crops including vegetables,
- to prepare a manual of farming practices,

- to advise and assist the project office staff, farmers and FWUC staff in improving farming system of paddy and diversified crops, and
- to prepare a manual on how to estimate crop yields to determine ISF rate in collaboration with FWUC Committee members.

## **H-2.2 Role and Responsibility of FWUC Staff**

### **H-2.2.1 General**

Immediately after the establishment of FWUC, the following key personnel of FWUC will be trained respectively for above mentioned subjects by the Project office staff assisted by the Experts for the smooth and sustainable operation of USP.

- FWUC Apex Committee Chairman (1 persons),
- FWUC Apex Committee Vice-chairman(1 persons),
- FWUC Chairmen (5 persons),
- FWUC Vice-chairmen (5 persons),
- Secretary of FWUC Apex Committee (1 person),
- Accountant of FWUC Apex Committee(1 person),
- Manager of Marketing Unit of FWUC Apex Committee (1 person),
- Accountant of Marketing Unit of FWUC Apex Committee (1 person),
- Technicians in O&M Unit of FWUC Apex Committee (2 persons)
- SC FWUC Accountants (6 accountants),
- SOs (8 persons), and
- FOs (72 persons).

### **H-2.2.2 Role and Responsibility of Key Personnel in FWUC**

#### **(1) FWUC Apex Committee Chairman**

- to invite the representatives of the FWUC and members to take part in the Apex Board meeting,
- to chair the Apex Board meetings,
- to direct and prepare annual irrigation plan including budgeting,
- to implement the work programs which are approved by the Apex Board meeting,
- to examine all the activities of each SC FWUC,
- to control expenditure in accordance with the approved plan,
- to submit the annual budget and work plan of FWUC Apex Committee to the Apex Board meeting,
- to jointly sign along with the a Accountant in the matters related to finance,
- to serve as an arbitrator for disputes among members,
- to discipline any member who fails to carry out the duties prescribed by the FWUC,

and

- to submit annual report of FWUC activity to MOWRAM.

(2) FWUC Apex Committee Vice-chairman

- to prepare the irrigation program in entire USP,
- to supervise the implementation of the irrigation programs,
- to monitor and inspect the operation of irrigation system in entire USP,
- to report regularly to the Chairman of FWUC Apex Committee about the activity of the irrigation work,
- to check and approve the routine maintenance and repair plan and cost estimates of Reservoirs and MC prepared jointly by Technicians and SOs,
- to check and prepare the request for annual maintenance and repair plan and cost estimates of Reservoirs and MC prepared jointly by Technicians and SOs to submit FWUC Apex Committee,
- to monitor and evaluate the yield of crops together with FO regarding ISF, if requested by the farmers concerned, and
- to chair the meetings of Apex FWUC Committee as the interim chairman, in the absence of the Chairman.

(3) SC FWUC Chairman in Respective SC

- to invite the representatives of the SC FWUC and members to take part in the meeting,
- to chair the SC FWUC Committee meetings,
- to direct and prepare annual irrigation plan including budgeting,
- to implement the work programs which are approved by the general meeting,
- to examine all the activities of each SC FWUC,
- to control expenditure in accordance with the approved plan,
- to submit the annual budget and work plan of SC FWUC to the Apex Committee,
- to submit annual M&R plan and cost estimates of SC, TCs and WCs to the SC FWUC Committee meeting,
- to jointly sign along with the a Accountant in the matters related to finance,
- to resolve the problems occurring within the command area,
- to discipline any member who fails to carry out the duties prescribed by the FWUC, and
- to submit annual report of SC FWUC activity to Apex Committee.

(4) SC FWUC Vice-chairman in Respective SC

- to supervise the design and construction of water courses to be carried out by members of farmers,
- to prepare the irrigation program,



- to supervise the implementation of the irrigation programs,
- to monitor the operation of irrigation system regularly and properly,
- to report regularly to the Chairman of FWUC about the activity of the irrigation work,
- to define the scope of work for farmers to maintain and repair TCs and WCs,
- to check and approve the routine maintenance and repair plan and cost estimates of respective canal prepared by SOs and FOs,
- to check and prepare the request for annual maintenance and repair plan of SC and TCs and those cost estimates prepared by SOs and FOs in collaboration with Technician in O&M Unit to submit FWUC Committee,
- to monitor and evaluate the yield of crops together with FO regarding ISF, if requested by the farmers concerned,
- to report regularly to the Chairman on the repairs carried out to the irrigation system, and
- to chair the meetings of SC FWUC Committee as the interim chairman, in the absence of the Chairman.

(5) Secretary of Apex FWUC Committee

- to prepare the meeting materials for the Apex Board meetings, annual budgets and cost estimates of Apex Committee including Marketing Unit,
- to manage the office administration, office filing, office record, store procedures, etc., and
- to chair the meeting of Apex FWUC Committee as the interim chairman, in the absence of the Chairman and Vice-chairman.

(6) Accountants of FWUC Apex Committee and SC FWUC Committees

- to maintain cash and petty cash book, bank account and cash book,
- to prepare the ISF rate comprising the capital costs (purchase and replacement of equipment) and the recurrent costs (staff costs, office running costs, routine maintenance and repair irrigation facility costs and contingency fund) and submit it to the respective Apex Committee and SC FWUC Committee,
- to collect ISF which will be done by each FWUG,
- to provide credit services for the weak, if approved by the Apex Committee,
- to prepare annual budget of FWUC and to submit it to respective FWUC Committee,
- to go through audit of the accounts of FWUC from the auditor approved by the Government, and
- to submit the statement of income and expenditure of FWUC along with an audit report to FWUC Apex Committee meeting.

- (7) Manager of Marketing Unit of Apex FWUC Committee
- to manage the marketing activities of agricultural products collected from the farmers,
  - to get information on markets and prices of products in the terminal market,
  - to assist the members to negotiate the prices with buyers,
  - to prepare guideline for marketing agricultural products,
  - to prepare the periodical dissemination paper to the members on market price according to the quality and quantity,
  - to develop the buyers at the terminal markets in Phnom Penh, and
  - to promote scheduled production, assembling and shipping by producers' group according to the market situation.
- (8) Accountant of Marketing Unit of FWUC Apex Committee
- to maintain cash and petty cash book, bank account and cash book,
  - to prepare annual budget of the Marketing Unit and to submit it to FWUC Apex Committee,
  - to go through audit of the accounts of Marketing Unit from the auditor approved by the Government, and
  - to submit the statement of income and expenditure of Marketing Unit along with an audit report to FWUC Apex Board meeting.
- (9) Technicians in O&M Unit of FWUC Apex Committee
- to design and cost estimates of on-farm irrigation facilities in collaboration with FO,
  - to monitor and inspect the conditions of irrigation facilities (reservoir dike and gates, canal dikes and slope, canal structures, etc.) in entire USP,
  - to prepare annual maintenance and repair program including cost estimates for reservoirs, MC, SCs, TCs and WCs in consultation with Senior Engineer of TSAU, MOWRAM,
  - to prepare tender documents of M&R works in mainly reservoirs, MC and SCs and to submit those to FWUC Apex Committee, and to supervise the construction of M&R works,
  - to supervise the farmers for routine maintenance and repair works of TCs and WCs, and
  - to prepare emergency repair program.
- (10) SOs in O&M Unit in FWUC Apex Committee
- to assess irrigation water requirement based on the cropping pattern in consultation with Senior Engineer of TSAU, MOWRAM,
  - to prepare water distribution schedule (WDS) in Headworks, MC, Canal 24 and

Tumnup Lok intake,

- to prepare rotation irrigation program for diversified crops in consultation with Agronomist, DAFF Takeo,
- to operate and close gates to ensure timely and equitable water distribution from the reservoirs to MC, Canal 24 and Tumnup Lok TCs, and from MC to 6 SCs, which includes recording water levels in the reservoir,
- to monitor and inspect the irrigation facilities in the reservoirs and MC in collaboration with the Technicians in O&M Unit,
- to report any illegal activity that may lead to damage to irrigation facilities to FWUC Apex Committee,
- to carry out minor maintenance work of embankment and structures if required,
- to prepare annual maintenance and repair program including cost estimates for reservoirs, MC and Canal 24 in collaboration with the Technicians in O&M Unit, and
- to prepare emergency repair program if needed.

(11) SOs in SC FWUC

- to assess irrigation requirement based on the cropping pattern in respective command area of SC in consultation with Senior Engineer of TSAU, MOWRAM,
- to prepare water distribution schedule (WDS) in respective TC,
- to prepare rotation irrigation program for diversified crops in consultation with Agronomist, DAFF Takeo,
- to operate and close gates to ensure timely and equitable water distribution to TCs,
- to monitor and inspect the irrigation facilities in respective SC in collaboration with the Technicians in O&M Unit,
- to report any illegal activity that may lead to damage to irrigation facilities, to SC FWUC Committee,
- to carry out minor maintenance work of embankment and structures if required,
- to prepare annual maintenance and repair program including cost estimates for SCs in collaboration with the Technicians in O&M Unit, and
- to prepare emergency repair program if needed.

(12) FOs in Tertiary Unit

- to design and cost estimates of on-farm irrigation facilities in collaboration with the Technicians in O & M Unit,
- to guide and supervise watercourse construction works to be carried out by the FWUG,
- to prepare rotation irrigation water distribution plan in each water course according to the irrigation requirement,

- to distribute properly irrigation water to the field in time,
- to monitor and inspect the TCs and WCs,
- to prepare annual maintenance and repair program of TCs and WCs and those cost estimates in consultation with the Technicians in O & M Unit,
- to guide and supervise the farmers for maintenance and repair works of TCs and WCs,
- to assist FWUGs in evaluation of farm products for ISF, if necessary, and
- to advise members of FWUG to pay ISF to SC FWUC.

## *Tables*

Table H-1 List of FWUGs of USP (1/2)

Canal	FWUG No.	Related Tertiary Blocks		FWUG Area (ha)	Village	Commune
		Name	Area (ha)			
Canal 24 & Canal 3U, Total FWUGs = 13 nos., Total tertiary blocks = 14nos.						
	24-1	TL-1	5.0	15.0	Dambok Kpos	Phong, Basedth, Kampong Spueu
		TL-2	10.0		Kpob Svay	Trapeang Kranhung, Tram Kak, Takeo
	24-2	C-1L	66.3	66.3	Trapeang Dang Tuek	O Saray
	24-3	C-2L	75.9	75.9	Trapeang Dang Tuek	O Saray
	24-4	C-3L	66.6	66.6	Trapeang Khchau	O Saray
	24-5	C-4L	80.2	80.2	Boeng Satong	O Saray
	24-6	C-5L	70.2	70.2	Boeng Satong	O Saray
	24-7	C-6L	58.7	58.7	Pou Doh	Trapeng Thum Khang Cheung
	24-8	C-7L	30.8	30.8	Pou Doh	Trapeng Thum Khang Cheung
	24-9	C-8L	57.6	57.6	Pou Doh	Trapeng Thum Khang Cheung
	24-10	C-9L	54.7	54.7	Prey Kdouch	Trapeng Thum Khang Cheung
	24-11	A3U-1L	45.6	45.6	Trapeang Krasang	O Saray
	24-12	A3U-2L	44.1	44.1	Trapeang Krasang	O Saray
24-13	A3U-3L	47.7	47.7	Trapeang Krasang	O Saray	
Sub-total (1)				713.4		
Canal 23, Total FWUGs = 16 nos., Total tertiary blocks = 23nos.						
	23-1	A23-1L	45.7	45.7	Peak Bang'aong	Trapeng Thum Khang Cheung
	23-2	A23-1R	44.3	44.3	Peak Bang'aong	Trapeng Thum Khang Cheung
	23-3	A23-2L	35.5	35.5	Pou Doh	Trapeng Thum Khang Cheung
	23-4	A23-3L	47.5	47.5	Prey Sbat	Trapeng Thum Khang Cheung
	23-5	A23-4L	49.6	49.6	Prey Sbat	Trapeng Thum Khang Cheung
	23-6	A23-5L	74.0	74.0	Prey Sbat	Trapeng Thum Khang Cheung
	23-7	A23-6L	17.1	17.1	Prey Sbat	Trapeng Thum Khang Cheung
	23-8	A23-6R	30.1	30.1	Ta Suon	Trapeng Thum Khang Cheung
	23-9	A23-7R	29.8	29.8	Trapeang Tuek	Cheang Tong
	23-10	A23-7L	51.3	51.3	Tuol Tbaeng	Cheang Tong
	23-11	A23-8R	24.6	37.8	Moeng Char	Cheang Tong
		A23-9R	13.2			
	23-12	A23-9L	38.7	80.7	Moeng Char	Cheang Tong
		A23-11L	42.0			
	23-13	A23-10R	18.2	47.8	Nomou	Cheang Tong
		A23-11R	29.6			
	23-14	A23-12L	46.8	70.0	Totueng Thngai	Cheang Tong
		A23-12R	23.2			
23-15	A23-13L	15.1	28.9	Trapeang Srangae	Cheang Tong	
	A23-13R	13.8				
23-16	A23-14L	27.4	83.5	Srae Kruo	Cheang Tong	
	A23-14R	21.9				
	A23-15L	34.2				
Sub-total (2)				773.6		
Canal 22, Total FWUGs = 13 nos., Total tertiary blocks = 21nos.						
	22-1	A22-1L	30.5	77.8	Trapeang Svay	Trapeang Thum Khang Cheung
		A22-1R	47.3			
	22-2	A22-2L	46.5	65.9	Prey Dak Por	Trapeang Thum Khang Cheung
		A22-2R	19.4			
	22-3	A22-3L	55.3	55.3	Ta Suon	Trapeang Thum Khang Cheung
	22-4	A22-3R	35.6	35.6	Ta Suon	Trapeang Thum Khang Cheung
	22-5	A22-4L	35.4	72.2	Ta Suon	Trapeang Thum Khang Cheung
		A22-4R	36.8			
	22-6	A22-5L	17.9	17.9	Trapeang Tuek	Cheang Tong
	22-7	A22-5R	63.2	63.2	Ta Toeum	Cheang Tong
	22-8	A22-6L	14.1	46.4	Moeng Char	Cheang Tong
		A22-7L	16.5			
		A22-7R	15.8			
	22-9	A22-8L	13.7	27.0	Nomou	Cheang Tong
		A22-8R	13.3			
	22-10	A22-9L	24.7	39.6	Nomou	Cheang Tong
A22-9R		14.9				
22-11	A22-10L	22.4	22.4	Trapeang Srangae	Cheang Tong	
22-12	A22-10R	30.4	30.4	Angk Kralanh	Cheang Tong	
22-13	A22-11L	29.9	55.1	Angk Baksei	Cheang Tong	
	A22-11R	25.2				
Sub-total (3)				608.8		

Table H-1 List of FWUGs of USP (2/2)

Canal	FWUG No.	Related Tertiary Blocks		FWUG Area (ha)	Village	Commune
		Name	Area (ha)			
Canal 21, Total FWUGs = 12 nos., Total tertiary blocks = 19nos.						
	21-1	A21-1L	31.3	51.2	Trapeang Svay	Trapeang Thum Khang Cheung
		A21-1R1	19.9			
	21-2	A21-2L	17.2	61.7	Prey Khvav	Trapeang Thum Khang Cheung
		A21-2R	13.4			
		A21-1R2	31.1			
	21-3	A21-3L	25.3	25.3	Ta Suon	Trapeang Thum Khang Cheung
	21-4	A21-3R	16.6	16.6	Prey Ta Lei	Trapeang Thum Khang Cheung
	21-5	A21-4L	37.0	37.0	Ta Toeum	Cheang Tong
	21-6	A21-4R	30.3	30.3	Srae Khvav	Cheang Tong
		A21-5L	23.2			
	21-7	A21-5R	40.6	79.8	Ta Reab	Cheang Tong
		A21-6R	16.0			
21-8		A21-6L	28.4			
21-9	A21-7L	24.5	68.2	Angk Kralanh	Cheang Tong	
	A21-7R	21.3				
	A21-8L	22.4				
21-10	A21-8R	47.0	47.0	Ta Much	Ta Phem	
21-11	A21-9L	26.8	26.8	Angk Baksei	Cheang Tong	
21-12	A21-9R	17.5	17.5	Trapeang Ampil	Ta Phem	
Sub-total (4)				489.8		
Canal 20+20S, Total FWUGs = 12 nos., Total tertiary blocks = 20 nos.						
	20-1	A20-1L	42.4	61.9	Prey Ta Lei	Trapeang Thum Khang Cheung
		A20-1R	19.5			
	20-2	A20-2L	34.4	64.7	Srae Khvav	Cheang Tong
		A20-2R	30.3			
	20-3	A20-3L	29.1	73.0	Srae Khvav	Cheang Tong
		A20-3R	43.9			
	20-4	A20-4L	49.2	49.2	Ta Reab	Cheang Tong
	20-5	A20-4R	47.7	47.7	Ti Pat	Cheang Tong
	20-6	A20-5L	20.0	26.0	Ang Kralanh	Cheang Tong
		A20-5R	6.0			
	20-7	A20-6L	44.6	80.3	Ta Much	Ta Phem
		A20-6R	35.7			
20-8	A20-7R	26.9	26.9	Ta Much	Ta Phem	
20-9	A20-8L	26.4	76.7	Trapeang Ampil	Ta Phem	
	A20-8R	50.3				
20-10	A20-9R	27.4	27.4	Trapeang Ampil	Ta Phem	
20-11	A20S-1L	17.1	38.8	Moha Sena	Ta Phem	
	A20S-1R	21.7				
20-12	A20S-2L	11.0	46.4	Moha Sena	Ta Phem	
	A20S-2R	35.4				
Sub-total (5)				619.0		
Canal 3D, Total FWUGs = 6 nos., Total tertiary blocks = 8nos.						
	3D-1	A3D-1L	19.6	19.6	Srae Khvav	Cheang Tong
	3D-2	A3D-2L	37.9	37.9	Ti Pat	Cheang Tong
		A3D-3L	22.4			
	3D-3	A3D-4L	47.3	69.7	Ta Mom	Ta Phem
		A3D-5L1	23.2			
	3D-4	A3D-5L2	38.1	61.3	Mrum	Ta Phem
A3D-6L		33.5				
3D-5	A3D-7L	38.1	73.4	Moha Sena	Ta Phem	
3D-6	A3D-8L	35.3				
Sub-total (6)				295.4		
Grand Total				3,500.0	32 villages	6 Communes

Table H-2 Cash Flow of FWUC Activities (1/3)

Item	Area(ha)	ISF Rate			ISF Collection (Riel Million)
		In kind (Paddy) kg/ha	Riel/ha	By Cash Riel/ha	
Wet Season	3,500	140	40,600	-	142.10
4 2005	500	-	-	40,600	20.30
Dry Season	550	-	-	76,500	42.08
Total (100% Collection)					204.48

ISF Collection Rate :		124.340%		100% Collection		80% Collection	
Wet S	Paddy	In kind(Paddy, kg/ha)	By cash (Riel/ha)	In kind(Paddy, kg/ha)	By cash (Riel/ha)		
	D.Crop	174.1	50,482	218	63,103		
	D.Crop	174.1	50,482	218	63,103		
Dry S	D.Crop	328.3	95,120	410	118,900		

(Unit : Riel Million)

Year in Order	Year	Revenue			Expenditure									Annual Balance	Cumulative	
		ISF	Paddy Storage	Total Revenue	Personnel		Annual O&M			Replacement			Total			
					Apex	SC-FWUCs	Sub-total	Apex	SC-FWUCs	Sub-total	Irrigation Facilities	Office & Equip.	Sub-total			
1	2002															
2	2003															
3	2004															
4	2005															
5	2006	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	0	0	163.6	106.4	106.4
6	2007	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	0	0	163.6	106.4	212.8
7	2008	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	0	0	163.6	106.4	319.2
8	2009	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	0	0	163.6	106.4	425.6
9	2010	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	11.7	26.8	38.5	202.1	67.9	493.5
10	2011	254.3	15.7	270.0	10.3	88.9	99.2	63.2	71.2	134.4	0	0	0	233.6	36.4	529.9
11	2012	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	134.7	134.7	298.3	-28.3	501.6
12	2013	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	0	0	163.6	106.4	608.0
13	2014	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	0	0	163.6	106.4	714.4
14	2015	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	57.1	2.2	59.3	222.9	47.1	761.5
15	2016	254.3	15.7	270.0	10.3	88.9	99.2	63.2	71.2	134.4	0	0	0	233.6	36.4	797.9
16	2017	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	0	0	163.6	106.4	904.3
17	2018	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	26.8	26.8	190.4	79.6	983.9
18	2019	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	0	0	163.6	106.4	1,090.3
19	2020	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	11.7	6.7	18.4	202.0	88.0	1,178.3
20	2021	254.3	15.7	270.0	10.3	88.9	99.2	63.2	71.2	134.4	0	0	0	233.6	36.4	1,214.7
21	2022	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	128.4	128.4	292.0	-22.0	1,192.7
22	2023	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	0	0	163.6	106.4	1,299.1
23	2024	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	0	0	163.6	106.4	1,405.5
24	2025	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	57.1	2.2	59.3	222.9	47.1	1,452.6
25	2026	254.3	15.7	270.0	10.3	88.9	99.2	63.2	71.2	134.4	0	26.8	26.8	260.4	9.6	1,462.2
26	2027	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	0	0	163.6	106.4	1,568.6
27	2028	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	6.7	6.7	170.3	99.7	1,668.3
28	2029	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	0	0	163.6	106.4	1,774.7
29	2030	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	1,737.7	0	1,737.7	1,901.3	-1,631.3	143.4
30	2031	254.3	15.7	270.0	10.3	88.9	99.2	63.2	71.2	134.4	0	0	0	233.6	36.4	179.8
31	2032	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	283.6	283.6	447.2	-177.2	2.6
32	2033	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	0	0	163.6	106.4	109.0
33	2034	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	184.8	184.8	348.4	-78.4	30.6
34	2035	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	0	0	163.6	106.4	142.6
35	2036	254.3	15.7	270.0	10.3	88.9	99.2	63.2	71.2	134.4	0	6.7	6.7	240.3	29.7	107.4
36	2037	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	0	0	163.6	106.4	213.8
37	2038	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	0	0	163.6	106.4	320.2
38	2039	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	0	0	163.6	106.4	426.6
39	2040	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	11.7	0	11.7	175.3	94.7	521.3
40	2041	254.3	15.7	270.0	10.3	88.9	99.2	63.2	71.2	134.4	0	0	0	233.6	36.4	557.7
41	2042	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	154.8	154.8	318.4	-48.4	509.3
42	2043	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	0	0	163.6	106.4	615.7
43	2044	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	6.7	6.7	170.3	99.7	715.4
44	2045	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	57.1	2.2	59.3	222.9	47.1	762.5
45	2046	254.3	15.7	270.0	10.3	88.9	99.2	63.2	71.2	134.4	0	0	0	233.6	36.4	798.9
46	2047	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	0	0	163.6	106.4	905.3
47	2048	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	0	0	163.6	106.4	1,011.7
48	2049	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	0	0	0	163.6	106.4	1,118.1
49	2050	254.3	15.7	270.0	10.3	88.9	99.2	28.2	36.2	64.4	11.7	26.8	38.5	202.1	67.9	1,186.0
50	2051	254.3	15.7	270.0	10.3	88.9	99.2	63.2	71.2	134.4	0	0	0	233.6	36.4	1,222.4
Total		11,697.8	722.2	12,420.0	473.8	4,089.4	4,563.2	1,612.2	1,980.2	3,592.4	2,012.9	1,029.1	3,042.0	11,197.6	1,222.4	-



Table H-2 Cash Flow of FWUC Activities (2/3)

Item	Revenue at Full Stage (Riel Million)	Marketing Operation Rate (%)
Market Charge	54.1	73.00%
Trade Income	128.3	73.00%
Total	182.4	

I. Marketing Support

(Unit : Riel Million)

Year in Order	Year	Revenue			Personnel Apex (M. Unit)	O&M	Equipment Purchase	Expenditure			Staff Training	Total	Annual Balance	Cumulative
		Market Charge	Trade Income	Total Revenue				Market Facilities	Shipping	Sub-total				
1	2002													
2	2003													
3	2004													
4	2005													
5	2006	13.3		13.3	7.4	5.9				0	13.3	0.0	0.0	
6	2007	22.0		22.0	7.4	5.9				0	13.3	8.7	8.7	
7	2008	30.7		30.7	7.4	5.9				0	13.3	17.4	26.1	
8	2009	35.1		35.1	7.4	5.9				0	13.3	21.8	47.9	
9	2010	39.5	93.7	133.2	9.4	20.0	111.9			0	5.3	146.56	(13.4)	34.5
10	2011	39.5	93.7	133.2	9.4	20.0	80.0			0		109.36	23.8	58.4
11	2012	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	162.2
12	2013	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	266.1
13	2014	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	369.9
14	2015	39.5	93.7	133.2	9.4	20.0		2.9		2.9		32.26	100.9	470.8
15	2016	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	574.7
16	2017	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	678.5
17	2018	39.5	93.7	133.2	9.4	20.0			6.0	6		35.36	97.8	776.4
18	2019	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	880.2
19	2020	39.5	93.7	133.2	9.4	20.0				80.3	80.3	109.66	23.8	927.7
20	2021	39.5	93.7	133.2	9.4	20.0			80.0	80.0		109.36	23.8	927.6
21	2022	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	1,031.4
22	2023	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	1,135.3
23	2024	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	1,239.1
24	2025	39.5	93.7	133.2	9.4	20.0		2.9		2.9		32.26	100.9	1,340.0
25	2026	39.5	93.7	133.2	9.4	20.0			6.0	6.0		35.36	97.8	1,437.9
26	2027	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	1,541.7
27	2028	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	1,645.6
28	2029	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	1,749.4
29	2030	39.5	93.7	133.2	9.4	20.0				80.3	80.3	109.66	23.5	1,772.9
30	2031	39.5	93.7	133.2	9.4	20.0				80.0	80.0	109.36	23.8	1,796.8
31	2032	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	1,900.6
32	2033	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	2,004.5
33	2034	39.5	93.7	133.2	9.4	20.0			6.0	6.0		35.36	97.8	2,102.3
34	2035	39.5	93.7	133.2	9.4	20.0			74.9	74.9		104.26	28.9	2,131.2
35	2036	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	2,235.1
36	2037	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	2,338.9
37	2038	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	2,442.8
38	2039	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	2,546.6
39	2040	39.5	93.7	133.2	9.4	20.0			105.9	105.9		135.26	(2.1)	2,544.5
40	2041	39.5	93.7	133.2	9.4	20.0			80.0	80.0		109.36	23.8	2,568.4
41	2042	39.5	93.7	133.2	9.4	20.0			6.0	6.0		35.36	97.8	2,666.2
42	2043	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	2,770.1
43	2044	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	2,873.9
44	2045	39.5	93.7	133.2	9.4	20.0			2.9	2.9		32.26	100.9	2,974.8
45	2046	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	3,078.7
46	2047	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	3,182.5
47	2048	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	3,286.4
48	2049	39.5	93.7	133.2	9.4	20.0				0		29.36	103.8	3,390.2
49	2050	39.5	93.7	133.2	9.4	20.0			86.3	86.3		115.66	17.5	3,407.7
50	2051	39.5	93.7	133.2	9.4	20.0			80.0	80.0		109.36	23.8	3,431.6
		1,760.1	3,935.4	5,695.5	422.7	863.6	191.9	83.6	696.8	780.4	5.3	2,263.9	3,431.6	-

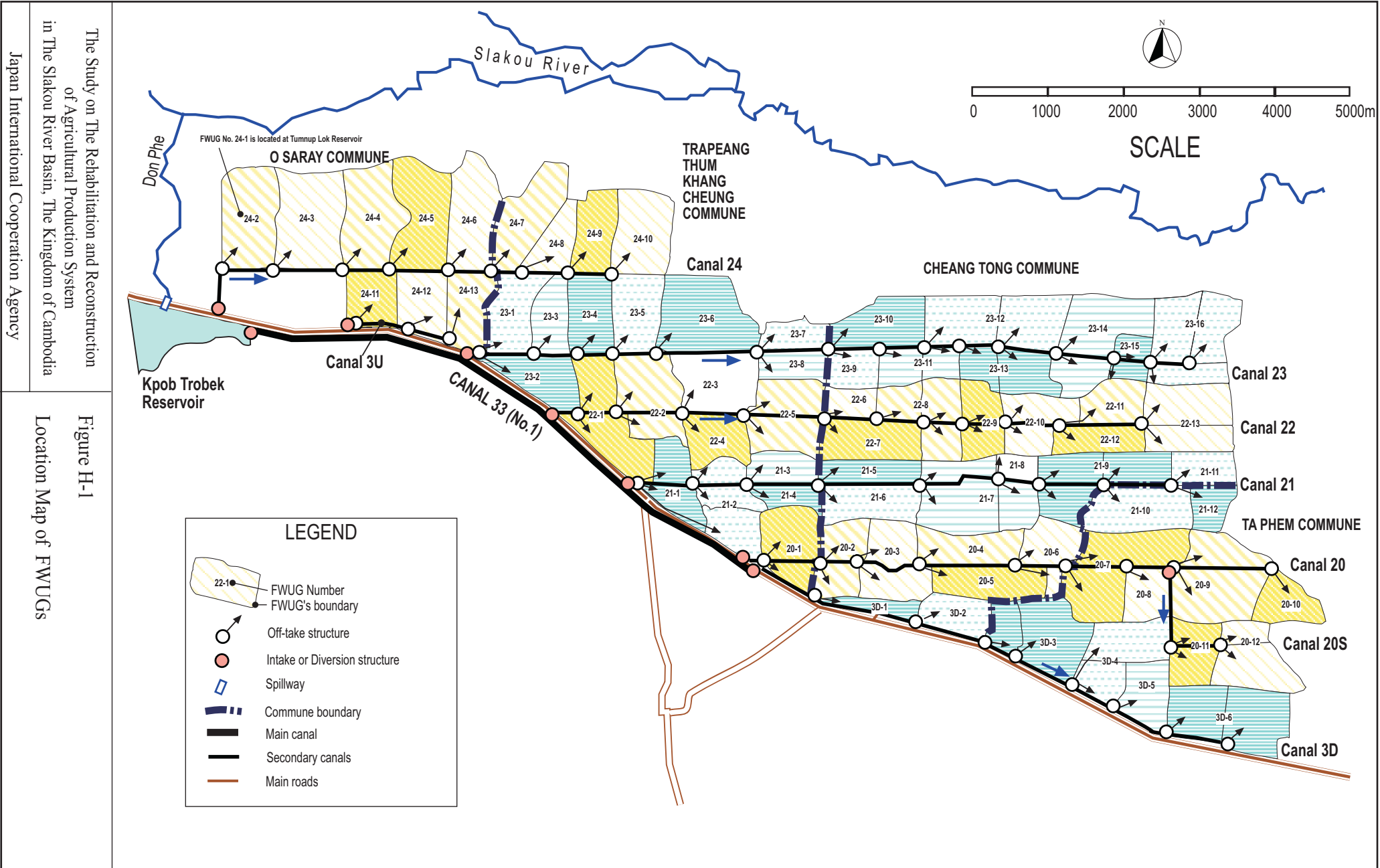
Table H-2 Cash Flow of FWUC Activities (3/3)

ISF Collection Rate :	124.3%
Rate of Marketing Operation :	
Market charge	73.0%
Trade impcme	73.0%

I. FWUCs' Whole Activities

Year in Order	Year	Revenue			Expenditure						Balance	Cumulative	
		Irrigation Activities	Marteing Support	Total Revenue	Personnel	O&M	Equipment Purchase	Replacement					Total
								Irrigation Activities	Marteing Support	Sub-total			
1	2002												
2	2003												
3	2004												
4	2005												
5	2006	270.0	13.3	283.3	106.6	70.3	0	0	0	0	176.9	106.4	106.4
6	2007	270.0	22.0	292.0	106.6	70.3	0	0	0	0	176.9	115.1	221.5
7	2008	270.0	30.7	300.7	106.6	70.3	0	0	0	0	176.9	123.8	345.3
8	2009	270.0	35.1	305.1	106.6	70.3	0	0	0	0	176.9	128.2	473.5
9	2010	270.0	133.2	403.2	108.6	84.4	111.9	38.5	0	38.5	343.4	59.8	533.3
10	2011	270.0	133.2	403.2	108.6	154.4	80.0	0	0	0	343.0	60.2	593.6
11	2012	270.0	133.2	403.2	108.6	84.4	0	134.7	0	134.7	327.7	75.5	669.1
12	2013	270.0	133.2	403.2	108.6	84.4	0	0	0	0	193.0	210.2	879.4
13	2014	270.0	133.2	403.2	108.6	84.4	0	0	0	0	193.0	210.2	1,089.6
14	2015	270.0	133.2	403.2	108.6	84.4	0	59.3	2.9	62.2	255.2	148.0	1,237.6
15	2016	270.0	133.2	403.2	108.6	154.4	0	0	0	0	263.0	140.2	1,377.9
16	2017	270.0	133.2	403.2	108.6	84.4	0	0	0	0	193.0	210.2	1,588.1
17	2018	270.0	133.2	403.2	108.6	84.4	0	26.8	6	32.8	225.8	177.4	1,765.6
18	2019	270.0	133.2	403.2	108.6	84.4	0	0	0	0	193.0	210.2	1,975.8
19	2020	270.0	133.2	403.2	108.6	84.4	0	18.4	0	18.4	98.7	111.5	2,087.3
20	2021	270.0	133.2	403.2	108.6	154.4	0	0	80.0	80.0	343.0	60.2	2,147.6
21	2022	270.0	133.2	403.2	108.6	84.4	0	128.4	0	128.4	321.4	81.8	2,229.4
22	2023	270.0	133.2	403.2	108.6	84.4	0	0	0	0	193.0	210.2	2,439.7
23	2024	270.0	133.2	403.2	108.6	84.4	0	0	0	0	193.0	210.2	2,649.9
24	2025	270.0	133.2	403.2	108.6	84.4	0	59.3	2.9	62.2	255.2	148.0	2,797.9
25	2026	270.0	133.2	403.2	108.6	154.4	0	26.8	6	32.8	295.8	107.4	2,905.4
26	2027	270.0	133.2	403.2	108.6	84.4	0	0	0	0	193.0	210.2	3,115.6
27	2028	270.0	133.2	403.2	108.6	84.4	0	0	7	6.7	199.7	203.5	3,319.2
28	2029	270.0	133.2	403.2	108.6	84.4	0	0	0	0	193.0	210.2	3,529.4
29	2030	270.0	133.2	403.2	108.6	84.4	0	1,737.7	80.3	1,818.0	2,011.0	(1607.8)	1,921.6
30	2031	270.0	133.2	403.2	108.6	154.4	0	0	80.0	80.0	343.0	60.2	1,981.9
31	2032	270.0	133.2	403.2	108.6	84.4	0	283.6	0	283.6	476.6	(73.4)	1,908.5
32	2033	270.0	133.2	403.2	108.6	84.4	0	0	0	0	193.0	210.2	2,118.8
33	2034	270.0	133.2	403.2	108.6	84.4	0	184.8	6.0	190.8	383.8	19.4	2,138.2
34	2035	270.0	133.2	403.2	108.6	84.4	0	59.3	74.9	134.2	327.2	176.0	2,214.2
35	2036	270.0	133.2	403.2	108.6	154.4	0	6.7	0	6.7	269.7	133.5	2,347.8
36	2037	270.0	133.2	403.2	108.6	84.4	0	0	0	0	193.0	210.2	2,558.0
37	2038	270.0	133.2	403.2	108.6	84.4	0	0	0	0	193.0	210.2	2,768.3
38	2039	270.0	133.2	403.2	108.6	84.4	0	0	0	0	193.0	210.2	2,978.5
39	2040	270.0	133.2	403.2	108.6	84.4	0	11.7	105.9	117.6	310.6	92.6	3,071.1
40	2041	270.0	133.2	403.2	108.6	154.4	0	0	80.0	80	343.0	60.2	3,131.4
41	2042	270.0	133.2	403.2	108.6	84.4	0	154.8	6.0	160.8	353.8	49.4	3,180.8
42	2043	270.0	133.2	403.2	108.6	84.4	0	0	0	0	193.0	210.2	3,391.1
43	2044	270.0	133.2	403.2	108.6	84.4	0	6.7	0	6.7	199.7	203.5	3,594.6
44	2045	270.0	133.2	403.2	108.6	84.4	0	59.3	2.9	62.2	255.2	148.0	3,742.6
45	2046	270.0	133.2	403.2	108.6	154.4	0	0	0	0	263.0	140.2	3,882.9
46	2047	270.0	133.2	403.2	108.6	84.4	0	0	0	0	193.0	210.2	4,093.1
47	2048	270.0	133.2	403.2	108.6	84.4	0	0	0	0	193.0	210.2	4,303.4
48	2049	270.0	133.2	403.2	108.6	84.4	0	0	0	0	193.0	210.2	4,513.6
49	2050	270.0	133.2	403.2	108.6	84.4	0	38.5	86.3	124.8	317.8	85.4	4,599.0
50	2051	270.0	133.2	403.2	108.6	154.4	0	0	80.0	80.0	343.0	60.2	4,659.3
		12,420.0	5,695.5	18,115.5	4,985.9	4,456.0	191.9	3,042.0	780.4	3,822.4	13,456.2	4,659.3	-

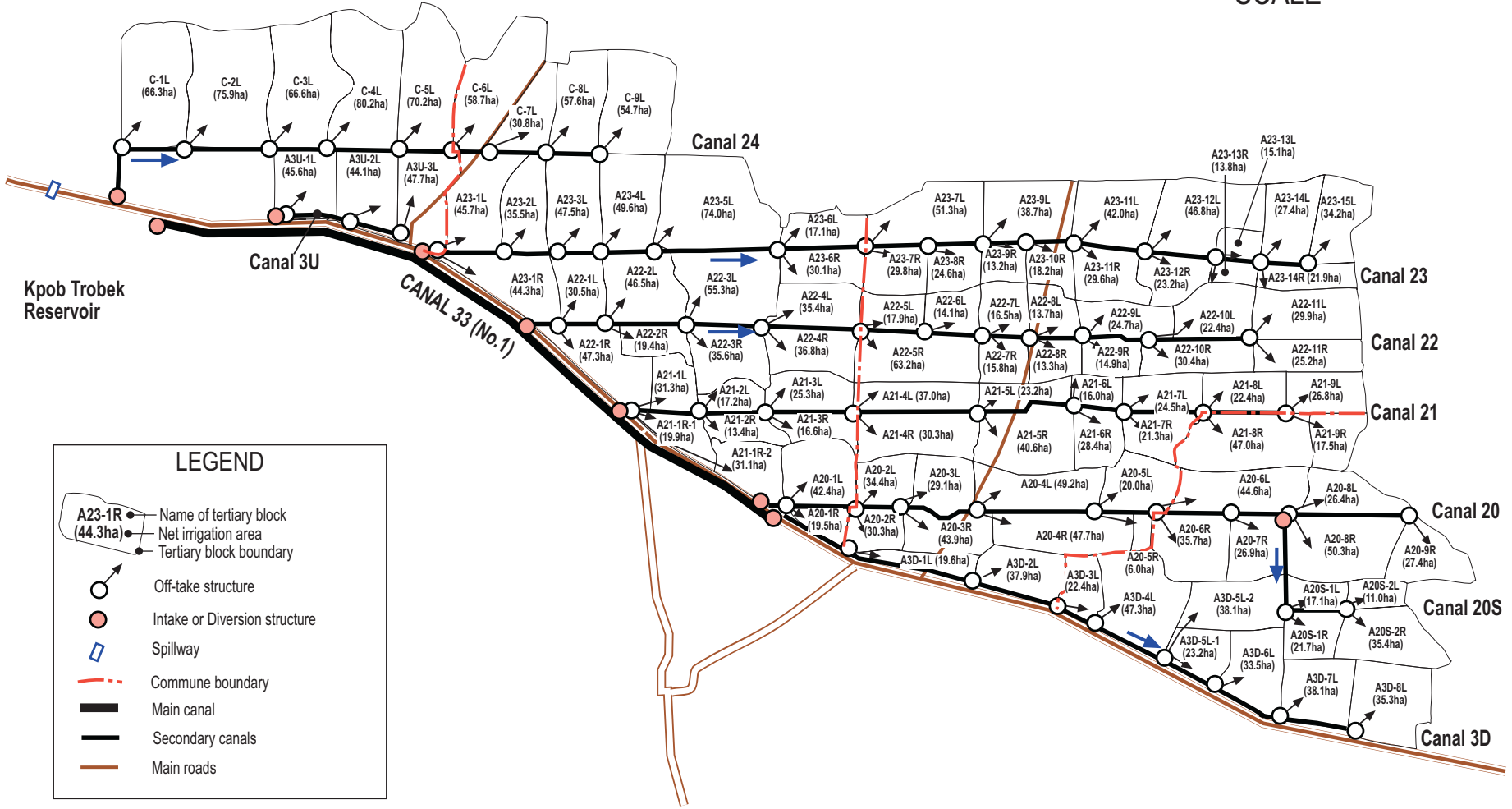
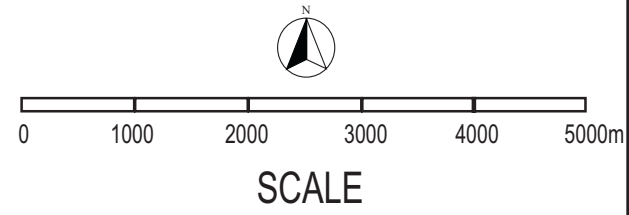
## *Figures*



The Study on The Rehabilitation and Reconstruction of Agricultural Production System in The Slakou River Basin, The Kingdom of Cambodia

Japan International Cooperation Agency

Figure H-1  
Location Map of FWUGs



The Study on The Rehabilitation and Reconstruction  
of Agricultural Production System  
in The Slakou River Basin, The Kingdom of Cambodia

Japan International Cooperation Agency

Figure H-2  
Tertiary Blocks of USP

Figure H-3 Assignment Schedule of Experts for Institutional Development & Capacity Building Program

Experts		1st Year												2nd Year												3rd Year												4th Year												5th year												6th Year											
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
FWUC Expert (F)	24	.....																																																.....																							
Irrigation OM Engr. (F)	16	.....																																																.....																							
Participatory On-Farm Dev. Expert (F)	34	.....												.....												.....												.....												.....																							
Farm to Market Organizer	12	.....																																				.....												.....																							
Sub-total	86	.....												.....												.....												.....												.....																							
FWUC Expert (L)	24	.....																																																.....																							
Irrigation OM Engr. (L)	36	.....																																																.....																							
Participatory On- Farm Dev. Expert (L)	42	.....												.....												.....												.....												.....																							
Accountant (L)	24	.....																																																.....																							
Legal Officer (L)	4	.....																																																.....																							
Marketing Expert (L)	36	.....																																																.....																							
Agronomist (L)	24	.....																																																.....																							
Specialists as Required	10	.....																																																.....																							
Sub-total	200	.....												.....												.....												.....												.....																							