

## Summary of Terminal Evaluation

I. Outline of the Project	
Country: Cambodia	Project title: Project for Improvement of Agricultural River Basin Management and Development (TSC 3)
Issue/Sector: Agricultural/Rural Development-Agricultural Development	Cooperation Scheme: Technical Cooperation Project
Division in charge: Rural Development Department	Total cost (estimated at evaluation): Seven hundred and eight Million JPY.
Period of Cooperation (R/D): From September 1, 2009 to August 30, 2014	Partner Country's Implementing Organization: Ministry of Water Resources and Meteorology: MOWRAM, Provincial Department of Water Resources and Meteorology: PDWRAM, Technical Service Center for Irrigation and Meteorology: TSC
	Supporting Organization in Japan: Ministry of Agriculture, Forestry and Fisheries (MAFF)
<p>1. Background of the Project</p> <p>Agriculture is the prime industry of the Kingdom of Cambodia. Agricultural production contributes to approximately 27% of the country's Gross Domestic Products (GDP), and approximately 60% of the national population relies on agriculture for their living. Despite abundant farmland and water resources, agricultural productivity of the country has rather been low mainly due to deficient irrigation systems, which is one of the essential developments of the country.</p> <p>The Royal Government of Cambodia (RGC) had requested the Government of Japan (GOJ) for a technical cooperation that aims at technical transfer on rehabilitation of existing irrigation systems such as survey, planning, design, construction, operation and maintenance. In response to the request, JICA conducted two projects, namely Technical Service Center for Irrigation System Phase-1 and Phase-2, from January 2001 until July 2009. In Phase-1, the technical capacity of the engineers and technicians of Ministry of Water Resources and Meteorology (MOWRAM) and Provincial Department of Water Resources and Meteorology (PDWRAM) was improved through supporting the establishment of Technical Service Center for Irrigation and Meteorology (TSC), setting up technical manuals and training module, and providing trainings to PDWRAM staffs. Trainings at TSC and assistance for constructing canals and related facilities (planning, survey, design, construction management, and operation/maintenance etc.) through on-the-job-trainings (OJT) at pilot sites were conducted in Phase-2.</p> <p>Due to increasing supports from donors, several irrigation projects which supported by different donors have been implemented in the same river basin without water use coordination. Consequently, it is required to be improved technical capacity of MOWRAM and PDWRAM in an irrigation system as a whole, including planning and survey in river basin unit. In response to this, JICA decided to implement the project for promoting river basin management and development through (1) strengthening TSC capacity of implementing training and technical support related to the agricultural river basin management and development, (2) supporting OJT and technical assistance of irrigation systems for the engineers and technicians in MOWRAM and PDWRAM.</p>	

## 2. Project Overview

### (1) Overall Goal

Agricultural productivity in the target areas is stabilized through efficient water resource management realized by improved technical capacity of MOWRAM and PDWRAM in agricultural river basin management and development

### (2) Project Purpose

Irrigation projects are properly planned, implemented and operated in the target area of the Project

### (3) Outputs

- 1) TSC obtain capacities to implement training and provide technical support for MOWRAM and PDWRAM related to the agricultural river basin management and development
- 2) The engineers and technicians in MOWRAM and PDWRAM obtain knowledge on concepts and technologies related to the agricultural river basin management and development through training
- 3) The capacities of the engineers and technicians of MOWRAM and PDWRAM on planning, survey, design, construction management, operation and maintenance (O&M) of facilities and structures in an irrigation systems as a whole are improved through training
- 4) The technical support system of TSC is established to promote implementation of irrigation projects by PDWRAM

### (4) Inputs

<Japanese side>

Long-term Japanese experts: 6 persons in 3 fields (Chief Advisor/Irrigation, Project Coordinator and Participatory Water Management), Short-term experts: total 25 persons

Trainees received in Japan : 40 persons,

Provision of machinery and equipment: Computer related equipment, vehicles, excavator, bulldozer, survey equipment, tools for meteorological station, Total 22 kinds of equipment and 1,068,964 US dollars as of Dec 2013

Local operation cost: 2.8 million US dollars

<Cambodia side>

Counterpart Personnel: total 16 persons assigned

Project office: Main offices, a training room, a meeting room, storages, parking space, associated electric and mechanical facilities

Project operation costs: Including general operation expenses, in total 0.71 million US dollars has been allocated by Cambodian side since the year Cambodian fiscal year 2009 until 2014.

## II. Terminal Evaluation Team

Members of Evaluation Team	1) Team Leader: Mr. Kenichiro Kobayashi, Director, Paddy Field Based Farming Area Division 1, Rural Development Department, Japan International Cooperation Agency (JICA) 2) Irrigation Technology: Mr. Tetsuya Oishi, Technical Chief, Design Division, Rural Infrastructure Department, Chugoku-Shikoku Regional Agricultural Administration Office, MAFF
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	3) Evaluation Analysis: Mr. Akira Matsumoto, President, A&M Consultant Inc. 4) Planning Management: Mr. Naoki Yoshikawa, Staff, Paddy Field Farming Area Division 1, Rural Development Department, JICA	
Period of Evaluation	From January 27, 2014 to February 13, 2014	Type of Evaluation: Terminal Evaluation
III. Results of Evaluation		
1. Measures taken to address the recommendations made at the Mid-Term Review		
<p>Recommendation 1</p> <p>We need to review the plan on model irrigation projects which should be completed in the remaining of the Project period. To be more specific, the Team recommends that the rehabilitation and the construction of irrigation facilities should not be covered at the following 3 model irrigation projects: Ream Kon in Battambang Province, Wat Chre and Wat Luong in Pursat Province. However, the soft component including workshops and farmer OJT etc. should be supported as planned. Additionally, the targeted areas in the 2 model irrigation projects: Thlear Maom in Pursat Province and Kandal Stung in Kandal Province, might also be shrunk. In spite of that, the prospect of achieving the Output 4, which is establishment of technical support system of TSC to PDWRAMs, is still highly expected.</p>		
<p>Measures Taken by the Project:</p> <p>The Project excluded the rehabilitation and the construction of irrigation facilities in Ream Korn, Wat Chre and Wat Loung. However, the Project supports the soft component in these 3 model irrigation projects, such as “Study tour” and “Farmer to Farmer OJT”, as planned. In addition, the Project shrank the irrigation projects in Thlear Maom from 3,500ha to 1,000ha and in Kandal Stung from 1,960ha to 910ha.</p>		
<p>Recommendation 2</p> <p>Within the TSC training courses, irrigation facilities such as dam, main canal, head works, and storage reservoir would be covered. Since the model irrigation projects do not cover large scale dams, the training should focus on small-scale irrigation facilities other than large scale ones.</p>		
<p>Measures Taken by the Project:</p> <p>The Project excluded the training course on large scale irrigation facilities such as dam, and focused on the training on small-scale irrigation facilities such as main canal, head works and reservoir.</p>		
<p>Recommendation 3</p> <p>In the remaining of the Project period, strengthening FWUC/FWUG and O&amp;M activities will be necessary. Moreover, it is very important that such activities should be done in a participatory manner so that farmers could have the ownership of the activities. Therefore, it is crucial issue that whether FWUC/FWUG can collect irrigation service fee continuously and constantly or not. Making consensus among water users is not easy and takes time to agree with the payment method because there is difference of irrigation water requirement depends on terrain conditions in each field. The Project should establish a system of determining the irrigation service fee considering how to grasp volume of water consumption, how to collect irrigation service fee according to the volume, how to calculate necessary O&amp;M cost, and how to estimate increased income by the benefit of irrigation.</p>		
<p>Measures Taken by the Project:</p> <ul style="list-style-type: none"> <li>• The Project conducted a series of workshop on O&amp;M for the FWUC/FWUG for seven irrigation projects in 2012 and for eight irrigation projects in 2013.</li> <li>• In 2012, the Project also conducted technical transfer through workshops on formulating Annual</li> </ul>		

plan and Accounting procedure, including how to calculate necessary irrigation service fee.

- The Project invited advanced FWUC/FWUG's in West Baray and conducted "Farmer to Farmer OJT" on FWUC/FWUG's activities. In the OJT, it was covered how to collect irrigation service fee from users according to the amount of water.
- In additions, the Project conducted workshops on water distribution for efficient water management.
- The Project conducted on farming trainings with APPP/JICA in order to improve agricultural income in following five projects: Thlea Maom, Lum Hach, Roleang Chrey, Upper Slakou, and Thomney. The training is going to be conducted continuously in 2014.

\* APPP= Agricultural Productivity Promotion Project in West Tonle Sap

#### Recommendation 4

There is a room for improvement in their participation and contribution to the Project. MOWRAM/PDWRAMs should take countermeasures against this. The Team proposes that at least three counterpart personnel shall be assigned as core counterparts who were already trained at TSC and/or have necessary technical capabilities, have good English communication skill, and should be involved in the Project constantly and continuously. Regarding implementation of model irrigation projects, sharing roles between TSC and PDWRAMs should be reviewed. The Team recommends TSC to transfer management initiative to the targeted PDWRAMs in order to implement the projects smoothly.

#### Measures Taken by the Project:

- In the model irrigation projects, three to eleven counterpart personnel from PDWRAMs were assigned for the construction of irrigation facilities and workshops.
- In the model irrigation projects, TSC counterpart personnel frequently visit the sites to reinforce the implementation system of construction management of PDWRAMs counterpart personnel. The duration of stay has been reduced from a week to three days.

Regarding workshops, PDWRAM counterpart personnel have been taken initiative role of the training instead of TSC counterpart personnel, after TSC staffs transferred knowledge and skill to PDWRAMs counterpart personnel.

#### Recommendation 5

- TSC should take necessary actions to come up with details for the mid-/ long-term human resource development plan, such as formulating the training courses for newly recruited staffs of MOWRAM/PDWRAMs. Japanese experts would provide technical support for it.
- It is observed that some trainees do not meet the qualification for participation in the training courses. In order to improve the above mentioned situation between level of training course and trainees' qualification, each PDWRAM should consider selecting the qualified staff for TSC training courses. On top of that, especially for PDWRAMs in targeted areas, PDWRAMs should allocate counterpart personnel who completed the training to the Project activities.

Outputs of the Project such as the result of technical transfer in the training and OJT in model irrigation projects could be utilized in Yen loan projects which is planned to implement in near future. Therefore, in the remaining of the project period, the Project should make consideration for this point in their activities. Furthermore, MOWRAM should coordinate among several projects like TSC3 and Yen loan projects through regular monitoring meeting for the Yen loan projects.

Measures Taken by the Project:

- Regarding the training courses for newly recruited staffs, the short-term expert conducted Needs survey in December, 2012. The short-term expert suggested the importance of recruiting staff, and assisted to make training course program and syllabus.
- The TSC training was concentrated on the same trainees in order to improve and accumulate their knowledge and experiences.
- A few trainees were not able to proficient English, therefore, the textbooks in Khmer were used in some training.
- The Project did technical transfer about the procurement procedure on public works, such as how to order the construction works to private companies. Furthermore, the Project conducted on the job training on construction management and control.
- MOWRAM including TSC attended the regular monitoring meeting for the Yen loan project. MOWRAM coordinated the construction of both the model irrigation projects in TSC 3 and the Yen loan project in Damnak Ampil.

Recommendation 6

- Regarding the counterpart fund, 50% of the fund for this fiscal year has been released. MOWRAM should make necessary arrangement with Ministry of Economic and Finance (MEF) to release the other 50% for this fiscal year, and next fiscal year.

Allowance issue, which from JICA to counterpart personnel, was raised through interview by the Team, with counterpart personnel. Counterpart personnel requested JICA additional allowance. Since JICA is not allowed to provide additional allowance due to its regulation in principle, additional resources should be found by MOWRAM/TSC. Water Resources Management Sector Development Program (WRMSDP) supported by ADB might be a candidate to support TSC/PDWRAM staffs salary. However, we must carefully consider the way to solve this issue to avoid negative affect to TSC3 itself. We should continue discussion to find the appropriate collaboration mechanism acceptable to TSC, JICA and ADB.

Measures Taken by the Project:

The counterpart fund was fully disbursed from September 2012, even though once the fund was released behind the schedule and caused an adverse effect to the training execution. Regarding the additional allowance, MOWRAM and ADB are currently under negotiation.

## 2. Achievement of the Project

### (1) Overall achievement and prospect for Outputs

The Project would come up with most of its expected outputs by the end of the Project period.

- 1) Output 1: TSC obtain capacities to implement training and provide technical supports for MOWRAM and PDWRAM related to the agricultural river basin management and development.

1. Over 90% TSC staff get knowledge and skills of carrying out training and technical supports because the rate of training participants who are satisfied with the training and technical supports of TSC has reached approx. 96.2% as a whole.
2. The rate of training participants who are satisfied with the training and technical supports of TSC has reached to 96.6 % in average (85.0%~100% among 18 courses).

It is reported that over 90 % of TSC staff become confident/competent in carrying out training and technical supports. In additions, it is reported that over 90 % of PDWRAM participants are satisfied

with training and technical supports of TSC. As the results on the above achievement, the self-evaluation of TSC staff as well as the satisfaction of the training participants, it is evident that TSC became to obtain sufficient capacities to implement training and provide technical supports for MOWRAM/PDWRAM related to the agricultural river basin management and development.

2) Output 2: The engineers and technicians in MOWRAM and PDWRAM obtain knowledge on concepts and technologies related to the agricultural river basin management and development through training.

1. So far 18 training courses have conducted.
2. The rate of training participants who achieved the curriculum targets has reached to 88.4 % in average (63.6%~100% among 18 training courses conducted).

For the Output 2 which focuses on the technical level on agricultural river basin management and development, it is evaluated that the Project beneficiaries such as engineers and technicians in MOWRAM and PDWRAM became capable on the basic knowledge on concepts and practical technologies according to the achievement of the number of training courses conducted and also the achievement of the curriculum targets of the training courses.

3) Output 3: The capacities of the engineers and technicians of MOWRAM and PDWRAM on planning, survey, design, construction management, O&M of facilities and structures in an irrigation system as a whole are improved through training.

1. So far 26 training courses have conducted.
2. The rate of training participants who achieved the curriculum targets has reached to 90.6 % in average (70.0%~100% among 26 training courses conducted).

For the Output 3 which focuses on the technical level on planning, survey, design, construction management, O&M of facilities and structures in an irrigation system as a whole, it is evaluated that the Project beneficiaries such as engineers and technicians in MOWRAM and PDWRAM became capable of their skills and experience because of the achievement of the number of training courses conducted and also the achievement of the curriculum targets of the training courses. As indicated in the evaluation results through questionnaire and field interview results, the trained engineers and technicians in MOWRAM and PDWRAM is utilizing the skills and knowledge gained from training in their office and field.

4) Output 4: The technical support system of TSC is established to promote implementation of irrigation projects by PDWRAM.

1. 27 project plans have been formulated and finally approved during the Project period up to 2013. (Including expecting final approval; 20=3+6+3+4+4 Grass Roots project as "Kusanone project" and 7=3+3+1 Counterpart fund project). The main component of the above rehabilitation project are secondly/tertiary canal rehabilitation, construction of check structures, drop structure, intake/outlet structure, culverts, embankment, concrete bridge, access road, turnout structures, and so on.

At the time on Terminal evaluation, it is not yet achieved the level of project indicators, however, it is evaluated that the technical support system of TSC is functioning and being highly appreciated by PDWRAM. Through the strong technical support by TSC, PDWRAMs became to design map and make proper proposal on small scale irrigation projects, therefore, it is highly expected to continue to

formulate and submit any irrigation projects for not only donors but also NGO and national government.

(2) Prospect to achieve the Project Purpose

Project Purpose: Irrigation projects are properly planned, implemented and operated in the target area of the Project

1-1) The newly irrigation system are formulated at the following 8 model site.

1-2) Total length of rehabilitated irrigation scheme/canal constructed by the Project will be approx.145,192 m. Within the total length, approx.102,494 m will be constructed by farmer participation and incidental facilities number will be approx. 801. The figure of length is approx. 11 times in compared to TSC2 project constructed (at the time on TSC2 project; approx. 13,460 m).

2) The number of PDWRAM technicians who obtained appropriate operation skills through TSC training is 1,049 persons, within the figure, it is reported as 534 PDWRAM technicians participated from the target 6 provinces. After participate training course, 39 PDWRAM technicians attend project activities such as construction, O&M WS, A&A/C WS, etc.

3) During the Project period, the newly farmers group (FWUG) are established at the model site on Por Canal, Damnak Ampil and Lum Hach. At the model site on Thlear Maom, Roleang Chrey, Kandal Stung, Upper Slakou and Thomney, FWUG have been already established.

(3) Prospect to achieve the Overall Goal

Overall Goal: Agricultural productivity in the target area is stabilized through efficient water resource management realized by improved technical capacity of MOWRAM and PDWRAM in agricultural river basin management and development.

1) The unit yield of rice differentiates on the target area. For 2012, the average yield of rice is reported as 1.8-4.4 ton/ha in the target area. And the paddy field with “Agricultural Productivity Promotion Project in West Tonle Sap (APPP)” project collaboration is reported as 4.5-7.1 ton/ha. (Target yield of rice in NSDP 2009-2013 update is currently 3.0 ton/ha.)

2) In the target area of the Project, total irrigated field area is increased to 3,315 ha due to the efficient water utilization and distribution, and within the area, it is reported approximately 361 ha as 2 or 3 season crop cultivation.

3. Summary of Terminal Evaluation Results

(1) Relevance

The relevance of the Project has been kept, since the Cambodian and Japanese policies of irrigation development in the agricultural sector have not changed since the commencement of the Project. Not only at central level, but also at local level, PDWRAMs and water user groups in particular, human resources development and capacity building are required to strengthen. Therefore, the relevancy of the Project is assessed high.

1) Relevant policy of the Royal Government of Cambodia

The direction of the Project is in line with the national priorities. The Project is consistent with the policies of RGC, as there has not been any major change in the Rectangular Strategy in 2013, revised National Strategic Development Plan (2009-2013 & 2014-2018) and the Strategy for Agriculture and

Water (SAW) of Technical Working Group on Agriculture and Water (2010-2013).

2) ODA policies of the Government of Japan (GoJ)

One of the four priority areas of the Japan's ODA policy to Cambodia is "Realization of Sustainable Economic Growth and a Stable Society". Within this area, agricultural and rural development is one of important issues. Then financial and technical cooperation in the fields of development of irrigation facilities, improvement of water management system, capacity development of water users associations, etc., are considered as highly important.

Similarity, the Country Program of JICA for Cambodia also emphasize the "Agricultural and Rural Development" with a cooperation program on "agricultural productivity" as one of the priority issues. Therefore, this Project is in conformity to priority assistance subjects of the GoJ, and considered to be quite consistent with the Japanese aid policy and alignment with RGC national policy.

3) Needs of the counterpart organization

It is relevant to choose TSC as the counterpart organization of the Project, since TSC is the sole training institution to carry out training activities for the capacity building of technicians and engineers in Cambodia regarding water management and increasing irrigation capacity across Cambodia.

4) Relevance of the Project approach and design

The Project applied an approach to enhance the capacity of both stakeholders in the irrigation sector, such as engineers and technicians of MOWRAM, PDWRAMs and TSC as well as the beneficiary farmers in the Project's target area. Considering the existing constraints of irrigation development in Cambodia, where technical workforce of the government are still limited both in number and the levels of technical capacities, the design of the Project is considered to be quite appropriate.

At the same time, it is reasonable to conclude that the target areas of the Project are relevant because not only the areas are high potential for irrigation development, but also the beneficiaries are well known in the Japanese cooperation since previous TSC 2 Project. They have experiences to utilize the Japanese assistance like irrigation scheme initiated by Grant Assistance for Grass Roots (Kusanone) projects and/or Counterpart-fund projects.

(2) Effectiveness

It is reasonable to conclude that the effectiveness of the Project is assured, based on the understanding about the achievements mentioned below:

1) Prospect of achieving the project purpose

Firstly, all the Project activities have been carried out smoothly though few activities were behind the schedule, and each output has been contributed to attain the Project purpose.

Engineers and technicians of the target areas enhanced their capacity, and it is well expected that the Project Purpose is likely to be achieved without any impending factors by the end of the Project.

In particular, this Project has been providing various technical supports related to agricultural river basin management and development, and various trainings in an irrigation system as a whole which covers on planning, survey, design, construction management, O&M and establishment/strengthening of FWUC/G.

Therefore, the targeted MOWRAM and PDWRAM officers who obtained sufficient technical

knowledge, practical skills and field experiences on the above subjects through the participation to the Project, they attempted to implement irrigation projects properly in collaboration with TSC.

## 2) Contribution of outputs to the achievement of the Project purpose

The logical sequence between the outputs and Project purpose is appropriate, and all of the four outputs have significantly contributed to the achievement of the Project purpose.

## (3) Efficiency

It is reasonable to conclude that the efficiency is largely assured, considering all the points below:

In general, the Inputs from the Japanese side and Cambodian side have been appropriated in terms of quantity, quality, and timing at most levels. However, counterpart personnel from Cambodian side were not sufficient to implement the Project activities efficiently and properly. On the other hand, the assignment of Japanese experts and irrigation facility construction expenses from Japanese side were drastically increased than the initial plan.

All inputs allocated to the Project have been fully utilized for smooth implementation of the Project. Then the Project is efficient in terms of providing inputs as well as good results.

## (4) Impact

### 1) Prospects of achieving the Overall Goal

Through the Project implementation, it became visible of the Overall goal of this Project and it is shown significant impact through the Project intervention.

#### a) Increasing irrigated field area

The total irrigated field area in targeted model sites is increased to 2,951 ha thanks to efficient water utilization and distribution.

#### b) Crop cultivation in multi seasons

It is reported approximately 361 ha as double/triple cropping cultivation (2 and/or 3 crop seasons per year) in the model sites in 2012 data. This means that farmers can get significant benefit through water utilization thanks to facility rehabilitation and better water management instructed by PDWRAM/TSC, PDA and local authority.

#### c) Increasing unit yield of rice

The result of the End-line survey, the average rice yield in the model site is increased in almost all the sites. Especially the area where the Project supported to the rehabilitation of the irrigation facility and trained the farmers is significant that exceed 3.0 ton/ha as the target yield of rice in NSDP 2009-2013.

As far as the paddy field with APPP project collaboration is reported as 4.5-7.1 ton/ha. It is evidently shown the great results of the good combination of hard and software component which consisted with facility construction with farmer participation, and instruction of O&M and farm management.

### 2) Positive changes of irrigation system management through the Project intervention

The comparison before TSC3 project started and after TSC3 project intervention, it is quite different economic/ technical aspects and perspectives of farmers in terms of Irrigation area, Irrigation facilities, Convenience of irrigation water, Convenience of farm roads, Facility O&M, Water operation/distribution/maintenance, Management of FWUC.

In the target areas, the interviewed farmers reported that the diminishing of the problems of water distribution at terminal facilities for the sake of tertiary or delivery canal rehabilitation, and positive effects are being realized on their water utilization, productivity and better facility management by themselves.

### 3) Spillover effects

#### a) Effects on farmers and farmers group in the target areas

Through the capacity building in TSC, the targeted engineers and technicians in PDWRAMs applied their knowledge much more practically. At the same time, in the target areas, several terminal irrigation facilities were rehabilitated properly and undertaken sound O&M of the facilities through the farmers' participation.

As a result, such continuous O&M management by the farmers themselves can provide and secure water, and farmers became to cultivate two or even three time crops per year and made a contribution to the improvement of the farmers' livelihood and also agricultural (rice) productivity due to the increase of rice cultivation time.

#### b) Promotion of irrigation projects

Various new irrigation projects assisted by Japan and/or other donors have been planned and implemented since the Project started.

#### c) Effect to the engineers and technicians in PDWRAM nationwide

Not only the targeted 6 PDWRAM staff, but also other PDWRAMs in nationwide, utilized the skills acquired by TSC training in their belonging organizations, and become confident to conduct survey, design, plan, produce GIS mapping, water management and create irrigation projects which can respond to the high demands from donors and beneficiaries.

## (5) Sustainability

### 1) Policy aspect

The necessity of irrigation development for the improvement of agricultural productivity as well as the consequence of human resource development in the water resource sector, are given high priority in the current policy of RGC, therefore the policy support from the RGC would continuously be secured even after the Project overs. With the recent enactment of the Law on Water Resources Management, the legal framework is being formulated such as the Sub-Decrees on establishment of FWUC/G, on River Basin Management, Water Quality Management and Water Licensing. Within the policy and legal framework above, TSC is continued to enact its status and missions, therefore, the sustainability of the Project on legal and policy aspect are considered high.

### 2) Technical aspect

Through this long-term technical cooperation under JICA, at individual level, it can be observed that MOWRAM/PDWRAM staffs as well as TSC counterparts have acquired the techniques and knowledge in the field of the agricultural river basin management and development. And they become sufficient capacity such as planning, survey, design, construction management and also supervising to other staff and private construction companies. In particular, TSC C/Ps enhanced their capacities for supervising construction management and contractor through model site works, and enabled to become to transfer these techniques efficiently to MOWRAM/PDWRAM staffs. Moreover, farmers has been gaining more knowledge related to maintenance of irrigation facilities

through farmer participated construction at the model site.

Therefore, it is certain that the technological aspect related to the agricultural river basin management and development will be sustainable. And after this Project, it is expected that these staff as core persons will not only contribute to human resources development for in their own offices but also implement any other projects related to the agricultural river basin management and development, which are schemed by national government budget, Yen loan project, grant assistance for the Grass Roots and other donors, by themselves.

While, turning to sustainability of institutional and financial level, challenges are pointed out as mentioned below.

### 3) Institutional and Financial aspect

MOWRAM and JICA are launching a new JICA TCP; “Project for River Basin Water Resources Utilization”. A part of the TSC staff is participating in the TCP. In order to ensure the Project’s sustainability, MOWRAM should consider the assignment of C/P without impairing the existing functions of TSC.

The budgetary condition of Cambodian government has been limited so far and it will inevitably be hard to secure financial sustainability at this stage. Therefore, in order to implement the Project successfully, Cambodian and Japanese sides are required to take necessary measures to secure the budget for the Project activities.

## 4. Factors that promoted realization of effects

### 1) Active participation and motivation of farmers and community leaders in the target areas

In the target areas, community leaders (district governor, community chief, and village chief) and FWUC leaders recognized the Project activities such as canal construction, O&M of irrigation facilities, and make annual plan and accounting record. Instruction and coordination by community leaders, the FWUC members have gradually understood the advantage of water for irrigation, operation and maintenance of facilities and canals, and then they continue to do the works for their irrigation facility to be a good condition and keep efficient water distribution even few farmers do not follow.

## 5. Factors that impeded realization of effects (hampering factors)

### 1) Delay of project approval for irrigation projects in the target areas

Initially, it is expected to utilize the Yen loan project fund for the irrigation projects in the target areas, however, its project approval delayed compared to its original schedule. It will be planned to start from the end of 2014. Due to this delay, it brought some dissatisfaction by farmers in the target areas, and makes delay of implementation of the model irrigation projects also.

### 2) Negative effects by the internal factors and external assumptions to the Project

The Project was affected by the internal factors such as C/Ps assignment and delay of budget release from the Cambodian side. Also the Project was affected by the external assumptions, such as conflict among upper and lower farmers, time requirement for farmer participation, and suspension of construction due to discover UXO, etc. caused the delay of implementation of the target areas activities.

## 6. Conclusion

As a result of Project work in TSC in 6 target provinces, the expected outputs have been produced. The Project has enough relevance and effectiveness. The Project has been achieved considerably positive results in terms of development impacts. Also, the Project implements to be efficient in general. With these reasons, it is considered that the Project is well managed and has achieved its purpose.

Training and technical capacity has been gradually developed in the TSC/MOWRAM/PDWRAM, while there are some issues that may need to be addressed such as prospective of TSC in the future, securing human resources and providing continuous financial support and their motivation. TSC is getting recognized as a tangible status & function which has been carrying out technical service for irrigation and meteorology in response to the needs of the technicians and engineers in Cambodia.

The Project has successfully been implemented without any major or critical problem and will mostly achieve its outputs by the end of the Project period. Prospect of achieving the Project purpose is evaluated as high, thus, it is concluded that the Project will be terminated as stipulated in the R/D.

## 7. Recommendations

### (1) Measures to be taken before the Project terminates

#### 1) Revision of the 2014 TSC Plan

After the Project is completed, the TSC is going to continue all necessary activities, using its own staff and budget, without JICA's input. Regarding the budget for 2013, TSC requested the budget to MEF, based on the TSC's annual plan. The budget amount which was requested to MEF was approx. 1,372 million Riel (US\$336 thousand: exchange rate, as of January 2013); however MEF approved only 77 million Riel (US\$19 thousand: exchange rate, as of January 2013). For the budget for 2014, though TSC requested approx. 1,372 million Riel (US\$340 thousand: exchange rate, as of January 2014), TSC may not be able to receive full budget from MEF.

Thus, considering this situation, TSC may have to revise the TSC annual plan for 2014 to set and achieve a more realistic goal based on the amount of budget approved by MEF.

The Team recommends to TSC for the revision are given as follows;

- a) To prioritize the activities in the existing TSC annual plan,
- b) To add important activities, which are not included in the existing TSC's annual plan, to TSC's annual plan, such as supporting the establishment of FWUC/G and the collection of a water fee, and providing training to newly recruited MOWRAM staff,
- c) To find other funding sources as much as possible, such as the national budget, the C/P fund for the new TCP, the soft component fund of the Yen loan project, and the other donors' fund (especially ADB), to fulfill the gap between the requested amount of the budget and the actual amount of the budget,
- d) To re-examine the activities in the existing TSC annual plan based on the expected funding which TSC will have found in c), and
- e) To re-examine the number and specialization of staff required to implement the revised TSC annual plan.

#### 2) Assignment of TSC staff to the new JICA Technical Cooperation Project (TCP)

MOWRAM and JICA are launching a new JICA TCP; "Project for River Basin Water Resources Utilization". A part of the TSC staff is participating in the TCP.

In order to ensure the Project's sustainability, the following recommendations are for the TSC;

- a) To assign C/P personnel for the TCP without impairing the existing functions of the TSC, such as providing training (planning, designing, construction management/supervision, water management), and providing technical support,
- b) To transfer capable staff to the TSC and/or recruit university graduates if a staff shortage occurs.

3) Minimization of construction activities in the model irrigation projects

Due to the budget limitation of both sides, the Team recommends to the Project that the construction activities in the model irrigation projects should be kept to a minimum to achieve the Project's purpose, and not to expand them any further.

4) Providing training to newly recruited staff

MOWRAM recruited 47 new staff in 2013, and will recruit about 100 new staff in 2014. So far, it is not easy to access to technical training for the staff, though each department, in which the new staff are assigned, provides training to the new staff. Thus, the department of administration in MOWRAM is recommended to make necessary arrangement so that TSC can provide technical training. In addition, since the training program for newly recruited staff was developed in the Project, the Team recommends to TSC to utilize the training program developed by the Project when TSC implement the training to the new staff.

5) Change the role of FWUC/G in the model irrigation projects from "FWUG for promoting construction works" to "FWUG for promoting O&M works"

In the target model sites, Thomney and Roleang Chrey have begun the collection of a water fee as of now.

Since, the construction works have been done, and farmers have started to use irrigation water in the model irrigation projects excluding Ream Korn, Wat Chre, Wat Luoung and Lum Hach, FWUC/G should start water fee collection as soon as possible. However, for FWUC/G member, water fee collection and other O&M activities are still challenging tasks, so they need technical support from the government side. Therefore, it is suggested that the PDWRAMs support more to FWUC/G to promote O&M activities like rehabilitation of small scale canals.

The Project has supported the establishment of FWUC/G as one of the Project's key activities since the beginning. Consequently FWUGs have been established, and farmers have participated in the construction work in a participatory manner. This will provide evidence that changes in farmers' attitudes, through the Project activities, have occurred, and the evidence that FWUC/Gs function as organizations for promoting construction works.

After construction works done, the FWUC/Gs' role should be changed from promoting construction works to promoting O&M works including water fee collection. Therefore, it is also suggested that the PDWRAMs provide the FWUC/Gs with the necessary knowledge and experiences, through workshops, especially on O&M issues, with technical support from TSC/JICA experts during the Project period. After the Project terminated, PDWRAMs are also recommended to work for FWUC/Gs with support from MOWRAM like the department of irrigated agriculture and the department of FWUC with technical support from TSC.

Besides that, since FWUC/Gs can cover only O&M works for small scale facilities, PDWRAMs should cover O&M works for mid to large scale facilities in the sites.

Furthermore, it is obvious that maps, which show land owner, can help FWUC/G a lot in terms of

water fee collection. Hence all PDWRAMs are recommended to prepare the maps as soon as possible with technical support from TSC.

## (2) Measures to be taken for the Post-Project

### 1) Apply the Project's outputs to other irrigation projects

In the Project, many engineers and technicians have developed their capacities through the practical training provided by TSC C/Ps and JICA experts. MOWRAM/TSC/PDWRAM needs to apply the output of the Project to other irrigation projects implemented in the near future, such as national budget projects, Japanese ODA projects (the Grant Assistance for Grass Roots (Kusanone) projects, the Yen loan projects) and other donors' projects.

PDWRAM staff is expected to do planning, designing, construction management/supervision, water management by themselves for the projects. TSC is expected to provide training to PDWRAM staff and provide technical support. MOWRAM is expected to do administration role, such as securing budget, allocation of necessary staff, coordination among other Ministries and internal department and so on.

### 2) Relief for an imbalance in the age distribution of MOWRAM staff

The number of young generation (21-35 years old) of MOWRAM is extremely small compared with the middle generation. Thus, ensuring sustainability, sound management of MOWRAM in the future recruiting young staff is essential. If MOWRAM continues to recruit less than 30 staff per year, sooner or later MOWRAM's ability to perform will deteriorate.

According to the current structure of MOWRAM staff, most of experienced staff will retire after 2020, after which time the total number MOWRAM staff will be drastically decreased. It is needed that MOWRAM recruits about 90 staff per year constantly, to secure the necessary number of staff in the year of 2030.

Based on the analysis, the Team recommends that MOWRAM should continue to recruit about 90 new staff per year, especially engineers and technicians, because MOWRAM/PDWRAM have to maintain and operate important infrastructure like dams and head works, and do proper water management of main river basins in the country. In order to do this, the RGC's key actors like executive members of MOWRAM and the Ministry of Public Function should understand that the purpose of this hiring policy. Hence the Team also recommends that the department of administration in MOWRAM explains the current critical situation and requests to take necessary measures to the authority and the executives by using the outputs of the Project, to relieve MOWRAM's present age-distribution imbalance.

### 3) Future perspective of TSC

Although detailed information on establishing "Institute of Crop and Water (ICW)" is not available, it seems that ICW will be launched in the near future. ICW might not only have training function which is the TSC's current responsibility, but also the function of higher education and research. In this concept, TSC would become one of the major pillars of ICW. The Team understands that TSC's role which provides in-house training in RGC would be still very important in the ICW concept. Furthermore, since human resource development of the private sector in the irrigation sector is also important, the Team suggests that it could be considered to cover the private sector during discussion about the ICW concept.

## 8. Lessons Learned

### (1) Effectiveness of combing hard and soft components

The Project aims to achieve the following goal, “Irrigation projects are properly planned, implemented and operated in the target area of the Project.” The Project has covered theoretical as well as practical trainings. The Project experts have especially focused their efforts on OJT in the model irrigation projects. In the field, C/Ps of PDWRAM/TSC received practical training, which was previously lacking due to budget constraints.

Consequently, C/Ps of PDWRAM/TSC acquired the confidence to manage construction works and supporting activities to FWUC/G by themselves.

In addition, farmers organized FWUC/Gs in each model site of the Project and participated in construction works.

We observed that it was not easy to motivate farmers after establishing farmers’ groups in other projects. However, since irrigation facilities have been constructed in the model sites and farmers realized that they would soon get irrigation water, they were motivated to establish the FWUC/Gs. Furthermore, we observe that farmers’ incomes have increased in these areas since the beginning of the Project.

On the other hand, from the project management view point, since the Project covers many model irrigation projects, TSC C/Ps and JICA experts have had difficulties managing the activities.

Based on the above information, the following the lessons can be learned.

- 1) The OJT model is effective in developing capacity among irrigation engineers and technicians.
- 2) When an activity “strengthening water user groups” is included in a project, including construction works in the project is effective to motivate the target farmers.
- 3) Even though covering many pilot sites is crucial to expand the project outputs nationwide, too many pilot projects can make it difficult for C/Ps and JICA experts to properly manage the project activities. Thus, considering input by the recipient and donor countries, the project’s contents and amount of activities should be decided.

### (2) Collaboration among projects in the agriculture sector

The Project has had the opportunity to work with another JICA project, titled APPP whose purpose is to ensure that “Productivity and income of farmers are improved.” The PDA/TSC staffs who are the C/P of the Project participated in several trainings sessions conducted by APPP. Thorough the APPP training, the PDA and TSC C/Ps learned about rice cultivation matters.

Through this collaborative work, PDA/TSC could learn how to teach O&M works to FWUC/Gs and farmers. Consequently, FWUC/Gs and farmers could learn how to manage irrigation water efficiently and produce higher yields. The collaboration among several complementary projects can be applied to projects in other countries. C/Ps in the recipient country can thus efficiently gain a wide spectrum of knowledge.