The Second Regional Workshop on Improvement of Irrigation Efficiency on Paddy Fields in the Lower Mekong Basin Project (IIEPF)

Workshop Proceedings

25 March 2008
Vientiane, Lao PDR

Organised by the Mekong River Commission Secretariat
Supported by the Government of Japan
Acknowledgements

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The opinions and interpretations expressed within are those of the authors and presenters and do not necessarily reflect the views of the Mekong River Commission.
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REPORT ON THE SECOND REGIONAL WORKSHOP

Improvement of Irrigation Efficiency on Paddy Fields in the Lower Mekong Basin Project (IIEPF)
(25 March 2008, Mekong River Commission Secretariat, Vientiane, Lao PDR)

1. Background

The Improvement of Irrigation Efficiency on Paddy Fields in the Lower Mekong Basin Project (IIEPF) is aimed at improving the efficiency of irrigation through the introduction of guidelines covering the technical, managerial and institutional aspects of irrigation schemes and of the operations of the facilities.

The project is funded by the Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan under the framework of the “Programme to Analyse and Evaluate Water and Ecosystems in Asian Paddy Fields”. The project is implemented by the Mekong River Commission Secretariat (MRCS) in close cooperation with the National Mekong Committees (NMCs) and their relevant line agencies.

The first regional workshop to finalise the project document and to discuss the outline of future project activities was held in May, 2006 at the MRCS in Vientiane, the Lao PDR. Immediately after this regional workshop, the MRCS conducted a Rapid Appraisal Process (RAP) training workshop in July 2006 with technical assistance provided by the FAO Regional office in Bangkok. These workshops were followed by the initial scheme performance appraisals at the four pilot sites. Once the baseline data for these four pilot sites had been set up, the country teams assisted by the MRCS conducted intensive field observations covering two crop seasons (2006 to 2007). In parallel with these field observations, the MRCS together with the consultant from NIRE, Japan conducted two field surveys and interviews between the middle to the end of 2007.

On the completion of the field activities including the analysis of the collected data, this second regional workshop was held in order to share all the activities and their outputs/findings under the IIEPF with member countries including field activities, the various publications produced mainly by the MRCS and the guidelines being drafted by the NIRE consultant. The second regional workshop also aimed to discuss the outline of the draft guidelines and asked opinions and comments of the member countries for further improvement.

The Workshop Agenda is given in Annex 1.

2. Organisation

2.1. Participants

A total of 23 participants attended the Workshop. These included five (5) participants each from Cambodia and Thailand, four (4) from Lao PDR, two (2) participants from Viet Nam, one (1) resource person from NIRE, Japan, one (1) diplomat from the Embassy of Japan to
the Lao PDR and five (5) professional and support staff from the MRCS. Two officials from VNMC were forced to cancel their participation by conflict of the schedule and sudden accident.

The list of the participants is given in Annex 2

2.2. Opening Remarks

The workshop began at 09.00 on Tuesday, 25 March 2008 in the MRC Conference Room, Vientiane, the Lao PDR with an opening address by Mr Do Manh Hung, the Director of the Operations Division and the Officer-in-Charge of the Mekong River Commission Secretariat. This was followed by an address by Mr Metoku Yuichi, Second Secretary of the Embassy of Japan to the Lao PDR.

Mr Hung expressed his appreciation for the support given to the MRC by the Ministry of Agriculture, Forestry and Fisheries of Japan and for the significant technical support to implementation from the FAO in Bangkok. He also acknowledged the work of the member countries, NMCs and the line agencies in terms of their contribution of fieldwork, and the analysis of the resulting data. He emphasised that irrigation development is expected to play a key role in the pro-poor development of agriculture which together with hydropower are key factors in the achievement of the MRC’s overall objective “to support Member States for more effective use of the Mekong’s water and resources for poverty alleviation” as set out in the Strategic Plan (2006-2010). He pointed out that this project had been created in response to the need to share the limited water resources efficiency between agriculture and the other sectors. He concluded by asking for constructive and critical comments to improve the final technical guidance document.

Mr Metoku stated that the Government of Japan was eager to support the development of the Mekong Region through both bi- and multi-lateral channels. This was illustrated by the “Japan-Mekong Foreign Ministers Meeting” held in Tokyo earlier this year in January. This meeting identified many “candidate projects for the Cambodia-Lao PDR-Viet Nam Development Triangle”. He confirmed continuing support and funding by the Japan-ASEAN Integration Fund (JAIF). He also mentioned that the Ministry of Agriculture, Forestry and Fisheries of Japan is especially active in the development of land and water resources for agriculture and informed the participants that the third series of contributions focused on the use of water for irrigation purposes pledged by the MAFF Japan at the annual consultation meeting in this year since the Ministry recognizes the challenges still facing effective water management for irrigation.

These speeches by Mr Do Manh Hung and Mr Metoku Yuichi are given in Annex 3.

3. Presentations and discussions

3.1. Workshop Agenda

The AIFP Senior Advisor outlined the agenda for the workshop;
1. the morning session would be devoted to listening to the presentations of the four Member countries detailing their observations and findings; and
2. the afternoon session would begin with a presentation of the concepts behind the technical guide, followed by a consultation of how these should be applied to the four schemes and would finish with input from the Member countries.

A questionnaire to evaluate the project concept and design was distributed. The results of this questionnaire are given in Paragraph 6.

3.2. Overview of IIEPF implementation and progress

The AIFP Senior Advisor presented an overview of IIEPF implementation and progress. He began by describing the funding arrangements. The Ministry of Agriculture, Forestry and Fisheries of Japan provided approximately US$ 1 million for three years corresponding to the Japanese fiscal years 2005 to 2007.

The Senior Advisor then reminded the participants of the project structure and emphasised the importance of the fieldwork. He presented the objectives; the overall objective was to contribute to an improvement of the efficiency of irrigation, with immediate objectives of an appraisal of the scheme performance, an enhancement of the capacity of the stakeholders and the production of guidelines. Under each immediate objective the planned activities were set as follow:

Performance Appraisal included:

- Field (scheme) level data collection
- Water balance analysis
- Scheme management appraisal
- Rapid Appraisal Process (RAP)

Capacity Enhancement included:

- Regular backstopping
- A RAP training workshop and an initial assessment
- National workshops

Guidelines activities included:

- A review of the information and data collected
- Field surveys and interviews
- Consultations through workshops

The participants were reminded that the last activity on this list would be conducted in the afternoon session of this workshop.

In terms of the plan and progress there had been no significant delays apart from a delay in the data analysis and the production of the guidelines. The outputs achieved included the completion of the initial assessments together with RAP training, and the collection and analysis of data in three countries during the 2006/07 dry season and the 2006/07 winter-spring crop in the tidal irrigation scheme in Viet Nam. The Senior Advisor also listed the various publications issued and the outputs currently in hand. This workshop would be the
first opportunity to discuss the guidelines and that due to both the time and budget restraints set by the completion date of June 2008, would be the only opportunity. The Senior Advisor asked for active participation and comments including those on a suitable title. In answer to a question from a member from Cambodia, he replied that his personal view was that perhaps “Guidelines” was too strong a title since the final product should not be seen as rules or regulations but rather as a presentation of the technical aspects together with suggestions. The member then went on to comment that the guidelines had already proved very useful and he saw no problem with the name. He was thanked and informed that this would form part of the afternoon’s discussion. The Senior Advisor then introduced the first of the member country presenters.

The overview is outlined in Annex 4.

3.3. Field observations and analysis by the country teams

Representatives from the four Member countries presented their field observations and analyses. Each presentation included details of the location, the size, a brief description of the irrigation scheme and its management, and the methods used in collecting the field data.

Long Hai Irrigation Area, Gocong Irrigation Project, Viet Nam

A member of the Viet Nam team gave the first presentation since their scheme, the Long Hai Irrigation area, Gocong Irrigation Project in the Mekong Delta, was the only example of a tidal irrigation scheme. The key function of the project is aimed at irrigation, drainage and salinity prevention. The analysis showed that irrigation efficiency was higher in the winter-spring crop but lower in the summer-autumn crop. Average productivity through three crop seasons accounts for 0.78kg per one cubic meter of water diverted into the command area. Each family earned 86% of their annual income from an average plot of 0.58 ha.

Huay Luang O & M Project, Udon Thani, Thailand

The second presentation was on the Huay Luang O & M Project in Udon Thani in Thailand. This gravity irrigation project covers some 13,917.9 ha and provides water for both domestic and industrial consumption. The reservoir with 118.8 MCM (Million Cubic Meters) of storage capacity provides 4.2 MCM for industry and 22.6 MCM for domestic use. However intensive field observation was carried out at the area under the left main canal, which provides irrigation for 7,912 ha in the wet season and 2,988 ha in the dry season. Although paddy is the main production in the region, non-paddy crops grown in the dry season accounted for more than 20% of the total area. There was a strong recommendation that the MRCS should provide equipment, and should not only fund but also provide training for the development of human resources.

Kamping Puoy Scheme, Battambang Province, Cambodia

The third presentation was on the gravity scheme of Kamping Puoy in Battambang Province in Cambodia where rice is grown in both the wet and dry seasons. The water management is through a water allocation plan agreed upon by Farmer Water User Committees. Although the team presented many field observation results it was pointed out that some of the data may not be absolutely reliable since problems had been encountered thus some data was either not recorded or not included. There was a request that the MRCS should allow for one
more year of research so that there would be more data for analysis and some information gaps could be filled in. However the members of the team had learnt a great deal and had gained much experience in conducting measurements in terms of the efficiency of irrigation water use and, on the operation and management of irrigation systems.

**Nam Houm Irrigation Project, Vientiane Capital, the Lao PDR**

The last country to present their findings was the Lao PDR. The Nam Houm Irrigation Project, a gravity scheme which has the objective of generating household income for families and of supporting and promoting the industrialisation of agriculture through the provision of irrigation services. The water is supplied solely for agricultural use and not for domestic or any other uses. From the field observations it was concluded that the low efficiency resulted from the poor facilities giving rise to water loss and drainage spill. The loss along canal and irrigation structures was estimated at 30% of total supply. Problems of water shortage are not adequately addressed by the system of water allocation since there is no feedback mechanism. The higher efficiency observed in the wet season (78.17%) results from the reduced demand then, while the higher productivity in the dry season (US$ 0.11/m$^3$ of water consumption) is due to the higher prices of paddy and non-paddy products and their production. In order to increase both the efficiency of water use and water productivity trials of better management practices need to be implemented.

All these presentations are given in full in Annex 5. Full text of country reports from NMCS are also placed in the CD.

### 3.4. Summary of the technical backstopping work under IIEPF in 2006/07 dry-season cultivation

The morning session closed with the AIFP Programme Officer presenting a summary of the technical backstopping work under IIEPF in the 2006/07 dry-season cultivation. The AIFP Programme Officer first apologised for the fact that this summary covered only the dry season cultivation since he had just received the wet season data and needed time to complete the analysis. He began with an overview of agriculture and irrigation in the Lower Mekong Basin, pointing out that the ever increasing population in the region makes an ever increasing demand on agriculture for food. Most agriculture in the region still depends on the rainfall between the months of April to November. However a significant gap between rainfall and the water demand by crops can be observed at the end of the rainy season (November) especially in northeast Thailand. He re-iterated the IIEPF Project objectives and described their expected impact. He then presented the results of the year long field observations for three gravity schemes followed by those from the tidal irrigation scheme. He concluded that high efficiencies were due to the water balance approach and the outstanding performance at the pilot sites. Moreover the high productivity was observed in schemes where there were multiple agricultural activities. He concluded with the comment that a similar practical approach was expected to be applied to irrigation systems throughout the Lower Mekong Basin.

This presentation is made available in Annex 6.
Mr Horikawa Naoki, the consultant from NIRE, Japan first presented the key concepts of the guidelines for the efficient use of water in irrigation. He began by saying that three indicators had been chosen, namely; reliability, flexibility and equity, and that these indicators were reflected in the chapters of the draft outline, the overall purpose of which is to describe the options in the improvements of the efficiencies of irrigation systems in the Mekong River Basin. The guidelines are focused on the management phase of a project and since most of the irrigation schemes in the Mekong Basin are open channel they focus on such schemes. Mr Horikawa explained the guidelines contained seven chapters dealing with (1) Water Allocation; (2) Water Distribution; (3) Canal Operations; (4) Management of Waters in Tertiary Canals; (5) Distribution; (6) Improvement of Physical Structures and (7) Technical and Management Aspects. He explained how these chapters reflected the three indicators. Mr Horikawa then gave further details; explaining and commenting on each chapter. He emphasised that decisions were often quite difficult to take since there were always many options, and that often there were both disadvantages and advantages.

His presentation and outline are in Annex 7.

3.6. Application to the pilot sites (case study)

Mr Horikawa Naoki, the consultant from NIRE, Japan, then went on to demonstrate how these draft guidelines could be applied to the pilot sites. He had made two visits to each site and since full details and descriptions of the sites had already been presented he would not repeat these.

**Nam Houm Irrigation Project, Vientiane Capital, the Lao PDR**

First Mr Horikawa commented on the Nam Houm Scheme where there was supplementary irrigation in the wet season. This water supply did not reflect the situation in the paddy fields. Overall the Nam Houm Project had mastered water allocation, and had reached an almost constant level of water distribution satisfying the first two indicators of reliability and flexibility. Their next step should be a consideration of the aspects of equity addressing; dry season rotation of the irrigation from tertiary canals, a flexible irrigation supply and the optimum operations of the reservoir to facilitate an increase of the crop intensity.

**Huay Luang O & M Project, Udon Thani, Thailand**

Next Mr Horikawa considered the Huay Luang O & M Project where irrigation efficiency is higher in the wet season than in the dry, and the water distribution to the four zones is controlled well. In relation to the chapters and indicators of the guidelines this site’s next steps should be to consider water management in the tertiary canals focusing on; low measurements at turnouts, feedback to intake to ensure flexibility, the assignment of dry season crop areas and the strengthening of the tertiary level of the Water User Groups.

**Kamping Puoy Scheme, Battambang Province, Cambodia**

The Kamping Puoy Scheme, Battambang Province was the next site for Mr Horikawa’s attention. In this site water is drawn from a nearby river and there are plans to extend the canal to provide for an additional irrigated area. In terms of their irrigation plan the consultant
felt there was not enough information for the wet season. There was room for improvement. However he acknowledged the difficulties associated with small staff numbers. The next steps should be; monitoring of the reservoirs, measurements of the flow rates at turnouts to the tertiary canals, the training of the leader of the Water User Groups at the tertiary canal level and the optimum operation of the reservoir.

Long Hai Irrigation Area, Gocong Irrigation Project, Viet Nam

The final site for comments was that of the Long Hai Irrigation Area, Gocong Irrigation Project. Because of the uniqueness of tidal irrigation, the water management of this scheme relies heavily on natural phenomena and this limits opportunities for improvement. However the consultant presented some recommendations in that the next steps for this scheme should be at the institutional level, namely; quality control to reduce flush water and an analysis of the water balance.

Presentation for this session is also in Annex 7.

3.7. Feedback from the Member Countries

Member countries were then invited to make comments. The AIFP Programme Officer was the facilitator and began by asking the Senior Advisor to present the key issues to be discussed. These included clarification by questions and answers, discussion on an appropriate title for the guidelines and the next process to be undertaken.

This presentation is in Annex 8.

The first question for clarification came from the Cambodian team who asked about the seasonal irrigation plan – how could they make a plan to cover the wet and the dry seasons? In the dry season water is taken from the reservoir. Mr Horikawa’s response was that there was no need for a wet season plan.

A member from Thailand then enquired about the next step which had been recommended and asked for a further explanation of what ‘feedback to intake’ meant. The response was that there should be a more flexible water management first in each zone and then between the zones.

Next came another comment from the Cambodian team regarding the next step of monitoring the water level in the reservoir (currently monitoring is done at the gate), and the question of how can leakage between the gate and the paddy fields be controlled. Mr Horikawa replied that since it is intended to extend the beneficiary area by 2,000 ha the project should know how many hectares can be irrigated, and so it is necessary to know how much water there is in the reservoir and what the water volume in the rivers is. These measurements are necessary to ensure future sustainability.

A member from Thailand asked how was it possible to deal with water shortages resulting from concentration of planted paddy plots as suggested by the consultant. Mr Horikawa explained that the concentration in the dry season of each year should be to places agreed upon by the water user groups, but that the places of concentration could be rotated each year. The Senior Advisor once again stressed that the need to consider the basic concept of
the guidelines. What are guidelines? Are they rules or are they simply for reference? Mr Horikawa then reminded the participants that in each country there are different social aspects so it is impossible to generalise for all countries. He asked that participants should remember that the guidelines are not the final answer applicable everywhere.

Another suggestion was that the guidelines should contain a section on the maintenance of the systems. Mr Horikawa agreed that maintenance was important and said that this would be considered.

A member from Cambodia asked what exactly was meant by ‘monitoring of the reservoir’ and could the consultant please elaborate on this. Mr Horikawa gave a more practical explanation and agreed that reservoir monitoring was difficult, however measurements could be handled by the leaders of the water user groups. He described the current situation which was control by the community leader who had to do so by trial-and-error with visual checking. If flow measurements could be introduced then this would make his job easier. Mr Horikawa continued by saying that training was very important especially for control in the tertiary canals since the people involved are not trained irrigation engineers. And in terms of the optimum management of the reservoir this crucial issue had already been covered. A further comment from the Cambodian team was that they were still unclear in how to monitor the reservoir. Mr Horikawa explained this could be achieved by measuring the differences in water levels, by calculating the discharge into the main canal and the water diverted from other areas to the project area. Clearer references between the case study and relevant parts of guidelines will be prepared by the consultant later.

A member from Viet Nam then referred Mr Horikawa to his suggested next step of quality control to reduce the flush water. Mr Horikawa replied that in the wet season water is drained to maintain the water quality so maybe quality control is not so important at that time, however during the dry season there is not enough water so the water quality is degraded. It may not be necessary to reduce the flush water but his suggestion should be retained if production was to be improved.

The Senior Advisor then intervened to say that enough time had now been spent on the case study and perhaps the members could give their feedback on the guidelines.

A member from the Lao team commented that the guidelines were very good and would be of great help in the Nam Houm Project where they would be distributed and used to improve the knowledge of the local staff.

The team from Thailand queried Item 5.2 – the Restriction of Land Use which they felt may give rise to problems particularly with land use changes. This may be difficult to achieve. They acknowledged the result could be a low efficiency in irrigation but it also involved other issues for example like those connected with salinity intrusion where paddy fields and sea water fish ponds were in close proximity. These issues could lead to disputes between farmers. They suggested that there could perhaps be a different wording. The consultant took note and will respond to this comment by adding a supplementary explanation when finalising the guidelines.

A member of the Lao team referred to Item 6 – the Improvement of Physical Structures. He pointed out that in the Lao PDR there were no automatic gates (Item 6.5) and that funds would be needed for training in remote monitoring and control systems. The Senior Advisor
once again stressed that following the guidelines was not compulsory. They are intended to simply give countries ideas and suggestions, which may be realised within the longer term.

A member from Cambodia commented that Item 4 – Water Management in the Tertiary Canals was too limiting and should be expanded to include both the main and secondary canals. The consultant responded that Item 1 to 3 covered both main/secondary and tertiary canal management and Item 4 included special considerations for tertiary canal in a separate chapter. This structure will be clearly shown in the next version.

The Senior Advisor thanked all the members for their contributions and asked for their comments on the term ‘guidelines’. Did they think that it was too strong and was it misleading? He asked them to remember that it deals mostly with technical issues and provides hints for water management for irrigation engineers. It does not intend to lay down rules. A member from Cambodia replied they had no objections but asked for alternatives. The Senior Advisor responded with some possibilities that he had in mind such as; Technical Guidance, Best Practices or Water Management Principles. He then concluded that since there seemed to be no strong objections perhaps the MRCS could be allowed to decide. He went on to say that since time and budget restraints made it unlikely that there would be the opportunity for another workshop further clarification would be through e-mail. Some consultation meetings were possible.

3.8. Wrap-up of the workshop discussion

The Senior Advisor began by apologising for the necessity for a very quick wrap-up because time was running out. He thanked everybody for their active participation and the various valuable comments particularly those on the possibility of the inclusion of a chapter on maintenance, and their comments on the issues of water shortages and changes in land use. He assured everyone that their comments would be incorporated in the final draft. There would also be further discussions on a suitable title and the next step would be decided. In this connection he again emphasised that further support and cooperation by member countries is still required.

All the member country delegates agreed that the MRCS could decide on the further processes towards finalisation of the guidelines, including the title and style appropriate for the final clarification. In general the member countries also showed their satisfaction with the progress and achievement of the IIEPF implementation up till now and supported the next steps toward completion of the IIEPF proposed by the MRCS at this workshop. A Thai delegate added his appreciation for the IIEFP which was one of the successful MRC projects under AIFP.

4. Closing Remarks

Mr Hung, the Director of the Operations Division and the Officer-in-Charge of the MRCS began his closing remarks with an apology for not having been able to attend the whole workshop. Although there had not been a huge amount of comments he understood that the members needed time to carefully read and digest the contents of the guidelines. He encouraged further consultations amongst team members and after this to send their suggestions. He understood that the time for this workshop was limited. Mr Hung thanked all members for their active participation.
The workshop finished at 17.00 on Tuesday 25 March 2008.

5. Social activity

A dinner to honour the participants was hosted by the MRCS in the evening of 25 March, 2008, at the Fu Man Lou Chinese restaurant in Vientiane. This gave the workshop participants the opportunity for informal discussions and allowed them to congratulate each other on their hard work and active involvement during the implementation of the project.

6. Questionnaire for project evaluation

An evaluation of the IIEFP project was conducted at the request of the MAFF, Japan through their own questionnaire format. It was suggested to the member countries that they should give at least two replies from each country. However the Lao PDR and Thailand voluntarily replied to more than the number requested.

In general, the evaluation revealed positive support for the IIEPF project. The majority supported the idea of an extension of the implementation period and an expansion of the pilot sites. Supporting activities to share findings and disseminate the project outputs such as training were also suggested. Another common suggestion was the challenge of the need for structural improvement although it had been clearly explained at the first regional workshop that this approach was outside the focus of the IIEPF, mainly because of budgetary constraints.

A Cambodian delegate greatly appreciated the IIEPF as a unique trial.

The Lao delegates repeated that at the development stage, the engineers’ skills and other capacities of the individual countries should be taken into consideration, although this point was clarified during the workshop discussion.

As the Thai team is now conducting follow-up activities in training their own staff and carrying out further data collection, they made a strong request to be able to keep the current meter provided.

A Viet Nam delegate suggested that the guidelines should go through the MRC clearance process before dissemination.

The questionnaire and summary of responses are attached as Annex 9.
ANNEXES
Annex 1: Workshop Agenda
# Workshop Agenda

The Second Regional Workshop on the Improvement of Irrigation Efficiency on Paddy Fields in the Lower Mekong River Basin Project (IIEPF)  
25 March 2008, MRCS, Vientiane, Lao PDR

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<td>Registration</td>
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<td>09:00-09:10</td>
<td>Opening Remark By Dir. Do Manh Hung (Director, Operations Division, MRCS)</td>
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<td>09:10-09:20</td>
<td>Remark By Mr. Metoku Yuichi (Second Secretary, Embassy of Japan)</td>
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<td>09:20-09:30</td>
<td>Introduction of Participants Facilitated by Mr. Okudaira (Senior Advisor, AIFP)</td>
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<td>09:30-09:35</td>
<td>Outlining Workshop Agenda By Mr. Okudaira</td>
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<tr>
<td>09:35-10:00</td>
<td>1. Overview of IIEPF Implementation and Progress By Mr. Okudaira</td>
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<td>10:00-10:20</td>
<td>Vietnamese team 10:00-10:20 Thai team (Each session is composed of 15 minutes presentation followed by 5 minutes for clarification)</td>
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<tr>
<td>10:20-10:40</td>
<td>2. Report on Field Observation and Analysis by Country Teams Facilitated by Mr. Okudaira</td>
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<td>10:40-11:00</td>
<td>Coffee Break</td>
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<tr>
<td>11:00-11:20</td>
<td>Cambodian team 11:00-11:20 Lao team (Each session is composed of 15 minutes presentation followed by 5 minutes for clarification)</td>
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<td>12:10-13:30</td>
<td>Lunch at MRCS courtyard</td>
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<td>13:30-14:30</td>
<td>4. Key Concept of the Technical Guide By Mr. Horikawa (consultant, NIRE, Japan)</td>
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<td>14:30-14:50</td>
<td>Coffee break</td>
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<td>14:50 - 15:10</td>
<td>5. Application to the Pilot Sites (Case Study) By Mr. Horikawa</td>
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<td>15:10-16:10</td>
<td>6. Feed Back from Member Countries Facilitated by Mr. Fongsamuth</td>
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<td>16:10-16:20</td>
<td>Wrap-up the Workshop Discussion By Mr. Okudaira</td>
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<td>16:20-16:30</td>
<td>Closing Remark By Dir. Hung</td>
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<td>18:00-21:00</td>
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Annex 2: List and photograph of Participants
The Second IIEPF Regional Workshop
Improvement of Irrigation Efficiency on Paddy Fields in the Lower Mekong Basin
25 March 2008, Vientiane, Lao PDR

List of Participants

Cambodia
1. H.E. Mr. Kol Vathana Deputy Secretary General, CNMC
2. Dr. Theng Tara Director of Water Resources Management and Conservation Department, MOWRAM and Focal Point of IIEPF
3. Mr. Hong Kimsan Deputy Director of Water Resources and Metrology Department of Battambang Province
4. Mr. Meas Peov Technical Officer of Agronomy and Agricultural Land Improvement Department, MAFF and Focal Point of IIEPF
5. Mr. Sok Khom National AIFP Coordinator, CNMC

Lao PDR
6. Mr. Khammay Vongsathiane Director of Technical Division, Irrigation Department/MAF and IIEPF Country Team Leader
7. Mr. Phouthone Siriphanthong Deputy Director of Operation and Maintenance Division, Department of Irrigation/MAF
8. Mr. Bounhap Vongvichith Nam Houm Irrigation Project Director
9. Mr. Phonepaseuth Phouliphanh Programme Coordinator, LNMC

Thailand
10. Mr. Chatchai Boonlue Director of Foreign Financed Projects Administration Division, Royal Irrigation Department
11. Mr. Somsak Vivithkeyoonvong Irrigation Engineer (RID)
12. Mr. Suwat Krajangmontree Chief of Operation and Irrigation Improvement (RID)
13. Mr. Pramote Phuengphian Chief of Water Operation and Maintenance Branch 3 (RID)
14. Mr. Satit Sueprasertsuk AIFP Coordinator, Department of Water Resources

Viet Nam
15. Mr. To Quang Toan Southern Institute for Water Resources Research
16. Mr. Huynh Phuoc Hai Tien Giang Provincial Department for Agriculture and Rural Development
Resource Person
17. Mr. Horikawa Naoki  Consultant, NIRE, Japan

Donor Representative
18. Mr. Metoku Yuichi  Second Secretary, Embassy of Japan

MRC Secretariat
19. Mr. Do Manh Hung  Director, OPD/OIC, MRCS
20. Mr. Okudaira Hiroshi  Senior Advisor, AIFP
21. Mr. Fongsamuth Phenphaengsy  Programme Officer, AIFP
22. Ms. Maureen Frances Brown  Editorial Consultant
23. Ms. Aksone Phaniphong  Secretary, AIFP
Photograph of participants

Director Do Manh Hung and Mr. Yuichi Metoku

Presenter (Mr. Okudaira, MRCS)

Presenter (Mr. To Quang Toan, SIWRR/Vietnam)

Presenter (Mr. Horikawa, NIRE)

Presenters (Mr. Somsak and Mr. Pramote, RID/Thailand)
Presenter (Dr. Theng Tara, MOWRAM, Cambodia)

Discussion at coffee break time

Presenter (Mr. Khammai, DOI, MAF, Laos)

Closing remark by Dir. Hung
Annex 3: Opening Remarks
Opening Remark by Mr Do Manh Hung
Director Operations Division and Officer-in-Charge, Mekong River Commission Secretariat

The Second Regional Workshop on Improvement of Irrigation Efficiency on Paddy Fields in the Lower Mekong Basin Project
25 March 2008
MRC Secretariat, Vientiane, Lao PDR

Mr. Metoku, Second Secretary, Embassy of Japan,
Representatives from the member countries,
Distinguished participants,
Ladies and Gentlemen,

On behalf of the Mekong River Commission Secretariat, I would like to extend a warm welcome to all of you to the Second Regional Workshop on Improvement of Irrigation Efficiency on Paddy Fields in the Lower Mekong Basin Project (IIEPF). This project is supported by the Ministry of Agriculture, Forestry and Fisheries, Japan.

On this occasion, I would like to express our high appreciation on the close cooperation and continuous support from the Ministry to MRC in general and the Agriculture Irrigation and Forestry Programme (AIFP) in particular.

Under the current MRC strategic plan (2006-2010) we have set our overall objective “to support Member States for more effective use of Mekong’s water and related resources for poverty alleviation” and set four strategic goals in order to achieve it. One of those is “to promote and support pro-poor development.” To realise this pro-poor development in this region, hydropower and agriculture, especially irrigation development are expected to play a key role. In this line, newly started BDP phase 2 also puts big emphasis to enhancement of those two sectors.

Agriculture is just one of the many water users but with more than 80 percent of water withdrawal in the Lower Mekong countries. Therefore agriculture is sometimes accused that it is primarily responsible for potential or substantial water dispute with other sectors. In response to increasing demand from other sectors, agriculture is expected more effort to share limited water resources for equitable access to others. Responding to this concern, the MRC Secretariat designed a project focusing on improvement of irrigation efficiency.

Financial support from the MAFF Japan has realized this IIEPF project, but for project implementation, I would also appreciate significant technical support from FAO headquarters and regional office in Bangkok. They have provided in-kind contribution through project designing and scheme performance appraisal.

My appreciation would also go to member countries, NMCs and line agencies, which have assisted the Secretariat to conduct fieldwork, provided valuable information including field data and its analysis. Without your active involvement, the Secretariat
alone could have never implemented the project smoothly. I would again appreciate your active involvement.

With all above support by three parties, in these three years, the IIEPF project has carried out intensive field observation and, based on collected information, prepared a draft technical guidance for better water management. Today’s workshop aims to share the project outputs, which include observation and analysis by member countries and a guidance drafted by the consultant team.

Due to delay of some activities, the technical guidance we could provide today is only the first version of the draft and it would need your constructive and critical comments for more improvement. However because of time and budget limitation, we may not have another occasion to meet together to discuss its next version. Therefore I would highly appreciate your idea/opinions/comments for further improvement today. Your ideas for any improvement proposed today will be appropriately incorporated through the finalization process, which the Secretariat together with the consultant continues to work on. We would promise to share the finalized document with all of you once completed. I believe that with your active participation our workshop will be successful.

Thank you very much for your kind attention
Remarks by Mr Metoku Yuichi
Second Secretary, Embassy of Japan in Lao PDR

The Second Regional Workshop on Improvement of Irrigation Efficiency on Paddy Fields in the Lower Mekong Basin Project
25 March 2008
MRC Secretariat, Vientiane, Lao PDR

Mr. Do Manh Hung, OIC of MRC Secretariat,
Participants from the MRC member countries,
Ladies and Gentlemen,

It is my honour to share time with you today at the second regional workshop of the IIEPF project, which has been funded by the Ministry of Agriculture, Forestry and Fisheries Japan since 2005. On be half of the Government of Japan, I would like to deliver a few remarks on this occasion.

As OIC Mr. Hung also mentioned in his opening remarks, the Japanese Government is keen to support the development of the Mekong region through both bi-lateral and multi-lateral channels. One visible example of Japan’s recent initiative is “Japan-Mekong Foreign Ministers’ Meeting” held in January this year in Tokyo. Through this meeting, we have identified numerous “candidate projects for the Cambodia-Lao PDR-Viet Nam development triangle” and confirmed stable cooperation between Japan and three countries by a memorandum signed by ministers. Identified projects are to be immediately funded by the Japan-ASEAN Integration Fund (JAIF) once feasibility is confirmed.

As a list of the candidate projects includes transportation, agriculture & community development, hydropower, health care & water supply, and education, the Japanese government has acknowledged pro-poor development is still one of the key challenges in this region. In this line, our government keeps steady support in agricultural development in association with the MAFF, JICA and other governmental bodies.

The MAFF is especially active in land and water resources development in agriculture. It has started to provide trust fund to the MRC since 1998 and by now it has kept stable contribution year by year. Its third series of contribution focuses on irrigation water use, which is the current project – IIEPF. The MAFF still understands effective water management for irrigation which requires further challenges in the region, it has pledged continuous support to the MRC with similar theme and budget size since 2008 at the annual consultation meeting this year. I would share this pleasant information with you on this occasion.

Coming back to the IIEPF project, I would say that water is fundamental asset for agricultural production, however with growing demand by population and industry in the world and also in this region, it is facing competition with other sectors or even sometimes among different crops. In order to contribute solving this situation, the
IIEPF project has started three years before aiming to provide technical guidance for more efficient irrigation water use, if I correctly understood.

The project has come to conclude its activity to end up its designed project term. I would expect today that the Secretariat well organizes this workshop and provides opportunity to share collected information/data/knowledge/findings from the project activities with all the participants and to collect feedback putting into the project final outputs. I wish this workshop may provide significant contribution to the project through your active participation.

Thank you for your attention.
Annex 4: Overview of IIEPF Implementation and Progress
Overview of IIEPF implementation & progress

Okudaira Hiroshi
AIFP/MRCS

Funding arrangement
by: Ministry of Agriculture, Forestry & Fisheries (MAFF) Japan
for: 3 years (JFY 2005 to 07)
with: approx. 1 million USD
started: June 2005 (ending June 2008)

Project structure

Assessment of Management practices
Supplement by FAO’s RAP

Intensive Observation in Water Use
Observed Irrigation efficiency
Constraints
Guidance as Counter-measures
Scheme level Improvement
Application Basin-widely

Improve Irrigation Efficiency in LMB

Objectives

Overall objective: aims to contribute improvement of irrigation efficiency

Immediate objectives:
- to appraise scheme performance
- to enhance capacity
- to produce guideline

Performance appraisal

Planned activities:
- Field (scheme) level data collection
- Water balance analysis
- Scheme management appraisal
- Rapid Appraisal Process (RAP)

Capacity enhancement

Planned activities:
- Regular backstopping
- RAP training workshop & initial assessment
- National workshops
Guideline

Planned activities:
- Review collected data/info.
- Field survey/interview
- Consultation thru workshop

Activities & agenda

<table>
<thead>
<tr>
<th>Year</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
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<td>Preparation stage</td>
<td>1. Overview of the project</td>
<td>2. Country reports</td>
<td>3. Findings from field observation</td>
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<td>RAP</td>
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<td>1. Overview of the project</td>
<td>2. Country reports</td>
<td>3. Findings from field observation</td>
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<td>Site selection</td>
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<td></td>
<td>1. Overview of the project</td>
<td>2. Country reports</td>
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<tr>
<td>Field observation</td>
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<td></td>
<td></td>
<td>1. Overview of the project</td>
</tr>
<tr>
<td>Data analysis</td>
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<tr>
<td>Review documents</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drafting guideline</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Finalizing</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Achieved outputs

- Initial assessment by RAP
- Dataset collected
- Other publications
  - Initial assessment
  - Dataset collected

Toward Completion

Current situation:
- Delay of the progress
- Discussion premature
- Time & budget constraints

Issues to be discussed:
- Suggestions for improvement
- Title of the final output
- Further process

Guideline
- Too strong
- Depends on today’s

Achievements:

- 06/07 dry season practices in three countries
- 06/07 W-S crop in VN tidal irrigation

Outputs under work

- Guideline
- Field observation final reports
- More publications (technical papers)
- 2 crop seasons at 4 pilot sites

Irrigation & water productivity in gravity system
Water use efficiency in tidal irrigation system
Comparison of gravity system performances
Irrigation schedule improvement (all provisional)
Annex 5: Presentations of Fieldwork by Member Country
Introduction

Within past decades, the production of agriculture has increased quickly in Mekong Delta.

- The delta contributed about 40% of agricultural production and half of rice production in the country.
- Rice production is 11 million tons. Accounts for 85% of exported rice for Vietnam.

One successful reason is the improvement of water management in Mekong Delta.
THE PROBLEMS OF IRRIGATION SYSTEMS IN MEKONG DELTA

Irrigation Structures Performance
- Low efficiency of structures such as pump stations, canals, and regulators, due to degradation and poor maintenance.
- Old technology for the regulation and monitoring system.
- Lack of water quantity control system.

Water Resources Development
- Impacted by many factors such as flooding or spring tide, acidity pollution of salinity intrusion, polluted by domestic and agricultural wastewater disposals such as fertilizers, pesticides and solid wastes.
- Conflicts over water because farmers change from freshwater rice to brackish water shrimp cultivation of higher value.

GO CONG IRRIGATION PROJECT

Background
- Water prices and tariffs for irrigation in Vietnam are rather low so that Irrigation Management Company (IMC) cannot generate enough revenue for operation and maintenance of systems. Tariffs are set by politicians of the Provincial Committees, not by IMC.
- The farmers, who are clients of an IMC, are still not organized into Water Users Associations (WUAs). There is no legal framework in place to take over, operate and maintain the newly controlled tertiary level.
- Operation and maintenance
  - Lack of procedures or guidelines for the operation and maintenance of most systems.
  - Have not installed a monitoring system for water level, water quantity and quality in the intakes/off-takes.
  - The power of managers is not strong enough to solve the conflicts between water users.

GO CONG IRRIGATION PROJECT

Present Condition
- Main canal network: 14 canals, total length of 157 km.

Infrastructure of Go Cong Project
- Go Cong Irrigation System
- Main canal network:
- 14 canals, total length of 157 km.
**Infrastructure of Go Cong Project**

**Present Condition**

**Sluices:**
- 54 sluices with the width of 1.5 m to 32 m

**Long Hai Irrigation Area (LHIA)**
- Total area: 950 ha
- Agr. area: 707 ha
- Population: 6176
- Consists Longbinh and Binhtan communes
- Cropping pattern: W-S, S-A and A-W
- Water sources: HL6 and Longhai sluices
- Water management: Under Gocong management board, Tien giang IMC

**Introduction**

**Organization Chart**

- Project authorities:
  - Responsible for the head works (sluices) and the main and secondary canals;
  - Planning for water supply;
  - Monitor gate operation and water quality;
  - Informing farmers the operation schedule on time.
- Water users:
  - Maintenance and management of tertiary canals;
  - Pay water fee to IMC via local taxmen;
- Agreement between IMC and WUs by contract, total irrigation area by each farmer each year;
- Priority for water distribution: limited by condition of salinity intrusion.

**Water Management Activities**
ADVENTAGES

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Gocong Project</th>
<th>Longhai irrigation area</th>
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<tbody>
<tr>
<td>Location</td>
<td>Closer (100 km)</td>
<td>Closer (150 km)</td>
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<tr>
<td>Size</td>
<td>Large (44,425 ha)</td>
<td>Large (700 ha)</td>
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<tr>
<td>Boundary</td>
<td>Closed</td>
<td>Closed</td>
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<tr>
<td>Management condition</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Maintenance condition</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Available data</td>
<td>Good</td>
<td>To be collected</td>
</tr>
<tr>
<td>Water fee collection</td>
<td>Good (90%)</td>
<td>Good (90%)</td>
</tr>
<tr>
<td>Available facilities</td>
<td>Good</td>
<td>Rain gauge</td>
</tr>
</tbody>
</table>

Outline of field observation

- Irrigation system and command area map
- Water flow measurement
- Monitor irrigation water applied
- Cropping pattern, calendar and record multiple use of water, obtain all kind of production...

Outline of field observation

- Topographic survey
- Canal system survey
- Crop area survey
- Map digitized with assisted from satellite image
- Making Z-W curve of canal

Outline of field observation

- At Longhai sluice
- Install water level sensors to record water levels up/downstream
- Record operation schedule
- Record rainfall and evaporation
- Monitoring the water flow
- Calculating water flow by equation
Outline of field observation

At HL6 sluice
- Install water data logger to record water levels up/down stream
- Record operation schedule
- Monitoring the water flow
- Calculating water flow by equation

At field level
- 5 field plots selected
- 5 water meters installed at each field
- Pump and drainage water, water level monitored
- Expenditure for pump, fertilizer and pesticides monitored
- Field survey form
- Evaluation of actual water used for rice crop and the expenditure

5 water meters installed at each field
- Monitoring the water flow
- Calculating water flow by equation

5 field plots selected
- Pump and drainage water, water level monitored
- Expenditure for pump, fertilizer and pesticides monitored
- Field survey form
- Evaluation of actual water used for rice crop and the expenditure

Outline of field observation

Recording cropping pattern, calendar, multiple use of water, production, at 120 families… with survey form

Recording cropping area, changed, production, actual irrigated area, multiple water use… at 2 communal with survey form

Data analysis and evaluated information for Longhai area

Water balance: Separated water balance for canal system and rice fields

Results of field observation
Result of field observation data

- Elevation ranges from 0.75-1.35 m
- <0.85: 2.5%
- <1 m: 34.4%
- 0.95-1.15: 73%

<table>
<thead>
<tr>
<th>Name of canal</th>
<th>Length (m)</th>
<th>Bed elevation (m+MSL)</th>
<th>Surface width (m)</th>
<th>Surface area (m²)</th>
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<tr>
<td>1</td>
<td>10.6</td>
<td>3.3</td>
<td>4.6</td>
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<td>2</td>
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<td>9.5</td>
<td>5.5</td>
<td>9.0</td>
<td>1219</td>
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</tbody>
</table>

Total length 33,936

Result of field observation data

- Total area 40 (ha)

Result of field observation data

- 100% agricultural area relies on canal water for irrigation water
- Negligible water use for other purpose
- 100% agricultural area got irrigation water

Table 3: Land use of the project area during 3 crop seasons in 2007

<table>
<thead>
<tr>
<th>No</th>
<th>Land use type</th>
<th>Abbreviation</th>
<th>Area for each crop season (ha)</th>
<th>Remarks</th>
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<tr>
<td>1</td>
<td>Agricultural area</td>
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<td>Surveyed data</td>
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<tr>
<td></td>
<td>- Rice crop</td>
<td>TRA</td>
<td>597.3</td>
<td>Surveyed data</td>
</tr>
<tr>
<td>2</td>
<td>Open canal system</td>
<td>TOSA</td>
<td>500</td>
<td>Calculated</td>
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<tr>
<td>3</td>
<td>Open canal.surface (at level of 0.8 m)</td>
<td>TOSA</td>
<td>500</td>
<td>Calculated</td>
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<tr>
<td>4</td>
<td>Other land</td>
<td>TOSA</td>
<td>500</td>
<td>Based on GIS data</td>
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<tr>
<td>Total</td>
<td></td>
<td></td>
<td>1698</td>
<td>Based on GIS data</td>
</tr>
</tbody>
</table>

Result of field observation data

- 100% agricultural area relies on canal water for irrigation water
- Negligible water use for other purpose
- 100% agricultural area got irrigation water
Key findings

Results of field observation data analysis
- 100% of irrigation area has relied on the water from the canal system;
- There was an average of 47 m length of the canal per ha of the cultivated area or 35 m length per ha in comparison to the overall natural area;
- The elevation of the rice crop area in the project area ranges from 0.75 to 1.35 m+MSL, the most common area has elevation ranges from 0.95 to 1.15 m+MSL (73.3%). Therefore, improvement of water management in the project area should be taken into account this common area;
- Rice is the most common crop in the project area as it is accounted for more than 98.6% of the total cultivated area during three crops in 2007;
- An average area for each family is 0.58 ha, and an average of 86% of the income for the families is from the rice cultivation;

Key findings

Results of surveyed crop data analysis
- W-S rice seeds in December accounted for 75% and in November 25%;
- S-A rice seeds in May accounted for 41.3% and in September 59.7%;
- The average crop length is 95 days for W-S and S-A and about 93 days for A-W crop.
- The average of seeds is 190 kg/ha for W-S, 174 kg/ha for S-A and 188 kg/ha for A-W.
- The V D20 and 3536 is considered as the dominated rice varieties of the LHIP it is accounted for more than 50% of the rice cultivated area.
- A average of benefit from rice cultivation is $566 USD/ha/crop, the highest benefit is $624 USD/ha come from A-W rice.
- A average of total expenditure for irrigation, pesticide and fertilizer is about 475 USD/ha/crop;
- The net income per person is about 3.52 MVND/per or $219/person.
- Farmers implemented an average of 17 irrigated times, 6 fertilized times and 5 used times for pesticides during W-S, and an average of 9 irrigated times, 4-5 fertilized times and 4-5 used times for pesticides during S-A, and A-W.

Key findings

Results of monitored data analyses
- The average of CWR was 461 mm/ha/crop, the highest CWR was 497.0 mm/ha for W-S rice crop;
- The average of CWR-Pe was 315 mm/ha/crop, the lowest value was 206 mm/ha for S-A rice crop;
- The average of IWR was 580 mm/ha/crop and the highest IWR was 835 mm/ha for W-S rice crop;
- Farmer used an average of 7,799 m3/ha of water in W-S, 4,489.8 m3/ha in S-A and 4,448.8 m3/ha in A-W;
- Total irrigation water diverted to the system over the year 2007 in gravity condition was 12,172 thousands m3 it was approximated equal to the TIWR of the system (12,000 thousand m3).
Key findings
Results of monitored data analyses:
- Overall CAE at the field level in 2007 was about 56.6%, the highest CAE at the field level was 61.5% in W-S;
- Overall CAE at the system level in 2007 was about 54.5%, the highest CAE at the system level was 90.9% in W-S, the lowest CAE at the system level was 30.3% in A-W;
- The POW at system level in 2007 was 0.78 kg/m3 and the POW at the field level was 0.81 kg/m3;
- Pumping is main mean of irrigation for all rice crop in the LHIA, there was only 2.5% of the cultivated area could get gravity irrigation condition for a total of 2.5 months over the year;

Recommendation
- Some farmers took water more than two to three times as needed in comparison with the calculated crop water requirement, therefore to improve irrigation efficiency of the system the basic experience introduced to farmers may be useful;
- The irrigation expend is not counted much in comparison with the total expend, therefore to extend the benefit from rice cultivation to the farm, the IPM may need to introduce;
- This is considered as the initial study for IIEPF for coastal zone in the Mekong delta, therefore it is recommended that a similar study could make for the other areas in the Mekong delta.

THANK YOU FOR YOUR KIND ATTENTION
Thai Working Team
Royal Irrigation Department (RID)

1. Mr. Chatchai Boonlue (RID HQ)
2. Mr. Somsak Vivithkeyoonvong (RID HQ)
3. Mr. Suwat Krajangmontre (Huay Luang O&M Proj.)
4. Mr. Pramote Pungpeun (Huay Luang O&M Proj.)
5. Mr. Sathit Sueprasrtsuk (DWR)

**Huay Luang Reservoir**

**Project feature**
- **Headwork**
  - **Length**: 4.8 km, **Width**: 6.00 m, **Height**: 12.5 m.
  - **Retention capacity**: 118,362 m³.
  - **Retention water surface area**: 32.00 sq. km.
  - **Avg. annual run-off**: 160,17 m³.
  - **Avg. rainfall intensity**: 1,249.85 mm/yr.
  - **Evaporation**: 1,504.79 mm/yr.
  - **Avg. temperature**: 26.5°C.
  - **Avg. humidity**: 74%

**Huay Luang O&M Project covers**

Irrigation area of 13,917.9 ha.

- **Qmax = 12.423 cms**
- **Qmax = 10.348 cms**
- **Farmers 3,832 households**
- **Farmers 3,244 households**
- **LMC area 7,912.16 ha.**
- **RMC area 6,005.76 ha.**
- **Office of O&M Branch 3**
- **Office of O&M Branch 2**

**Office of O&M Branch 2**

**Office of O&M 3 Right Main Canal**

**RMC area 6,005.76 ha.**

**LMC area 7,912.16 ha.**

**Huay Luang O&M Project covers**

Irrigation area of 13,917.9 ha.
Water for domestic consumption
Unit: cu.m/year
1. Udon Thani Water Supply Authority 21,000,000
2. Kud Jab Water Supply Authority 840,000
3. Nong Wua Sor Water Supply Authority 540,000
4. Pois Sa-ard Water Supply Authority 50,400
5. Ban Nam Pon Water Supply Authority 804,000
Total 22,634,400

IIEPF activities conducted in the pilot schemes

Irrigation Efficiency
Flow measurement at 9 points in each canal level (twice a week/point)

- LMC1, LMC2, LMC3, LMC4
- 1R-L, 3R-L
- 1L-3R-L, 2L-3R-L, 3L-3R-L

IIEPF activities conducted in the pilot schemes

• Conveyance efficiency examination
  - 1 Left main canal
  - 10 Lateral canals
  - 3 Sub-lateral canals
  - 6 Ditches
• Calibration of 10 farm turnouts

IIEPF activities conducted in the pilot schemes

• Daily percolation measurement in paddy field of each zone
• Daily Water level measurement in fishpond of each zone

Cropping pattern calendar of Huay Luang O&M Project

<table>
<thead>
<tr>
<th>No</th>
<th>Crop</th>
<th>Water allocation</th>
<th>Drp</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pastry</td>
<td>water allocation</td>
<td>dry season</td>
<td></td>
<td></td>
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<tr>
<td>2</td>
<td>Upland</td>
<td></td>
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<tr>
<td>3</td>
<td>Vegetables</td>
<td></td>
<td></td>
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<tr>
<td>4</td>
<td>Sugarcane</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>5</td>
<td>Fishpond</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>6</td>
<td>Lotus pond</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
3.75

JMC's monthly meeting for water allocation and water rotation plan

Analysis results and major findings

Farmers' participatory irrigation water management

Analysis results and major findings

Farmers' participatory irrigation water management

Analysis results and major findings

Analysis results and major findings

Analysis results and major findings
Conclusion & Recommendation

1. Water allocation mostly meet the water requirement except during the shortage of rainfall period in wet season.
2. Water productivity is based on irrigation water supply only.
3. IIEPF should continue to cover another area of the Huay Luang O&M Proj. in order to evaluate overall system.
4. IIEPF result is very useful for decision making for better improvement of the irrigation water management.
5. To sustain efficient irrigation water management, not only human resource skill but also necessary equipments. Working team strongly recommend MRC to provide some equipments so that IIEPF could be sustainable development.
6. IIEPF is not only give the financial and technical supports but also chance for officials and WUG to improve and develop knowledge and experience. It is recommended training or seminar line officials are very important and MRC should provide some opportunities.

Analysis results and major findings

<table>
<thead>
<tr>
<th>Water Requirement of each plant (cu.m.)</th>
<th>Water Supplied</th>
<th>Rainfall (mm.)</th>
<th>Effective rainfall (1000 water)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugar</td>
<td>14,887</td>
<td>3,450</td>
<td>6,751.5</td>
</tr>
<tr>
<td>Latex</td>
<td>7,912</td>
<td>2,263</td>
<td>4,528.6</td>
</tr>
<tr>
<td>Grass</td>
<td>2,919</td>
<td>2,263</td>
<td>4,528.6</td>
</tr>
<tr>
<td>Total</td>
<td>20,718</td>
<td>8,124</td>
<td>11,271.1</td>
</tr>
</tbody>
</table>

Conveyance efficiency

<table>
<thead>
<tr>
<th>Canal</th>
<th>Responsible area (ha.)</th>
<th>Conveyance efficiency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left main canal</td>
<td>2,919</td>
<td>92.96</td>
</tr>
<tr>
<td>Lateral canal</td>
<td>3,450</td>
<td>89.99</td>
</tr>
<tr>
<td>Sub-lateral canal</td>
<td>2,263</td>
<td>88.17</td>
</tr>
<tr>
<td>Ditch</td>
<td></td>
<td>82.73</td>
</tr>
</tbody>
</table>

Wet season 2007

<table>
<thead>
<tr>
<th>Water requirement</th>
<th>Effective rainfall</th>
<th>Water supplied</th>
</tr>
</thead>
<tbody>
<tr>
<td>60,522,360</td>
<td>53,417,978</td>
<td>106,614,650</td>
</tr>
<tr>
<td>50,956,035</td>
<td>50,996,035</td>
<td>101,952,060</td>
</tr>
<tr>
<td>26,097,553</td>
<td>26,097,553</td>
<td>52,195,106</td>
</tr>
</tbody>
</table>

Wet season 2006/2007

<table>
<thead>
<tr>
<th>Water requirement</th>
<th>Effective rainfall</th>
<th>Water supplied</th>
</tr>
</thead>
<tbody>
<tr>
<td>265,423,000</td>
<td>265,423,000</td>
<td>530,846,000</td>
</tr>
<tr>
<td>251,273,525</td>
<td>251,273,525</td>
<td>492,547,050</td>
</tr>
<tr>
<td>216,443,180</td>
<td>216,443,180</td>
<td>432,886,360</td>
</tr>
</tbody>
</table>

Conclusion

- Water allocation mostly meet the water requirement except during the shortage of rainfall period in wet season.
- Water productivity is based on irrigation water supply only.
- IIEPF should continue to cover another area of the Huay Luang O&M Proj. in order to evaluate overall system.
- IIEPF result is very useful for decision making for better improvement of the irrigation water management.
- To sustain efficient irrigation water management, not only human resource skill but also necessary equipments. Working team strongly recommend MRC to provide some equipments so that IIEPF could be sustainable development.
- IIEPF is not only give the financial and technical supports but also chance for officials and WUG to improve and develop knowledge and experience. It is recommended training or seminar line officials are very important and MRC should provide some opportunities.
แสดงระบบส่งน้ำ ผู้ใช้ส่งน้ำและบารุงกันที่ 3

การส่งน้ำและบารุงกันนั้นขั้นตอน

รวมทั้งสิ้น
WUG = 314 กลุ่ม จำนวนส่งน้ำทั้งหมด 335 กลุ่มส่งน้ำ
User = 3,832 ครอบครัว
Area = 49,451 ไร่ ซึ่งมีกลุ่มส่งน้ำ 45,991 ไร่

หน่วยของ ก = ดม.รูปด้าน
หน่วยของ L = กิโลเมตร
หน่วยของ A = ไร่ ซึ่งเป็นประมาณ

Check

- โซน 1
- โซน 2
- โซน 3
- โซน 4
Regional Workshop
on
IMPROVEMENT OF IRRIGATION EFFICIENCY ON PADDY FIELDS IN THE LOWER MEKONG BASIN PROJECT (IIEPF)

Cambodia Study Team

**Background**
- The project was funded by the MRC under the Framework of Program to analyze and evaluate water and ecosystem in Asia paddy fields.
- **Period**: One year from February 2007 to February 2008
- **Team members**:
  - Dr. Theng Tara (Team leader, MOWRAM)
  - Mr. Thach Sovanna (Report assistance, MOWRAM)
  - Mr. Meas Peov (Field assistance, MAFF)
  - Mr. Sao Sam Phors (Field assistance, MOWRAM)
  - Mr. Hong Kim San (Field work, Battambang PDOWRAM)
  - Mr. Sok Khom (Facilitator, CNMC)
has two teams: Field Team and Management team
- **overall objective** is to extract information on water demand for rice plants and to improve irrigation efficiency on paddy fields.

**Location of Study Areas**

- Kamping Puoy scheme is one gravity type of irrigation system.
- located in Banan district, about 25 Km from Battambang province.
- Catchment area $A = 347 \text{ km}^2$, $W = 110,000,000 \text{ m}^3$.
- Total Irrigated area 1,1000 Ha
- has two main dams with the length of about 14 Km and some intakes structure
- The irrigation canal network consists of:
  - one main canal 9Km
  - three secondary canals 27Km
- Only Rice is growing in the scheme wet and Dry seasons.
1- Conducting inflows and outflows measurements

- 23 points inflows and 18 outflows (dry), 25 inflow + 20 outflow (wet)

Measure flow with current meter at a selected location in the canal,
- Cross section is divided vertically into sub segment
- Total discharge is attained by summarizing of partial discharges

\[ V_i = \frac{1}{2} (V_{0.2} + V_{0.8}) \]

\[ A_i = d_i \times w_i \]

\[ Q_i \text{ (partial)} = V_i \times A_i \]

\[ Q \text{ (total)} = \sum Q_i \]

2- Record water level in rice paddy field

<table>
<thead>
<tr>
<th>Location</th>
<th>Coordinate (X, Y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WL 1</td>
<td>In Agriculture center 282688 1447120</td>
</tr>
<tr>
<td>WL 2</td>
<td>In M9-2 rice field 284462 1447838</td>
</tr>
<tr>
<td>WL 3</td>
<td>In M19-1 rice field 287976 1447377</td>
</tr>
<tr>
<td>WL 4</td>
<td>In N2-3-2 rice field 290300 1444956</td>
</tr>
<tr>
<td>WL 5</td>
<td>In N2-4-1 rice field 290576 1444112</td>
</tr>
<tr>
<td>WL 6</td>
<td>In M23 rice field 289567 1446009</td>
</tr>
</tbody>
</table>

Tank with bottom with rice \( E + T + R \)
Tank without bottom with rice \( E + T + P + R \)
Wooden Staff gate with scale \( E + T + P + S + R \)
Tank with bottom without rice \( E + R \)
Rainfall recorder \( R \)
3- \( (ETc) \) was calculated by two methods:
1- Averaging from field measurement and
2- FAO formula
\[
ETc = ETo \times Kc
\]
Where:
ETc : crop water requirement or Evapo-transpiration requirement
mm/day
ETo : reference crop Evapo-transpiration mm/day
Kc : Crop coefficient
4- The percolation is determined by using the percolation apparatus
Percolation = Water loss in depth – Evapotranspiration
5- Effective rainfall for rice crop was calculated following by the method that was use by FAO.
\[
Pe = P \times 0.6 - 10 \quad \text{if} \quad P < 75 \text{mm} \quad \text{and} \quad Pe = P \times 0.8 - 25 \quad \text{if} \quad P > 25 \text{mm}
\]
6- Record cropping pattern and crop calendar
10 days in one time by the farmer
7- Identify actual irrigated area
   a) Provided by the farmer
   b) GPS equipment to record the points and boundaries

8- Conduct conveyance loss test along the canals
   On main Canal, secondary canal N2 and tertiary canal
   - Prepare table for recording data
   - Select measurement point
   - Draw cross section of canal
   - Define depth point of canal from left to right
   - Define point to measure water velocity
   - Measure depth of canal from bridge to bottom
   - Draw cross section of canal by AUTO CAD software
   - Equipments preparation (Current meter instrument)
3- CONVEYANCE LOSSES ON TERTIARY CANAL

<table>
<thead>
<tr>
<th>No</th>
<th>Structure</th>
<th>pk (m³/s)</th>
<th>Pk - 0.20</th>
<th>0.202</th>
<th>0.211</th>
<th>0.212</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M-9</td>
<td>3.6</td>
<td>0.013</td>
<td>0.052</td>
<td>0.173</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>M-9</td>
<td>4.62</td>
<td>0.221</td>
<td>0.489</td>
<td>0.773</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>M-9</td>
<td>5.56</td>
<td>1.207</td>
<td>1.207</td>
<td>1.012</td>
<td></td>
</tr>
</tbody>
</table>

5. Structure

Q = $\mu \cdot S \cdot \sqrt{Z}$

Q : Discharge m³/s
S : Area of opening gate
$\mu$ : Discharge Coefficient
g : Gravitational Acceleration
Z : Head Loss

H-Q curve of 10 Gates

Scheme is owned by Battambang PDWRAM under supervision of the MOWRAM
FWUC is responsible for the whole scheme management activities and plays an important role in the operation and maintenance works in consultation with PDWRAM
Meeting of FWUC to review, prepare principle and plan for Implementation
FWUC meets and extends on principles and plan to their members
FWUC meet and make decision on principle and plan for implementation
FWUC prepare water sharing and distribution calendar and submit to Battambang PDWRAM for decision
FWUC meet and design plan to clear forest, repair and improve all canals
FWUC meet and review water fee collection service for the season before starting implementation
Implementation the plan

9- Water Management

Total actual irrigated area: dry season is 1452.5 ha and wet season is 2,518.37 ha,
The rainfall from February-December 2007 was 1310 mm,
The average of CWR: Dry 6.87 mm/day, Wet 5.11 mm/day,
The average of percolation: Dry 2.61 mm/day, Wet 1.71 mm/day,
The total of land preparation was 193.4 mm,
The total SWR: Dry 16.12 MCM ; Wet 30.15

4- Analysis Results and Major Finding

- All members shall contribute for the operation and maintenance of all facilities irrigation system,
- Secondary canal, tertiary canal and all related structures are responsible by the FWUC, but main canal and main structure are responsible by the PDWRAM or MOWRAM
- All the paddy fields in the scheme shall have sufficient water for crop production,
- Upper members should allow water flow to the lower part,
- All committees shall have a water allocation plan,
- The water allocation shall follow according to the water allocation plan and also refer to the meeting,
- The water utilization shall follow to the irrigation condition,
- If the land is not smoothly, higher and far from the water source, this land has a first priority for irrigation,
- When the gate open and water flow to the paddy field, all members should wait and see until water sufficient in the field and also look at the losing of water through the dike,
- The members do not have a right to open the water without permission from the committee
The volume of water diverted to the system: Dry 23.50 MCM; Wet 29.59 MCM.

The volume of water delivered by system: Dry 13.85 MCM; Wet 14.61 MCM.

Conveyance efficiency: Dry 72.54%; Wet 84.15%.

Overall project command area efficiency: Dry 72.38%; Wet 86.28%.

The average yield: Dry 0.371 Kg/m²; Wet 0.33 Kg/m².

The water productivities: Dry 0.023 kg/m³; Wet 0.28 Kg/m³.

Recommendation and Conclusion

It is not expected that the data from the field observation is perfect. Many troubles happened when we took the data such as crab broke the levee or dike is made a hole, water overflow into the tank, there are too much rain etc... Therefore, in the process of calculation, we cancel some data or we do not take it.

Based on the above research, we propose and request that the MRC should add one or 2 year more research in order to have more data for analysis and fill some gaps that we face in the previous study.

From this research, we learnt and received a lot of data and experiences of how to conduct water use efficiency for irrigation and also this data are very useful for the operation and management of irrigation system.

In the future, the Royal Government of Cambodia (MOWRAM) must strongly continuous this research activity from MRC and take consideration on the collection of data and information related to the water use in the irrigation systems because it is very useful for irrigation water use efficiency, preparing water use planning, and also for operation and maintenance of irrigation system.

THANK YOU FOR YOUR KIND ATTENTION
Field Observation & Analysis Work of IIEPF in the Nam Houm Irrigation Project

Prepared by Lao Team IIEPF LNMC & MAF
Backstopped by Romsamuth (MRCS)

1. Location

- Located in Vientiane Capital
- 35 km from Vientiane Capital City by road No. 13 to the north
- Project areas cover two districts: Naxaythong District Xaythany District

2. Scheme Outline

Constructed in 3 phases:

Phase 1: 1978 - 82
The construction works included: Dam, intake, spillway, main canal, and some on-farm canals (irrigated 150 ha) by govt. budget with loan from OPEC & grand aid from Japanese govt.

Phase 2: 1990 - 93
N1 secondary canal (400 ha) with financial assistance from Italian govt., through interim Mekong Committee.

Phase 3: 1997 - 2000
Additional main canal (2.3 km), secondary and the remaining canals (completed 3000 ha) by govt budget.

3. Brief IIEPF Activities conducted in the Scheme

4. Major Findings

5. Conclusion
2. Scheme Outline (3)

Storage Capacity
- Maximum Storage: 60 MCM
- Active storage: 54 MCM

Canals
- MC: 9.30 km
- SC: 46.84 km
- TC: 4.50 km
(367 gates + check structures)

3. Field Activities

Major Field Activities:
- Conducting RAP as first system performance assessment
- Identifying cropping pattern
- Monitoring ETo, Etc, Percolation, rainfall --> water requirement
- Flow measurement in & out of system & inside system --> water balance
- Conveyance efficiency test
- Crop production survey
- Overall command area efficiency
- Water productivity
- Identifying management appraisal

Not all activities presented

3. Field Activities & Its Results (1)

Irrigation days & Cropping Pattern
- 90 days of dry-season rice & 120 days of wet-season rice
- Cash crops mainly grown in dry season & beginning of wet season (not heavy rain period)
- Fish farming practiced thought the year
- Irrigation in wet season mainly in land preparation & transplanting periods

3. Field Activities & Its Results (2)

Flow Monitoring:
- Construction of Bamboo bridges at all measurement points
- Every 15 days (7 days spending for each measurement)
- 2 measurement teams
- Total 44 points (5 natural inflow streams, 4 natural outflow streams)
- 7 places of conveyance tests

Summary of Total Flows

<table>
<thead>
<tr>
<th></th>
<th>Dry Season</th>
<th>Wet Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original Design Capacity</td>
<td>46.6 MCM</td>
<td>4.6 MCM</td>
</tr>
<tr>
<td>In flow from main canal into system</td>
<td>27.33 MCM</td>
<td>7.31 MCM</td>
</tr>
<tr>
<td>Inflow from natural stream into system</td>
<td>5.57 MCM</td>
<td>27.21 MCM</td>
</tr>
<tr>
<td>Drainage (outflows)</td>
<td>9.16 MCM</td>
<td>14.62 MCM</td>
</tr>
</tbody>
</table>
3. Field Activities & Its Results (4)

- Daily measurement
- No rainfall in dry season (Dec-April)
- High rainfall in Aug & Sep
- **Dry Season**: High ETo in Feb.
- **Wet Season**: High ETo in Aug & Sep

<table>
<thead>
<tr>
<th>Season</th>
<th>ETo (mm)</th>
<th>Rain (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry S.</td>
<td>3.06</td>
<td>0.07</td>
</tr>
<tr>
<td>Wet S.</td>
<td>4.04</td>
<td>20.35</td>
</tr>
</tbody>
</table>

3. Field Activities & Its Results (5)

- Lesser in Dry Season
- **Dry Season**: high in Feb & March
- **Wet Season**: high in July & Aug
- Higher in dry season
- **Dry Season**: High in Mar & Apr
- **Wet Season**: High in Sep & Oct

3. Field Activities & Its Results (6)

- Apply unit harvested method (1 m X 1m) for collecting paddy production
- Total samples of 24 points in dry seasons & 20 points in wet seasons
- Collecting value cross checked with farmers' interview

<table>
<thead>
<tr>
<th>Crop Types</th>
<th>Area (ha)</th>
<th>Yield (T/ha)</th>
<th>Price (US$/T)</th>
<th>Total Yield (T)</th>
<th>Price (US$/T)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paddy</td>
<td>1.67</td>
<td>1.8</td>
<td>1.12</td>
<td>3.09</td>
<td>1.26</td>
</tr>
<tr>
<td>Cash crops</td>
<td>0.17</td>
<td>2.1</td>
<td>2.85</td>
<td>0.48</td>
<td>0.92</td>
</tr>
<tr>
<td>Aquaculture</td>
<td>0.00</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2.84</strong></td>
<td><strong>4.19</strong></td>
<td><strong>3.96</strong></td>
<td><strong>11.34</strong></td>
<td><strong>5.2</strong></td>
</tr>
</tbody>
</table>

4. Major Findings (1)

**Summary of Water Requirement (WR)**

<table>
<thead>
<tr>
<th>Sector</th>
<th>WR of each sector (MCM)</th>
<th><strong>Total (MCM)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquaculture (MCM)</td>
<td>9.13</td>
<td>13.46</td>
</tr>
<tr>
<td>Cash Crops (MCM)</td>
<td>20.9</td>
<td>20.96</td>
</tr>
<tr>
<td>Paddy (MCM)</td>
<td>20.370</td>
<td>20.370</td>
</tr>
<tr>
<td><strong>Total (MCM)</strong></td>
<td><strong>40.4</strong></td>
<td><strong>40.4</strong></td>
</tr>
</tbody>
</table>

**Conveyance Efficiency**

- Higher WR in wet season due to longer period & larger planted areas
- **Dry Season**: high WR in Dec (Land Preparation stage) & in Feb & Mar (Flowering stage)
- **Wet Season**: WR fluctuated due to rainfall, high WR in early Sep & Oct

4. Major Findings (2)

**Efficiencies & Water Productivities**

- Conveyance Efficiency: The same value used in both dry & wet seasons because the test conducted at one time
- Higher overall efficiency in wet season due to shorter irrigation days, although much more rainfall observed
- Higher water productivity in dry season due to higher yields & higher price

<table>
<thead>
<tr>
<th>Efficiency Type</th>
<th>Efficiency Value</th>
<th><strong>Dry Season</strong></th>
<th><strong>Wet Season</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Conveyance Effi.</td>
<td>0.114</td>
<td>69.04%</td>
<td>69.04%</td>
</tr>
<tr>
<td>Water Productivity</td>
<td>0.097</td>
<td>65.30%</td>
<td>69.06%</td>
</tr>
</tbody>
</table>

4. Major Findings (3)

**Organization & Water Management**

- **SWS**: System Water Requirement
- **ER**: Effective Rainfall

<table>
<thead>
<tr>
<th>Responsibilities</th>
<th><strong>Primary</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Reasvoir &amp; main canal</td>
<td></td>
</tr>
<tr>
<td>Secondary canal</td>
<td></td>
</tr>
</tbody>
</table>

4. Major Findings (4)

- ETo & Rainfall
- Dec - Apr: No rainfall in dry season
- Aug & Sep: High rainfall
- Feb: High ETo in Dry Season
- Aug & Sep: High ETo in Wet Season
4. Major Findings (4)

**Water Allocation**
- Water allocation plan for every dry-season cultivation, but not for wet season
- Continues/free water supply (no control) when full storage of reservoir
- Rotation in 3 zones when less reservoir storage (unstable rainfall)

**4. Major Findings (5)**

**Irrigation Service Fee - ISF**
- Water fee important for water management as covering facility maintenance & incentive for staff
- Rate of ISF: 150,000 Kip/ha
- 47% collected in 2006-07 & 40% collected in 2007-08

**Project Constraints**
- Poor irrigation infrastructures
- Lack of effective water distribution plan & monitoring system
- Lax enforcement regulation in water management practice
- Low skill of staff on proper water management

5. Conclusion

- High efficiency compared with other schemes in Laos (40-50% in general)
- Outflows not observed & controlled by the project
- Water allocation plan not suitable with actual water requirement, adoption plan needed
- Higher efficiency in wet season because of shorter irrigation days (lesser irrigation water supply)
- Water productivity in dry season higher than wet season due to higher paddy yield and higher production prices
- Good water management practice needs to be implemented to trail the best solution in order to increase water use efficiency, water productivities & farmers' income household
Annex 6: Presentations of Technical Backstopping
Summary of Technical Backstopping
Work under IIEPF/AIFP in the Dry-Season Cultivation (2006-07)

The 2nd IIEPF Regional Workshop
MRCs Conference Room, Vientiane, Laos
25 March 2008

Fongsamuth Phephaangsy
AIFP, MRCs

Project funded by Government of Japan, MAFF with technical cooperation of FAO-RAP

Content

- Agriculture & Irrigation in the Basin
- IIEPF Project
- Summary of Field Activities
- Summary of Major Findings
- Conclusion

1. Agriculture & Irrigation in LMB

Agriculture, in the future, still needs to meet growing demand

1. Agriculture & Irrigation in LMB

Rice Planted Areas
Rainfall

April

1. Agriculture & Irrigation in LMB

Rice Planted Areas
Rainfall

August

1. Agriculture & Irrigation in LMB

Rice Planted Areas
Rainfall

November

1. Agriculture & Irrigation in LMB

Rice Planted Areas
Rainfall

2000 2025

Population (millions)

Cambodia

Lao PDR

T-LMB

VN - LMB

Agriculture, in the future, still needs to meet growing demand.

Rice Planted Areas
Rainfall

April

Rice Planted Areas
Rainfall

August

Rice Planted Areas
Rainfall

November

FAO AQUASTAT & IWMI WATER-SIM simulation

Agriculture, in the future, still needs to meet growing demand.

Rice Planted Areas
Rainfall

April

Rice Planted Areas
Rainfall

August

Rice Planted Areas
Rainfall

November
1. Agriculture & Irrigation in LMB

<table>
<thead>
<tr>
<th>Country</th>
<th>Annual Water Use (bil. m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>2.7</td>
</tr>
<tr>
<td>Laos</td>
<td>3.0</td>
</tr>
<tr>
<td>NE Thailand</td>
<td>9.4</td>
</tr>
<tr>
<td>Vietnam Delta</td>
<td>26.3</td>
</tr>
<tr>
<td>Vietnam Highlands</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>LMB total</strong></td>
<td><strong>41.8</strong></td>
</tr>
</tbody>
</table>

- **8.8%** of annual discharge (475 bil. m³)

2. IIEPF Project - Objectives

- to appraise irrigation efficiencies in selected irrigation systems
- to enhance the capacity of stakeholders in using up-to-date concepts of irrigation efficiency and water balance tools and procedures for their assessment
- to produce guidelines for improving irrigation efficiency on paddy fields based on actual water use practices in the LMB member countries

3. Field Monitoring

<table>
<thead>
<tr>
<th>Year</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prep</td>
<td></td>
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<td></td>
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<tr>
<td>RegW</td>
<td></td>
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<tr>
<td>Appra</td>
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<tr>
<td>Slt</td>
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<tr>
<td>Obvs</td>
<td></td>
<td></td>
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<tr>
<td>Dta</td>
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<tr>
<td>RevD</td>
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<td></td>
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<tr>
<td>Deftg</td>
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<tr>
<td>Finiz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Major Findings
Rainfall, ER, and Perc. (DS 2006-07)

- Rainfall more in lower basin
  peak Apr – May
- ER constant in L
  clear variation in T.
- Percolation
  high-initial, low-late in L
  big fluctuation in C.

Water Requirement (Observed Value VS Plan Value)

- Almost the same between NH & HL
- Gap between observed & planned values
- High gap in Num Houm (Laos) & Komping Pouy (Cambodia)
- Gap filled if increasing water use efficiency
  Huay Luang (Thai) adapt to actual observed value

<table>
<thead>
<tr>
<th>System (observed)</th>
<th>Planned Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>m3/ha</td>
</tr>
<tr>
<td></td>
<td>m3/ha</td>
</tr>
<tr>
<td></td>
<td>m3/ha</td>
</tr>
<tr>
<td></td>
<td>m3/ha</td>
</tr>
</tbody>
</table>

|                   |                   |
|                   |                   |
|                   |                   |
|                   |                   |

Efficiencies

- High efficiency caused by Water Balance Approach
- Active & intensive water management in Huay Luang --> high efficiency
- Poor irrigation fac. (WR-ER)/(Inflow * Conveyance Effi.-Drainage)
  cause by reuse of drain water, less out flow observed
- Too large capacity of main canal compared with planted area
  But water allocation schedule often feedback

Water Reuse in Num Houm

Water Productivity

- Low value in general
- High value in scheme practicing multiple crops & variety agriculture diversification
- Low value in scheme practicing single crop e.g. Komping Pouy
- Fish farming & cash crops give high value because of high price
- Scheme with high water use efficiency also provide high water productivity

Efficiencies

Water Productivity - RAP & Field Analysis

- RAP considering all
  Lower than RAP due to 1 crop
  GC/LH (Vietnam)

Tidal Irrigation (GoCong/Longhai Project)
Water Balance Concept

Water Balance Results

[Table showing various water balance results such as Crop Water Requirement (CWR), Effective Rainfall (ER), and others.]

Major Findings - Tidal Irrigation

Role of Water Management
- Maintain good water quality inside command area and diverting fresh water as much as possible to replace the stagnant condition of water.
- To ensure availability of water in the canal, raising up water level to support gravity condition.
- Conveyance efficiency has no meaning since no control & service by each canal level.
- No requirement of farmer participation in managing water distribution.

Conclusion
- Examining irrigation water use efficiency for one-year crops, interesting results found.
- High efficiencies due to the water balance approach & outstanding performance pilot sites.
- High water productivity observed in scheme where combine multiple agriculture activities.
- Similar practical approach expects to be applied for whole basin to understand situation of irrigation system in LMB.

Thank you for your support & cooperation during field work.
Annex 7: Outline of the Guidelines and Supplementary Document
Guidelines for efficient irrigation water use

Naoki HORIKAWA
National Institute for Rural Engineering

Objectives and Scope
The purpose of this guideline is to describe options to improve irrigation efficiencies of the irrigation systems in the Mekong river basin.

Planning  Design  Management

3 Phase of irrigation project and scope of this guideline

Features of irrigation projects in the Mekong river basin

<table>
<thead>
<tr>
<th>Canal Type</th>
<th>Open channel</th>
<th>Pipeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm size</td>
<td>Small farms</td>
<td>Estates</td>
</tr>
<tr>
<td>Main crop</td>
<td>Rice</td>
<td>Upland crop</td>
</tr>
<tr>
<td>Irrigation</td>
<td>Supply oriented</td>
<td>Demand oriented</td>
</tr>
<tr>
<td>Climate</td>
<td>Tropical monsoon</td>
<td></td>
</tr>
</tbody>
</table>

Contents of the guideline

1. Water allocation
   (Seasonal Irrigation Plan)
   - Water balance, inundation analysis
   - Irrigation plan of tidal irrigation area
   - Area water level control
   - Irrigation area allocation
   - How much water can be used in reservoir storage?
   - Estimation of available water and water requirement

2. Water Distribution
   (Irrigation scheduling)

3. Canal operation

4. Water management of tertiary canal

5. Institution

6. Improvement of physical structures

1. Water allocation
   (Seasonal Irrigation Plan)
   - What is the irrigation plan?
   - Irrigation plan of tidal irrigation area
   - Area water level control
   - Irrigation area allocation
   - How much water can be used in reservoir storage?
   - Estimation of available water and water requirement

2. Water Distribution
   (Irrigation scheduling)

3. Canal operation

4. Water management of tertiary canal

5. Institution

6. Improvement of physical structures

Estimation of available water and water requirement

- Estimated water resources
- Effective rainfall

High production
- Present reservoir storage
- Estimated water resources
- Effective rainfall
- Using record of drought year or other certain year

Failure of water supply
- Present reservoir storage + average inflow into reservoir
- Estimated based on average rainfall

Irrigation area = Irrigation demand for out area - Estimated effective

Optimum Reservoir operation

Reliability
Flexibility
Equity

55
Dynamic programming (DP)

Dynamic programming is the method that can directly find the policy that can generate the maximum benefit under conditions given and an evaluate function such as the rice production.

\[ f_i = \max \{ g_i + f_{i+1}, I_i f_i + R_i \} \]

- Dynamic programming
- Evaluation function
- Reservoir storage change
- Constraints

Restriction

The seasonal irrigation plan is calculated after comparing estimated available water and irrigation water demand calculated by a temporal plan. When the former is less than the latter at any period of next irrigation season, a temporal plan must be revised as for cultivated crop, irrigated area, crop establishment, the starting date of irrigation.

- Cultivated Crop
- Irrigated area
- Crop establishment method
- Delay of planting

Allocation of irrigated area

Distribution of irrigation implementation

Area water level control (1)

Water can be distributed evenly if irrigation project area is very flat and canals have enough capacity. This irrigation system called as Tidal Irrigation etc. can achieve high irrigation efficiencies by controlling water level. Target water levels should be decided at some points and in some periods. Target water level depends on the location of irrigation project.

Area water level control (2)

Inundation analysis
- Flood estimation
- Unsteady flow model
- Basin water balance

Allocation and distribution of irrigation implementation

Irrigation should be started at the same time at tertiary level to reduce the duration of irrigation. While, start date of irrigation should be distributed for cut peak of water demand (land preparation) at project level.
Inundation analysis

Schematic diagram of channel networks
Forecasting of operation
Design of canal system and structures

Basin Water balance

Monthly storage change
Ground water movement

Flood water intrusion estimation

River
Upstream block
C-P East Bank

The amount is too small to be estimated

2. Water distribution
(Irrigation Scheduling, weekly or daily distribution plan)

<table>
<thead>
<tr>
<th>contents</th>
<th>Related Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigation scheduling</td>
<td>What is the irrigation scheduling</td>
</tr>
<tr>
<td>Type of water distribution</td>
<td>Flexibility and water distribution</td>
</tr>
<tr>
<td>Interval, frequency</td>
<td>When is the water distribution decided</td>
</tr>
<tr>
<td>Monitoring and Procedure</td>
<td>How is it decided</td>
</tr>
<tr>
<td>Continuous water supply</td>
<td>Which can improve irrigation efficiencies</td>
</tr>
<tr>
<td>and intermittent water supply</td>
<td></td>
</tr>
<tr>
<td>Flood introduction</td>
<td>Management to utilize water resources</td>
</tr>
<tr>
<td>Reservoir operation</td>
<td>Water management in water shortage</td>
</tr>
<tr>
<td>Cycle of ordering</td>
<td>Simulation</td>
</tr>
</tbody>
</table>

Procedure of ordering
In some projects, farmers apply for irrigation water to water manager in advance. The water manager divert water from intake to main canal and distribute to each branch canal according to farmers application. In Japan there are three method to estimate water demand practically. As special case, the water manager operate to irrigate each farm plot instead of farmers in some irrigation project. This case is classified to supply oriented water control.

Example

Farmer
Kanri-Han
Kanri-Ku
Association
Integrated association

Supply-oriented water control
- Supply-oriented water control
- Flexibility and water distribution
- Interval, frequency
- Monitoring and procedure
- Continuous water supply and intermittent water supply
- Flood introduction
- Reservoir operation
- Cycle of ordering
- Procedure of ordering

Example
Farmer 600
Kanri-Han 60
Kanri-Ku 14
Association
Integrated association

Example

Supply-oriented water control
- Supply-oriented water control
- Flexibility and water distribution
- Interval, frequency
- Monitoring and procedure
- Continuous water supply and intermittent water supply
- Flood introduction
- Reservoir operation
- Cycle of ordering
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Example

Supply-oriented water control
- Supply-oriented water control
- Flexibility and water distribution
- Interval, frequency
- Monitoring and procedure
- Continuous water supply and intermittent water supply
- Flood introduction
- Reservoir operation
- Cycle of ordering
- Procedure of ordering

Example
Continuous irrigation supply and intermitted (on-off) irrigation supply

- Control supply volume by duration
- High irrigation efficiency, equity with poor management

<table>
<thead>
<tr>
<th>Supply Type</th>
<th>Volume Control</th>
<th>Efficiency</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous</td>
<td>Flow rate</td>
<td>Flexible</td>
<td>Main canal</td>
</tr>
<tr>
<td>On-off</td>
<td>Duration</td>
<td>Multiple</td>
<td>Tertiary canal</td>
</tr>
</tbody>
</table>

4. Water management of the tertiary canal

- Discharge
- Turnout for one plot

Water user association
Special treatment
Rotation between tertiary
Plot to plot irrigation

Communication between operators
- Operation of cross regulator
  - Monitoring and control
    - Upstream control or Downstream control
  - Communication
    - Communication between operators

Operation of cross regulator
- the gate which keeps constant upstream level automatically was introduced to irrigation canal system in some projects.
  - This gate keep upstream level mechanically at division points. Introduction of this type of gates makes operation simple. Managers only have to operate intake gate and division gate which discharge must be varied. The open degree of division gate obey only its discharge.
  - But some problems remains or caused. In irrigation canal system, upstream branches have advantage than down stream branches. If there were no check gates, even most upper weir can't get their require water. But if there were check gates, upstream weir can get all they want. There is no problem if operators of branch gate follows general manager of total canal system instructions. Thus construction of the automatic weirs which control constant upper level may cause water shortage at last.

Control of turnout works

- Operation
  - A: Flow rate control (measurement) at main turnouts
    - From upstream to downstream
  - B: Several times a day (long canal system)
  - C: Flow rate control (measurement) at key points
    - Water level control (measurement) at main turnout
    - Several trial or experience
  - D: Water level control (measurement) at main turnouts
    - Several trial or experience
  - E: Rotation between turnouts
    - Proportional distribution without reflection of changing demand

Reservoir operation rule

- Once flow rate measurements is established, flow rate control is easier than Water level control.
5. Institution

- Water right
- Restriction of land use
- Water quality protection rule
- Re-plotting system in land consolidation

6. Improvement physical structures

<table>
<thead>
<tr>
<th>Contents</th>
<th>Related analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulation reservoir</td>
<td>Capacity needed</td>
</tr>
<tr>
<td>Cross regulator</td>
<td>Unsteady flow model</td>
</tr>
<tr>
<td>Canal system</td>
<td>Reduction of direct turnout</td>
</tr>
<tr>
<td>Tertiary canal</td>
<td>Advantage and disadvantage</td>
</tr>
<tr>
<td>Remote monitoring and control system</td>
<td>Outline</td>
</tr>
<tr>
<td>Automated gate</td>
<td>What is controlled?</td>
</tr>
</tbody>
</table>

Remote monitoring and control system (1)

It is desirable to operate facilities in higher degree by less staff. To enable this, remote control and monitoring systems are introduced in Japan. Remote monitoring system collects many data such as rainfalls, water levels and water discharges. Water manage can observe these data at control center. Collected data are displayed to digital or analog meter on graphic panel (panel graph).

The manager decide how to operate water facilities such as gates, bulbs and pumps by judging according to observed data. Facilities operations are executed by using operation console.

As a communication between control center and on-site station, there are three types communication. There are wireless, exclusive communication line and commercial line.

The purpose of remote control and monitoring system is as follows:
1. Equal water distribution
2. Utilization of water resources without wasting
3. Elimination of labor
4. Prevention of disaster in facilities
5. Adjust of data

Construction of tertiary canal

Construction of tertiary canal would improve irrigation efficiencies of plot to plot system. But high density of irrigation canals may sometimes result in low efficiency with poor water management.
Remote monitoring and control system (2)

Automated gate

1. Gate opening
2. Upstream water level
3. Downstream water level
4. Flow rate (discharge)

Managerial and technical aspects

Monitoring
- Frequency and period
- Rainfall
- Reservoir
- Flow
- Field survey
- Farmer requests

Water requirement
- Net water requirement
- Gross water requirement
- Irrigation efficiency
- Effective rainfall
- Pre-saturation water depth

Organization
- Structure
- Operator
- PIM

Monitoring Rainfall

Large-scale irrigation projects consisting of reservoirs contribute to the stability of rice cropping in Southeast Asia, but the water storage capacity of some reservoirs is not sufficient for double cropping. Therefore, it is necessary to promote appropriate release reduction by monitoring the average amount of rainfall in irrigation systems. This study aims to propose a method for evaluating rainfall station density.

Water requirement: Effective rainfall

Concept of water requirement estimation is the same used for seasonal irrigation plan and irrigation scheduling. When the same is used for irrigation project planning, related factors, such as irrigation area, irrigation efficiency etc., should be revised.

PIM and irrigation efficiency

Objectives of Participatory Irrigation Management
- Establishment of communication between irrigation projects and water users
- Effective irrigation management
- Sustainable water management (collection of water fee)
- Irrigation Management Transfer

Improvement of irrigation efficiency

Temporary lower irrigation efficiency
Guidelines for efficient irrigation water use

Outline

1. Water allocation
   1.1 Seasonal Irrigation plan
       Seasonal irrigation plan determines crop, crop area, irrigation period and
       irrigation water delivery for the coming irrigation season to ensure the reliable
       water supply, based on careful studies of water resources, water requirement, and
       other related factors. Present and future water resources are allocated into
       irrigation use and other uses in the plan.

   1.2 Procedure of planning
       Seasonal irrigation plan should be determined earlier enough before irrigation
       season starts. Water users such as farmers are involved to decision making
       process of this plan. Procedure of planning is informed stakeholders in advance.
       First related factors are investigated and draft of irrigation plan is made by
       irrigation managers. The draft becomes the irrigation plan after agreement of the
       meeting which reflects water users will.

   1.3 Investigations
       Present available water volumes such as reservoir storage are measured and
       historical meteorological and water use data are collected to estimate available
       water. Farmers and land situation are also surveyed. It is necessary to know water
       users will about water allocation.

   1.4 Estimation available water and irrigation water demand
       Available water is estimated by present available water, expected water resources
       in the next irrigation season, water use for other purpose such as municipal water
       and water volume which should be remained at the end of next irrigation season.
       Irrigation water demand are estimated by crop water requirement and effective
       rainfall.

   1.5 Calculation of the seasonal irrigation plan
       The seasonal irrigation plan is calculated after comparing estimated available
       water and irrigation water demand calculated by a temporal plan. When the
       former is less than the latter at any period of next irrigation season, a temporal
       plan must be revised as for cultivated crop, irrigated area, crop establishment, The
       staring date of irrigation. Once irrigation plan become feasible, irrigation area,
       irrigation period, cultivated crop and there are, irrigation water are determined.

   1.6 Optimal reservoir operation
       When reservoirs are large enough to keep water storage beyond one irrigation
       season, estimation of reservoir storage change is estimated for a longer period.

   1.7 Allocation of irrigated area
When available water is not enough to irrigate whole irrigable area for crops desired by farmers, irrigated area or cultivated crops is limited. Such a limitation should be owed by related farmers equally. It is desirable to concentrate the irrigated area in order to reduce non-productive consumption.

1.8 Area water level control
Water can be distributed evenly if irrigation project area is very flat and canals have enough capacity. Target water levels are decided in these irrigation projects at some points and in some periods instead of canal flow rate. Target water level depends on the location of irrigation project. Intrude flood water, area water consumption are estimated for the next irrigation season.

1.9 Announcement
The seasonal irrigation plan is informed to water users to allow them to prepare for the next irrigation season through organizations or mass media.

2. Water distribution
2.1 Irrigation scheduling
Water supply is determined at a certain period, reflecting water demand change, climate or other related factors. Water scheduling determined the water supply at any canal level.

2.2 Determination of irrigation scheduling
Water scheduling are decided by monitoring, field survey or ordering.

2.3 Interval
It is desirable to establish daily irrigation scheduling to increase irrigation efficiencies. It should be examined at least twice a month.

2.4 Monitoring and Procedure
Rainfall, water supply, and river flows to reservoirs, at intake points and at drainage canals are measured. Standing water depth of field, crop stage and actual crop area are useful for irrigation scheduling. When ordering system are adapted, water users requests are gathered.

2.5 Continuous water supply and intermitted water supply
In selection water supply method disadvantage and advantage are compared. Generally intermitted (on-off) irrigation reduce water loss at tertiary canals and continuous water supply are adapted in the main canal.

2.6 Food introduction
If there is available water, water is taken into canal system above water demand in the irrigation project which suffer from water shortage, which may be stored paddy fields, canals or ponds.

2.7 Reservoir operation
When reservoir storage go lower than planned level in the irrigation season, water supply may be reduced.

3 Canal operations
3.1 Canal operation and spill
Canal system is operated in order to deliver water to the field with reducing spill from main or secondary canals.

3.2 Operation of turnout works
It is desirable to operate turnout works to control flow rate for gravity irrigation system. But operation type of turnout works depends on measurement system. When flow rates are not measured, water level control or mixed control are adapted.

3.3 Operation of cross regulator
Cross regulators are operated in upstream control or downstream control. It depends on the physical and social situations.

3.4 Communication
Operators should communicate to reduce spill from main and secondary canals.

4. Water management of the tertiary canal
4.1 Water users association
Water users association acts an important role to reduce excess water intake at tertiary canal level. Water users upstream are apt to take much water than needed, which results in increasing water demand at the turnout works to tertiary canals. Mutual monitoring or rules among water users in the tertiary canal is useful to reduce such actions.

4.2 Special treatment
The authorized one water managers operations of turnouts from tertiary canal to individual farmers farm plots decrease water loss which generated by each water users operations. Since this operation deprive water users of their own water management, the water managers operation would be limited in severe water shortage period.

4.3 Rotation between tertiary
Inequity on water delivery is serious when water supply is not enough to the canal. On-off irrigation supply is one method to reduce the inequity on water delivery. When water users association dose not function well, rotation between tertiary canals is recommended to reduce inequity.

4.4 Plot to plot irrigation
Sometimes there are some conflicts between water users in plot to plot irrigation. Arrangement of water manager or leader of village can resolve these conflicts. It
is important for water users to recognize the irrigation flow route to corporate each other.

5. Institution

5.1 Water right system
Water right system is important to resolve conflicts between upstream and downstream water users at a tributary.

5.2 Restriction of land use
Distributed irrigated are results in reduction of irrigation efficiencies. Restriction of land use may prevent the generation of distributed irrigated area.

5.3 Water quality protection rule
Water is circulated within tidal irrigation area, which cause high irrigation efficiencies and degradation of water quality. Sometimes water in internal canals is drained to keep water quality, which volume should be diverted to the area. Water quality control can reduce the additional water demand.

5.4 Re-plotting system in land consolidation
Re-plotting system is useful to facilitate the construction of tertiary canals.

6. Improvement of physical structures

6.1 Regulation reservoir
Regulation reservoirs in the canal system reduce the gap between water demand and water supply which is caused traveling time of irrigation flow or delay of information. The maximum volume of regulating reservoir is determined by the physical structures of canal or river system and water demand fluctuations.

6.2 Cross regulator
There are manual gates, automatic gates and weirs as cross regulator. The type of gate is determined after examining functions, operation easiness and total costs.

6.3 Canal system
Construction of main canals or secondary canals without direct turnouts leads to less water level fluctuations, which facilitate canal system operation.

6.4 Tertiary canal
Construction of a tertiary canal enable to attain earlier water delivery than plot to plot irrigation system. On the other hand, spill point from farm plots may increase. The reduction of traveling time increase irrigation efficiencies and increase of
spill points in number may decrease irrigation efficiencies with poor water management. Construction of tertiary canals should be carefully examined.

6.5 Remote monitoring and remote control system
Introduction of remote monitoring and control system reduce irrigation loss through quick response to the change of water situation in a project.

6.6 Automated gate
Automated gate may increase water level fluctuation in poor manual gate managements at the same hydraulics system. It is desirable to introduce automated gate with improving manual gate operations.

7. Managerial and technical aspects

7.1 Monitoring
Real time monitoring is useful to recognized water demand or supply changes and respond to them immediately. Long record is also necessary for creating operation rules.

7.2 Water requirement
Concept of water requirement estimation is same used for seasonal irrigation plan and irrigation scheduling. When the same was used for irrigation project planning, related factors, such as irrigation area, irrigation efficiencies etc. should be revised.

7.3 Organization
Participatory irrigation management is generally contributes irrigation efficiency improvement. But since some objective of PIM activities is not to improve canal operation, irrigation efficiency may be temporary decreased without appropriate measures.
Water management of pilot projects

Naoki HORIKAWA
National Institute for Rural Engineering

- Supplementary irrigation in the rainy season
- High performance in the rainy season
- Water supply in the rainy season don’t reflect water situation of paddy field.

Irrigation Plan

<table>
<thead>
<tr>
<th>IRRIGATION PLAN</th>
<th>ROTATION</th>
<th>WATER ALLOCATED TO NEXT SEASON (L/HA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DRY</td>
<td>WET</td>
</tr>
<tr>
<td>Summer irrigation plan</td>
<td>Concentrated</td>
<td>Distributed</td>
</tr>
<tr>
<td>Functions</td>
<td>Protect against droughts</td>
<td>Water quality improvement</td>
</tr>
<tr>
<td>Procedure</td>
<td>Water harvesting</td>
<td>Water storage</td>
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<tr>
<td>Water allocation in non-rotation</td>
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<td></td>
</tr>
<tr>
<td>Utilization</td>
<td>Utilization</td>
<td>Utilization</td>
</tr>
</tbody>
</table>

Operation

<table>
<thead>
<tr>
<th>OPERATION PLAN</th>
<th>WATER LEVEL CONTROL AT MAIN TURNOUTS</th>
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<tbody>
<tr>
<td></td>
<td>FROM UPTAKE TO DRAINAGE</td>
</tr>
<tr>
<td></td>
<td>SEVERAL TIMES A DAY</td>
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<td>SEVERAL TIMES A DAY</td>
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<td></td>
<td>PROPORTIONAL DISTRIBUTION WITHOUT REFLECTION OF CHANGING DEMAND</td>
</tr>
</tbody>
</table>

Next step

- Dry season
  Rotation irrigation between tertiary canal
- Flexible irrigation supply
- Optimum reservoir operation to increase of crop intensity

Water user Association
Monitoring measurement
Huay Luang

Irrigation efficiency of the rainy season is higher than one of the dry season. Water distribution is well controlled in each zone.

Irrigation Plan

<table>
<thead>
<tr>
<th>Season</th>
<th>Month</th>
<th>Area</th>
<th>Irrigation times</th>
<th>Delivery schedule</th>
<th>Discharge (main, Lateral)</th>
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<tbody>
<tr>
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<td>November (dry)</td>
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</tbody>
</table>
|1. Water allocation (Seasonal Irrigation plan)
2. Water Distribution (Irrigation scheduling)
3. Canal operation
4. Water management of tertiary canal
5. Institution
6. Improvement of physical structures

Operation

<table>
<thead>
<tr>
<th>Operation</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
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</thead>
<tbody>
<tr>
<td>Flow rate control (measurement) at main turnouts</td>
<td>From upstream to downstream</td>
<td>Several times a day</td>
<td>Several times a day</td>
<td>Several times a day</td>
<td>Several times a day</td>
<td>Several times a day</td>
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<tr>
<td>Water level control (measurement) at main turnouts</td>
<td>Rotation between turnouts</td>
<td>Proportional distribution without reflection of changing demand</td>
<td></td>
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</tr>
</tbody>
</table>

Next step

- Flow measurements at turnouts
- Feedback to Intake (flexibility)
- Dry season crop area assignment
- Strengthen WUG (tertiary level)

Kompung Puoy

Water is diverted from adjacent river (Mongkol Borey River)
The canal will be extended for additional irrigation area
-Ordering system
-On/off irrigation in main canal level
**Irrigation Plan**

<table>
<thead>
<tr>
<th>Seasonal Irrigation Plan</th>
<th>Area</th>
<th>Irrigated Area</th>
<th>Delivery Schedule</th>
<th>Discharge (Main, Lateral)</th>
</tr>
</thead>
<tbody>
<tr>
<td>November (dry)</td>
<td>Non-rotation</td>
<td>Non-rotation</td>
<td>Non-rotation</td>
<td>Concentrated</td>
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<td>December (wet)</td>
<td>Non-rotation</td>
<td>Non-rotation</td>
<td>Non-rotation</td>
<td>Distributed</td>
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</tbody>
</table>

**Operation**

A. Flow rate control (measurement) at main turnouts from upstream to downstream

B. Several times a day

C. Flow rate control (measurement) at key points of water level control (measurement) at main turning

D. Water level control (measurement) at main turnouts

E. Proportional distribution without reflection of changing demand

**Next step**

- Monitoring of reservoirs
- Measurements of flow rate at turnout to tertiary canal
- Training of WUG leader (tertiary canal)
- Optimum reservoir operation

**Goongong**

Tidal irrigation area
3 crops a year
1. Water allocation (Seasonal Irrigation plan)
2. Water Distribution (Irrigation scheduling)
3. Canal operation
4. Water management of tertiary canal
5. Institution
6. Improvement of physical structures

Next step (GoCong)

- Institutional issues
  - Quality control to reduce flush water water right (master plan)
- Water balance analysis
Annex 8: Presentations of Key Issues for Discussion
Feed back from Mem. Countries

Okudaira Hiroshi (AIFP/MRCS)
Horikawa Naoki (NIRE Japan)

Key issues to be discussed

- clarifications (Q&A)
- suggestions for improvement
- title of the final output
- further process

from the floor

- clarifications (Q&A)
- suggestions/comments for improvement
  pls. focus on ideas/concepts
  technical aspects

Guideline - Isn't it too strong?

- more technical issues
- hints for water mgmt. engineers
- NOT aiming like WUP rules
- publish as MRC a product
e.g. part of MRC Technical paper

Further process

- another WS unrealistic
- clarification thru email – easiest
- consultation meetings possible
- extension – last choice
  MAFF Japan pledged in Jan 08
- another 3-year project (2008-11)
- similar budget size
- issue: irrigation water management
Annex 9: Project Evaluation
Project Policy Evaluation Questionnaire

on Improvement of Irrigation Efficiency on Paddy Fields in the Lower Mekong Basin project under the Programme to analyze and evaluate water and ecosystem in Asian paddy fields

Q1: First of all, please show us your background partly.

1. What country do you live? ______________________________________________________

2. What is your nationality? _____________________________________________________

3. Where are you working at?
   □ Ministry / Government
   □ Institute under the jurisdiction of the Government
   □ International organisation
   □ Institute under the jurisdiction of the international organisation
   □ Union of cooperative
   □ Private enterprise
   □ Private farm
   □ University
   □ Non-Governmental Organisation (NGO)
   □ JICA
   □ The other
      Please write what is “the other”, if you’d like.

4. What is your occupation?
   □ Executive officer
   □ Executive technical officer
   □ Official / Secretary
   □ Technical official
   □ Resercher
   □ Manager
   □ Farmer
   □ Professor / Assistant
   □ Student
   □ JICA staff
   □ The other
      Please write what is “the other”, if you’d like.

The outline of the project/study

Name of the Project/study: Improvement of Irrigation Efficiency on Paddy Fields in the Lower Mekong Basin project under the Programme to analyze and evaluate water and ecosystem in Asian paddy fields

Overall Goal: to improve irrigation efficiency on paddy fields in the Lower Mekong Basin

Project/study Goal:
1. to appraise irrigation efficiencies and the irrigation system based on the modern concepts in the selected irrigation schemes;
2. to develop capacity of the line agencies in using up-to-date concepts of irrigation efficiencies and water balance and modern tools and procedures for their assessment;
3. to produce guidelines for improving irrigation efficiency based on actual water use conditions in the member countries;
4. to identify capacity development requirement of line agencies for better adoption of the guidelines in the LMB countries;

Project/study Output:
1.1: Establishment of minimum set of data to evaluate irrigation efficiencies and irrigation system
1.2: Water balance and assessment of Efficiencies and water productivity
1.3: Appraisal of scheme management
1.4: Rapid Appraisal Process
2.1: Backstopping note for the implementing agencies
2.2: Training workshop on RAP
2.3: National workshops in the project countries
3.1: The guidelines
4.1: Report on assessment of existing capacity and recommendations for capacity development and training of the line agency staff.

The outline of the study is as above. Please express your evaluation on the study in figure by each question. “5” is the highest score, and “1” is the lowest score on the evaluation.

Q2: Please tick the check box in accordance with your feeling by each question.

(1. relevance)
1-1. This project is aiming to improve irrigation water use efficiency through the introduction of the guideline for efficient water use and expected to lead sustainable agricultural development in the MRC member countries. Do you think the context and achievements of the project is in accordance with the needs of the MRC member countries?

(2. effectiveness)
2-1. Are you willing to disseminate and apply the guidelines, which will be produced through the project, for the purpose of efficient use of water resources of the MRC member countries?


2-2. Please describe the problems on the dissemination and application of the guidelines if any.

2-3. Please describe your own ideas to improve the project concept or any other request, which will contribute to design the succeeding projects with the close concept.

(3. efficiency)
3-1. Do you evaluate the project is implemented efficiently, especially in terms of implementation arrangement such as work plan and other implementation protocol.


(4. impact)
4-1. Do you think the guidelines for efficient water use will contribute the improvement of agricultural production and poverty alleviation?


(5. sustainability)
5-1. Do you think physical and institutional framework to disseminate and apply the guideline is established (or will be established) in the MRC member countries?


Please write your ideas and requests about the Project/Study below freely.

This is the end of the questionnaire. Ministry of Agriculture, Forestry & Fisheries of Japan thanks you for your cooperation.
# Summary of Project Policy Evaluation Questionnaire

**Project:** Improvement of Irrigation Efficiency on Paddy Field in the Lower Mekong Basin project

This questionnaire conducted on 25 March 2008, at 2nd Regional Workshop of the project

<table>
<thead>
<tr>
<th>Country</th>
<th>Organization</th>
<th>Occupation</th>
<th>Q1</th>
<th>Q2-1</th>
<th>Q3</th>
<th>Q3-1</th>
<th>Q4</th>
<th>Q5</th>
<th>Q2-2</th>
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<tbody>
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For me I think that this research is perfect for Cambodia, that before we never doing. My request is that MRC should add one or 2 more research in order to collect data from the field and fill up some gap that missing in the previous time.

The concept or guideline for the MRC member countries should be based on the data or information at least 5 years research or study period.

The project should also study on soil structure that is also impact on water efficiency. Moreover the project should analyze on the comparison of the cost of wet and dry season yield.

Guideline can not cover all MRC member countries, should reconsider country situation.

Guideline are not appropriated to each member country, if it's designed for the whole LMB.

Guideline concept should be reconsider to the country situation and needed of the country. It would be thinking to the country policy on water management.

Guideline are not appropriated to each member country, if it's designed for the whole LMB.

IIEPF should continue to other projects.

If want to IIEPF, so that needs improvement of physical structures and to establish modernization project for distribute knowledge to another project.

Project concept should be reconsider to the country situation and needed of the country. It would be thinking to the country policy on water management.

If possible will practicing to another project to compare experiences like pumping scheme project for final evaluation to pumping scheme in nationwide.

Project study should be continuing step-by-step, it not just for guideline, but it shall have its own model for water management in the future, and project should not be data collection only in one pilot.

The working team is willing and has intention to disseminate knowledge gaining from the project. Unfortunately, the important equipment like velocity instrument and etc. are requested to return to MRC immediately. This budget allocated is quite limited and is not set to first priority to proved such instruments. How will knowledge be disseminated and demonstrated properly?

To improve irrigation efficiencies needs both structural and non-structural method. The project emphasised to improve irrigation efficiencies using non-structural method. However trying to operate hydraulics structure without cooperation with farmers, and others may not reach the goal. In addition, some hydraulic structures at pilot area are multifunction or improper working which absolutely affect to irrigation efficiency.

1. To disseminate knowledge concerning participatory irrigation water management is very important therefore the project should support or contribute to training, seminar and etc.
2. Some necessary instruments should provide to the project in order to expand the area and try to improve irrigation efficiencies.

Sustainable development needs the participation of stakeholders. It is not only to do the irrigation efficiency experiment, collect data, etc, but also awareness raising concerning water as economic goods and vulnerable particularly the farmers, the major consumers, by supporting the seminar, training, etc.

1. To disseminate knowledge concerning participatory irrigation water management is very important therefore the project should support or contribute to training, seminar and etc.
2. Some necessary instruments should provide to the project in order to expand the area and try to improve irrigation efficiencies.
3. Extend the experiment and William is he been experiments in other areas.

For 1.

**note:**
- 5. Excellent
- 4. Good
- 3. Fair
- 2. Slight
- 1. Poor

*Apparent errors (both grammar and spelling) only fixed Others remained as original*