

付 属 資 料

1. 調査日程
2. 主要面談者
3. ミニッツ（合同評価報告書を含む）

1. 調査日程

期間：2003年10月26日～11月8日

月 日	曜日	行 程	宿泊地	備 考
10月26日	日	成田発 バンコク着 (JAL717 15:30)	バンコク	コンサルタント団員
10月27日	月	JICAタイ事務所表敬 現地調査 (ロップリ) カウンターパートインタビュー	ロップリ	コンサルタント団員
10月28日	火	現地調査 (ロップリ) 質問票回収、農家インタビュー	バンコク	コンサルタント団員
10月29日	水	カウンターパート聞き取り調査 (バンコク) 質問票回収、カウンターパートインタビュー 質問票の集計、合同評価報告書案の作成	バンコク	コンサルタント団員
10月30日	木	成田発 (官団員4名) バンコク着 (JAL717 15:30) 専門家との打合せ	バンコク	官団員
		合同評価報告書案作成	バンコク	コンサルタント団員
10月31日	金	日本人専門家から概況説明 合同評価調査団結成 合同評価会1 評価方法の説明 (評価分析団員より) 5グループに分かれて進捗状況の確認 (カウンターパート発表による) JICAタイ事務所、在タイ日本大使館表敬	バンコク	
11月1日	土	資料整理	ロップリ	
11月2日	日	ロップリへ移動 現地調査 (ロップリ) 状況の確認、農家インタビュー等	ロップリ	
		合同評価報告書案作成	バンコク	コンサルタント団員
11月3日	月	現地調査 (ロップリほか) バンコクへ移動	バンコク	
		合同評価報告書案作成	バンコク	コンサルタント団員
11月4日	火	合同評価会2、今後の課題を確認 ミニッツ案・合同評価報告書案作成	バンコク	
11月5日	水	専門家との協議 ミニッツ案・合同評価報告書案修正	バンコク	
11月6日	木	合同評価会3 合同評価報告書最終確認 合同調整委員会 合同評価結果の報告、ミニッツ署名	バンコク	
11月7日	金	JICAタイ事務所報告、在タイ日本大使館報告	バンコク	
11月8日	土	成田着 (6:40)		

2. 主要面談者

〈タイ側関係者〉

Samart Chokkanapitark	Director General, RID
Va-San Boonkird	Acting Deputy Director General for O&M, RID
Kanok khatikarn	Deputy Director General (Training), DOAE
Theerawat Tangpanich	Director of Office of Hydrology and Water Management, RID

〈日本側関係者〉

在タイ日本大使館

萩原 秀樹	一等書記官
都築 慶剛	一等書記官
新屋 千樹	二等書記官

JICA タイ事務所

中井 信也	所 長
奥邨 彰一	次 長
沖浦 文彦	所 員

プロジェクト専門家

塩田 克郎	チーフアドバイザー／システム開発
藤崎 隆志	業務調整／研修
上田 達己	水管理
小野寺 晃宏	水利組織
片山 茂	圃場施設
坂本 治彦	営農（短期専門家）
市川 雄樹	土壌肥料（短期専門家）

3. ミニッツ (合同評価報告書を含む)

MINUTES OF MEETING
BETWEEN THE JAPANESE TERMINAL EVALUATION TEAM
AND THE AUTHORITIES CONCERNED OF THE GOVERNMENT
OF THE KINGDOM OF THAILAND
ON JAPANESE TECHNICAL COOPERATION
FOR THE MODERNIZATION OF WATER MANAGEMENT SYSTEM PROJECT


The Japanese Terminal Evaluation Team (hereinafter referred to as "the Japanese Team") organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA") and headed by Mr. Ryuzo Nishimaki, visited the Kingdom of Thailand from October 26 to November 7, 2003 in order to conduct an overall review and evaluation of the Technical Cooperation for the Modernization of Water Management System (hereinafter referred to as "the Project").


For this purpose, the Japanese Team and the Thai authorities concerned formed the Joint Evaluation Team (hereinafter referred to as "the Evaluation Team"). The Evaluation Team evaluated performance and achievements of the Project through field visits, interviews, and had a series of discussions in respect of desirable measures to be taken by both Governments for the successful implementation of the Project.

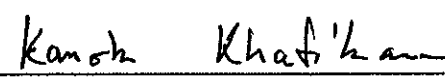
The Evaluation Team agreed on the contents of the Evaluation Report attached and reported the evaluation results at the Joint Coordinating Committee.

As a result of the discussions, the Japanese Team and the Thai authorities concerned agreed to recommend to their respective Governments the matters referred to the document attached hereto.

Bangkok, November 6, 2003


Ryuzo Nishimaki
Leader
Japanese Terminal Evaluation Team
Japan International Cooperation Agency
Japan



Samart Chokkanapitark
Director General
Royal Irrigation Department
Ministry of Agriculture and Cooperatives
The Kingdom of Thailand


Kanok Khatikarn
Deputy Director General
For Director General
Department of Agriculture Extension
Ministry of Agriculture and Cooperatives
The Kingdom of Thailand

Attached Document

Contents of Agreement

1. The Joint Evaluation Team has presented the Evaluation Report to the Joint Coordinating Committee.
2. The Joint Coordinating Committee has accepted the Report, and recognized the necessity of the Follow-up Program for 1.5 years.


S. Chakkrapitak
Kanch Khut

Attached Document

**THE TERMINAL EVALUATION REPORT
ON
THE MODERNIZATION OF WATER MANAGEMENT SYSTEM
PROJECT
IN
THE KINGDOM OF THAILAND**

Bangkok, November 6, 2003

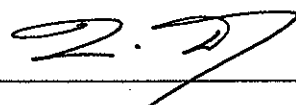


Ryuzo Nishimaki

Leader

Japanese Terminal Evaluation Team

Japan International Cooperation Agency



Boonyong Piyasirinon

Leader

Thai Terminal Evaluation Team

Royal Irrigation Department

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1. Evaluation of the Project

1-1. Objectives of Evaluation

- 1) To review the degree of achievement of Input, Output, Project Purpose, in comparison with the Original Plan described in the Project Documents, such as the Record of Discussions (R/D), Project Design Matrix (PDM) and Tentative Schedule of Implementation (TSI).
- 2) To evaluate the Project in terms of the five evaluation criteria (Relevance, Effectiveness, Efficiency, Impact and Sustainability).
- 3) To make recommendations regarding the measures to be taken for improvement of the Project, as well as to draw the lessons for the improvement in planning and implementation of similar technical cooperation projects.

1-2. Methodology of Evaluation

The evaluation study was conducted by the Joint Evaluation Team composed of the Japanese Terminal Evaluation Team and the nominated Thai officials who had not been directly involved in the Project.

- 1) The degree of achievement of the Project Plan was assessed, using the Evaluation Grid (Result and Process), which was attached in ANNEX 2.
- 2) Analysis was made for the Five Evaluation criteria described below, based on the Evaluation Grid attached in ANNEX 8.

a) Relevance

Relevance refers to the validity of the Project Purpose and the overall goal in connection with the development policy of the Kingdom of Thailand as well as the needs of beneficiaries.

b) Effectiveness

Effectiveness refers to the extent to which the expected benefits of the Project have been achieved as planned, and examines if the benefit was brought about as a result of the Project (not of external factors).

c) Efficiency

Efficiency refers to the productivity of the implementation process, examining if the input of the Project was efficiently convert into the output.

d) Impact

Impact refers to direct and indirect, positive and negative impacts caused by implementing the Project, including the extent to which the overall goal has been attained.

e) Sustainability

Sustainability refers to the extent to which the Project can be further developed by the recipient country, and the benefits generated by the Project can be sustained under the recipient country's policies, technology, systems, and financial state.

1-3. Members of the Team

1) The Japanese Team

Name	Assignment	Occupation
Ryuzo Nishimaki	Leader	Senior Researcher, Agricultural Development Department, JICA
Norio Kiyono	Water Management	Deputy Director, Oversea Land Improvement Cooperation Office, Rural Development Bureau, Ministry of Agriculture, Forestry and Fisheries
Tsutomu Fukuda	Farming	Technical Advisor, Department of Planning and Evaluation, Japan Green Resources Corporation
Yuko Kishino	PCM Evaluation	Chief Program Officer, Training and Development Group, IC Net Limited
Tatsuaki Shinohara	Planning Management	Staff, Agricultural Technical Cooperation Division, Agricultural Development Department, JICA

2) The Thai Team

Name	Job Title	Occupation
Boonyong Piyasirinon	Leader Water Management	Director of Training Division, Royal Irrigation Department (RID) , Ministry of Agriculture and Cooperatives(MOAC)
Lersak Rewtarkulpaiboon	On-Farm Facilities	Director of Irrigation Development Institute, RID, MOAC
Prapai Panit	On-Farm Facilities	Economist 7, Project Evaluation Division, RID, MOAC
Wuthichai Muangsombat	Farming	Subject Matter Specialist 7, Industrial Field Crop Group, Field Crops Division, Bureau of Agricultural Commodities Promotion and Management, Department of Agriculture and Extension, MOAC
Orathai Krisananyong	Water Users' Organization	Chief of Foreign Procurement Branch, Foreign Financed Projects Administration Division, RID, MOAC
Prawissorn Hoskul	Training	Project Analyst 7, Department of Technical and Economic Cooperation, Ministry of Foreign Affairs

2. Outline of the Project

2-1 Background of the Project

In 1996, The Government of the Kingdom of Thailand (hereafter referred to as "Thailand") made a formal request for the Technical Cooperation to the Government of Japan, which is to establish modernized water management system.

In response to this request, the Government of Japan dispatched a Preliminary Study Team in November 1997, in order to confirm the background, actual situation and problems to be improved in the field of water management and the definite contents and methodology of each activity. After the Preliminary Study, Supplement Study was conducted in July to August 1998, in order to formulate the framework of the Project. Record of Discussion (hereafter referred to as "the R/D") was signed on December 16, 1998, and the Project started on April 1, 1999. In November 1999 a Consultation Team was dispatched and the Plan of Operations (hereafter referred to as "the PO") was discussed. The PO was signed by Resident Representative of JICA Thailand Office, Director General of the Royal Irrigation Department and Director General of the Department of Agricultural Extension. In September 2001 a Mid-Term Evaluation Study was conducted which evaluated the progress of the Project based on the R/D, Project Design Matrix (hereafter referred to as "the PDM") and PO. As a result of evaluation, PDM and PO were revised and some recommendations were confirmed by Mid-Term Evaluation Team and Thai authorities concerned.

Nearly four and half years have passed since its commencement.

2-2 Summary of the Project

The Project purpose is "In dry-season's irrigation period, through effective irrigation water utilization, the planted acreage of dry-season's field crops in Model Area (18R canal area) is expanded, and crop diversification is also promoted", and as a result of discussion, the outputs of the Project are confirmed as follows.

- 1) In the Model Area, on-farm level irrigation/drainage facilities that are necessary for cultivating both rainy-season's rice and dry-season's field crops and lateral level irrigation facility for them are rehabilitated as a model, and guidelines are expanded.
- 2) Water management method using telemetering system for the Chao Phraya River Basin is designed and its pilot project is implemented; Decision Support System for the operation of main facilities in the upper east bank of the Chao Phraya Delta is developed, and as a result of it, related RID officers and farmers can compare the planned and actual data of water allocation.

- 3) Water users' groups that are in charge of the operation and maintenance of on-farm level irrigation/drainage facilities are established, trained and strengthened; furthermore, RID and water users' groups operate and maintain irrigation/drainage facilities under lateral canal level cooperatively.
- 4) Field crops and their cultivation methods that should be prompted to extend in dry-season are selected; furthermore, farming activities are accelerated through establishment and strengthening of the farmers' groups for farming and the supporting system for them.
- 5) RID, DOAE, and farmers' group leaders that are selected to disseminate the project achievements are trained through scheduled training courses and seminars by counterparts.

3. Achievement of the Project Plan

Achievement of the Project plan was examined in accordance with the Evaluation Grid (Result and Process) (ANNEX 2) prepared by the Team. The summary of the results is as follows.

3-1 Achievement of Inputs

1) Input from the Japanese Side

Dispatch of Experts

A total of ten (10) long-term experts and a total of thirty (30) short-term experts have been dispatched and one (1) more short-term expert will be dispatched by the end of the project. The list of the experts is attached in ANNEX 3.

Provision of Equipment, Machinery and Materials

A total amount of 63,170,212-yen (equivalent to 22,033,558 Baht¹) equipment, machinery and materials were provided to carry out the activities effectively as shown in ANNEX 4.

Training of Thai Personnel in Japan

A total of twenty-five (25) counterparts have visited Japan and three (3) more counterparts will visit to participate in technical training. The list of trained personnel is attached in ANNEX 5.

¹ 1 Baht= 2.867 yen (Oct. 2003)

Supplementary Funds to Cover Local Cost

The Japanese side bore a part of the Project local cost to implement the Project more effectively. The supplementary fund made by the Japanese side is shown in ANNEX 6.

2) Input from the Thai Side

Provision of Land, Buildings and Facilities

The facilities and land for the Project have been provided.

Allocation of Budget

The Thai side bore expenses for technical equipment for staff, ditch and dike construction in the 18R area, rehabilitation of the 18R lateral canal, telemetering system pilot project, farming and other miscellaneous expenses, and the disbursement of counterparts fund was adequate as shown in ANNEX 6.

Assignment of Counterparts

Thai counterparts have been assigned to the Project. The list of assigned counterparts is attached in ANNEX 7.

3-2. Achievement of Outputs

1) **Output 1:** In the Model Area, on-farm level irrigation /drainage facilities that are necessary for cultivating both rainy-season's rice and dry-season's field crops and lateral level irrigation facility for them are rehabilitated as a model, and related guidelines are expanded.

Indicators:

- By the end of September 2002, irrigation/drainage facilities for each plot at more than 200 ha paddy fields in the Model Area are constructed.
- By the end of September 2003, the irrigation facilities of 18R canal within the management section Km.6 are rehabilitated.

Ditch and Dike project with 35,384m of irrigation ditches, 5,870m of drainage ditches, and 10,670m of farm roads in total were completed at 800ha paddy fields in the Model Area. A guideline for on-farm facilities development for both rainy-season's paddy rice and dry-season's field crops was completed through the series of project activities. However, some items need further development to achieve the Project Purpose. First, construction methods of the drainage facilities for promoting dry-season's field crops in on-farm levels have not been justified yet. Second, construction costs of the U-shape ditch should be lowered to meet criteria (4,000

Baht/rai) set by the Thai government. Third, irrigation facilities for dry-season's floating rice area in the downstream of 18R lateral canal have not been tested enough to establish a construction method.

The irrigation facilities of the 18R canal were rehabilitated between management section Km.0 and Km.3.6 by September 2003. However, the end of the Project would not have completed rehabilitation between management section Km.3.6 and Km.6. The delay came from the modification of the initial rehabilitation plan after realizing possible economic costs for farmers caused from rehabilitation work. The plan might have hindered them from cultivating paddy for three consecutive years. The rest of the section is scheduled to complete by 2005, consequently, the concrete lining lateral canal is expected to increase its efficiency of irrigation water.

2) **Output 2:** Water management method using telemetering system for the Chao Phraya River Basin (CPRB) is designed and its pilot project is implemented; Decision Support System for the operation of main facilities in the upper east bank of the Chao Phraya Delta (CPD) is developed, and as a result of it, related RID offices and farmers can compare the planned and actual data of water allocation.

Indicators:

- By the end of March 2001, basic design report for telemetering system in the CPRB is completed.
- By the end of September 2003, the telemetering system of the pilot project starts operation.
- By the end of September 2003, the digitized O&M data in the upper east bank of the CPD and related hydrology data are arranged and opened daily throughout the network.

The basic design report for the telemetering system in the CPRB was completed by the end of March 2001, and RID staff acquired necessary technology for establishing system and operation. On September 17, 2003, the telemetering system of the pilot project started its operation, and this enabled RID to send data automatically and continuously between eight stations and headquarter. Also, a development of Decision Support System helped RID headquarters, Regional Irrigation Offices, and O&M project offices to share the O&M and hydrology data in order to improve accuracy of the water allocation plan. Techniques required such as database, GIS, and remote sensing have been properly transferred to counterparts. In the following stage, integration of the system between database and GIS is expected.

Through these achievements, the data is now available by Internet and in the LAN at the RID headquarters, and can be utilized to compare the plan and the actual amount of the allocated water.

All necessary techniques and information were compiled as a guideline for water management planning and operation. For all these achievements, the target of the Output 2 is achieved as expected.

- 2) **Output 3:** Water users' groups that are in charge of the operation and maintenance of on-farm level irrigation/ drainage facilities are established, trained and strengthened; furthermore, RID and water users' groups operate and maintain irrigation/drainage facilities under lateral canal level cooperatively.

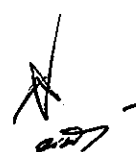
Indicators:

- By the end of September 2003, farmers establish more than 14 Water Users' Groups (WUGs) and 1 Integrated Water Users' Group (IWUG) in the Model Area, and then RID and IWUG decide the schedule of irrigation water distribution in 18R area cooperatively.
- Based on that decision, RID operates gates in 18R canal, and more than 80% of WUGs operate and maintain on-farm level irrigation/ drainage facilities.

21 Water Users' Groups were established and then grouped as one Integrated Water Users' Group by June 2001. The Project adopted the way to form tentative irrigation Water Users' Groups in the downstream by each irrigation ditch where its facilities were not developed. Afterwards, they were formed into an Integrated Water Users' Group. This was very successful in terms of allocating water equally and preventing water-use problems along the whole 18R lateral canal. These are described in two guidelines made by the Project to disseminate information to both RID staff and farmers.

Since then, IWUG has been playing an important role to transfer information and to coordinate between the Khok Kathiam O&M Project Office and each WUG in water management. The WUGs have started maintenance activities of the on-farm facilities. From April 2002 to March 2003, 28 O&M activities were held and 398 members attended in the activities.

By strengthening Water Users' Groups, the O&M Project Office is now able to make detailed water allocation plan in the lateral canal in cooperation with IWUG. Based on the plan, the O&M Project Office is operating the gates in 18R canal. Moreover, in the 2002 rainy season rotational irrigation plan at the ditch level was



made by IWUG and WUGs guided by RID. In the 2003 rainy seasons, rotational irrigation plans at both the ditch and lateral levels were made in the same manner. Yet, any rotational irrigation plan in the dry season is not made so far.

Even though WUGs and IWUG are not independent enough to implement these activities, it is noted that the Output 3 has been achieved with the fact that RID has enough capacity to manage them.

- 3) **Output 4:** Field crops and their cultivation methods that should be promoted to extend in dry-season are selected; furthermore, farming activities are accelerated through establishment and strengthening of the farmers' groups for farming and the supporting system for them.

Indicators:

- By the end of September 2003, more than 5 kinds of field crops that are promoted to extend at the Model Area in dry-season and their cultivation/irrigation methods are decided, and then the extension activities of those to more than 50 farmers in the Model Area are started.
- By the end of March 2004, farmers in the Model Area establish more than 2 farmers' groups for farming, and more than one supporting system for them is established.

As a result of tests in demonstration farms for three years, six kinds of non-paddy crops (soybean, peanut, mungbean, sweet corn, okra, and sunflower) for the dry seasons were selected. Based on the demonstration results, farmers planted mungbean and sweet corn in the targeted 35ha farmlands in total. However, it completely failed in harvest due to several unfavorable conditions, such as unseasonable heavy rain, poor drainage in a plot, heavy clay soil, and other damage. Further study on controlling stagnant water in a plot is necessary. Thus, recommended upland crops have not yet been selected, nor cultivation/irrigation techniques have been verified.

Agricultural Development Committee was established cored by RID and DOAE in September 2001, aiming to promote farming system in the Model Area. However, it is not functioning very well. It is the fact that production of field crops is very limited; therefore, a strong back-up system for marketing is not necessary at this moment. On the other hand, Agricultural Machinery Users' Group, which was established in November 2001, is functioning properly. The main roles include providing training to tractor operators, renting a tractor, and maintaining tractors.

One of the targets was to establish two farmers' groups; however, it is not urgently necessary to set up one more group in the situations that cultivation/irrigation methods for dry-season's field crops are not verified.

- 4) **Output 5:** RID, DOAE and farmers' group leaders that are selected to disseminate the project achievements are trained through scheduled training courses and seminars by counterparts.

Indicators:

- By the end of March 2004, counterparts deliver more than 15 lectures and 5 presentations to more than 100 staff of RID and DOAE, and more than 50 farmers' group leaders in according with dissemination plan, more than 90% of participants receive certificates as a result of completing the training.

By now, two training courses and one seminar were held from 2002 to 2003. Counterparts delivered 15 lectures and 4 presentations to 67 staff and 25 farmers, and contributed to disseminate the achievements of the project activities. All participants completed training or seminar satisfactory and obtained certificates. By the end of March 2004, the third training courses and the second seminar will be organized for 37 staff and 25 farmers as targeted. During a course of the preparation, contents of training and seminar were carefully examined in cooperation with four working groups and experts. All training and seminar included group discussions and presentation sessions, so that participants had opportunities to exchange opinions and share information. The series of these activities were used not only for disseminating project achievements but also ensuring counterparts' skills and knowledge.

3-3 Achievement of the Project Purpose

Project Purpose: In dry-season's irrigation period, through effective irrigation water utilization, the planted acreage of dry-season's field crops in the Model Area (18R canal area) is expanded, and crop diversification is also promoted.

Indicators:

- By the end of March 2004, non-paddy field crops are cultivated more than 35 ha during dry-season in the Model Area.
- Weekly water allocation plan at the lateral irrigation canal level is made for the Chainat-Pasak canal command area and implemented.

In the 2002/2003 dry seasons, 25 farmers planted 33.6ha of mungbean and 3.2ha of sweet corn in a large scale; however, none of these but for 0.3ha of sweet corn was successful in harvest. Since techniques and methods have not been identified, the technical transfer to counterparts has not been done yet. Hence, the Project Purpose, crop diversification in the paddy field during the dry seasons, is not achieved.

After analyzing important factors, such as drainage system, land preparation, water requirement, irrigation method, application of fertilizer, farmers will try planting mungbean and sweet corn in a much smaller scale in this dry season under the experts' supervision. Therefore, it will take extra years to justify techniques and methods for crop diversification in the Model Area.

The second target has been achieved to some extent. Weekly water allocation plan at the lateral irrigation canals along the Chainat-Pasak main canal is made by RID, together with Regional Irrigation Offices based on annual plan set by the National Water Resources Committee. However, the Project Purpose is not yet to be completely achieved because four O&M offices along the Chainat-Pasak canal command area do not implement water allocation as planned. As shown in the Table below, all O&M Project Offices used more water than planned in the dry season 2002. It also shows that O&M Project Office in upstream tends to use more water than the one in downstream. Further efforts should be made to remedy inequality in water use between upstream and downstream as well as disparity between plan and actual.

Table: Seasonal summary of water allocation in the dry season 2002

	← Upstream		Downstream →		
O&M Offices	Manorom	Chong Khae	Khok Kathiam	Roeng Rang	4 Offices
Planned (mcm)	116	148	134	114	512
Actual (mcm)	239	249	150	145	783
Ratio (%)	206	168	112	128	153

Source: Plan-prepared by Regional Irrigation Office 10 and the Project

Actual-O&M data collected with the E-mail report system

3-4 Achievement of the Overall Goal (Prospect)

In the PDM version 3, the Overall Goal, "to increase farmers' income through sustainable farming", is used as "Super Goal", which is to be attained more than 10 to 20 years after the end of the project. Then, the target attained within 3 to 5 years after the project (equivalent to "Overall Goal") in this project was set as follows:

"In the upper east bank of the Chao Phraya Delta, the planted acreage of dry-season's field crops that presupposes effective irrigation water utilization is expanded;



and crop diversification is also promoted.”

As noted in 3.3, it will take some more years to achieve the Project Purpose with additional assistance, especially for crop diversification program; obviously it requires additional years to realize the “Overall Goal” and “Super Goal” under certain conditions.

4. Results of the Evaluation with Five Criteria

Based on the survey results regarding the achievement of the Project Plan, the Project was evaluated in terms of the five criteria as follows. Details of each evaluation result can be referred to in the Evaluation Grid (five criteria) attached in ANNEX 8.

4-1 Relevance

At the time of ante-evaluation, Overall Goal, Project Purpose, and Outputs were highly relevant to the Thai government policy. In the 8th National Agricultural Development Policy (1997-2001), the government gave priorities to strengthen an international competitiveness through producing high value-added and diversified crops, and maximizing efficiency in use of natural resources. At the time of evaluation, they are still in line with the policy of the 9th National Economic and Social Development Plan (2002-2006), which states the efficient use of water, promotion of less-water used crops, and participatory development. However, situations behind the crop diversification policy, namely, a decrease in rice price, an emergence of plague, and a severe water shortage in the dry seasons, have been improved in recent years. Thus, the relevance declines somewhat in terms of the policy for crop diversification, although the future is not known.

The Project was planned to meet the needs of RID, especially in terms of modernization of water management system. The system using telemetering is promoted by the King of Thailand to resolve water shortage problems during the dry seasons and flood problems during rainy seasons. While, the needs for crop diversification of DOAE and farmers are relatively low compared to the ones for water management. The needs may increase when cultivation/irrigation methods for non-rice field crops in the Model Area are successfully established.

Relevance of the project planning is not high with regard to a selection of the Model Area, a structure of the plan, and its duration. Although the Project aims to promote crop diversification during the dry seasons, soil in the Model Area is not suitable at all for cultivating upland crops and requires lots of inputs. More detailed study should

be undertaken to justify the economic benefits from promoting dry-season's field crops in the Model Area. It cannot be denied that this makes it difficult to achieve the Project Purpose.

4-2 Effectiveness

As seen in 3-2, an achievement level of each Output is relatively high, except Output 4. However, these achievements did not lead to a realization of the Project Purpose. This was because the Project Purpose was largely dependent on degrees of the achievement of Output 4 and Output 1. Major factors to hinder the achievement of the Project Purpose were:

(1) Cultivation methods in a large-scale farmland were not identified. (related to Output 4)

Dry-season's field cropping in a demonstration farm was successful with intensive care for the first three years of the Project. However, cropping in a large scale, careful attentions in selection of crops, seeding, application of fertilization, and weeding were required. Problems may arise from a lack of study in the differences between a demonstration farm and a large-scale farm.

(2) Land preparation method and irrigation method were not appropriate. (related to Output 4)

For heavy clay soil in the Model Area, land preparation and irrigation are very important. A three-time plowing and special ridging may be required; however, farmers selected broadcasting sowing without any land preparation.

(3) Drainage system in a plot was not enough. (related to Output 1)

Because a size of one plot was large compared to the demonstration plot and it was difficult to drain excess water from drainage ditch. Current on-farm facilities developed by the Project were not enough to do so. Once there was a heavy rainfall, water would be stagnant in a plot, followed by great damage to crops.

(4) Cultivation period was not appropriate. (related to Output 4)

Recommended cultivation period in the Model Area is between December and March. However, farmers could not adjust its planting to this recommended cropping calendar.

Besides the above, an important assumption needs to be taken into consideration to assess the Project effectiveness. During the 2002/2003 dry seasons, there was unseasonable heavy rainfall in December and March. This forced farmers to change the cultivation period and omit a three-time plowing land preparation.

Meanwhile, Output 2 and Output 3 contributed to the achievement of the second indicator to a great extent. However, the Project Purpose will not be attained within the period. Though weekly water allocation plans at the lateral irrigation canal for the dry seasons were made, they were not implemented as planned. Two major problems were identified. First, current data collection and observation are not enough to increase accuracy of the water allocation plan even though new telemetering system and Decision Support System have been developed by the Project. Second, farmers do not follow the instructions by RID and demand more water than the plan. In spite of the attempts to promote farmers' participatory planning by the Project, it is the fact that it takes time to change farmers' attitude and custom in water use.

4-3 Efficiency

(1) Japanese Experts

By September 2003, a total of 10 experts (in the fields of chief adviser/system development, coordinator/training, on-farm facility development, water management, and water users' organization) as well as 17 short-term experts (30 assignments in total: Details are in ANNEX 3) were dispatched and one will be scheduled to dispatch in February 2004. For a whole period of the Project, no long-term experts in the field of farming were dispatched due to a limit in the number of long-term experts, whereas the field of farming was a main engine of the crop diversification. With this constraint, 2 short-term experts (8 assignments in total) were dispatched during only the dry seasons, instead. It is not denied that absence of the long-term experts had effects on the degree of the project achievement. Besides, despite realizing heavy clay soil in the Model Area, it was not until the fifth year of the project that a short-term expert in the field of soil and fertilizer was dispatched. If soil experts were dispatched earlier, the outcomes would be different. For other fields, the timing of dispatch was generally appropriate.

(2) Counterparts

Counterparts are assigned mainly from RID as well as DOAE, totaling to 50 at the beginning of the Project and 56 at the time of evaluation. Working Group for each field was established in order to implement activities effectively and efficiently. Commitment and devotion to the Project activities by the qualified counterparts definitely contributed to producing the Outputs. One thing to weaken the efficiency was that 21 counterparts were either transferred to other divisions or left.

(3) Training in Japan

By September 2003, 25 counterparts had been dispatched for training to Japan, and three more counterparts are scheduled to leave for training. It was very efficient to

make a linkage between a dispatch of the counterpart and a dispatch of the expert. The acquired knowledge and experiences through training in Japan were shared in seminars after returning to Thailand.

(4) Provision of Equipment

The majority of equipment was procured within the first three years of the Project. Most of them were delivered without any special problems although some equipment delayed. The quality and quantity were met for needs of counterparts owing to discussions between counterparts and experts in a selection. Moreover, the established O&M system in RID helped to maximize utilization. Thus, the project is regarded as efficient in a sense that inputs have been fully utilized at their utmost potentials.

4-4 Impact

Intended impact of the Project has not clearly emerged as described in 3.4. The Project had some positive impacts that lead to the Overall Goals. There is no negative impact identified so far.

(1) Technical Impact

The impact is observed in the upper east bank of the Chao Phraya Delta along the Chainat-Pasak main canal and other areas. U-shaped ditches introduced by the Project have been adopted in 19R lateral canal, Ban None Thammang and Irrigation Water Management Experiment Station 8 in Nakhon Sri Thammarat, being admitted its strengths of easier construction work, less maintenance, and durability. Another impact is seen in the 19R lateral canal. Water Users' Groups with the same establishment process as the Project were formed for the better management of water use and irrigation facilities.

(2) Economic and Social Impact

According to data collected from some randomly selected farmers by the O&M Office, the rainy season's paddy yield per unit increased from by 21 % to 34 % between 1997 and 2002 due to more efficient use of irrigation water. In Bang Lee, a downstream area of 18R lateral canal, dry-season's paddy yield in 2002 was 750kg per rai, compared to none of yield before the project. With increased income, some farmers in the Ditch 01-Ditch 14 diversified a source of income, such as chicken farming or fish farming. Farm roads have very positive socio-economic impacts. Farmers have now easier and quick access to their farm fields by truck, consequently, they save time and labor costs. From the social point of view, there are positive impacts on communications and interactions between farmers in upstream and downstream in the lateral canal as well as between farmers and the related government officers. Before the establishment of the

IWUG, there were few communications, but after the Project, communications and interactions become more active.

4-5 Sustainability

1) Institutional aspects

RID has enough number of and qualified staff to continue the project activities. However, once working groups are dismissed after the Project, it would be difficult to continue cooperation and coordination among concerned divisions and offices. In order to assure the sustainability of the Project activities, it is necessary to strengthen managerial capacity for administering and supervising all related organizations, and to transfer authority and responsibility to the appropriate divisions.

As the decentralization policy is promoted, the role of IWUG is getting increased. Concerning on-farm facilities, property rights will be transferred to Tambon Administrative Organization (TAO), while O&M rights will be transferred to IWUG. Under this circumstance, it is necessary for IWUG to strengthen their capacity further for sustainable development.

2) Financial aspects

It is likely that the Thai government will continue to support the project activities. RID has secured the budget of 230 million Baht for five years from the 2004 fiscal year to expand program of the telemetering system in the Chao Phraya River Basin. While, DOAE also admits that it will make every effort to keep budget for supporting crop diversification. In this year, DOAE prepared some budget to purchase hybrid seeds. However, there are so many uncertainties accompanied with the recent reform in budgeting system under the decentralization policy. As for IWUG, it collects membership and O&M fees with a high collection rate of more than 70%; therefore, it is likely to continue their activities financially.

3) Technical aspects

Through a combination of inputs such as dispatch of experts and training in Japan, counterparts have gained the basic techniques to continue their activities. The number of the staff attained basic techniques in each field is 12 in on-farm facility development, 18 in water management, 6 in water users' organization, and 12 in farming. While, the number of the staff who has enough capability to instruct others is, 5, 7, 3, and 2, respectively. However, the rest of them have potentials to be instructors after training. Further cooperation would be recommended to ensure the technical sustainability in irrigation/drainage facility development for dry-season's field crops, construction methods of irrigation ditch for floating rice area, techniques for development and O&M

of the telemetering system, capacity of rotational irrigation planning, legal system of the water users' groups.

In order to continue disseminating results of the activities, training and seminar are very effective means. Because the working group will dismiss, it is increasingly important to select an organizing division and transfer authority and responsibilities to concerned person.

5. Conclusion

The Project started responded to the necessity to improve efficiency of water use and increase competitive capacity in the agricultural sector. In this sense, the Project is highly relevant. Project members' devotions and farmers' cooperation toward the activities with generally appropriate inputs have contributed to the significant achievements in the Outputs. In spite of the fact, the Project Purpose is not expected to achieve its targets by the end of the period. It set the numerical indicators at the very high level, especially in crop diversification at the 35-ha of harvests of five field crops in unsuitable soil in the Model Area. This made it difficult to achieve the Project Purpose within five years. On the other hand, some techniques developed by the Project have already been extended and applied in other areas of the upper east bank of the Chao Phraya Delta, and also, some positive socio-economic impacts are identified in the Model Area.

Based on the evaluation results, it is concluded that it will take some more years to achieve the Project Purpose despite a certain level of effectiveness and efficiency. The remaining issues are to be resolved by enhancing the techniques transferred by the Project. Further cooperation would move forward to realize the Project intention, to sustain the development effects, and to extend them to other areas in Thailand.

The fields need further assistance are as follows. The details are described in the following section.

- 1) On-farm Facilities Development
- 2) Basin and Delta Level Water Management
- 3) Farming

6.Recommendations

As a result of the evaluation, the Team makes recommendations as follows.

- (1) Further assistance from the Japanese side
- (2) Necessary preparation by the Thai side
- (3) Necessary improvement of the present Project

- (1) Further assistance from the Japanese side

It is not easy to achieve the project purpose in some fields within 5-year project period. Therefore, further assistance from the Japanese side is needed in the fields of On-Farm Facilities, Basin and Delta Level Water Management and Farming.

It is suggested that three long-term experts for assistance to the above fields need to be dispatched, and other inputs for achieving the project purpose are expected if necessary.

It is also suggested that the project period needs to be extended 1.5 years at a maximum as a follow-up program.

The follow-up activities and inputs are;

- 1) On-Farm Facilities

For the successful cultivation of the dry-season's field crops, it is necessary to study and verify the on-farm facilities for the purpose of intensifying the drainage function.

Proper construction method for both the deep-water rice and the floating rice areas in the downstream of 18R lateral canal needs to be established. A long-term expert is expected to assist these activities and be in charge of the rotational irrigation instead of the expert of Water Users' Organization.

- 2) Basin and Delta Level Water Management

The prepared water allocation plan has been practiced but not functioned properly yet. It is necessary to approximate the plan to the actual conditions and operate the irrigation facilities as planned. For instance, a long-term expert and short-term expert (Water Balance Analysis) are expected to assist these activities, as for telemetering system, a short-term expert is expected if technical problems occur.

- 3) Farming

It is necessary to examine, determine and extend suitable cultivation/ irrigation technology for the dry-season's field crops. A long-term expert is expected to assist these activities.

- 4) Others

It is suggested that counterpart training for IWUG leaders needs to be implemented and a short-time expert needs to be dispatched for strengthening of IWUG and WUG. For extension of the Project outputs outside the model area, trainings in Thailand need to be implemented for RID, DOAE officials and farmers.

(2) Necessary preparation by the Thai side

In the view of sustainability of the Project, local costs including training in Thailand, construction and rehabilitation expense in the model area need to be born by the Thai side as much as possible. It is necessary to prepare the budgets for appropriate implementation of these activities by the Thai side.

(3) Necessary improvement of the present Project

1) Revision of PDM

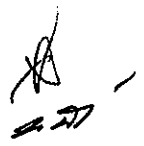
In the field of Basin and Delta Level Water Management, although the output has been already achieved, the output has not been fully linked to the project purpose. Therefore, the present output needs to be revised to link it more directly to the project purpose. The new Output2 is as follows; "The water allocation plan for the dry season is made on the consensus of RID Head Office, Regional Irrigation Office 10, O&M Project Offices and Integrated Water Users' Group, and water allocation is practiced according to the plan in the model area."

Objectively Verifiable Indicators of some outputs need to be revised properly, because some of these indicators are inadequate to evaluate the current situation and the outputs.

2) Farming

Through the cooperation of Farming, it is recognized that sustainable farming system in the dry seasons in the model area can take two approaches in general, high-input to high-return and low-input to moderate-return. Based on these approaches, the Project aims to show a model of the possible farming system in the Model Area. The trainings for farmers outside the model area are important to achieve the overall goal. Therefore, the trainings for farmers need to be strengthened.

Surveys on farming system in the Upper East Bank of Chao Phraya Delta area need to be implemented, especially cropping pattern and dry-season's field crops. The information on cropping patterns which will be reported above will be useful for promoting the crop diversification in the Chao Phraya Delta.



Final acceptance for the follow-up program would depend on budget situation, especially for the three concerned departments of the Thai side that have to go through a new process of the budgeting system of the Government of Thailand.

7. Lessons Learned from the Project

1) RID, DOAE, DTEC and Japan have established a good relationship on the basis of long-term cooperation. Since the Project has been implemented with such a background, assignment of counterparts and budget allocation by the Thai side has been carried out quite smoothly, on the basis of mutual trust between the Thai and the Japanese sides. It is very important for the JICA technical cooperation projects to have such a trustful relationship.

2) The Project has achieved a significant result in the field of Water Users' Organization. By contrast, JICA projects in other countries undertaking similar activities have suffered from disappointing results. This is because farmers are not shown the merits of participating the water users' organization. This Project has attained farmers' participation by offering them some improvement works of on-farm facilities, as well as incentives to get water stably by allocating water fairly through discussions at their meetings. This gives a model of a good linkage between inputs of hardware and software.

3) In Thailand, the economy is recovering very rapidly, and situations concerning agriculture are also changing. Under such a drastic change in society, schemes for implementing the PDM more flexibly should be taken into consideration.

Project Design Matrix (PDM: Version 3)

Project name: The Modernization of Water Management System Project

Project area: Chao Phraya river basin, especially 18R canal area in Khok-Kathiam O&M Project

Duration: April 1, 1999 - March 31, 2004

Target group: Farmers and technical staffs of RID & DOAE

ANNEX1

Date: September 5, 2001

Narratives Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<p>Overall Goal To increase farmers' income through sustainable farming</p>	<p>Farmers' agricultural income Sustainable farming system</p>	<p>Evaluation report</p>	<p>Policy to promote crop diversification is not changed.</p>
<p>Project Purpose In dry-season's irrigation period, through effective irrigation water utilization, the planted acreage of dry-season's field crops in the Model Area (18R canal area) is expanded, and crop diversification is also promoted.</p>	<p>By the end of March 2004, non-paddy field crops are cultivated more than 33 ha during dry-season in the Model Area; Weekly water allocation plan at the lateral irrigation canal level is made for the Chaint-Pasak canal command area and implemented.</p>	<p>Survey of cultivated area by field crops in dry-season; Report of water allocation planning; Actual data of water allocation at the lateral canal level</p>	<p>Outputs of the Project are diffused from the Model Area to the upper east bank of the Chao Phraya Delta.</p>
<p>Outputs</p> <ol style="list-style-type: none"> In the Model Area, on-farm level Irrigation / Drainage Facilities that are necessary for cultivating both rainy-season's rice and dry-season's field crops and Lateral Level Irrigation Facilities for them are rehabilitated as a model, and related guidelines are expanded. Water management method using telemetering system for the Chao Phraya River Basin (CPRB) is designed and its pilot project is implemented; Decision Support System for the operation of main facilities in the upper east bank of the Chao Phraya Delta (CPD) is developed, and as a result of it, related RID offices and farmers can compare the planned and actual data of water allocation. Water users' groups that are in charge of the operation and maintenance of on-farm level irrigation / drainage facilities are established, trained and strengthened; furthermore, RID and water users' groups operate and maintain irrigation / drainage facilities under lateral canal level cooperatively. Field crops and their cultivation methods that should be promoted to extend in dry-season are selected; furthermore, farming activities are accelerated through establishment and strengthening of the farmers' groups for farming and the supporting system for them. RID, DOAE and farmers' group leaders that are selected to disseminate the project achievements are trained through scheduled training courses and seminars by counterparts. 	<ol style="list-style-type: none"> By the end of September 2002, Irrigation / Drainage facilities for each plot at more than 200ha paddy fields in the Model Area are constructed; By the end of September 2003, the irrigation facilities of 18R canal within the management section Km.6 are rehabilitated. By the end of March 2001, basic design report for the telemetering system in the CPRB is completed; By the end of September 2003, the telemetering system of the pilot project starts operation; By the end of September 2003, digitized O&M data in the upper east bank of the CPD and related hydrology data are arranged and opened daily throughout the network. By the end of September 2003, farmers establish more than 14 Water Users' Groups (WUGs) and 1 Integrated Water Users' Group (IWUG) in the Model Area, and then RID and IWUG decide the schedule of irrigation water distribution in 18R area cooperatively; and based on that decision, RID operates gates in 18R canal, and more than 80% of WUGs operate and maintain on-farm level irrigation / drainage facilities. By the end of September 2003, more than 5 kinds of field crops that are promoted to extend in the Model Area in dry-season and their cultivation / irrigation methods are decided, and then the extension activities of those to more than 50 farmers in the Model Area are started; By the end of March 2004, farmers in the Model Area establish more than 2 farmers' groups for farming, and more than one supporting system for them is established. By the end of March 2004, counterparts deliver more than 15 lectures and 5 presentations to more than 100 staff of RID and DOAE, and more than 50 farmers' group leaders in according with dissemination plan, more than 90% of participants receive certificates as a result of completing the training. 	<ol style="list-style-type: none"> Record of construction and Registration book of lateral canal facilities Basic design report of the telemetering system; Condition of installed telemetering system; Data file Record of water users' groups; Survey of the activities of water users' groups; Survey of the activities of on-farm level water management Survey of cropping pattern in dry-season; Survey of irrigation method in dry-season; Survey of the activities of farmers' groups; Survey of the supporting system Evaluation of curriculum, materials and topics; Activity report 	<ul style="list-style-type: none"> Price and market of products is stable. Price of materials for farming is stable. Climate condition is stable. Farmers cultivate dry-season's field crops independently applying the decided field crops and those cultivation / irrigation methods.
<p>Activities</p> <ol style="list-style-type: none"> Improvement of on-farm development methodology of On-farm level irrigation / drainage facilities <ol style="list-style-type: none"> Making a plan of On-farm development method considering dry-season crops Verification of improved On-farm development method in the model area Study on appropriate on-farm development method in the future Improvement of development methodology of lateral level irrigation facilities <ol style="list-style-type: none"> Collecting the existing irrigation and drainage facilities data Making a rehabilitation plan of lateral canal Study on the suitable operation and maintenance methodology Improvement of irrigation and drainage planning, and facilities' operation <ol style="list-style-type: none"> Analysis of current situation, and examination for efficient water management Examination of appropriate water resources utilization Improvement of data communication system <ol style="list-style-type: none"> Basic design of data communication system for the Chao Phraya river basin Installation of telemetering system Application of RS and GIS technology Strengthening of water users' groups <ol style="list-style-type: none"> Analysis of existing water users' groups' activities Establishment of water users' groups in the Model Area Strengthening of established water users' groups in the Model Area Arrangement of the result of activities, and start of its diffusion Training for the technical staff of RID and the leaders of farmers' groups concerning the strengthening of water users' groups Improvement of water management method in on-farm level <ol style="list-style-type: none"> Study of current on-farm water management performance Examination of method to improve on-farm water management in the Model Area Guidance to the technical staff of Khok-Kathiam O&M Project for efficient water management in the Model Area Guidance to water users' groups for efficient water management in the Model Area Arrangement of the result of activities, and start of its diffusion Examination and extension of the dry-season's field crops and their suitable cultivation / irrigation technology <ol style="list-style-type: none"> Survey and analysis of present farmhouse economy and land utilization condition Survey and problem finding through detail farmers' cultivation technique in the Model Block Examination and draw up the land preparation method and dry-season's field crops introduction plan Advise and guidance for strengthening of extension activity Making guide-line for strengthening of extension activity Introduction and examination of dry-season's field crops and their cultivation technique, and their extension Examination of water requirement of each crop Draw up the irrigation water request plan Establishment and strengthening of the farmers' groups for farming and the supporting system for them <ol style="list-style-type: none"> Establishment and strengthening of the farmers' groups for farming Survey of present farmer/cultivation activity back-up system and its problem finding Organization and strengthening of the back-up system for farming cored by RID and DOAE Implementation of training for the local technical staff of RID and extension staff of DOAE <ol style="list-style-type: none"> Planning training courses, curriculum and schedule Compilation of training material Implementation of training course Evaluation and monitoring Dissemination of outputs of activities through seminars <ol style="list-style-type: none"> Planning seminar program and schedule Compilation of seminar material Implementation of seminar Evaluation and monitoring 	<p>Inputs</p> <p>Japanese side</p> <ol style="list-style-type: none"> Dispatch of experts <ul style="list-style-type: none"> Long-Term Experts <ul style="list-style-type: none"> Chief Advisor / System Development Coordinator / Training Water Management Water Users' Organization On-farm Facilities Short-Term Expert(s) <ul style="list-style-type: none"> Farming Data Communication System Planning / Design of Facilities And others when necessity arises Provision of equipment Acceptance of counterpart in Japan <p>Thai side</p> <ol style="list-style-type: none"> Land, Building and Facilities <ul style="list-style-type: none"> Main office (RID), Site office (RID Khok-Kathiam) Space necessary for the Equipment provided Office facilities Other necessary land, building and facilities Assignment of C/P and staff <ul style="list-style-type: none"> Project Director / Deputy Project Director Project Manager / Deputy Project Manager Counterpart Personnel Administrative Personnel Other supporting staff in main office and site office Necessary equipment other than provided by JICA Project cost 	<ul style="list-style-type: none"> The minimum irrigation water requirement is assured for the Model Blocks. Land for Ditch and Dike program is prepared in the Model Blocks. Collaboration is assured between RID and DOAE. C/Ps are assigned continuously and work actively. Input from both sides are timely and adequately provided. <p>Pre-conditions</p> <ul style="list-style-type: none"> Farmers accept the Project and cooperate well. 	

(Note) Overall Goal

When the MWMS Project was agreed by the R/D, there was no definition about when the Overall Goal would be attained. Therefore, the Overall Goal of the project was set up to be attained more than 10 to 20 years after the end of the project. Recently, the time span of the Overall Goal was defined by JICA that the Overall Goal should be attained within 3 to 5 years after the end of the project. Thus, the time span of the Overall Goal was consequently shortened in comparison with that at R/D. The original Overall Goal of this project should be understood as the Super Goal and new Overall Goal should be set up. However, we must respect the description of R/D. To overcome this problem, we remained the original Overall Goal that is actually equivalent to the Super Goal, and set up the Target that is actually equivalent to the Overall Goal by new definition, as follows:

Target that should be attained within 3 to 5 years after the end of the project

In the upper east bank of the Chao Phraya Delta, the planted acreage of dry-season's field crops that presupposes effective irrigation water utilization is expanded; and crop diversification is also promoted

Verifiable Indicators

After the Project finished, by the end of 2009, non-paddy field crops are newly cultivated more than 200 ha during dry-season in the upper east bank of the Chao Phraya Delta

Means of Verification

Survey of cultivated area by field crops in dry-season

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Evaluation Grid (Results and Process)
The Modernization of Water Management System Project in the Kingdom of Thailand

Items	Survey Items	Detailed Survey Items		Means of Verification	Findings		
Results	1	Achievement of the Overall Goal(1) <10 to 20 years after> "to increase farmer's income through sustainable farming"	1.1	<ul style="list-style-type: none"> Average annual farmer's income Average annual farmer's income from agriculture 	How much did average annual farmer's income increase in the Model Area from 1999 to 2003?	-Statistics -Survey on farmers' socio-economic conditions in the Model Area	The rainy-season's paddy yield per unit increased by 21-34% between 1997 and 2002. Increased amount of annual income is not known exactly due to fluctuations of rice price.
	2	Achievement of the Overall Goal (2) <3 to 5 years after>	2.1	Changes in dry season's crop pattern and irrigation method in Manorum, Chong Khae, Maharaj, and Roeng Rang O&M Project Office commanding area	Are new cultivating method, irrigation method, water management extended to the left bank area of the Chao Phraya Delta?	-Interview with C/P and farmers	U-shaped ditches are introduced in the 19R lateral canal (2km) for on-farm facilities development and other areas. As regards effective water utilization, water user's organization emerged in the 19R lateral canal. However, the dry-season's fields crops have not extended to other areas because they have no success cases.
		Achievement of the Project Purpose "In dry-season's irrigation period, through effective irrigation water utilization, the planted acreage of dry-season's field crops in the Model Area (18R canal area) is expanded, and crop diversification is also promoted.	3.1	<ul style="list-style-type: none"> The number and kind of the dry season's fields crops introduced by the end of March 2004 The planted acreage of the dry season's field crops by the end of March 2004 	Will the planted acreage of dry season's field crops in the 18R lateral canal command area be more than 35 ha by the end of March 2004?	-Interview with C/P, experts, and farmers	In 2003-2004, the planted acreage of the dry-season's fields crops will be 1.6ha (10rai) of mungbean and maximum 4.8ha (30rai) of sweet corn in Ditch 02, 04 and 06. At the moment, one farmer offers to plant mungbean and thirty farmers desire to grow sweet corn. In case that the crop calendar, land features or drainage position are not suitable for growing sweet corn, discussion will be held with the farmer, and then final acreage of sweet corn will be decided. Mungbean is expected to be harvested in the end of January and sweet corn is in the end of March. Thus, numerical target of 35ha planted acreage will not be achieved. The target of 35ha was set in the mid-term evaluation on the assumption that about 50% of Model Block Ditch 04 (51.6ha) and 03 (37.5ha) have accessibility to irrigation water, and on the assumption that 80% of farmers plant dry season's fields crops. However, it is difficult to plant dry-season's fields crops in the Ditch 03 because the drainage ditches are not developed well yet.
	3		3.2	The actual planted acreage of the dry season's field crops in the 2002-2003 dry season	What was the actual planted acreage of the field crops in the 2002-2003 dry season?	-Interview with C/P, experts, and farmers	The total planted area was 36.8 ha, consisting of 33.6ha of mungbean and 3.2 of sweet corn. The kind of the crops were decided by farmers' intention survey. Mungbean was selected because it was easy to grow, and sweet corn was chosen for its profitability.
			3.3	<ul style="list-style-type: none"> The actual harvested area of the dry season's field crops in the 2002-2003 dry season The actual yield per harvested area in the 2002-2003 dry season 	How many areas of the dry season's field crops were harvested in the 2002-2003 dry season?	-Interview with C/P, experts, and farmers	The actual harvested area of mungbean was zero and sweet corn was 0.3ha (harvested by one farmer. The actual yield is unknown.)
		Indicator 1 : By the end of March 2004, non-paddy field crops are cultivated more than 35 ha during dry-season in the Model Area.	3.4	Reasons for the disparity between plan and actual		-Interview with C/P, experts, and farmers	Main factors of the failure are as follows. 1)Weather: Rice harvest was delayed due to heavy rainfall of 50mm in December (Average amount of rainfall in December is 8mm), so farmers planted mungbean in January. Heavy rainfall of 200mm in March (Average amount of rainfall in March is 30mm) set off poor drainage. 2)Drainage: A size of plot is too big and it is 300m far from the drainage ditch. Excess water remained in the plot, and damaged sweet corn. 3)Soil: Heavy clay soil is suitable for paddy cropping, but unsuitable for field cropping. 4)Land preparation and management: It was necessary to prepare the land (plow, harrow, harrow by tractor), drain water out in accordance with the growth of crops and irrigate frequently.
			3.5	Potential of the dry season's field crops in the Model Area		-Interview with C/P, experts, and farmers	Promoting the dry-season's field crops is difficult because of the following reasons. 1) Cultivation technique is not established. 2) It is high-cost and labor-intensive to prepare the land and cultivate because the soil is not suitable for field cropping. 3) Most crops are profitless except for some high-profitable crops. 4) It is difficult to find the markets except local markets. (Products don't meet the quality standard.) 5) Farmers are inexperienced for dry-season's field cropping, and there are no example of success. Few farmers are willing to shift to field cropping.

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Results	Indicator 2 : Weekly water allocation plan at the lateral irrigation canal level is made for the Chai Nat-Pasak canal command area and implemented.	3.6	<ul style="list-style-type: none"> Weekly water allocation plan for 5 O&M Project Offices along the Chai Nat-Pasak Main Irrigation Canal (1999-2003) The actual water allocation for each O&M Project Office (1999-2003) 	<p>Was a weekly water allocation at the 18R lateral irrigation canal level planned?</p> <p>Was the water allocation executed as planned?</p>	-Interview with RID, O&M Project Office and experts	There are two options. First option is to plow into furrows three times then keep a crop from drying out by using rice straw mulch. Second option is to choose a crop which is easy to plant such as beans. Dig trenches by hands and make broad bed, and then fourth, to sow by broadcasting method. The former method is costly, so high-profitability crop such as sweet corn should be chosen. The latter is a low-cost method. Mungbean which can use as a green manure for the next period of rice cropping is suitable for this method. With these options, farmers may make the final choice by themselves.	
			3.7	Reasons for the disparity between plan and actual	-Interview with RID, O&M Project Office and experts	Farmers use water before the irrigation plan or request water distribution much more than planned amount set by IWUG and O&M Project Offices. The actual water distribution always exceed the plan because O&M Project Offices pass the request to RIO and RID without modification. Although both RIO and O&M Project Office take a part in leading farmers to comply with the plan, they are not able to do so. In order to cope with this situation, 5-6 O&M Project Offices have built Irrigation Committee Organizations which promote a proper request of water distribution or the compliance with the plan by providing explanations or consultations to the farmers.	
			4.1	The actual area of paddy fields where irrigation ditches, drainage ditches, and farm roads have been constructed	Have more than 200 ha of the farms in the Model Area been developed and equipped with irrigation and drainage ditches for both dry season's field crops and rainy season's paddy?	-Interview with RID, O&M Project Office, and farmers	Ditch and Dyke construction project with irrigation ditches (35,384), drainage ditches (5,870m) and farm roads (10,670m) have been done in 300ha of Ditch 01-13. The main developed area is in the Model Block (02, 04, 06), the right bank of the upper 18R. In other area, drainage ditches and farm roads are not constructed intensively.
	4	Indicator 1 : By the end of September 2002, Irrigation/Drainage facilities for each plot at more than 200 ha paddy fields in the Model Area are constructed.	4.2	Progress of On-farm facilities development	Provide records and layout of engineering works.	Record of engineering works and maps	(Obtained the map of On-farm facilities development)
			4.3	Reasons for the disparity between plan and actual	-Interview with experts	The Project aimed to develop the on-farm facilities in the upper stream of the 18R. The total area is around 800 ha. At the beginning, it target only 200 ha of the total area.	
			4.4	Relevance of the plan of On-farm facilities and its development methodology (Applicability to other areas as a model)	Were design, methodology, and target (200ha) appropriate?	-Interview with experts	Irrigation area of 18R lateral canal is 2,560ha in total. The downstream area is the fields for deep-water rice and floating rice, and not suitable for upland cropping. For this reason, the upstream was targeted for upland cropping and on-farm facilities were developed in the most part of the region (300ha). However, because of heavy clay soil, the on-farm facilities is not capable of drainage for upland cropping in dry seasons. Further development of facilities may be needed. As the on-farm facilities for rice cropping in rainy and dry seasons, it can be applied to other regions. Although U-shaped ditch is expensive compared to the existing trapezoidal-shape concrete-lining ditch, RID promotes U-shaped ditch as it has a number of advantages. For instance, it requires less land; the construction is not affected by weather, etc. 2km U-shaped ditch has already been constructed in the 19R lateral canal and it started demonstration. Ultimately, plans for construction will be formulated so as to meet requirements of all farmers in the irrigation area.
			4.5	Alignment, capacity, and density of On-farm facilities where there are drainage problems	Is the present drainage system enough for the dry season's field crops?	-Interview with experts	It is necessary to review and reconsider type of farming, scale of the plot, distance to a drainage ditch, and land features in order to make the dry season's field cropping a success. Cultivation/irrigation methods will be modified after the result of the harvest in 2003/2004.

Results	4		4.6	<ul style="list-style-type: none"> Scale of On-farm facilities Access to a drainage ditch from a plot Land leveling preciseness Soil Understandings of farmers about importance of the drainage in plot level 	Are there any other problems but density of the drainage ditches and the method of drainage?	-Interview with C/P and experts	Water management in the Model Area is important, and is very difficult because of heavy clay soil.
			4.7	Technical transfer to farmers by C/P	Have necessary skills been transferred to farmers by C/P?	-Interview with C/P, experts, and farmers	Practical instructions and study tour have been conducted three times about the usage of a tractor, cultivation by tractor and planting method of dry season's field crop.
			4.8	Evaluation on facilities and On-farm development method by farmers	How did farmers evaluate on the development plan and its method? (Do they think that the facility development is a burden for them?)	-Interview with farmers	Farmers highly appreciate on-farm facilities development. They are very satisfied with the actual condition on the premise that they cultivate rice. If more drainage ditches are required for upland cropping, they are not willing to incur costs unless they assure that economic benefits exceed the investment. RID will explain to farmers about importance of developing ditches and farm road, and plans for construction will be formulated to meet requirements of farmers.
			4.9	<ul style="list-style-type: none"> Technical measures Possibility of measures to take Necessary input 	What are technical measures to be taken to resolve the existing problems?	-Interview with C/P and experts	In the upstream of the Model Area, reconsideration of drainage facilities is necessary after the results of the harvest in 2003/2004. (It is also necessary to confirm the period which is required to establish a development method). In the downstream, construction method will be established in the deep-water rice and floating rice areas during the dry season of 2004 based on the test results. It is necessary to test overhead flooding inundation twice at least in order to establish the development methods.
			4.10	Applicability and versatility of the Guideline prepared by the Project	Is the Guideline prepared by the Project applicable and versatile to other areas? Are C/Ps able to operate and maintain them by themselves?	-Interview with C/P and experts	Guideline for on-farm facilities development is highly versatile to other areas. But it should be modified according to the land feature or soil of the area. Contents of guideline are introduced to the staff in Ditch and Dike Section of R/Os and O&M Project Offices through a training or seminars held by C/P. O&M Project Offices provide a training directly to farmers on the occasion of IWUG monthly meeting or a briefing session.
			4.11	<ul style="list-style-type: none"> Necessary skills Progress of the technical transfer to C/P by experts 	Were design and construction methods about on-farm facility development for the dry season's field crops transferred to Thai side?	-Interview with C/P and experts	Design and construction methods about irrigation ditches, drainage ditches and farm roads were transferred to Thai side and they are able to operate by themselves. However, construction methods of developing drainage ditches for the dry season's field crops and irrigation ditches for deep-water rice and floating rice areas are not transferred yet.
			4.12	Present technical level of C/P	Is the present technical level of C/P good enough to operate and maintain them?	-Interview with C/P and experts	C/P has technical knowledge on construction of the U-shaped ditches and on-farm facilities development and their technical levels are enough to conduct a training by themselves.
			4.13	Progress of the rehabilitation of the 18R lateral canal (area and length)	Has the rehabilitation of the 18R lateral canal (km.0 to km.6) been completed?	-Interview with C/P and experts	The rehabilitation sections completed by the end of September 2003 is between km.0 and km.3.6. The section from 3.6 to 6.770km will be completed by 2004. 6km of 18R lateral canal is located in the upper region and it is possible to plant the dry season's field crops if irrigation ditches are developed. Thus, the rehabilitation of lateral canals in the downstream region is not conducted during the project period.

Results	4	Indicator 2: By the end of September, 2003, the irrigation facilities of 18R canal within the management section Km. 6 are rehabilitated.	4.14	Reasons for the disparity between plan and actual		-Interview with C/P and experts	Development of irrigation ditches and other facilities was conducted in the Model Block (Ditch04 and 06) during dry seasons of 1999-2000 and 2000-2001. At first, the rehabilitation of 18R lateral canal were scheduled to start in a 2002 dry season. If the rehabilitation had been conducted as scheduled, farmers in those areas could not cultivate rice in dry seasons for three years, and they would suffer a financial blow. Thus, only the check gate of km 2 was repaired in the first year and the rehabilitation of lateral canal was started one year later.		
			4.15	Cropping area and cropping pattern in Ditch 04 and 06 during dry seasons(2000/01, 2001/02, 2002/03)	Did the plan consider the rehabilitation works would hinder farmers from cropping during a 2000/01 dry season?		-Interview with C/P and experts	Economic costs caused by hindering farmers from cropping during dry seasons for three years were not considered at the planning stage.	
			4.16	Relevance and verification of On-farm facilities development method	Were the plan, level and method of the development appropriate for dry season's field crops in the Model Area?		-Interview with C/P and experts	As mentioned above, it was not considered at the planning stage that the rehabilitation would affect the dry season's rice cropping. The level and method of the development were appropriate.	
	5	Achievement of Output 2 (Water Management and System Development)		5.1	Design of the telemetering system	Has a basic design of the telemetering system in the CPRB been completed?		-Interview with C/P and experts	A basic design of the telemetering system in the CPRB has been completed by the end of March 2001.
				5.2	Progress of the telemetering system development project co-financed by ADB and JBIC	How is a progress of the telemetering system development project co-financed by ADB and JBIC ?		-Interview with C/P and experts	No information on the telemetering system development project co-financed by ADB and JBIC was available..
				5.3	Indicator 1 : By the end of March 2001, basic design report for the telemetering system in the Chao Phraya River Basin (CPRB) is completed.	Progress of the technical transfer to C/P by experts	Have the skills and knowledge necessary to design, operate, and maintain the telemetering system been transferred to C/P properly?		-Interview with C/P and experts
			Are C/Ps able to establish the telemetering system in the CPRB by themselves?				-Interview with C/P and experts	RID secures a budget to establish the telemetering system in the CPRB under a five-year plan in 2004.	
			Indicator 2: By the end of September 2003, the telemetering system of the pilot project starts operation.	5.4	Present situation of the pilot project	Is a pilot project of the telemetering system in-service ?		-Interview with C/P and experts	Head office and 8 bureaus in the Chao Phraya Delta Basin will send data automatically and continuously by wireless connections under the pilot project. There was no technical problem but delay in services was caused by the delay in procurement.
			5.5	Present situation in releasing O&M of water use data and hydrology data by the Decision Supporting System (DSS)	Are digitized O&M data in the upper east bank of the CPD and related hydrology data opened daily throughout the network?		-Interview with C/P and experts	By the Decision Support System, the O&M data and hydrology data in the Model Area are input at O&M Project Office. O&M Project Office sends the data to RID by e-mail. After RID inputs the data into database, it is opened throughout the network. According to experts, the skills and knowledge on GIS and remote sensing have been transferred to C/P. Integrated system by combining database and GIS layers/Remote sensing is recommended. It seems to be possible for C/P to develop the system by themselves if they have technical supports by Thai IT experts.	

Results	5	Indicator 3: By the end of September 2003, digitized O&M data in the upper east bank of the CPD and related hydrology data are arranged and opened daily				<p>Water discharge, supply and demand are not precisely analyzed due to the insufficient data to formulate a water allocation plan. Additional observation sites are required in order to survey side flow in the left bank of CPD. The on-site data in the CPD is insufficient. For the purpose of expanding the database system across the country, it is considered to establish Database Improvement Working Group and to take measures to improve water management system.</p> <p>C/P said that the existing analysis model (AISP) is too complicated to use. They desire to simplify AISP before they introduce the monitoring system for irrigation efficiency of each O&M Project Office within two years. But they have technical difficulties in simplifying the model by themselves. It is necessary to improve the accuracy of a water allocation plan by developing data collection and analysis. In addition, framework which enables farmers to follow the plan should be established.</p>	
			5.6	Explanation method to farmers about water allocation plan	Has the mechanism of farmers' obtaining water allocation data (planned and actual) been established?	-Interview with C/P and experts	There is no mechanism that enables farmers to compare the actual amount of water to the planned one. However, it is possible for farmers to check the actual amount personally through a chief of WUG. All chiefs of Water Users' Group (WUG) monitor the usage of water at both the ditch levels and lateral level.
			5.7	Sustainability of the telemetering system	Are C/Ps able to operate and maintain its system by themselves?	-Interview with C/P and experts	Experts say that C/Ps are capable of managing and maintaining the Decision Supporting System by themselves. On the other hand, it is difficult for C/Ps to maintain the telemetering system on their own because they are lack of experiences. Support for maintenance skills in the telemetering system is needed.
			5.8	Farmers' participation in a water allocation planning	How are farmers involved in a water allocation planning process?	-Interview with RID, O&M Project Office, and experts	Each O&M Project Office formulates a plan together with Integrated Water Users' Group (IWUG) based on the plan at the lateral level prepared by RID head office and RIOs. Irrigation plan at the ditch level is posted on the notice board.
			5.9	Applicability and versatility of the Guideline prepared by the Project	Is the Guideline prepared by the Project applicable and versatile to other areas? Are C/Ps able to operate and maintain them by themselves?	-Interview with C/P and experts	The techniques, skills and knowledge have been transferred to only one C/P. At least 3 or 4 persons are required.
			5.10	• Necessary skills • Progress of the technical transfer to C/P by experts	Have necessary skills and knowledge been transferred to C/P?	-Interview with C/P and experts	The skills and knowledge necessary to design, operate, and maintain the pilot project for the telemetering system have been transferred to C/P properly. Also, required techniques are transferred, that are, GIS layer development, methods to analyze area of paddy-fields and water-laden paddy based on satellite images, and Remote sensing itself.
			5.11	Present technical level of C/P	Is the present technical level of C/P good enough to operate and maintain them?	-Interview with C/P and experts	The technical level of C/P is not good enough to maintain the telemetering system and rewrite AISP in order to analyze a volume of irrigation water.

Results	6	Achievement of Output 3 (Water Users' Group)	6.1	<ul style="list-style-type: none"> Activities of the IWUG Activities of each WUG 	Have more than 14 WUGs and 1 IWUG been established?	-Interview with C/P, experts, and IWUG	Twenty-one WUGs and one IWUG was established in June 2001.	
		6.2	Reasons for the disparity between plan and actual			-Interview with C/P, experts, and IWUG	Firstly, it was planned to establish 14 WUGs in the upstream region. Actually, WUGs were established in the downstream along the whole 18R lateral canal. In Thailand, WUG is usually established after the on-farm facilities development has been finished. In this project, WUG was established tentatively, where the facilities had not been developed yet, in order to form IWUG at an early stage. This method aims to focus on water allocation of the whole lateral canal, holding a meeting to discuss about water allocation for the more efficient and equal water allocation.	
		6.3	Applicability and versatility of the Guideline prepared by the Project	Is the Guideline prepared by the Project applicable and versatile to other areas? Are C/Ps able to operate and maintain them by themselves?		-Interview with C/P and experts	It was a new attempt to have an auditor and an advisory committee in IWUG. The Guideline prepared by the Project is applicable and versatile to other areas.	
		6.4	<ul style="list-style-type: none"> Necessary skills Progress of the technical transfer to C/P by experts 	Have necessary skills and knowledge been transferred to C/P?		-Interview with C/P and experts	The skills necessary to establish/strengthen water users' groups, to measure water level, to formulate a rotational irrigation plan, to maintain facilities and manage finance/accounting have been transferred to 4 C/Ps. Registration procedures for water users' groups in obedience to the law (Land Improvement Law of Japan) is not transferred.	
		6.5	Present technical level of C/P	Is the present technical level of C/P good enough to operate and maintain them?		-Interview with C/P and experts	The present technical level of C/P is good enough to operate and maintain them.	
	More than 80% of WUGs operate and maintain On-farm level irrigation/drainage facilities.	6.6	Indicator 2: RID and IWUG decide the schedule of irrigation water distribution in 18R area cooperatively. Based on that decision, RID operates gates in 18R canal.	Process of the irrigation water allocation plan in the 18R lateral canal	Do RID and IWUG cooperate each other in planning water allocation in the 18R lateral canal?		-Interview with C/P, experts, and IWUG	IWUG compiles water demand from each WUG and formulates a water allocation plan of 18R lateral canal with IWUG. However, IWUG is not capable of making the plan independently.
		6.7	Planned and actual rotational irrigation during a rainy season	Was a rotational irrigation plan during a rainy season made?			-Interview with C/P, experts, and IWUG	The rotational irrigation plan at the irrigation ditches level during a 2002 rainy season was made from a plan designed by O&M Project Office through the coordination with IWUG. Also, in the 2003 rainy seasons, rotational irrigation plans at both the ditch and lateral levels were also made. Each WUG is supposed to make a rotational irrigation plan at the ditch level independently. But a technical training for that has not been completed yet.
		6.8	Planned and actual rotational irrigation during a dry season	Was a rotational irrigation plan during a dry season made?			-Interview with C/P, experts, and IWUG	The rotational irrigation plan at the ditch level during a 2003 dry season will be made soon.
		6.9	Reasons for the disparity between plan and actual				-Interview with C/P, experts, and IWUG	The rotational irrigation plan at the ditch level during a 2002 dry season was not compiled because the rehabilitation of lateral canal was implemented at the same period.
		6.10	What are actions to be taken?				-Interview with C/P, experts, and IWUG	As mentioned above, the rotational irrigation plan at the ditch level during a 2003 dry season will be compiled between O&M Project Office and IWUG. IWUG has not been strengthened enough to formulate the plan independently.
		6.11	Situation of the gate operation at the irrigation ditches	Are they operated as planned?			-Interview with O&M Project Office, experts, and IWUG	Farmers don't follow the plan made by RID, start irrigate before the plan and request water much more than plan made by IWUG and O&M Project Offices. In some cases, there are misunderstandings between farmers and the head of WUG.
		6.12	Operation and maintenance of irrigation and drainage ditches by 21 WUGs	Are more than 80% of WUG members participated in O&M activities?			-Interview with O&M Project Office, experts, and IWUG	13 of 14 WUGs (about 93%) had O&M activities on-farm facilities during April 2002- March 2003. However, some members do not participate in a O&M activity due to poor communication between IWUG and WUG members.
				How many times O&M activities of on-farm facilities are conducted by WUGs?			-Interview with O&M Project Office, experts, and IWUG	O&M activities had been conducted 28 times during April 2002- March 2003. 398 members participated in total.
6.13	Participation rate of the WUG members to O&M activities	What is a participation rate of the WUG members in the O&M activities?			-Interview with O&M Project Office, experts, and IWUG	The number of the WUG members participated in the O&M activities were 241. The participation rate was 77.7%. Compared with other areas, the rate is high.		

Results	6		6.14	Funds for Water User's Group's activities	Are they able to collect funds to maintain their activities?	-Interview with O&M Project Office, experts, and IWUG	According to IWUG and C/P, they are able to cover the cost necessary to maintain their activities.
			6.15	Collection rate of the union fees in each WUG	What is a collection rate of the union fee (5 bahts/rai/year)?	-Interview with O&M Project Office, experts, and IWUG	A collection rate of the O&M fee in January 2002 was 63.75% (except for Ditch 11 and 12). The rate is relatively high, however, farmers who are in charge of collecting the fee change frequently, so that it spends more time to collect fee.
			6.16	Management of the union fees	Are the union fees properly managed?	-Interview with O&M Project Office, experts, and IWUG	The collected fees are saved in the bank and the record of expenditures are kept adequately.
			6.17	O&M of the agricultural machinery	Is the agricultural machinery properly operated and maintained?	-Interview with O&M Project Office, experts, and IWUG	Tractors are maintained properly.
			6.18	Sustainability of the WUGs	What are actions to be taken to sustain the WUGs?	-Interview with O&M Project Office, experts, and IWUG	They are not capable of establishing the rotational irrigation plan independently. According to decentralization policy, the property right of the on-farm facilities is transferred from RID to Tambon Administrative Organization (OBT) and the maintenance right is delegated to IWUG. Farmer participation in water use is promoted. Based on this, OBT and 20% of farmers incur costs in the construction and maintenance of the on-farm facilities. Reflecting the fact that water users' organization is not certified as a public entity, consolidation of the legal system is needed.
			6.19	Applicability and versatility of the Guidelines prepared by the Project	Is the Guideline prepared by the Project applicable and versatile to other areas? Are C/Ps able to operate and maintain them by themselves?	-Interview with C/P and experts	The guideline is applicable and versatile to other areas. The project attempts are introduced to 10 O&M Project Offices so far.
			6.20	• Necessary skills • Progress of the technical transfer to the technical staff of RID and leaders of farmer's group by experts	Have necessary skills and knowledge been transferred to C/P and leaders of farmers?	-Interview with C/P and experts	The basic skills necessary to strengthen a water users' organization, to measure water level, and to formulate a rotational irrigation plan have been transferred. But Land Improvement Law of Japan is not sufficiently introduced.
			6.21	Present technical level of C/P	Is the present technical level of C/P and leaders of farmers good enough to operate and maintain them?	-Interview with C/P and experts	The present technical level of 3 C/Ps is good enough to operate and maintain them.

Results	7	Achievement of Output 4 (Farming)	7.1	<ul style="list-style-type: none"> The number and kind of recommended dry season's field crops Examination results 	<p>How many dry season's field crops are selected?</p> <p>What are the criteria for selection?</p>	<p>-Interview with DOAE and experts</p> <p>-Interview with DOAE and experts</p>	<p>Although soybean, peanut, mungbean, baby corn, sweet corn, okra, sunflower and sesame are selected as the dry season's field crops in the test field, the crops in a large scale have not been selected yet.</p> <p>The criteria for selection are: crop calendar, method of cultivation, profitability, and price stability. (It should be confirmed)</p>
		Indicator 1 : By the end of September 2003, more than 5 kinds of field crops that are promoted to extend at the Model Area in dry-season and their cultivation/irrigation method are decided.	7.2	Irrigation technique for each dry season's field crop and its guideline	<p>Has the irrigation technique for each crop been determined?</p> <p>Is the Guideline prepared?</p>	-Interview with DOAE and experts	The irrigation and cultivation techniques have not been determined. Guideline should be based on the harvest of the dry season's field crops. Therefore, it will be compiled after a 2004 dry season.
		7.3	Cultivation technique for each dry season's field crop and its guideline	<p>Has the cultivation technique for each crop been determined?</p> <p>Is the Guideline prepared?</p>	-Interview with DOAE and experts		
		7.4	Field crops which technical transfer of the irrigation and cultivation method have already been completed	What are crops whose irrigation and cultivation technique had already been transferred to C/P and farmers?	-Interview with DOAE and experts	The dry season's field crops had been planted in the demonstration farm for the first three years. In the fourth year, it was expanded to a large scale and failed in harvest as mentioned above. For the moment, cultivation techniques to be transferred have not been established.	
		7.5	<ul style="list-style-type: none"> Preparation method for cropping by agricultural machinery in heavy clay soil and Present situation 	Are there any problems of cropping in heavy clay soil using agricultural machinery?	-Interview with DOAE and experts	It was a successful to plow for three times by tractor, to make special ridging and seed. But it is not demonstrated at the on-farm level.	
		7.6	Field crops whose cultivation method and irrigation method have already established in On-farm level	What are field crops whose cultivation and irrigation methods in On-farm level have been determined?	-Interview with DOAE and experts	There are some achievements in the demonstration fields with added fertile soil, but any field crops have not been determined at the on-farm level. For the future, the dry season's field crops will not be planted in the floating rice (deep-water rice) area and it will be planted in which proper irrigation facilities are built.	
		7.7	<ul style="list-style-type: none"> Necessary activities and inputs to test and determine techniques for dry season's field crops in the Model Area Expected profit of the field crops in a dry season 	<ul style="list-style-type: none"> What are activities and inputs necessary to determine cultivation technique, On-farm preparation method, water requirement, and irrigation technique for each dry season's field crop in the Model Area? What are expected profits of each field crop? 	-Interview with DOAE and experts	These items should be analyzed after cropping and harvest of mungbean and sweet corn in a 2003 dry season.	
		7.8	Applicability and versatility of the Guideline prepared by the Project	<p>Has the Guideline been completed?</p> <p>Is the Guideline prepared by the Project applicable and versatile to other areas?</p> <p>Are C/Ps able to operate and maintain them by themselves?</p>	-Interview with DOAE and experts	There is a draft of manual at the demonstration farm, but the guideline has not been completed yet.	

Results	7	Indicator 2: The extension activities of those to more than 50 farmers in the Model Area started. Indicator 3: By the end of March 2004, farmers in the Model Area establish more than 2 farmers' groups for farming and more than one supporting system for them is established?	7.9	<ul style="list-style-type: none"> Necessary skills Progress of the technical transfer to C/P and farmers by experts 	Have necessary skills and knowledge been transferred to C/P and farmers?	-Interview with DOAE and experts	The basic methods of three-time plowing (plowing, harrowing, and harrowing by tractor), ridging, irrigating and blocking vermin have been transferred. Training for tractor operators has been provided over 250 hours. However, the skills and knowledge on cultivation technique, farm preparation, irrigation requirement and overhead flooding inundation technique have not been transferred because the recommended dry season's field crops are not determined yet.
			7.10	Present technical level of C/P and farmers	Is the present technical level of C/P and farmers good enough to use them?	-Interview with DOAE and experts	The technical level of C/Ps and farmers is not enough.
			7.11	The number of farmers which adopt new cultivation and irrigation techniques	Did more than 50 farmers adopt the new techniques and methods in the Model Area?	-Interview with DOAE and experts	Only 25 farmers planted mungbean and sweet corn in a 2002 dry season. In a 2003 dry season, 20-30* of 36 farmers in Dich04 and 06 will plant sweet corn and one farmer will grow mungbean. The actual number of farmers will be determined in around November. *The number comes from experts. IWUG estimates 10.
			7.12	<ul style="list-style-type: none"> Progress of the establishment of farmers' groups for farming and supporting system Progress of the activities 		-Interview with DOAE and experts	RID and DOAE played a central role in establishing the Agricultural Development Committee (September 2001) and Agricultural Machinery Users' Group (November 2001) for supporting farming in the Model Area. DOAE intends to establish Agricultural Production Group as a farmers' groups for farming.
			7.13	Reasons for the disparity between plan and actual		-Interview with DOAE and experts	Second farmer's group for farming should be set up after cultivation techniques, land preparation method, and irrigation techniques have been established.
			7.14	Progress of the activities and outputs of Agricultural Machinery Cooperative Use Group and Agricultural Development Committee		-Interview with DOAE and experts	Agricultural Machinery Users' Group leases tractors by the parcel, do maintenance and provide a training. In this year they had 243,000 baht income and 229,000 baht expenditure. Balance is 13,541 baht. Plowing cost depends on the job but usually it costs 250 baht per rai for mungbean and 550 baht for sweet corn. Agricultural Development Committee provides manure, seed and feed crop.
			7.15	Reasons for the disparity between plan and actual		-Interview with DOAE and experts	Organization for marketing is not necessary because the harvest of dry season's field crops is limited. For the moment, the market is small enough for local people; therefore, farmers are able to handle it by themselves. DOAE staff fixed things up with Talat-Tai in Pathumthani, and there is no problem in the local market. Seed, manure and a training is sufficiently provided by DOAE. RID gives enough supports for irrigation and drainage.
			7.16	Preparation method for cropping by agricultural machinery in heavy clay soil	Have the geophysical improvements of the heavy clay soil been analyzed?	-Interview with DOAE and experts	Now experts are examining the methods for geophysical improvements of the heavy clay soil in the Model Area. Soil in the Model Area is called "Vertisol" and its viscosity is 80%. Vertisol spreads 32% of whole Chao Phraya Delta and it is suitable for rice cropping because it has plenty of nutrients such as calcium and magnesium. However, it is unsuitable for upland cropping because it becomes same condition as clay when it gets wet, conversely, it becomes like a stone in drying. The method of improvement should be considered by conducting upland cropping in a 2003 dry season. It takes at least 2 dry seasons in 2003/2004 to establish the method of improvement. After that, six months will be required as a period of dealing with problems.
					What are measures to be taken to solve the stagnant water problem in a plot?		There are two possible solutions. One is to select a farm located in upland and near to the drainage ditches. The other is to make more than 3 gutters by hand and it would help water drainage.
			7.17	Applicability and versatility of the Guideline prepared by the Project	Is the Guideline prepared by the Project applicable and versatile to other areas? Are C/Ps able to operate and maintain them by themselves?	-Interview with DOAE and experts	It has not transferred yet.
Results	7		7.18	<ul style="list-style-type: none"> Necessary techniques and skills Progress of the technical transfer to C/P and farmers by experts 	Have necessary techniques and skills been transferred to C/P and farmers?		It is uncertain.
			7.19	Present technical level of C/P and farmers	Is the present technical level of C/P and farmers good enough to use them?	-Interview with DOAE and experts	Technical transfer has not been done yet.

8	Achievement of Output 5 (Training)	8.1	Plan of training and seminar by March 2004	Will the training plan (more than 15 lectures and 5 presentations by March 2004) be executed as planned?	-Interview with experts and instructors	15 lectures for 2 training courses (in June 2002 and March 2003) and 4 presentations for 1 seminar (in December 2002) have been conducted by now. The third training is scheduled in November-December 2003 and the second seminar will be held in January 2004. The number of C/P who is able to be a lecturer is 7 of 18 (39%) in the water management, 5 of 12 (42%) in the on-farm facilities development, 3 of 6 (50%) in water users' organization, and 2 of 12 (17%) in farming.
	Indicator 1: By the end of March 2004, counterparts deliver more than 15 lectures and 5 presentations to more than 100 staff of RID and DOAE, and more than 50 farmers' group leaders in according with dissemination plan.	8.2	• Contents of training and seminar • The number of training and seminar held by today		-Interview with experts and instructors	
		8.3	Reasons for the disparity between plan and actual		-Interview with experts and C/P	There was no delay in the training schedule.
	Indicator 2: More than 90% of participants receive certificates as a result of completing the training.	8.4	Required course of the training Required duration and number held of the training		-Interview with experts	Required courses of the training are water management of the farm, farming, water management at river basin or delta level, on-farm facilities development and capacity building for water users' organizations. C/P says it is sufficient to conduct a training once a year.
		8.5	• Evaluation result of the trainings • Evaluation result of the seminar	What were levels of understandings and satisfactions of the participants?	-Interview with experts and instructors	According to the results of the questionnaire, levels of understandings and satisfactions of the participants were high in both 2 training courses. More than 80% participants were highly appreciated. The seminar was also highly evaluated by the participants. The training and seminar were fairly successful.
		8.6	• Curriculum • Text and materials for each course • Guidelines for each course	Have curriculum, text, material, and guideline for each course been prepared?	-Interview with experts and instructors	Curriculum is prepared by the WGs and experts of each field including the training WG. In the first training, C/P compiled a tentative text for each courses based on the results of activities under the supervision of experts. Considering the improvements of the first training, they examined and revised the text for the second training. As a result, three guidelines (water management, on-farm facilities development and water utilization organization: except for farming) were approved at the Joint Coordinating Committee in September 2003.
		8.7	• The number of participants to the training by March 2004 • The number of participants to the seminars by March 2004	Will the number of participants to training and seminar by March 2004 reach more than 100 and 50, respectively?	-Interview with experts and instructors	67 persons have attended to the trainings and 25 have participated in the seminar. In the future, the training will have 37 participants and the seminar will have 25. The targeted number seems to be achieved.
		8.8	• Actual number of participants to the training • Actual number of participants to the seminar	What are the actual numbers of participants?	-Interview with experts and instructors	
		8.9	• Required number of the staff and farmers which need technical transfer • Proportion of the planned number to the required number	Were the targets appropriate?	-Interview with experts and instructors	Training will be provided to the Water Masters and staff of the O&M division at O&M Project Offices which are under control of RIO 10, 11 and 12. Considering the effects of training, the number of participants per training should be limited. The planned number is appropriate.
		8.10	The number of certificates which were given	Did more than 90% of participants obtain certificates?	-Interview with experts and instructors	100% of participants has obtained the certificate. A three-day training requires 80% of attendance to issue a certificate while all participants of the seminar can receive the certificate.

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Results	9	Inputs (Comparison between plan and actual)	9.1	Experts (number, M/M, period, field)	Documents for terminal evaluation appendix 1	10 long-term experts (295M/M) 30 short-term experts (31short-term experts by the end of the Project)
			9.2	Equipment (name, price, operation, maintenance)	Documents for terminal evaluation appendix 4 -Interview with C/P and experts -Visit	Refer to ANNEX 4
			9.3	C/P training (number, field, practice)	Documents for terminal evaluation appendix 2 -Interview with C/P and experts	Refer to ANNEX 5
			9.4	Assigned C/Ps to the Project	Documents for terminal evaluation appendix 3	On-farm facilities: 17 in total / 13 in actuality (8 continue, 5 new, 2 transferred, 2 resign) Water management: 24 in total / 19 in actuality (11 continue, 8 new, 4 transferred, 1 resign) Water utilization organization: 7 in total / 6 in actuality (4 continue, 2 new, 1 study abroad) Farming: 17 in total / 11 in actuality (5 continue, 6 new, 6 transferred) Training: 14 in total / 7 in actuality (3 continue, 4 new, 7 transferred)
			9.5	Changes in the number of permanent and temporary C/Ps (1999-2003)	Documents for terminal evaluation -Interview with C/P and experts	Refer to ANNEX 7 At the beginning, there were 50 staff in total. At the time of evaluation, a total of 56 counterparts are assigned.
			9.6	Local costs bared by the Japanese government and the Thai government	Documents for terminal evaluation appendix 5	Japanese government: 38,391,000 yen (13,150,000 baht) Thai government: *56,315,000 yen (20,069,000 baht) *as of March 2003
			9.7	Total local costs	Documents for terminal evaluation appendix 5	Refer to ANNEX 6
Process	1	Progress of activities	1.1	Progress of activities	Documents for terminal evaluation attachment 2 (Progress of activities and outputs) -Questionnaire to C/P and experts	Refer to ANNEX 9
			2	Monitoring	2.1	Monitoring method
	2.2	Actual monitoring activities			Progress report -Questionnaire to C/P and experts	Project activities have been monitored regularly based on Plan of Operation for a whole period, annual work plan, and detailed plans which were prepared by C/Ps and experts.
	2.3	Modification of PDM			Advisory team report Mid-term joint evaluation report	PDM and PO (version 1) were designed during the JICA Study in November 1999. After that, version 1 was revised and version 2 was signed in September 2000. Furthermore, the draft of revised PDM was approved at Joint Coordinating Committee on 1 May 2001. Version 3 was revised and signed during the middle evaluation in August 2001.
	3	Relationship between experts and C/P	3.1	Communication	-Questionnaire to C/P and experts	Most experts communicate with C/Ps at least every other day.
			3.2	Problem solving by experts and C/P	-Interview with experts	Any problems arisen were discussed in WG or among concerned persons.
			3.3	Changes in attitude and ownership of C/P toward the Project	-Interview with experts	Counterparts committed and devoted to the project activities.
	4	Involvement of beneficiaries	4	Changes in attitude and ownership of farmers toward the Project	-Questionnaire to C/P and experts -Interview with C/P and experts	Further study is necessary.
	5	Ownership of RID and DOAE	5	Degree of participation of executives at RID and DOAE	-Interview with experts	Working Group for the field of the System Development was established in February 1999 and WG for the field of the on-farm facilities department was build in April 1999. Two WGs were integrated and became a WG as water management at river basin and delta level.

The List of Long-term and Short-term Experts

The Modernization of Water Management System(MWMS) Project in Thailand

Name	Field	Begin	End	JFY:1999					JFY:2000					JFY:2001					JFY:2002					JFY:2003								
				4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8
Long-term Experts																																
Yoshito	YUYAMA	Water Management	1999.4.01	2002.3.31																												
Tatsuji	ONIMARU	Water Users' Organization	1999.4.01	2002.3.31																												
Noboru	NAKAZAWA	On-farm Facilities	1999.4.01	2002.3.31																												
Akira	SUZUKI	Coordinator	1999.5.11	2001.5.11																												
Takeshi	MIYAZAKI	Chief Advisor / System Development	1999.5.25	2001.6.09																												
Takashi	FUJISAKI	Coordinator / Training	2001.4.26	2004.3.31																												
Katsuro	SHIODA	Chief Advisor / System Development	2001.6.01	2004.3.31																												
Shigeru	KATAYAMA	On-farm Facilities	2002.3.22	2004.3.31																												
Tatsuki	UEDA	Water Management	2002.3.22	2004.3.31																												
Akihiro	ONODERA	Water Users' Organization	2002.5.02	2004.3.31																												
Short-term Experts																																
Teruhisa	NAMBA	Farming	1999.5.11	1999.8.10																												
Yutaka	TOMINAGA	Data Communication System	1999.7.7	1999.11.3																												
Takeshi	SASAHARA	Data Communication System	1999.7.7	1999.11.3																												
Hiroshi	HIEHATA	Basin Level Water Management Information System	1999.8.3	1999.8.31																												
Teruhisa	NAMBA	Farming	1999.12.1	2000.5.31																												
Seigo	FURUDONO	Facility Improvement	2000.2.20	2000.3.11																												
Masayoshi	SATO	On-farm Water Management	2000.2.18	2000.3.4																												
Teruhisa	NAMBA	Farming	2000.11.1	2001.1.31																												
Takahiro	SHIONO	Water Management Support Tool(GIS)	2000.11.12	2000.12.1																												
Takeshi	SASAHARA	Data Communication System	2000.12.1	2001.2.28																												
Masayoshi	SATO	Organization of On-farm Level Water Management	2001.2.26	2001.3.10																												
Teruhisa	NAMBA	Farming	2001.3.1	2001.5.31																												
Teruhisa	NAMBA	Farming	2001.10.15	2002.1.31																												
Shigeo	OGAWA	Water Management Support Tool (GIS)	2001.11.4	2001.11.17																												
Youichi	YAMAUCHI	Rotation Irrigation	2001.12.12	2001.12.27																												
Takeshi	SASAHARA	Data Communication System	2002.1.8	2002.3.30																												
Teruhisa	NAMBA	Farming	2002.3.4	2002.5.15																												
Yoji	KUNIMITSU	Analysis of Cost Benefit on Ditch & Dike	2002.9.16	2002.10.2																												
Shigeo	OGAWA	Remote Sensing (Cultivation)	2002.10.28	2002.11.9																												
Haruhiko	SAKAMOTO	Farming	2002.10.15	2002.5.15																												
Naoki	HORIKAWA	Water Balance Analysis	2002.10.3	2002.10.30																												
Koji	NAITO	Rotational Irrigation/Maintenance of Irrigation Facilities	2002.12.1	2003.1.31																												
Takeshi	SASAHARA	Operation and Maintenance of Telemetry System	2003.3.30	2003.5.30																												
Kiyotaka	FURUSAWA	Land Improvement Law in Japan	2003.7.21	2003.8.13																												
Koji	NAITO	Regulation Improvement and Guidelines for On-farm Facilities Development	2003.8.22	2003.9.19																												
Shigeo	OGAWA	Remote Sensing (Inundation)	2003.8.24	2003.9.6																												
Hideto	FUJII	Guideline for Water Management Planning and Operation	2003.9.1	2003.9.19																												
Kenji	IMAI	Accounting Management of Integrated Water Users' Organization	2003.9.1	2003.9.26																												
Haruhiko	SAKAMOTO	Farming	2003.9.15	2004.3.31																												
Yuki	ICHIKAWA	Soil and Fertilizer	2003.9.15	2003.11.15																												
Takeshi	SASAHARA	Update of Basic Design for Telemetry System	2004.1.15	2004.3.15																												

* JFY : Japanese Fiscal Year, from April 1 to March 31 in the following year.

List of Equipment Provided by JICA

Abbreviations used in the List

Dated : 6 November, 2003

Activity Field

On-farm F. : On-farm Facility
 Water M. : Water Management
 System D. : System Development
 W.U.O. : Water Users' Organization
 Farming : Farming
 Admin.. : Coordinator/Training

Place of Installation

RID Head quarter

IEC405 : Experts' Room
 IEC410 : Coordinator's Room
 IEC407 : Chief Advisor's Room
 IEC401 : Analyses Policy Section (Planning Division)
 ITC : Information Technology Center (IEC303)
 RAH : Research and Applied Hydrology Branch
 IMD : Improvement and Maintenance Division
 WIFB : Water Information and Forecast Branch
 TOB7 : Technical Building 7F(On-farm Design Branch 4)
 IWUDB : Irrigation Water Use Development Branch
 WMB : Water Management Branch
 TD : Transport Division

Khok Kathiem, Lopburi, and other areas

KPSO : Khok Kathiem Project Site Office
 KO&MPO : Khok Kathiem O&M Project Office
 DDO8 : Ditch and Dike Operation 8 (currently 10)
 RIO8 : Regional Irrigation Office 8 (currently 10)
 LPAEO : Lopburi Provincial Agricultural Extension Office (DOAE)
 KO&MPWM1 : Khok Kathiem O&M Project, Water Master1 Office
 KO&MPWM2 : Khok Kathiem O&M Project, Water Master2 Office
 HC5 : Hydrology Center 5 (Central Hydrology Center)
 MAO&MP : Manorom O&M Project Office
 CKO&MP : Chong Khae O&M Project Office
 RRO&MP : Roeng Rang O&M Project Office
 MHO&MP : Maharaj O&M Project Office
 CNTAMC : Chainat Agricultural Machinery Center (DOAE)

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