

(AF)51-32

SUMMARY REPORT
OF
THE PRELIMINARY SURVEY MISSION
ON
IRRIGATED AGRICULTURE PROJECT
IN THAILAND

AUGUST 1976

JAPAN INTERNATIONAL COOPERATION AGENCY

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Forword

This survey was conducted for the period of 25 days from May 10 through June 3, 1976 based on the co-operation request for the *the Irrigated Agriculture Project* from the Thai Government.

The Mission could complete very successfully the field survey and consultations as scheduled backed by the atmosphere of high expectation to our co-operation among the officials of Thai government authorities concerned which we came to notice in the course of our survey work.

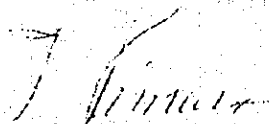
It is our great pleasure to submit herewith the Summary Report on our preliminary survey work to the Thai Government (through our embassy in Bangkok) as we promised in our memorandum which we submitted before leaving Bangkok.

We hope that this Summary Report would serve usefully as a basis for future consultations between the two governments.

I would like to take this opportunity to express on behalf of the Mission our heartfelt gratitude to Mr. John Boonlu, Director of Central Office of Land Consolidation, Ministry of Agriculture and Co-operatives and other government authorities concerned for their friendly assistance and co-operations making necessary arrangements for our survey work and providing us with valuable advice and data,

and to reiterate our Mission's sincere wish that the project
be implemented successfully at an earliest possible date.

August 20, 1976



Takashige Kimura

Leader, Japanese Preliminary Survey
Mission on Irrigated Agriculture
Project in Thailand

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CONTENTS

	Page
1. Introduction	1
1-1 Background of the Survey	1
1-2 Duty of the Survey Mission	5
1-3 Understanding of the Backgrounds of the Request for Cooperation	7
(1) Requirements from socio-economical viewpoint	8
(2) Requirements from the viewpoint of agricultural technology	14
2. Understanding the contents of the request for cooperation	21
2-1 Definition and interpretation of <i>Irrigated Agriculture Project</i>	21
2-2 Understanding on <i>the Irrigated Agriculture Project</i>	22
2-3 Present situations and problems of land consolidation in Thailand	25
3. Studies on How to Meet the Request Based on the Field Survey	29
3-1 General conditions of the districts concerned with the cooperation request - As observed by the mission based on the field survey	29
(1) Greater Mae Klong Irrigation Project	30
(2) Upper Chao Phya Project	32
(3) Petchburi Irrigation Project	34
(4) Mae Wang Irrigation Project	34
3-2 Agricultural Policy of the Government of Thailand and <i>Irrigated Agriculture Project</i>	36

	Page
3-3 Situations in Thailand with Regard to the Cooperation Request	39
4. Formation of the Cooperation Project on Irrigated Agriculture Project - Idea of the Mission -	42
4-1 Appropriateness of the Cooperation Projects	42
4-2 Basic Strategy for the Realization of the Project	44
5. Proposals of the Mission for the Cooperation on Irrigated Agriculture Project	51
5-1 Recommendation on the districts to be covered by the cooperation	51
5-2 Orientation on the contents of the cooperation	51
5-3 Early materialization of training cooperation	68
5-4 Advice on the procedure of the project for the time being.....	71
 [Appendix]	
(1) Location Map	74
(2) Memorandum of the Preliminary Survey Mission on Irrigated Agriculture Project in Thailand	75
(3) List of persons concerned of Thailand	82

1. Introduction

1-1 Background of the Survey

The despatch of the Survey Mission to Thailand was decided by the Japanese Government based on the official letter dated February 6, 1976 of the Japanese Embassy which reported the request of the Department of Technical and Economic Cooperation (DTEC) for cooperation on agricultural development.

Until this request for cooperation was made, there had been assiduous approaches to mutual understanding by the governments of both the countries and the people with goodwill in civil circles, extending through many years. The technical cooperation of Japan for Asian countries in the field of agriculture started by way of participating in the Colombo Plan Agreement in 1954. Then, the bilateral cooperation have been extended to agricultural development in various projects in Asia. For Thailand, however, there has been no chance of extending the full-fledged cooperation for agricultural development mainly aiming at the development of paddy cultivation on the governmental base.

The reason for it can be surmised as follows. In Thailand, they have wide paddy field extending over about 6,800,000 ha for rice production, enjoying the fertile delta formed by the Chao Phya river and sufficient water supply, and produce one million tons of surplus of rice for export annually.

They practice stable agricultural production in comparison with other Asian countries. It will be considered that Thailand is provided with favorable agricultural conditions in location, and the agricultural production centered on rice production has been played the role as a main pillar to support the national economy. The Thai Government has been put importance stress on the expansive development of agricultural production, and made considerable amounts of national investments to consolidate the agricultural infrastructure. Particularly, the irrigation systems were constructed by the Royal Irrigation Department with a higher technical level to that of other Asian countries, and there are many projects which are highly evaluated internationally. Among them, the Chao Phya dam completed in 1957 with the recommendation of FAO Survey Mission (1952) and the World Bank Loan amounting 18 million dollars has given a big impact and valuable suggestion to various countries in Asia. The blue print of this dam construction was drawn in 1902 by Hollander civil engineer Van Der Heide, and the good idea of the planning and magnificent scale of the project has given deep impression to not only Thai engineers but many irrigation engineers of advanced countries.

A number of Japanese engineers also visited and inspected Chao Phya dam and drew many lessons from it and it has given a chance to made contact with the engineers of RID and to

deepen mutual understanding.

Later, in 1972, the Water Management Convention was held in Tokyo under the joint sponsorship of FAO and Japanese Government, and in 1975, the Water Management Symposium was held under the sponsorship of Tropical Agriculture Research Center, Ministry of Agriculture and Forestry. On these occasions, many engineers visited Japan from Ministry of Agriculture and Cooperatives and RID, Thailand, and had the chance to exchange valuable opinions, enabling them to intensify reliance on each other.

Junior Government staff who completed the irrigation training courses, carried out in these 10 years by the cooperation agencies (OTCA and JICA), and those who specialized in irrigation engineering course in Japanese universities are working as active middle class staff in the Thai Government. All these facts have been also behind the request as one of consequences.

Then Government staff working in the irrigation development have been obtaining many lessons from the European consulting engineers and international organizations, but the terminal irrigation system and water management on-farm have many problems unsolved. There, there is a room Japanese irrigation technology to be utilized for cooperation of both countries.

It is very understandable that leaders of the Thai Government reached to know the importance of on-farm development and have moved to toward the request to the Japanese Government cooperation in this respect.

As mentioned above, we can easily understand that, there have been approaches between the circle of the personnels of two countries and mutual reliance has been already established and under such circumstances, both parties reached to take up the cooperation projects in the field of Irrigated Agriculture on the request of the Thai Government, hence such friendly relationship will be very helpful for the fruitful result of technical and economic cooperation in future.

In the request of cooperation, the Thai Government concentrate to develop the terminal irrigation system by applying the Japanese technology of on-farm development.

In the meantime, paying attention continuously for long period to the importance of land consolidation works of paddy fields in Thailand, a Japanese consultant firm has been endeavoring in doing various studies in the agricultural development by their own funds and has enlightened the authorities concerned of the Thai Government. Their modest and serious services are favorably estimated by the officials concerned of the Ministry of Agriculture and Cooperatives,

Thailand. The fact, such bona fide approaches by the private enterprise cannot be overlooked.

1-2 Duty of the Survey Mission

The appointed tasks of the Mission can be summarized as "to make a field survey (preliminary survey) based on cooperation request No. 1704 (1)/1969 on 4 districts given as proposed sites for cooperation as *the Irrigated Agriculture Project* in the request, and to exchange preliminary discussion with the Thai Government on the possibility of further cooperation."

As mentioned in the previous Section 1-1, it could be surmised that the request was intended to cover the terminal irrigation development from the present situation of the Thailand. However, the conception of *Irrigated Agriculture Project* given in the official letter was not understandable to us, because of the term is not available as a international idiomatic and caused various surmises.

According to the fragmentary informations, we could conjectured that the Thai Government promotes large-scale on-farm irrigation works centered on land consolidation works aiming at the increased yield of rice, and it was surmised that they refer, by this term, to the technical and economic cooperation necessary to execute intensively

the works.

Therefore, the Mission decided to start with the purpose of fact finding of the *Irrigated Agriculture Project* referring to the opinion of the Thai Government at the earliest contact after the arrival of the Mission in Thailand.

The period of the field survey by the Mission was relatively short, and this was the first preliminary survey made on the governmental base. Considering these points, the Mission desired to restrict the contents of the Mission duty to some extent and to achieve the task to be obtained within the limit of the capacity of the Mission.

This demand of the Mission was almost accepted in the preparatory meeting in Tokyo, and then the Mission determined their objects as follows and obtained the acknowledgment of the Japanese organs concerned before their departure.

- 1 : To promote further mutual understanding and friendly relations, as a first governmental survey mission.
- 2 : To confirm actual intention of the request for cooperation and circumstances where the request came up.
- 3: To visit the proposed sites for cooperation,

and to pay preliminary considerations for orientation.

4 : To talk with the governmental organs concerned with this cooperation and their managers, discussing the possibility of cooperation as concretely as possible.

1-3 Understanding of the Backgrounds of the Request for Cooperation

It is very important to well understand what is backgrounds of this request for the cooperation by the Thai Government. Then, first of all the fact finding must start by knowing exactly the intention of the Thai Government in reference to *Irrigated Agriculture Project*.

The significance of this problem is so important as to dominantly affect the agricultural policy of the Thai Government in future. Though it cannot be definitely said that with its limited capacity, the Mission can provide sufficient studies and observations, various problems involved in the requested cooperation were investigated by the Mission, as cited in the following paragraph. And it is to be added that the following description owed much to the knowledge obtained through discussion with Mr. John Boonlu.

To facilitate the clarification of the matters, it will be better to observe the present standing of Thailand from the two viewpoints of (1) socio-economy and (2) agricultural technology, and what is concretely in the background of the *Irrigated Agriculture Project*. requiring Japanese cooperation will be noted.

(1) Requirements from socio-economical viewpoint

a) At present, Thailand faces the explosive increase of population, viz. annual rate of 3.2%, and on the contrary, the increase rate of rice production tends to be stagnant. According to statistical processing, if the situation advances as it is, the surplus of rice production for export amounting to one million tons in 1974-75 year may be swallowed by the increase of population in 1981, leaving nothing for export.

b) In the world-wide clamor of food crisis, the rice export capability of Thailand has considerable influence on the international rice market. The rice yields of rice-producing countries in Asia has not yet been reached to provide surplus rice for export, in spite of strong emphasis by the governments of respective countries.

For the time being, the rice export from Thailand will serve to lighten the food shortage in Asian countries.

c) The production amount of rice in Thailand greatly depends upon the weather conditions of the year, and yearly fluctuations are large.* This is because the agricultural infrastructure for rice production is prepared insufficiently. In addition, because the floor price guarantee (300 bahts/t) lets farmers run to sugar cane plantation, and as a result the production of sugar canes tends to increase. Particularly in a part of Mae Klong basin, rice and sugar canes compete each other as irrigation agricultural products. To reconcile both, the conversion from mono-cultural agriculture to crop diversified agriculture is stressed, and farm land consolidation to allow rotation is required.

*:

Unit: 1,000 tons

Crops	1973	1974	1975 (estimate)
Rice (paddy)	13,934	12,982	14,725
Maize	2,300	2,550	3,000
Sugar canes	12,700	14,500	15,700

d) The national economy of Thailand depend upon very largely on the agriculture. Particularly, bigger part of the export is covered by agricultural products, and its economy is greatly affected by the world-wide supply and demand of food and business fluctuations. Therefore, the accurate projection of demand is important for the decision of policies. At the same time, it is necessary for the Government to store agricultural products so that the Government can take proper steps according to the estimated international balance of demand and supply. For this purpose, exporters are obligatory to sell a certain amount of rice at certain rate to the Government when they export. This rate was one for Government and one for export. Since November 7, 1975, this rate has been raised to 1 : 0.5. This measure was taken to lighten the burden of exporters, since the international price of rice dropped*.

Thus, the "rice" problem in Thailand shares an important part in the national economic policies, and the weight of rice in Thai economy increases year by year.

e) The Thai economy can be said to have been

*: The export price of rice marked the highest 650 dollars per ton in April, 1974, but recently went below 400 dollars per ton. This must be not because the demand decreased, but because advanced countries such as Australia and USA increased their supply.

supported by the world-wide steep rise of prices of agricultural products since 1973. Without particular industrial resources, industrial sector in Thailand suffer from serious depression since the time of the oil shock. Though the agriculture was prosperous, it means that distributors and agricultural cooperatives made profits, and it cannot be definitely said that the profits were restored to farmers.

The distribution and price quotation of agricultural products in Thailand are in hands of middle men. In this situation, it is not easy to make profits restored to farmers. The introduction of price support system for agricultural products can be one solution, but there is necessity to drastically improve agricultural structure. Especially since the political reform at the end of 1973, the political demands of farmers led by students, etc. are increasing, and the argument for abolishing disparity in wealth penetrates into rural area. A series of these phenomena are similar, in various aspects, to the phenomena caused in Japan since the middle to the end of the Meiji era. Therefore, the Thai Government is

forced to take fundamental measures. In 1974, Land Consolidation Law, Farm Rent Restriction Law, Farmers Assistance Fund Law, etc. were enacted, and in 1975, the Agricultural Land Reform Law which had been disputed between landowners and tenant farmers on landownership as the largest issue passed the Diet. In addition, large agricultural policies for modernization of agriculture were worked out legally and practically, such as the price support of agricultural products, and the establishment of a governmental special organ as a measure to prevent the exploitation by middlemen in distribution, etc. Moreover, the structural reform of Ministry of Agriculture and Cooperatives (MOAC) was executed. The Royal Irrigation Department (RID) conventionally belonging to the Ministry of Internal Affairs has been incorporated in the MOAC, and have been newly established the Central Office of Land Consolidation in charge of planning and executing land consolidation works, the Land Reform Office in charge of agricultureland reform, and so on.

A series of these administrative measures were enforced in a short time. It shows that Thai Government started to consider the agriculture as

a most important factor for the life of the nation and to face seriously the solution of various problems. This must be highly evaluated.

However, various troubles are expected to confront in executing agricultural improvement by making the best use of the system and the organization. Overcoming the factors of these troubles one by one are the task appointed to the officials concerned of the MOAC of Thailand. For this purpose, the mutual cooperation and coordination among the departments and offices concerned are very important, but urgent questions are how to raise funds and how to cover the shortage of personnel in charge.

f) It must be noted here that the rice crop technical guidance team of Taiwan has recently left their projects site, remaining a remarkable performance in the technical guidance in on-farm development in Upper Chao-Phya district. The land consolidation works of so-called Taiwan system is highly valued by the Ministry of Agriculture and Cooperatives.

(2) Requirements from the viewpoint of agricultural technology

a) The trunk irrigation canal systems in Thailand was promoted at a rapid pace after the World War II, and many main facilities were completed. Still now, main canals are being constructed everywhere, and the completed main canals are fully flowing irrigation water. However, due to lack of secondary canals, tertiary canals, intake facilities and land consolidation, such water is not completely utilized to farming. It seems that the construction is in the process of transition from main facilities to terminal facilities. Main canal construction can be sufficiently executed with the technology of civil engineering, but construction of terminal irrigation system requires delicate considerations, and is regarded to be technically much difficult. The construction as far as terminal irrigation system can be designed and executed by European engineers, but as they lack in experiences and technology in this field of agriculture in their countries, their concrete techniques are generally surmised to be unskilled. For long years, Thai people have been guided by European engineers, but at present stage,

it seems they feel a kind of hesitation and deadlock for their further going.

b) In the 1960s, the rice of IRRI high yield variety swept over rice planting areas in Asia, and for a while it was said that the introduction of IRRI variety had solved the food problem of Asia. However, a certain numbers of experts were not quite optimistic in this regard, while they recognized the superiority of IRRI variety. They considered that it would be difficult for the variety settled as it was to take firm root on everywhere paddy fields in Asia, because the variety has characteristics of being as highly responsive to fertilizer as Japonica variety, of being liable to catch a kind of virus disease, and of requiring water management, etc.

Particularly, certain specialists have warned that careful attitude must be taken for the introduction of IRRI high yield variety in the poor condition where water management is not practiced.

In the general optimistic trend in Asia, the Ministry of Agriculture and Cooperatives of Thailand has avoided to involve in the sensational Green Revolution, and modestly created RD high

yield variety in their own country, making conservative effort to spread the RD variety. This attitude is worthy of high appraisal. However, even the RD variety requires proper technology of water management to increase the yield, and they now feel strongly the necessity of land consolidation for the proper water management.

c) The extension of the RD variety requires the proper water management. As an essential circumstances to increase the area for extension of RD variety, the land consolidation works has been taken up, and simultaneously to introduce modern agricultural technology, the argument for reviewing and improving the agricultural technological system has been caused.

d) The land consolidation works refers to the improvement of terminal irrigation network conditions combined with the optimization of plots by readjustment of farmer's arable lands. Therefore, it cannot be executed without the consensus and understanding by farmers. The legislative system of the Thai Government has been improved to allow the execution in 1974 - 75, and the farmers have been awakened to the necessity.

Though the importance of the land consolidation works is known, it requires a considerable amount of long-term investment. The minimum unit investment for the land consolidation is estimated at 1,000 dollars/ha. Therefore, a considerable amount of fund is required to perform for undertaking on the scale of several decades thousand hectares. Thailand is considered to be advanced in development compared with other Asian countries and is not in the list of countries allowed to use AID fund. If they borrow regular loan from international financial organs such as IBRD and ADB, considerably interest must be paid. The IBRD reveals their intention to positively extend a credit to Thailand for a good project. This year, they noticed 8.5% p.a. for a loan after June 1st and 9% p.a. after July 1st for a new project. Even if the land consolidation works is judged to be proper as a result of feasibility study, such high interests for agriculture, especially for on-farm project are supposed to make the Thai Government hesitate in using such credit.

Furthermore, domestically, though the Land Consolidation Law was established last year as an

important policy of the Thai Government, a subsidiary policy is not yet introduced in this system. In addition, since the undertaking of project is not based on applications by farmers, farmers are not obliged to repay funds. Such problems on legislative system remain unsolved, and there occurs a demand in the Government to learn these system techniques from Japanese experiences.

e) The technical approach to land consolidation in Thailand cannot be said to have been established. There are a method developed by Dutch engineers and a method developed by the Taiwan team, but they do not completely satisfy the conditions for improving the present status. The method now employed in Japan is technically almost near to perfect one, but will not be suitably introduced into Thailand as it is, because of the high investment cost. In the large scale project on land consolidation works, execution of the works at lower possible cost is imperative from point of view of project economic, and the Japanese method must be more studied in this respect. However, it is certain that the Japanese method

is technically the most advanced, and as a matter of fact it contains many points worth to learn.

It is also seen that the persons concerned in agriculture in Thailand actually pay attention to these facts.

The above statement on the background of requirements was examined from two different viewpoints. In every respect, the Mission consider that Japan has potentiality to extend the requested cooperation, and the request of Thailand to Japan for the cooperation is considered to be appropriate.

Japan has experienced the development of terminal irrigation facilities since the Meiji era, and is in a position to understand the distress of the Thai Government. In Japan, construction of irrigation facilities have been steadily expanded, and it cannot be overlooked that development funds from other sector than agriculture sector have been introduced under a subsidiary system.

In this regard, Thailand cannot rely on other sector for enormous investment into the agriculture project, and moreover many socio-economic problems in rural area must be settled in the framework of

agriculture itself. However, the sagacious staff concerned in agricultural administration recognize that the development of on-farm facilities by the *Irrigated Agriculture Project* only can pave the way for the modernization of agriculture in Thailand.

2. Understanding the contents of the request for cooperation

2-1 Definition and interpretation of *Irrigated Agriculture Project*

It is very important to correctly understand the meaning of *Irrigated Agriculture Project* and to create a cooperation project with contents proper for the request for cooperation, viz. the needs of the Ministry of Agriculture and Cooperatives.

As the terminology of *Irrigated Agriculture Project* is not firmly established as an internationally, the Mission asked for the exact meaning of *Irrigated Agriculture Project*.

They defined as follows:

--- The term of "*Irrigated Agriculture Project*" means the integrated on-farm development based on land consolidation works which will lead to double cropping and/or diversification of crops and increase the productivity. ---

As it is obvious from the above, this project connotes widely on-farm development utilizing not only the technology of irrigation engineering but integrated technologies useful to directly increase agriculture production.

Therefore, the literal translation of the term in Japanese does not correctly convey the intention of the MOAC, the Government of Thailand on this project.

2-2 Understanding on the Irrigated Agriculture Project

To cope with the cooperation for this project, the following points should be understood by the Government of Japan.

This proposed project will be promoted with emphasis on the consolidation of agricultural land for the modernization of agriculture, but requires further more extensive cooperation. At first, cooperation should be provided to improve farm conditions to allow double cropping or crop diversification. Further cooperation should be provided to introduce the advanced farming technologies as the most suitable form into the provided field.

The technologies will include integrated approaches to increase agricultural production and lead farmers to stability, such as water management technology on the level of farmers, improvement of planting technology, fertilization technology, technology on agricultural chemicals, counter-measures against rats, agricultural machines, assistance to the activities of agricultural cooperatives, and development of markets, etc.

The area to be covered by the project also should be taken into consideration. It is said that this type of technical cooperation is in general is performed in limited and restricted area and in consequence, the good result of the project stay only within in the project area and does not

easily extend to its environs. If so the case the new technologies introduced with much effort will remain just at the point (restricted area), and will not contribute to the increase of production on wide scale. In the past, conventional Japanese technical cooperation in agriculture for Asian countries had been done this kind of failure in spite of painstaking efforts by deputed experts at the project.

When reflecting on this fact, it is found that from the very beginning of the project formulation, the project area was selected within very limited and restricted zone and to concentrate intensively investments and technical cooperation efforts only to this specific project area. Consequently, the production increase remarkably in the area during the project term without any relation with outside of the project, and after the termination of cooperation and investment it become in many cases difficult to maintain the farming technique newly introduced, and finally become to the original status i.e. before the project status.

How to avoid such failure in cooperation will be the largest problem in planning this proposed project.

For this reason, it is considered most desirable to tackle with the proposed project, with the spread of new technologies into a perimeter as larger as possible where strategical target will be set up from the stage of project formulation. For concrete strategy for the target, the following should be considered.

- a) The area to be covered by the cooperation should be taken widely beforehand, including the extent with spreading effect.
- b) Agricultural infrastructure should be improved by the cooperation. Particularly, irrigation facilities on farms allowing double cropping should be provided.
- c) The modern agricultural technologies to be introduced, emphasis should be laid on the farmer's desire for technology, and for the time being to make consistent technical guidance on it.
- d) The agricultural administration to derive incentive of farmers for agriculture should be studied and developed jointly with the staffs of MOAC.
- e) The cooperation should be extended to the existing agricultural extension service system. There are many points to be improved in regard of the training, etc., and the cooperation activities should cover these improvements.

The Mission has understood that the arrangement of the contents of the proposed project cooperation with the above points considered meets the meaning of "The Integrated on-farm Development" intended by MOAC, the Government of Thailand.

Based on the results of the field survey, the Mission discussed with the organs concerned of MOAC of Thailand in Bangkok, and the discussion was summarized as the Memorandum of the Mission attached herewith. Refer to the items concerned.*

2-3 Present situations and problems of land consolidation in Thailand

The land consolidation works as the main part of the *Irrigated Agriculture Project* will be considered as follows.

At the present stage of irrigation development in Thailand, main irrigation canals are now being constructed, but irrigation facilities after secondary canals inclusive are not constructed at many places.

In case of Japan, water resources structures (dam, head works, etc.) and main canals are constructed to the border of 500 ha on-farm area by the responsibility of the state. Then, prefectural government follow it's construction as far to the border of 100 ha on-farm area. Further facilities to the border of 5 ha on-farm area is constructed by the responsibility of the land improvement district office organized by farmers.

* Reference items:

- (2) Reconfirmation of the target of the proposed project
 1. Renovation of agricultural infrastructure
 2. Introduction of modern agricultural technology and its extension

Terminal facilities to farms from the 5 ha border are constructed by the respective beneficiary farmers. Therefore, generally together with the progress of main canal constructions, constructions by prefecture and constructions by land improvement district office are promoted in parallel, and in this way the effects of the set-up to provide the effect of project construction penetrate and spread very rapidly to the end beneficiarises, farmers.

In case of Thailand, main canals have been constructed by RID, but the construction set-up from secondary canals to farms is not clear, and where the responsibility lies is not obvious.

Taking the case of Japanese large scaled irrigation project as an example again, the amount of money invested for the construction of trunk facilities plus main canals as national works is generally smaller than the total amount of money invested for the terminal irrigation facilities by prefecture and land improvement district office.

Furthermore, water management on farms affects deeply the growth of rice, and is normally conducted by the land improvement district office by the unit of 50 ha or less. In Japan, a policy of empharizing the consolidation of on-farm facilities has been taken, so on-farm water management technology is well known and practiced very smoothly among the farmers.

On the contrary, in Thailand, the construction of on-farm facilities is almost entrusted to individual farmers, and is far behind the construction of main canals. Therefore, when water is wanted in a dry season, the water flowing in main canals cannot be utilized by farms because on-farm facilities are incomplete. This does not allow double cropping. To promote double cropping as soon as possible by improving this situation, the construction of on-farm irrigation facilities must be hastened by all means.

Therefore, when the development stages are considered, it must be sufficiently examined whether the immediate execution of complete form land consolidation works are suitable or not. In the present situation, for the district where main canals are completed with water flowing in the canals but irrigation not yet provided due to lack of intakes, secondary and tertiary canals, the first priority must be put, before all, on the construction of these terminal irrigation facilities to draw out existing irrigation efficiency, and awaiting the time comes when the production increase and farmers motivation raise up, the land consolidation works will be executed as a next step and at the same time to teach farmers the importance of water management by settling irrigation water control system.

To execute land consolidation works, it is necessary to have the consentment and cooperation of farmers in the project

area. But in addition to it, in the case of Thailand, it is very important to know following facts such as the actual situations on landownership system, relationship between tenant farmers and landowners, and economic control of rural villages by middle-men, the possibility on the exchange and junction of arable land, expected increase in cultivated area, land fragmentation, etc. for establishing the proposed project plan based on the policy of land reform of MOAC.

3. Studies on How to Meet the Request Based on the Field Survey

3-1 General Conditions of the Districts Concerned with the Cooperation Request - As Observed by the Mission Based on the Field Survey

The following 4 districts are given in the cooperation request No. 1704(1)/1969.

- (1) Greater Mae Klong Irrigation Project
- (2) Upper Chao Phya Project
- (3) Petchburi Irrigation Project
- (4) Mae Wang Irrigation Project

Agricultural investment had already been started in these districts by the Thai Government, and the main frameworks of project construction are established. However, investment for on-farm agricultural facilities is insufficient, not giving the effect estimated at the time of planning.

The reasons why the effect not raising well depend upon the difference of the conditions of respective districts, but a common reason conceivable is that the insufficient on-farm agricultural facilities do not bring into full operation of main frameworks.

The conclusion of the Mission describe as follows, based on the survey results of these districts. These districts are very promising in that high agricultural potentiality by executing *the Irrigated Agriculture Project* as

requested, centered on the completion of on-farm agricultural development.

(1) Greater Mae Klong Irrigation Project

This project covers about 400,000 ha arable land and 5 regions classified in terms of land use type according to the Mae Klong River Basin Agricultural Development Plan.* The district has regional characteristics as shown in the following table in the remarks. The development pattern desired in this basin is not rice crop only, but crop diversification with upland crops and fruits incorporated. The soil in this basin compose of fertile Kampaeng Saen series, and is suitable for up land crop.

If hydraulic condition were provided, the basin will be expected to develop as a typical agricultural zone in Thailand, but due to shortage of discharge of the Mae Klong River in the dry season, the present development has been made mainly for upland crops. However, Ban Chao Nain Dam is being constructed at the up stream of Mae Klong River under the loans of IBRD and Japan (OECF), and the supplyment of water resource is expected to be remarkably improved by the dam completion within several years. Then, the integrated on-farm development based on land consolidation, under

the conception of rotated land use for both rice and upland crops cultivation will be introduced quite a new type of agriculture which giving many suggestions to the agricultural development in other similar districts covering mountains to delta area in Thailand.

* : This project is promoted under the joint work of Thammasat University (socio-economic survey), Kasetsart University (study on agricultural technologies) and Mahidol University (investigation on sanitation), with the assistance of the Rockefeller Foundation.

The area covered by the plan is about 360,000 ha of Mae Klong Basin. The IBRD is interested in the agricultural development in this basin, and has already executed the basic survey. Furthermore, the joint work of RID and US Bureau of Reclamation completed "Feasibility Report on the Greater Mae Klong Multi-purpose Project - Second Stage Development for Irrigation, Flood Control, and Hydro-power, Aug. 1968", and general examination was made.

Land use table of the Mae Klong river Basin:

Source: Thammasat University

Region	Paddy	Upland	Fruits	Housing	Others	Total (ha)
1	11,031	34,718	5,795	4,538	740	56,822
2	21,818	2,649	1,703	1,322	1,351	28,843
3	75,131	2,991	27,306	6,307	3,399	115,134
4	25,771	2,312	580	2,280	382	31,325
5	46,844	61,872	5,007	9,857	4,916	128,496
Total	180,595	104,542	40,391	24,304	10,788	360,620

Of these, regions 5 is Kanchanaburi Pref (famous as a scene in "Bridge over the River Kwai"), and the most of the area cover *Kampaeng Saen series* regarded as the best for upland cultivation in chemical and physical properties. At present, due to short age of water for irrigation, sugar canes are planted as a non-irrigation upland crop.

(2) Upper Chao Phya Project

This project covers the district which is benefited directly with the effect due to the completion of Chao Phya Dam which may well be called as the wonderful feat of RID after the Second World War. The principle idea of Chao Phya Dam was shown in the master plan drawn by Dutch engineer, *Van Der Heide* who had been invited by the Thai Government from 1902 to 1909. According to the FAO report, the construction of the dam started in 1952 and was completed in 1957 with a loan of 18 million dollars from IBRD.

It is called Chao Phya Dam, having 237m long head works with the overall width of the river closed by 18m high gates. It is a magnificent irrigation project to intake water by 5 main canals in the upper reaches of the dam. The area benefited with irrigation extends over total 555,145 ha on the right bank of the Chao Phya river, and total 252,900 ha on the left bank. According to the explanation of Mr. John Boonlu, Director of Central Office of Land Consolidation MOAC, concerning the command area of Chao Phya Dam, the area acreage higher than 4.5m elevation is classified as Upper Chao Phya basin, while that lower than 4.5m elevation, as Lower Chao Phya basin.

At present, leading canals were almost completed in this district, and the construction of main canals southward are promoted by RID. The Noi River, a diversion of the Chao Phya River, serves as a main canal. In the region of "Chanasoot Irrigation Project" to take irrigation water from Yang Manee head works provided along the Noi River, the land consolidation work of this area designed by Dutch NEDCO engineers is carried out by RID. In the region of "Sappaya Multi-purpose Cooperative Project," the land consolidation work by technical assistance from Taiwan was carried out, and the effect by the land consolidation is prevailing. In these regions, double cropping is actually materialized. The Upper Chao Phya basin occupies the upper portion of a triangle with *Chainat* corresponding to the vertex of the delta, and allows gravity irrigation. Though land consolidation progresses already, most of the district is yet to be worked out for land consolidation. If Japan is to cooperate in the land consolidation work, it is not troublesome to select proper regions for cooperation. However, since IBRD executes already land consolidation, it may be advisable to refrain from there for time-being.

(3) Petchburi Irrigation Project

This district located in the basin of the Petchburi River. In the upper reaches, the Kangkrachan Dam constructed by RID. Irrigation water divert into 3 main canals from the Petchburi head works provided in the Petchburi River. Major topographical features comprise recent *alluvial plain*, *semi-recent terrace* and *coastal terrace*. At the center of the district, a national road runs through from south to north, reaching to Bangkok. Besides paddy, bananas, coconuts, citrus fruits, oranges, sugar canes, etc. are cultivated, and MOAC is desiring the proposed land consolidation to fit on crop diversified farming. The farmers in the district agree with the Government in executing land consolidation works in their land and demand early materialization. These seem to have caused this district to be selected as a proposed site in cooperation request.

(4) Mae Wang Irrigation Project

The largest basin opening in the mountainous region in the northern Thailand is Chieng Mai, and the project is located in Lampang basin about 80km apart in the south from Chieng Mai. Irrigation water is intaken from Sop Ang head works to the project area, and Kew

Lom dam exists in the up stream. Sog Ang head works was completed before the Second World War. It was designed with the natural topographic features of the river elaborately employed, and the selected site is very excellent as a place of head workds. Main canals are also completed and available full of flowing water. In this district, irrigation facilities seem to have been made already about 13th century, with irrigation agriculture established. Though the history is long, the relations between landowners and tenant farmers are intricate. Therefore, in order to introduce modern agriculture, socio-economic survey must be sufficiently conducted, and then a land consolidation plan must be carefully drawn with a view to creating owner farmers.

The topographic features of this district are the most similar to those of Japan among the four proposed districts. But is may be wonder whether hasty to execute land consolidation at this stage immediately or not. Early in project formulation, the socio-economic survey lay stressed on landownership system should be done. Following the survey, the minimum necessaried terminal facilities, such as the construction of intake gates from main canals, construction of tertiary canals to follow them, and construction of farm-roads, should be executed before the comprehensive

land consolidation works were started.

In the above description due to the extremely limited period of the field survey, there might have contained some subjective observation by the Mission for which the Mission feels necessary their apologize.

3-2 Agricultural Policy of the Government of Thailand and *Irrigated Agriculture Project*

The Mission wanted to know the fundamental policy for *Irrigated Agriculture Project*.

As a result of investigation and hearings from the officials concerned of the MOAC, it was known that there actually exists no formal project with the title of *the Irrigated Agriculture Project*.

Eventually, the Mission understood that *the Irrigated Agriculture Project* is a concrete idea of policy set out by the MOAC of Thailand, which aiming to reconstruct the infrastructures of agricultural production drastically, and modernize the overall agriculture in Thailand. Therefore, the MOAC has a strong intention to take it up as one of the top priority policies, and to start the projects urgently for the four districts as proposed in the request.

In order to convert this basic policy into a project as strategy for agricultural modernization, it is desirable to select the districts provided with such social and physical conditions as to allow that the project has provided sufficiently demonstrative effect as a pilot scheme.

As a result of the survey, it was found that the four districts proposed in the request had been selected by the Thai Government with these conditions taken into account.

Moreover, the MOAC intend to promote the work for executing the project, with closed coordination maintained among the MOAC offices and departments concerned (Central Office of Land Consolidation, Royal Irrigation Department, Land Reform Office, Department of Agriculture Extension). There was a convincing impression that if these faculties are integrated to demonstrate fighting power, a fairly enormous scale of undertaking will be able to be accomplished.

As regards the relation between the basic agricultural policy of the Thai Government and this proposed project, the following can be considered.

The 4th five-year plan to be started from October, 1976 is drawn up with main emphasis laid on the investment in rural development. Since rural economy is supported by agriculture, it is expected that the investment into agricultural development is intensified and that this project will be given high priority.

The 4th five-year plan basically aims at correcting the disparity in income in weak fields caused by the distortion in the economic growth promotion policy taken so far, deriving potentiality from the bottom of economy, and removing social unrest by promoting economic development selectively in the districts conventionally little favored with national investment.

The *Irrigated Agriculture Project* to challenge straight the improvement of the structure of agricultural production in this sense exactly fits the basic conception of the 4th five-year plan.

The approach through structural renovation can be said orthodox as strategical agricultural development point of view, therefore, its execution requires an enormous fund and enough technical ability.

Even though this approach is evaluated to be good, countries in Southeast Asia will not be able to readily take it, because of a huge amount of soft fund, difficult to provide.

Great respect is to be paid to the strong will of MOAC to execute the approach under the slogan of the *Irrigated Agriculture Project* under such circumstances.

Among the countries in Southeast Asia, Thailand must be the country with the largest engineering ability to challenge the agriculture development in this way, in view of potentiality

of national economy as well. Therefore, the expected success in Thailand of *the Irrigated Agriculture Project* will give a favorable impetus to agricultural development in Southeast Asia, and Japan has insisted the importance of on-farm development for long years, so greatly interested in this project.

3-3 Situations in Thailand with Regard to the Cooperation Request

(1) As regards the proposed districts given in the cooperation request, internal consensus in the Government of Thai was once obtained at the time when the reference materials were submitted from MOAC to the Department of Technical and Economic Cooperation. But the determination to the above four districts was not quite definite, and there was left a much room for flexible discussion with the Mission. It is a historically apparent fact that Thailand has peculiar philosophy for cooperation and assistance from foreign countries, and has given careful and prudent considerations. This request for cooperation is never exceptional.

(2) These districts in the request are already covered by the "Irrigation Project". Most of main irrigation facilities in the districts are completed, and remaining facilities are assiduously being constructed by RID. That is, the skeleton of the project as a whole is already

framed up. Therefore, the expected cooperation project should be executed with the effective utilization of the existing facilities of the skeleton. These facts are different in nature from the cooperation projects in other Southeast Asia countries where it needs to start from zero. Especially for the irrigation development in the basin of the Chao Phya river, several projects are being accomplished by RID, and the techniques and technical standards are internationally appraised.

(3) It was understood that the districts proposed in the request are those in which the political voice of farmers has increased since the reformation in 1973, requiring the Government to take any measures. The MOAC is required to establish concrete policies with higher priority for the districts. In addition, these four districts have respectively different locational conditions for agriculture, and the development strategies in the 4 districts, if established, can be applied as agricultural development models of the entire Thailand. If some exaggeration is allowed, the possible success of these projects allow a large step toward the modernization of agriculture in Thailand. On the contrary the undesired failure is surmised not only to make farmers distrustful of the politics, causing social confusion, but also to gravely affect the reconstruction of Thai economy.

The request to Japan for extensive cooperation on the basic agricultural development intending to improve the agricultural structure in Thailand can be understood as an action the Thai Government has taken with full confidence on the Japanese Government and the Japanese agricultural technologies.

4. Formation of The Cooperation Project on Irrigated
Agriculture Project - Idea of The Mission -

4-1 Appropriateness of The Cooperation Projects

The Mission has recognized that the materialization of the cooperation for this project is greatly significant for the friendship between Japan and Thailand and for mutual economic development.

They also have recognized that the cooperation for this project involves technically very interesting subjects for Japan from a standpoint of assistances to agricultural development in other part of Asia.

When Japan extends technical cooperation for this project, the experienced technologies for improving agricultural structure will be applied usefully and the technical capability of present Japanese irrigation engineering is surmised to have sufficient potentiality for guidance.

The execution of this project should be judged not only in the light of appropriateness of economic investment, but also by highly valuating social effect which the progressive stability of agriculture will give to Thai society. As for the appropriateness of economic investment, it can be judged sufficiently feasible even before detailed survey.

However, the proper amount of project investment must be determined based on a careful study. Furthermore, even if an appropriated project investment were calculated based on the survey, there are another question whether or not the financial authorities of Thai Government admit the expenditure. The Thai Government as well as almost all the governments of developing countries is not positive for agricultural investment requiring a long period of time before getting fruits for the reason of financial pressure.

With regard to the land consolidation works which requires major investment in *the Irrigated Agriculture Project*, the amounts of economic investment can be approximately estimated as follows, through they depend upon the physical properties of field, kinds of plants to be planted, level of farming technology, interest of invested capital, etc.

Land consolidation works for double rice cropping:

	Water management	Field plot	Yield (paddy double)
1)	Incompleted	Irregular	4 ~ 6 t/ha
2)	A little unsatisfactory	A little irregular	7 ~ 8 "
3)	Satisfactory	Regular	10 "

In case of above noted, in the present situation of Thailand, the amounts which the Thai Government can invest

themselves on land consolidation works are estimated as follows:

In the conditions of 1),	800 ~ 1,800 dollars/hectare
" 2),	2,000 ~ 2,400 dollars/hectare
" 3),	3,000 dollars/hectare

However, this estimate was made without considering the present national financial standing of Thai Government, but purely in light of economic investment.

Therefore, even if Japan extends cooperation in this field, any plan exceeding 3,000 dollars/hectare is not surmised permissible when the importance of extension effects project cooperation considered.

4-2 Basic Strategy for the Realization of the Project

As mentioned above, the Mission has just done the preliminary survey stage in a short time, and the members of the Mission are not considered to have technical ability to investigate generally through the prospect to Thai agriculture. However, succeed in this project, the Mission hold the conviction that consistent basic strategy should be established from the planning stage of the project, and sufficient consensus should be obtained between both the Governments.

This cooperation relates to a large project exceeding the scale of conventional technical cooperation for agriculture

based on an agreement between two countries. Simple technical cooperation does not allow entire achievement of the project. Essentially, economic assistance is required. For the success of the project, desirable is the introduction of a long-term fund of 20 years or more with interest as low as possible (3~5%). From this standpoint, it is desired that the nature of this project is thoroughly understood based on the following basic strategy.

No. 1 - Adoption of integrated method with technical cooperation and economic assistance

In the past, technical cooperation and financial cooperation were mostly done separately in different areas selected, but in this project, it is desirable to execute conjointly both cooperations in one selected area. As for agricultural development, conventional projects by technical cooperation covered restricted areas, viz. normally several hectares to several decade hectares as a model farm or several hundred hectares as a pilot scheme, and generally the amounts of materials and mechanical equipment used per hectare tended to be large under the concentrated guidance of experts. Furthermore, since the cooperation was extended under grant base in principle, with some implication of experimental execution, and trial and error seems to have been allowed to

some extent. In planning, it was intended to spread the results of the projects to the surrounding areas, but normally the actual situations, it did not spill over as expected. The expansion of the project area was limited due to the situations of the countries to provide cooperation.

On the other hand, the economic cooperation by providing funds or loan for agricultural development of recipient countries was mostly extended to cover large-scale agricultural development projects extending over several decade thousand hectares. However, as the amounts of loans were limited, the cooperation was restricted to main facilities such as dams, head works, barrage or construction equipment. Therefore, even if the basic facilities were completed with economic cooperation, intermediate and terminal facilities were in very many cases left incomplete. This exactly applies to Thailand, in which many main facilities were completed but expected project effects do not come up to planner's expectations.

Even though it was known that the on-farm developments technology which requires delicate technique such as water management necessary for double cropping, is to be extended on large project area to seek the

progressive productivity and extension effects in rural scale, there were many cases ended without getting sufficiently expected fruits of project planning. Enlargement of technical cooperation project area was oftenly limited in the past.

To compensate the disadvantages of these two types of cooperation and to obtain multiplied effects, it is most desirable to go into the formation of the project by applying the cooperation system integrating the advantages of both formulas.

In Thailand, to bring *the Irrigated Agriculture Project* into brightfull success, it is indispensable to adopt this integrated system, and only by doing it, expected fruits can be collected.

No. 2 - Harmonious cooperation among the organs concerned

Cooperating country, Japan in this case, must maintain the mutually close cooperation between technical cooperation agency and economic cooperation agency to achieve this project successfully. At the same time, Thailand, too, is required to maintain harmonious cooperation among the organs concerned. The MOAC now has the structure to allow easy formation of a harmonious cooperation setup among respective offices and departments concerned due to the structural reform in the ministry

made in 1975. In the process of achieving this project, it will be tested whether or not the present setup can operate effectively. The executive officers of Thai MOAC who experienced that the completion of main irrigation facilities gave only few on-farm effects, to the agriculture and as a result understand the importance of on-farm development, then make the request to the Mission not only the cooperation for land consolidation works, but also extensive cooperation covering the establishment of planting technology, extension work of farming technology, guidance of agricultural cooperatives, and modernization of socio-economy in rural area. To materialize this kind of cooperation, the harmonious cooperation among the offices and departments concerned in MOAC is the most important administrative element.

No. 3 - Execution policy to provide cooperation timely to respective fields and works with consistent philosophy in the project

The project proceeds in order from the stage of survey through execution of various works to completion. Therefore, for smooth progress, what will be required in the next step should be prepared beforehand, to allow timely transfer to the next step each time. Particularly because this project expects the increase of agricultural production in a wide area, only with technical cooperation

and economic cooperation combined, special consideration must be given to the timing of cooperation enforcement. It is considered that a lesson must be drawn from many cases where though cooperation was executed with agreements among many people, the delay in timing caused the executed cooperation to be valued low.

No. 4 - Forming the project with emphasis on socio-economic development

This project aims at obtaining the outputs of stability of farmers with agricultural production increase, and of modernization of rural socio-economy, by means of achieving *Irrigated Agriculture Project*, by deriving the potential self-help efforts of Thailand, with the inputs of technical and economic cooperation. Conventionally, the cooperation from advanced countries stuck to individual targets for the cooperation, and could not approach to the field of rural socio-economic development. In this sense, it is important to conduct sufficiently the socio-economic survey in the districts concerned for thorough capture of the present conditions in the stage of project formation, and to confirm particularly, contradictions, points to be improved, intentions of inhabitants, etc., for reflecting the results in planning and operating the project.

No. 5 - Foundation of responsible project execution set-up and the establishment of its supporting system

It is a first challenge for Thai Government to take against full-fledged *Irrigated Agriculture Project*. Therefore, both the Governments must well discuss the respective shares of responsibility, and endeavor to establish an organization to facilitate strong and steady works, in founding an execution setup to be directly in charge of executing the project.

For executing the project, various items for discussion are expected to arise in the process of deciding policies, since it is a project of a new venture. Since prompt decision making is an element indispensable for executing the project smoothly, the "Managing and Coordinating Board" to cooperate and get in close contact with MOAC will have to be established.

5. Proposals of the Mission for the cooperation on *Irrigated Agriculture Project*

5-1 Recommendation on the districts to be covered by the cooperation

Based on the field survey, the Mission has selected the following two districts out of the four districts proposed in the cooperation request, as a result of discussion with the organs concerned of Thai Government, and has judged that they are proper for cooperation on *Irrigated Agriculture Project* under the bilateral cooperation.

- (1) The Greater Mae Klong Basin
- (2) The Greater Lower Chao-phyu Basin

The contents of cooperation will be investigated by the survey mission despatched in succession to this Mission, and will be decided by discussion between both the countries. The Mission considers as follows, for orientation for the time being.

5-2 Orientation on the contents of the cooperation

For *the Irrigated Agriculture Project* expected to be developed in the above two districts based on the request of the Thai Government, discussion will be made variously between both the countries in future to achieve the purpose. The Mission considers the contents of the Japanese Governmental

cooperation will be within the frame of technical cooperation for the time being, as follows.

I. The Irrigated Agriculture Project on the Greater Mae Klong Basin

The contents and outlines as follows.

Part 1

- Intensive on-farm development scheme No. 1 -

This area covers the area of about 6,000 Rai (1,000 ha) to take irrigation water by pumping from the right bank of the Mae Klong river where the most upper portion of the Greater Mae Klong Irrigation Project, comprising single cropping rain-fed paddy fields on low yeild and Kampaeng Saen soil zone for cultivating sugar canes on up land. The pumping station for irrigation in the region is almost completed, and the main canals and the central main drainage canal are perfectly completed. The construction works to be done in this region are the execution of the land consolidation works. Basing on the land consolidation works, the modern farming technologies to allow complete double cropping or the rotation farming of paddy and sugar canes should be introduced, and to place this

scheme No. 1 project to the position of a pilot scheme for agricultural redevelopment in the Mae Klong basin.

The procedure for the above shall be set up as follows:

1) Drafting of final design survey report

To be drafted by a survey mission (7 to 8 experts, 2 months of field survey and 3 months of domestic work)

2) Composition and despatch of experts
(April ~ July, 1977)

3) Procurement and shipment of materials & equipment for cooperation (from April, 1977)

4) Execution of cooperation activities

-1 Construction of terminal facilities
(from October, 1977)

-2 Land consolidation works (from October, 1977)

-3 Farming guidance (from April, 1978)

-4 Guidance of agricultural cooperatives
(from October, 1978)

-5 Extension activity (from October, 1978)

-6 Guidance of marketing system (from April, 1979)

-7 Guidance of water management technology
(from April, 1978)

5) Socio-economic survey and project evaluation
tion

The above should be executed timely according to the necessity. Of the results, the elements which require the orbital course correction of the project should be fed back to the project operation.

The works of 4)-1 and 4)-2 concerning the improvement of agricultural land is desirable to be executed in the dry season (November to May, in the following year). The process of smooth activity will require an execution setup based on construction equipment to allow completion in two dry seasons of 1977 ~ 1978 and 1978 ~ 1979. The construction equipment provided will leave the life of 50% to 70% even if the works in this region are completed. The remaining construction equipment will be used also for Part 2, Land Consolidation Scheme No. 2, and Part 3, Petchburi model scheme.

The above cooperation activities in this region are desirable to be completed under the technical cooperation in 5 years, except the guidance of 4)-5, 4)-6 and 4)-7.

Part 2

- Land consolidation scheme No. 2 -

The region is a paddy field zone with the area of 3,000 Rai (500 ha) where irrigation water intake from the left bank of the Mae Klong river and main canals are already completed. Double rice cropping is aimed at under the land consolidation work.

The detail design of the land consolidation work in this perimeter is already completed by the Thai Government. Since the MOAC wishes to execute the work as soon as construction equipment are obtained, the work in this region has been decided to be executed on the responsibility of Thailand as a result of discussion with Mr. John Boonlu, Director of Central Office of Land Consolidation. If Japan were to extend cooperation, the contents will be as follows:

1. Supply of construction equipment (from December, 1978)
2. Technical advices on the land consolidation works (from October, 1977)
3. Supply of materials and equipment for farming (from December, 1978)
4. Farming guidance (from April, 1978)

This scheme is expected to derive the self-help effort of the country sufficiently. Then, this way is much more liable to spread widely than the scheme depending solely on cooperation. The result is surmised to be worthy of paying attention.

Part 3

- Petchburi model scheme -

This scheme area is located in Petchburi Pref., in the basin of the Petchburi river, and therefore, cooperation in this region was requested as an independent scheme as in the above mentioned request letter of Thai Government. However, if the main project office of the cooperation in Mae Klong area is placed in Kanchanaburi City, the region is about 2 hours away from the city by car, and can be covered for extension services in the range of cooperation activity of the scheme No. 1.

The proposed cooperation will be extended to the farmers in 600 Rai (100 ha) along the national road who have agreed to the execution of land consolidation to form a crop diversification model scheme. If Japan were to extend cooperation, the contents will be as follows:

1. Land consolidation work to allow paddy-upland rotation (from December, 1978)
2. Farming guidance on crop diversification (from April, 1978)
3. Supply of materials and equipment for farming (from December, 1978)
4. Advices on transportation of agricultural products and market development. (from December, 1978)

This region is advantageously positioned as a source of supply of fruits and daily vegetables to the largest metropolitan consumer city, Bangkok. In addition, it will provide a large demonstration effect as a model farm because of its emplacement, along the national road.

Part 4

- Feasibility study for on-farm land consolidation -

The Thai Government strongly desires that land consolidation works are developed as extensively as possible in the Mae Klong basin. However, the execution of land consolidation works in the basin requires a fund of at least 1,700 dollars/hectare. Even if the results of the feasibility study justify

the economic execution, the execution cannot be started before the prospect for fund availability is obtained.

The Thai Government seems to inquire the fund for this execution at low interest for a long period of time in terms of economic cooperation.

To meet the necessity of Thai Government, the feasibility study must execute as a matter of course. And since the entire agricultural land of 400,000 hectares in the Mae Klong basin can be said to be a district requiring land consolidation works, regions for the cooperation must be selected based on the results of field survey and it's priority study. Furthermore, in the Mae Klong basin, the technique of land consolidation to satisfy the conditions of this district is not yet established. If the results of the cooperation of the above Part 1 and other parts are obtained, many valuable data will be available to serve the establishment of the technique. But, it will take several years to get the results. Therefore, at the stage of feasibility study, the justification of alternatives on the land consolidation works including very basic experiment work must be made to establish an execution policy.

Based on the above considerations, the orientation of the cooperation by our country for the feasibility study is considered as follows.

- (1) Master plan study and justification of alternatives on the land consolidation works

The agricultural land of about 400,000 hectares in the Mae Klong basin can be covered by the land consolidation works. This basin can be classified into 5 regions (see 3, 3-1, (1)) in terms of land use type. Since a land consolidation project is generally established to cover the area of about 5,000 to 50,000 hectares, master plan survey should be conducted for the overall area of 400,000 hectares, to obtain the orientation of the whole, and then the priority order for the cooperation should be decided.

Then, the technique most suitable for the land consolidation works in the basin must be studied and determined. These operations are desired to be executed in stage of the feasibility study.

1. Survey work period (to be started

at an earliest opportunity and
arranged in about one year)

2. Experts (about five members, consisting of one for socio-economy, one for agriculture and three for irrigation)
3. Supply of materials necessary for justification study.

(2) Feasibility study (first step)

The proper scale of the feasibility study will be about 300,000 Rai (50,000 ha). The execution region will be decided as a result of the survey of above (1).

For instance, the land consolidation executed in Japan domestically for 3 years from 1972 to 1975 covered the area of about 140,000 ha, viz. average about 50,000 ha per year.

In the case of Thailand, it is not advisable to take too much time for the feasibility study, because if the apparent economic appropriateness of this project were confirmed, the Thai Government will give a top priority for the project execution. It is rather advisable to make sufficient work in the stage of the detail

design, expecting the guidance by Japanese experts, since this project is expected to be carried out in relation with the technical cooperation as mentioned before (4, 4-2, No. 1). For agricultural development in this district, the IBRD shows strong interest in the development, and they will watch the results of Japanese cooperation in this district. Therefore, it is surmised necessary to promote the cooperation works through survey, planning and execution smoothly without any interval, to give effects as early as possible on the scale to meet international evaluation.

The outline is surmised to be as follows:

1. Working period of feasibility study
(November 1977 ~ October, 1978)
2. Experts: about 10 members

Since the technical cooperation project works will have been operated at that time in No. 1 scheme by a number of experts the feasibility study survey team will be considerably provided with data, and other conveniences.

II. The West Bank Tract of the Lower Greater Chao Phya Project

The contents and outlines are as follows:

Part 1

- Feasibility study on the West Bank Tract for dike cum land consolidation scheme -

This proposed project is investigated by the Central Office of Land Consolidation (COLC) and the Land Reform Office (LRO) of MOAC under a quite new conception.

The delta basin of the Chao Phya river is called "Rice Bowl" of Thailand, and is the center of paddy production. It is benefited by the Chao Phya Dam completed in 1957, but on-farm development in the basin are not sufficient. Most regions are damaged by flooding inundation in the rainy season and do not allow planting due to the shortage of irrigation water in the dry season. However, as a matter of fact, the situation has been improved by the efforts of RID for long years.

About half of the paddy field area in this delta basin is under the control of landowners, and at present, the farmers' incentive to have higher production is variously restricted and is not so

high. However, among owner farmers, there are highly motivated farmers who surround their land by circled low dike by their own money, to prevent the damage of flooding inundation in the rainy season, and supply water by vertical pumps or *dragon bones wheel pump* (local wooden made) in the dry season, in seeking double cropping.

According to the conception of this undertaking at present, the Land Reform Department, MOAC will buy 5,000 ha of paddy fields owned by large land-owners. And after, they surround the land by a circled dike. *Waju* in Japanese, and construct irrigation and drainage facilities to allow complete double cropping under the land consolidation program, the land will be divided to tenant farmers by 25 Rai (about 4 ha) each to create owner farmers. This trial is revolutionary and ambitious in Thailand, and shows the intention of Thai Government to grapple squarely with the present social requirements. Therefore, the MOAC wishes to make this first plan succeed by all means.

This district is on the right bank of the Chao Phya river between Bangkok and Ayudhya, and is located about 30km in the southwest of Ayudhya.

It is an alluvial flat area of Chao Phya delta with gentle slope, located in the north side at the center of Phya Banlue canal connecting the Chao Phya river and the Subhan river.

In the rainy season, the paddy fields are inundated to the depth of about 40 ~ 70cm with flooding from the upper reaches, and in the dry season, the surface of paddy fields is higher than the water surface of Phya Banlue canal by about 80 ~ 150cm. Therefore, gravity irrigation from the canal cannot be made. The water level is adjusted by the locks provided at the points connecting Chao Phya river and Subhan river with this canal. But in the dry season, this water level adjusting equipment cannot raise the water level enough to allow gravity irrigation. According to the original plan of RID, gravity irrigation was possible by canals taken from the upper reaches and the farmers in this district seem to have believed in it, and now seem to be unhappy with the present situation. Under such circumstances, single paddy cropping only is effected in the district, and the houses of farmers along the canal indicated they were poorer than those in other districts in Thailand.

However, if the circled dike is completed with

irrigation facilities, the agricultural land will entirely be changed and it is easily imagined the area will become most promising because of the very fertile soil. Since dams have been completed in the upper reaches, sudden water level hike will not occur. Therefore, the circled dike is to be provided just for preventing inundation, and the height of about 1m is sufficient. The cost of circled dike construction will not be so much. For the construction of a pumping station for irrigation and drainage, since there is a transmission line at 12 ~ 13km from the district, electricity seems to be available just by arranging a distribution line for the distance.

From the above, the arrangement in the feasibility study and in the detail design survey of this district is not technically difficult in particular, and is surmised to proceed relatively easily.

The Mission considers the following settings are proper as orientation for the time being.

1. With about 5,000 ha set by MOAC, as a target of cooperation, the feasibility study should be conducted as soon as possible.

2. There is owner farmers' land around the region of 5,000 ha, and the regional area can be expanded in view of geographical conditions. However, in order to meet the desire of MOAC to complete as soon as possible for obtaining results, 5,000 ha is considered a proper area for a project. Furthermore, to meet conceivable is to select 1,000 ha from the 5,000 ha for a detail design survey based on the feasibility survey, and to construct a pilot farm under the technical cooperation.

3. Despatch of the feasibility study survey mission

Working period (from October, 1976, 2 months at the site, 3 months for domestic work)

Proposed survey team (about 10 experts, to include one socio-economist by all means)

4. Technical cooperation

Detail design survey (at an earliest opportunity in 1977)

Despatch of experts for execution (in or after July, 1977)

Part 2

- Pilot farm construction scheme -

As mentioned above, the area the most proper as a pilot farm should be selected from the 5,000 ha covered by the feasibility study, and the final design, execution of works and on-farm guidances should be made throughout under the technical co-operation.

Personnel of MOAC should be trained in this pilot farm, and it is desirable to advise Thai Government to execute the works on 4,000 ha on their responsibility.

Also, it is desirable that the construction of on-farm development will be completed in 3 years, and that new vigorous owner farmers will be created in 5 years.

The contents mentioned above should be considered for cooperation for the time being. However, as known from the above explanation, the project is very extensive, and it seems proper to make the orientation of the next stage when cooperation works proceed to some extent in a stage.

The years and months given above in the parentheses to show working times are entered just for

approximate references, and should be altered according to necessity by deliberations in future.

5-3 Early materialization of training cooperation

In relation with the execution of the project, the training of Thai governmental personnel in Japan is also an effective means to help the success of the project.

Since the project is developed with emphasis laid on the improvement of on-farm structure, the following training is desirable.

(1) Training concerning land reform systems

The weakest sphere of agricultural structure in Thailand is on-farm development as frequently pointed out. The present organization of Thailand does not incorporate the on-farm development as a system. It is desirable that the on-farm development is executed by the Government directly, but the application on a wide area is difficult because of the governmental financial problem. In Japan, the subsidiary system is elaborately introduced, to derive the incentive of beneficiary farmers.

It is very important to study Japanese systems which may be applied in the agricultural policies of Thailand, for deriving the selfstrain efforts of farmers.

It is desirable to invite higher personnel engaged in the administration in MOAC and Ministry of Finance in Thailand, and to guide them kindly until they can draw up drafts.

(2) Training concerning water management

The water management technology on farms is Japan's "art" and is a technology which must be mastered by all means to succeed in this project. The water management technology must be taught well to and executed by farmers on-farms, and for this purpose, special engineers for water management must be cultivated.

It is surmised that Japanese water management technology cannot be applied as it is, therefore, the exploitation of the technology suitable for the agricultural conditions in Thailand is necessary. However, the training in the initial state is desirable to be executed in Japan.

(3) Training concerning agricultural extension services

At present, there are extension workers in Thailand, but the guarantee of their personal status is not sufficient. The guidance on agricultural technologies is provided by the earnest extension

workers who have sufficiently mastered the agricultural technologies suitable to the respective fields. The establishment of extension service system is necessary by all means as a part of agricultural policies, to allow extension workers to make their extension activities based on a stable professional position.

At first, desirable is the training of MOAC personnel concerned, to establish this system.

(4) Training concerning the activities of agricultural cooperatives

A key to the success of the project is the activities of agricultural cooperatives.

In Thailand, the economic control by middle man is prevailing in all parts of rural villages. It can be reasonably imagined that if the agricultural production in the districts increase by the execution of the project, middle men extend their power into the districts. The project intends that the increase of agricultural production is restored as profits of the farmers, for stable development of rural society. For this purpose, the agricultural cooperatives to be built in the project must be guided to be strong enough. And

as a part of cooperation works, various measures must be taken to help the cooperatives make active.

All the four categories of training are considered important, but among them, the training of (1) is desired to be executed as soon as possible in the planning stage of the project.

5-4 Advice on the procedure of the project for the time being

For smooth promotion of the project cooperation, the action to take the next step must be taken steadily without loss of time. Proposals with goodwill often become useless unless they will not be put on schedule for implementation. These situations should be avoided by all means as far as this project cooperation is concerned.

In this sense, the Mission want to give the following advices for the procedure of the project for the time being.

- (1) Mae Klong Basin: For the final design of the intensive on-farm development scheme No. 1, the field survey is desirable to end by March, 1977.
- (2) Chao Phya Basin: The feasibility study on the West Bank Tract for dike cum land consolidation scheme is desirable to end by March, 1977, including domestic work.

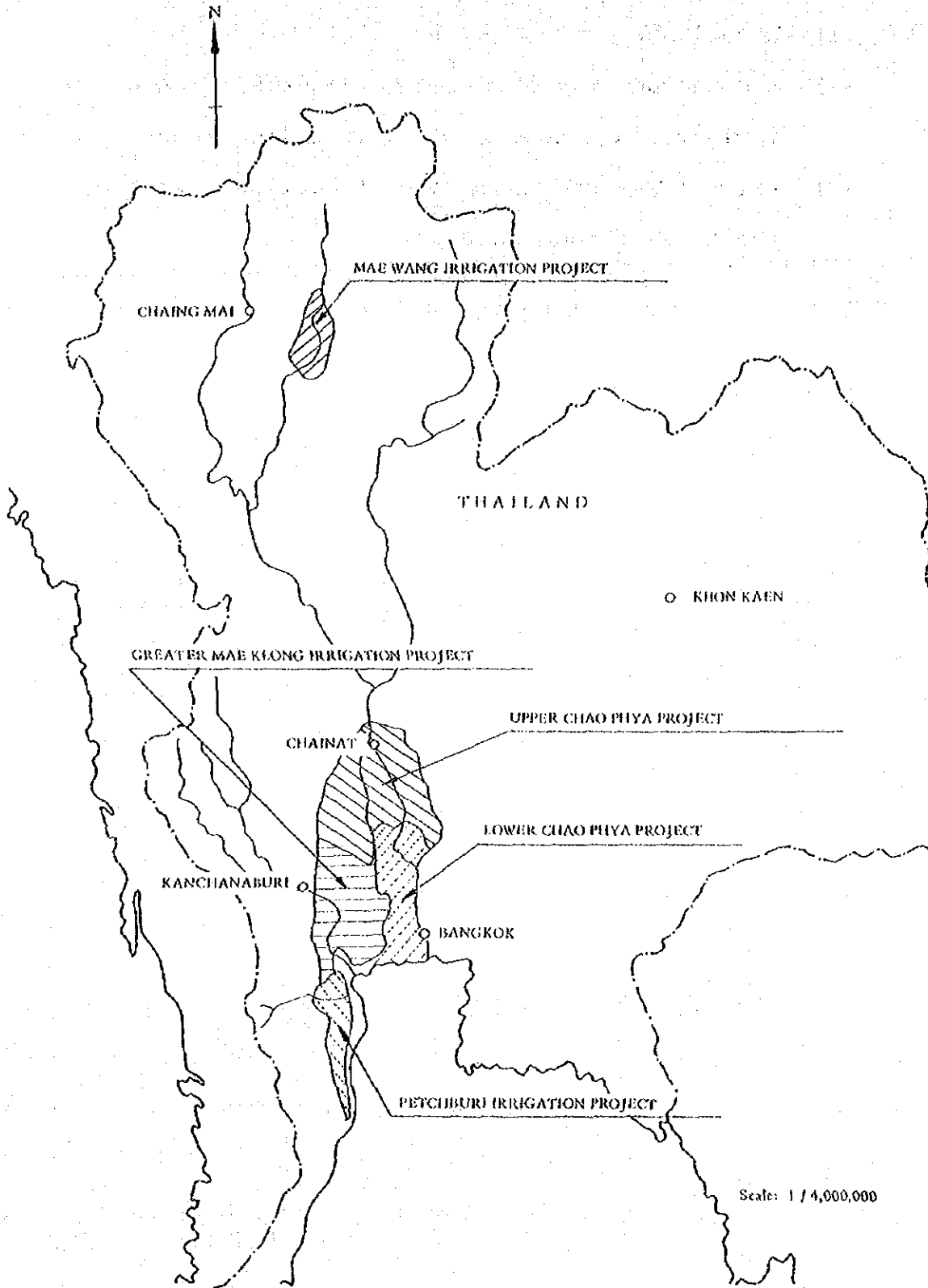
- (3) The detail design survey of the 1,000 ha region selected in the feasibility study is desirable to be conducted in succession to the above (2).
- (4) The Record of Discussion (R/D) between Thai and Japanese governments concerning this cooperation is desirable to be made out in the latter on the middle time of the survey period of above (1).
- (5) The team composition of Japanese experts to participate in this project cooperation is desirable to be completed in April to July, 1977.
- (6) If the Thai Government requires the early start of cooperation, it is desirable to despatch some experts before the R/D agreement according to the Colombo Plan regulation, and to make them engaged in preparatory works before the start of cooperation.
- (7) The training of Thai Government personnel on the land reform systems is desirable to be executed by March, 1977.

For the success of this project cooperation, the smooth coordination between technical cooperation and economic cooperation is an essential condition. For this purpose, the sufficient discussion among the organs concerned is strongly recommended.

[Appendix]

- (1) Location Map
- (2) Memorandum of the Preliminary Survey Mission on Irrigated Agriculture Project in Thailand
- (3) List of persons concerned of Thailand, with whom the Mission made contact

(1) LOCATION MAP



(2) Memorandum of the Preliminary Survey Mission on Irrigated Agriculture Project in Thailand

The Japanese Preliminary Survey Mission (hereinafter referred to as the Mission), organized by Japan International Cooperation Agency (JICA) and led by Dr. TAKASHIGE KIMURA, visited Thailand on 10th May to 2nd June, 1976 for the purpose of preliminary survey on the technical cooperation between Thailand and Japan for the Irrigated Agriculture Project in Thailand which was requested by the Department of Technical and Economic Cooperation (DTEC), reference No. 1704(1)/1969 (hereinafter referred to as the request), the Royal Government of Thailand.

During its stay in Thailand, the Mission had fruitful talks through several meetings with persons concerned with the matter and the joint field survey concerning the desirable measures to be taken by the Mission which will contribute to the successful formulation of the proposed project. Also the Mission could obtain valuable references and materials through the cordial cooperations of the staffs of the Ministry of Agriculture and Co-operatives (MOAC). As a result of the meetings and the joint field survey, the Mission and authorities concerned have reached an understanding on the followings:

(1) Amendment of the proposed project sites

As a result of the study of the both sides, between the Mission and Thai authorities concerned, the proposed project sites will be undertaken as follows:

1. The Greater Mae Klong Irrigation Project*
 2. The West Bank Tract of the Lower Greater Chao Phya Project
- * Including the Petchburi integrated model farm scheme

The Mission agreed that necessary procedure for the amendment based on the request is to be taken to the Government of Japan by the responsibility of the Mission.

(2) Reconfirmation of the target of the proposed project

The term of "Irrigated Agriculture Project" means the integrated on-farm development based on land consolidation works which will lead to double-cropping of rice and/or diversification of crops and increases in productivity.

The main activities of the proposed cooperation will be applied to following three (3) fundamental approaches to obtain steady and step by step spreading of intensive agricultural on-farm development in each proposed project area.

1. Renovation of agricultural infrastructure

This approach aims at developing agricultural infrastructure for the establishment of modernized agriculture and introducing farmer's incentive as well. The concrete measures will be realized through on-farm land consolidation works, improvement of minor irrigation facilities, rehabilitation works, and adequate water management at farm level.

2. Introduction of modern agricultural technology and its extension

This will be obtained by the following activity mentioned above (2) 1. The conceivable measures are similar as the paragraph 4-3 in the request. Besides the above, crop diversification will be considered for the Mae Klong Project area.

3. Feasibility studies and their justification

The proposed feasibility studies will be carried out on the Greater Mae Klong Project area and the West Bank Tract of the Lower Greater Chao Phya Project area. Each study will include justification on the conceivable alternatives not only from technical aspect but also from socio-economic point of view. In addition, the consideration should be given to determine appropriate farmers holding ability and size of farming unit for the land consolidation works.

The Mission will recommend to the Government of Japan the above-investment survey both under the technical cooperation program.

(3) Embodiment of the proposed irrigated agriculture project cooperation

As a result of several meeting and the joint field survey, the Mission has agreed to take note of materialization of the project.

The proposed cooperation will be objected on irrigated agricultural development of the Greater Mae Klong Irrigation Project and the West Bank Tract of the Lower Greater Chao Phya Project.

Each project consists of following cooperation activities:

1. The Greater Mae Klong Irrigation Project

(1) Pioneer activities:

1. Intensive on-farm development scheme No. 1
Area: about 6,000 Rai R.B.
2. Land consolidation scheme No. 2
area: about 3,000 Rai L.B.

3. Petchburi model scheme
Area: about 600 Rai

(2) Feasibility study for on-farm land consolidation

1. Master plan and justification of alternatives
Area: Whole Mae Klong basin
2. Feasibility study on the 1st stage
Area: about 300,000 Rai

II. The West Bank Tract of the Lower Greater Chao Phya Project

- (1) Feasibility study on the West Bank Tract for dike cum land consolidation scheme
Area: about 30,000 Rai
- (2) Pilot farm construction scheme
Area: about 6,000 Rai

Detailed contents and its schedule for the cooperation will be determined by the possible forthcoming mission after negotiations with the Thai authorities concerned.

Required project sites for each scheme are referred to Annex "A".

(4) Project organization chart for the cooperation project

Concerning the project executing organization tentatively negotiated between the Mission and the Thai authorities concerned, is referred to Annex "B"

(5) Consideration by the Mission

The field survey enabled the Mission to find various facts in rural area and to get better understanding on the objectives and significance of the request for the setting up of the Irrigated Agriculture Project.

The Mission has been greatly impressed by the enthusiasm of persons concerned to do land consolidation work. And the Mission recognized the abundant agricultural potentiality of Thailand without any doubt especially in the area of the proposed project sites such as the Greater Mae Klong and the Lower Chao Phya basin. In these respects, the Mission was deeply interested in the requested program and would make every endeavor to ensure the materialization of the cooperation project between Thailand and Japan.

Also, the Mission considers that the determination of proper project is the vitally important factor for these cooperation projects.

(6) Notes on others

1. Assignment of Japanese experts

Assignment of Japanese experts will be wholly the responsibility of the Government of Japan. According to the necessity, a coordinating manager will be attached to the project (refer to Annex "B").

The number and qualification of the experts will be decided by the possibly forthcoming mission through negotiation with the Thai authorities concerned.

2. Supplies and equipment concerned

The detailed measurement will be determined after the completion of design survey.

The Mission considers that, besides the requested equipment, necessary construction equipment for the land consolidation works could be provided by the Government of Japan under the technical cooperation program within its budgetary limitation. So, the listed equipment on the request can be modified according to actual needs.

3. Issue of technical guide book

Necessary technical guide book and manual will be prepared under the cooperation activities.

4. Short term experts for preparatory survey on intensive on-farm development will be considered in due course.

5. A survey report by the Mission will be sent to the Ministry of Agriculture and Cooperatives through the proper channel. After sending the report, the Mission hopes the next mission will visit Bangkok in this fiscal year for the purpose of the detailed design survey and the agreement in the form of "Record of Discussion".

Dr. Takashige KIMURA

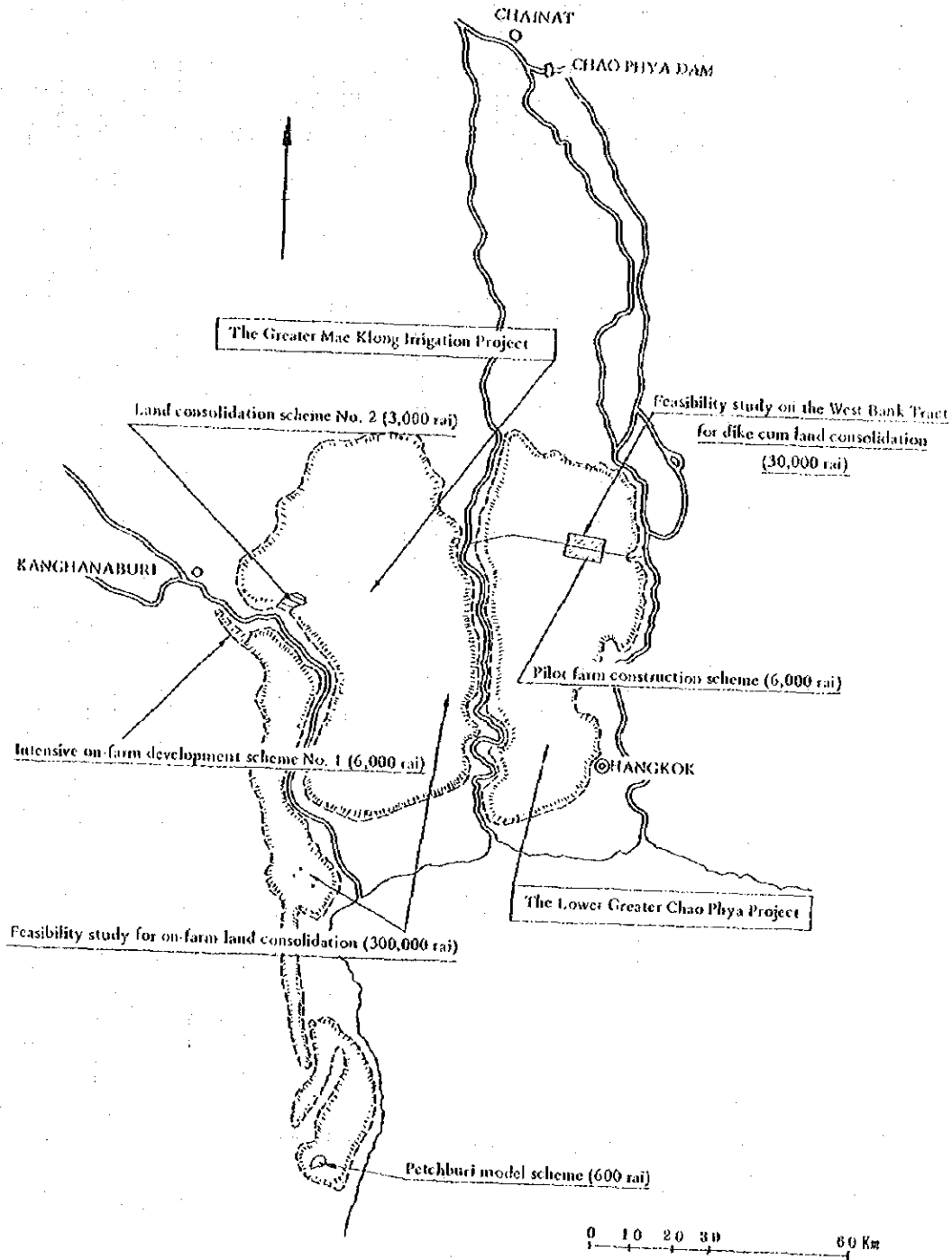
Head, The Japanese Preliminary Survey Mission

ANNEXES:

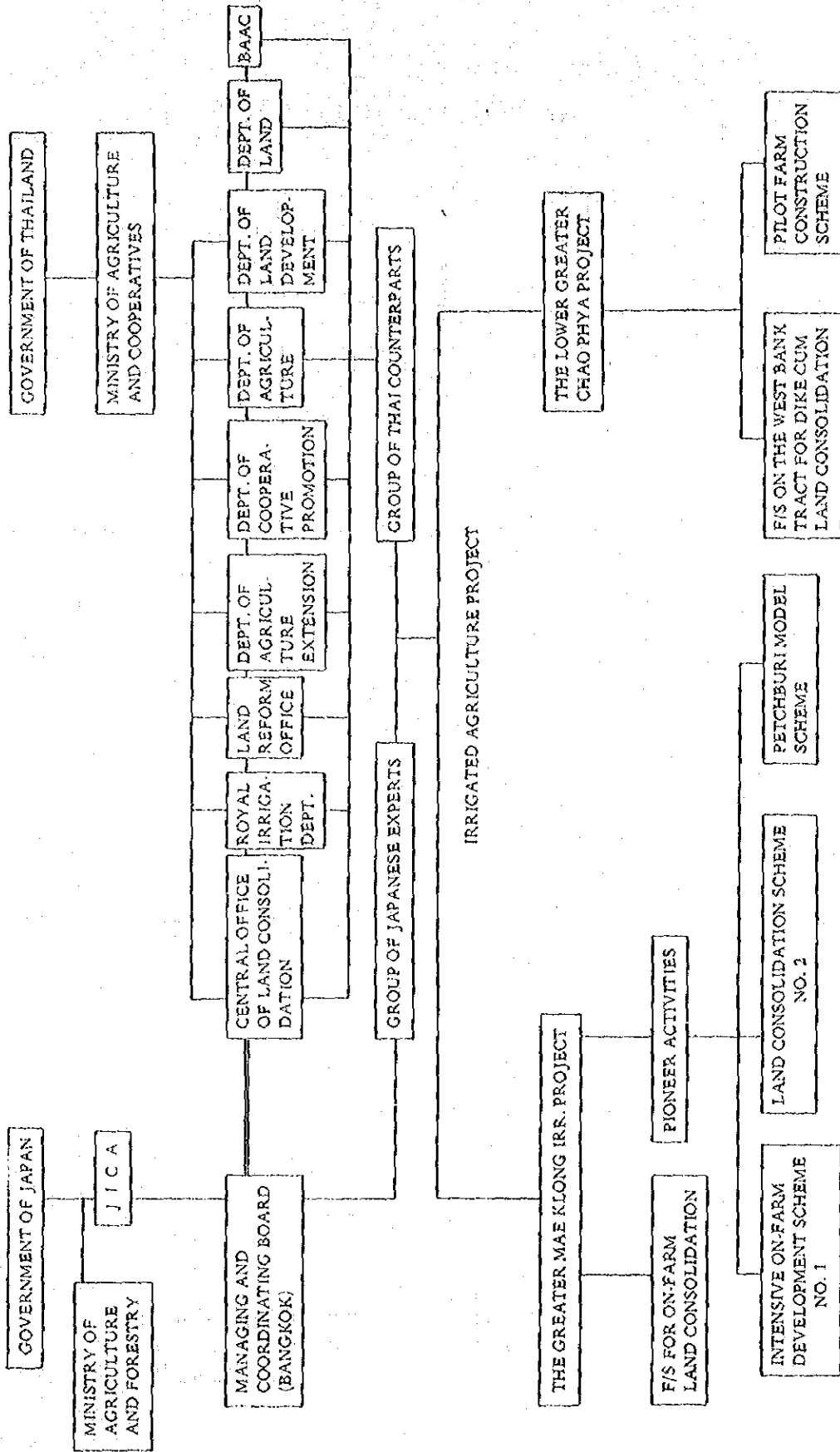
- A. The proposed project map
- B. Project organization chart
- C. Concerns the Mission contacted

Annex "A"

THE PROPOSED PROJECT MAP



PROJECT ORGANIZATION CHART FOR THE IRRIGATED AGRICULTURE PROJECT



Annex 'C'

CONCERNS THE MISSION CONTACTED

	Executives	Coordination
Project:-		
1. Nong Wai Pioneer Agriculture Project	RID	ADB
2. Chanasoot Irrigation Project	RID	ILACO
3. Sapphaya Cooperative Project	RID	TAIWAN
4. Rice Irrigation Research Center	MOAC	
5. Samchook Irrigation Project	RID	
6. Suphanburi Rice Experimental Station	MOAC	
7. Mae Klong Irrigation Project	RID	IBRD
8. Irrigation Agriculture Experiment Station	RID	
9. Ban Chao Nen Dam Project	EGAT	IBRD, OECF
10. Petchburi Irrigation Project	RID	
11. West Bank Tract of Lower Chao Phya Project	RID	
12. Mae Wang Irrigation Project	RID	
13. Kew Lam Dam Project	RID	

Department:-

1. Central Office of Land Consolidation, Ministry of Agriculture and Cooperatives (MOAC)
2. Royal Irrigation Department, MOAC
3. Land Reform Office, MOAC
4. Department of Agriculture Extension, MOAC
5. Department of Technical and Economic Cooperation, Prime Minister Office

(3) List of persons concerned Thailand

1. Dr. Thalerng Thamlong Nawasawat Under Secretary of Ministry of Agriculture and Cooperatives (MOAC)
2. Mr. John Boonlu Director of Central Office of Land Consolidation (COLC), MOAC
3. Mr. Paitoon Palayasoot Deputy Director of COLC, MOAC
4. Mr. Thavatchai Satrusajang First Grade Engineer of COLC, MOAC
5. Mr. Charin Athayodhin Deputy Director of Royal Irrigation Department (RID), MOAC
6. Mr. Chalermthep Ratanaprayooh Agronomist, Section of Irrigated Agriculture, RID, MOAC
7. Mr. Chamlong Attanatho Inspector General of MOAC
8. Mr. Yookti Sarikaphuti Director of Department of Agriculture Extension, MOAC
9. Mr. Taweesak Sesavetch Deputy Director, Department of Agriculture Extension, MOAC
10. Mr. Worasuk Pukdee Extension Officer, Department of Agriculture Extension, MOAC
11. Mr. Chulhathep Pongsroypech Extension Officer, Department of Agriculture Extension, MOAC
12. Dr. Chaoyong Chuchart Director of Land Reform Office
13. Mr. Kangwan Dhephasadin Na Ayuthaya Deputy Director of Land Reform Office, MOAC
14. Dr. Suttiporn Jeerabhandhu Land Reform Office
15. Mr. Apichai Karunyanitch Planning Division of Under Secretary Office, MOAC
16. Mrs. Somlukkana Kaewboonreaung Planning Division of Under Secretary Office, MOAC

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|-----|------------------------------|--|
| 17. | Mr. Wanchai Siriratna | Deputy Director of Department of Technical and Economic Cooperation (DTEC), Prime Minister Office |
| 18. | Mr. Kirkkri Jirapat | Chief of Colombo Plan Division, DTEC |
| 19. | Mr. Mahop Tangusaha | Colombo Plan Division, DTEC |
| 20. | Mrs. Prachit Kambhu | Director of Division 4, Budget Bureau, Prime Minister Office |
| 21. | Mr. Pairoj Suchinda | Chief of Agriculture Planning Division, NESDB |
| 22. | Mr. Wanchai Tepsuwan | BAAC |
| 23. | Mr. Skulwattana Chanthwobol | Project Manager of Nong Wai Pioneer Agriculture Project |
| 24. | Mr. Laait Sainankeo | Assistant Engineer of Chanasoot Irrigation Project |
| 25. | Mr. Tanti Jeragalangulwongse | Project Engineer of Land Consolidation in Sappaya Cooperative Project |
| 26. | Mr. Peng Pentakoon | Chief Provincial Cooperative Officer of Chang Vad, Chainat |
| 27. | Mrs. Lanna Boonplitpol | Assistance of Chief Provincial Cooperative Officer |
| 28. | Mr. Kasem Jarinto | Chief Agriculture Extension Officer in the Land Consolidation Area of the Upper Chao Phraya Irrigation Project |
| 29. | Mr. Vichien Sasipraya | Director of Suphanburi Rice Experimental Station |
| 30. | Mr. Boonlert Klyprayong | Suphanburi Rice Experimental Station |
| 31. | Mr. Chari Tulyanond | Chief Engineer of Mae Klong Irrigation Project |
| 32. | Mr. Sompote Sukhumparnich | Assistant Chief Engineer of Mae Klong Irrigation Project |

33. Mr. Sanang Jampa Director of Ban Chao Nen Dam Project
34. Mr. Manoch Nilniyom Assistant Chief Engineer of Petchaburi Irrigation Project
35. Mr. Sukson Tanapum Chief Engineer of Kewlom Dam Project
36. Mr. Thawat Tantiteerawit Mae Wang Irrigation Project

