At the field level, the project implementation Coordinating Committee, composing of agencies related to the project such as RID, PCLC, LD, ALRO, DAE, ARDD, BACC, etc., would be established under the leadership of RID. The Committee should play an important role in the cadastral mapping and registration, substituted land schedule, promotion of agricultural supporting services, organization of farmers' group, cooperation and coordination among each agnecy and project. etc. The Committee would be chaired by the Mae Klong Project Director.

5.2. Operation and Maintenance

(1) Organization

The Operation and Management of the completed irrigation project is undertaken by RID under the administrative assistance of the Operation and Maintenance Division for each system. The Regional Directors are also responsible for the O & M of existing irrigation systems completed by RID in their jurisdictions.

For the Kamphaeng Saen Sub-project O & M Office, Project Engineer would be assigned. The Project Engineer under the Regional Director X is responsible for O & M of the Kamphaeng Saen Irrigation System which is the same system as existing one. Staffs of engineering, agricultural services, O & M, mechanical and administration section would assist him. Under the Chief of O & M, supervisors would be appointed to serve the O & M of an irrigable area covering about 20,000 ha with assistance of water masters, who would supervise zone man (or water operator). Common irrigator would distribute water to an irrigation unit which would be the smallest area for water management responsible by the RID.

The Project Engineer, as chief of O & M offices, for the Kamphaeng Saen area would be responsible for all of the works on the Operations and Maintenance of the irrigation and drainage including maintenance of service roads. Maintenance works, such as repair, improvement and rehabilitation of the canals and facilities would rest with staff of Engineering Section. For promoting advanced cultures for irrigated agriculture to the farmers, Agricultural

Supporting Section would play a critical role. Mechanical Section would deal with the management and maintenance of equipment and vehicles in the office. Staffs of Administration Section would help Project Engineer in the administrative matters including budget, finance, etc. O & M Section would deal with all of the water operation and maintenance of canals and facilities. Supervisor who belongs to this section would be supervising the activity of water masters and be responsible for all O & M works in his jurisdiction.

(2) Water Management

The Project, for efficient water operation, would formulate water management program, which would ensure to distribute water to each small unit of farm plot through provision of adequate on-farm facilities.

Water master would directly be responsible for water delivery and supervise about 5 zone men and some gate tenders, and his major works are as follows:

i) to examine and determine the cropping pattern suitable for the area based on water availability and estimate a quantity of irrigation water to be supplied from the canals to each irrigation unit on weekly basis;

ii) to check and control the quantity of water passed through at specified points according to the cropping pattern already laid down;

iii) to make record and statistical study of actual consumption of irrigation water based on invested and measured losses of water in the canal and at the terminal;

iv) to supervise the water operators and gate tenders and arrange for their works with regard to efficient water management and adequate maintenance of the canals and facilities; and,

v) to make monthly report on the water operation, specially irrigated land, and list of farm land irrigated during wet and dry seasons.

Zone man would supervise 5 to 6 common irrigators and would support water master's works in estimating and reporting to water master about irrigated area and quantity of water delivered and also the water to be delivered through the laterals and/or sub-laterals and perform the maintenance of works of the laterals as well as drainage canals in the district assigned to him.

Common irrigator would manage the water distribution at the turn-out which would cover an irrigation unit, area of about 40 ha to 60 ha. Three irrigation units would be handled by one common irrigator (farmer), who will make the contract with the Project Engineer for the O & M office. Besides the water operation works, his performance is to report to zone man on water quantity required from farmers, to maintain the main ditches and perform the necessary works for water management.

(3) Water Users' Association

As for effective use of water and increase of agricultural productivity, emphasis would be made on mutual cooperation among farmers in the irrigated land. There are at present several farmers' groups supported by the Government. Those are, however, mostly organized by the personal principle and might have difficulty in accepting water management under the present system. Water Users' group organized on the basis of irrigation systems is then of primary importance.

The proposed organization of water users' association would be set up in an irrigation unit. Main purpose of this group would be to manage the water effectively to distribute in their own farm land under mutual cooperation. The president of the association, who would be selected by mutual vote, is responsible for distributing the water

fairly to each farm plot in the area managed by the association with mutual cooperation. Water distribution method would be decided by mutual consent of the members. It is desirable that rotational interval would be adequately determined based on sub-irrigation unit covering an irrigable area of about 8 to 12 ha and water supply would be measured and/or distributed at definite time. Specially, any conflict on water distribution should be avoided when it is in shortage of water, in cooperation with common irrigator. This farmers' group should be established by the RID.

The water users' group would be expected to be a group to obtain loan from BAAC and become a contact group instead of contact farmers' group under the NAEP. Moreover, this group would favorably cooperate the collection of irrigation fee for the BAAC. Upon organizing the group, these units would be associated with each other in large scale of system for water management. This big scale of group would become the water association for the entire area of Kamphaeng Saen Project in future.

5.3. Proposed Agricultural Supporting Services

(1) Strengthening of Extension Services

The government would push on National Agricultural Extension Project which covers the Kamphaeng Saen project area in order to strengthen the extension services through increasing of staff, improvement of extension method, training of extension staff, construction of training centers and procurement of equipment and instruments for the services. It is expected that the present extension institutions would be upgraded for the success of this project.

In order to achieve successful result of the Kamphaeng Saen Project, cooperation and coordination between RID and DEA is primarily important. Consequently, Agricultural Development Coordinating Committee composing staff of agencies related with agricultural supporting services, such as BAAC, LD, AC, etc., should be created.

This Committee would coordinate with the planning and problems of related agencies.

On the other hand, under the project Water User's Association would be established under the administrative control of RID. This association would be organized on the basis of definite area. (irrigation system area) and associated with all of farmers operating in its service area. Thereby, when the association and/or its members form a small unit group for the said extension project, it would bring about effective services.

The Kamphaeng Saen Irrigated Agriculture Development Project would initiate the on-farm development with land consolidation in the Mae Klong river basin. The Project, therefore, requires to introduce new farm management, farming techniques, and new crop varieties to meet the improved on-farm conditions. From the viewpoint of promoting these requirements, a facility for training and study through familiar way of audio-visual equipment should be provided so that the farmers can develop their positive attitude toward the farm management and learn the advanced farming practices.

(2) Agricultural Inputs Supply

Seed

Upon completion of the project, HYV of paddy in any farm plots could be planted. The use of HYV is very important factor to increase production of paddy as well as farm income. Supply of seed is presently insufficient, therefore, effort at increasing seed production of HYV should be extend more. Besides this effort, the cooperation with farmers as well as smooth marketing would be required for securing the seed in its quantity. Moreover, insuring supply of seed resistance for deep water, which is suitable for the farm plot where inundation is comparatively deep, would also be required. The extension offices should take action to keep this variety seed and ensure the supply system. Under the project, demand of certified seed would be necessary to about 1,300 ton/year in its quantity.

Fertilizer

In order to gain higher production, more fertilizer should be applied to paddy. Under the project, Urea would be used as supplemental sources of nitrogen although ammo-phos is presently used as the principal fertilizer. Application rates would be increased to 64 kg N/ha for HYV and 86 kg N/ha for sugarcane. The total demand for ammo-phos is expected to increase from 1,740 tons/year to 6,190 tons/year and demand for Urea requires about 1,670 tons/year. Marketing of fertilizer is presently handled by a large number of private dealers, shopkeepers and increasingly by cooperatives. Besides marketing, the Government should pay effort to keep the fertilizer with enough quantity and to make smooth distribution to farmers.

Credit

Farmers should prepare a considerable fund for agricultural production in future in order to apply adequate quantity of seed, fertilizer and chemicals. This credit would be necessary in the initial stage which farmers intend to increase their production. It is expected to obtain loan from the bank for this purpose. The BAAC should provide with enough fund either directly to farmers or through Agricultural Cooperatives. Furthermore, the bank should conduct active campaign in the encouragement of agricultural credit. For this purpose, it is recommendable to establish a small office/counter of the bank or the cooperatives in the villages near the farms at first. Although some social and/or traditional obstruction from the manager of bank and/or cooperatives and some difficulties to carry out this program might appear, this strategy might be desirable in order to give farmers credit opportunity and extend cooperatives' activities.

(3) Expansion of farmers' groups

Farmers' groups must not be organized by a limited number of people, however, any farmer can participate in and cooperate with each other. The groups which have desire to obtain much benefit will not succeed. The agricultural cooperatives and the farmers group themselves have no problem and therefore, they should expand its capacities.

A farmer should be selected in the group as contact farmer under NAEP, representing its group for extension services. The contact farmers thus selected will be distributed equally in the Project Area because the group is formed on territorial principle. Furthermore, registration of the group, if available, as sub-organization of the cooperation will reinforce the power of the cooperatives themselves.

5.4. Consultants' Services

Although the RID has experience in project construction for irrigation and drainage works as well as on-farm development works, trained and well-experienced persons might not be enough to execute the project works in the light of several projects carried out in Thailand. Therefore, experienced consultants would contribute to the project implementation in final design and construction supervision together with establishment of farmers' group for O & M.

The Consultants would be engaged by the government and the engineers and experts shall consist of Irrigation and Drainage Engineer, Civil Engineer for On-Farm Development, Equipment Engineer, O & M Expert, Agri-Institution Expert and others as deemed required. The Consultants' services will cover 180 man-months, of which foreign consultants work will not exceed 60% of the total man-months.

Under the project, about eight counterparts would be trained abroad for two months in on-farm development works and land exchange/consolidation acts and procedures in collection of project charges.

FIG. 5-1. PROPOSED ORGANIZATION CHART FOR PROJECT IMPLEMENTATION

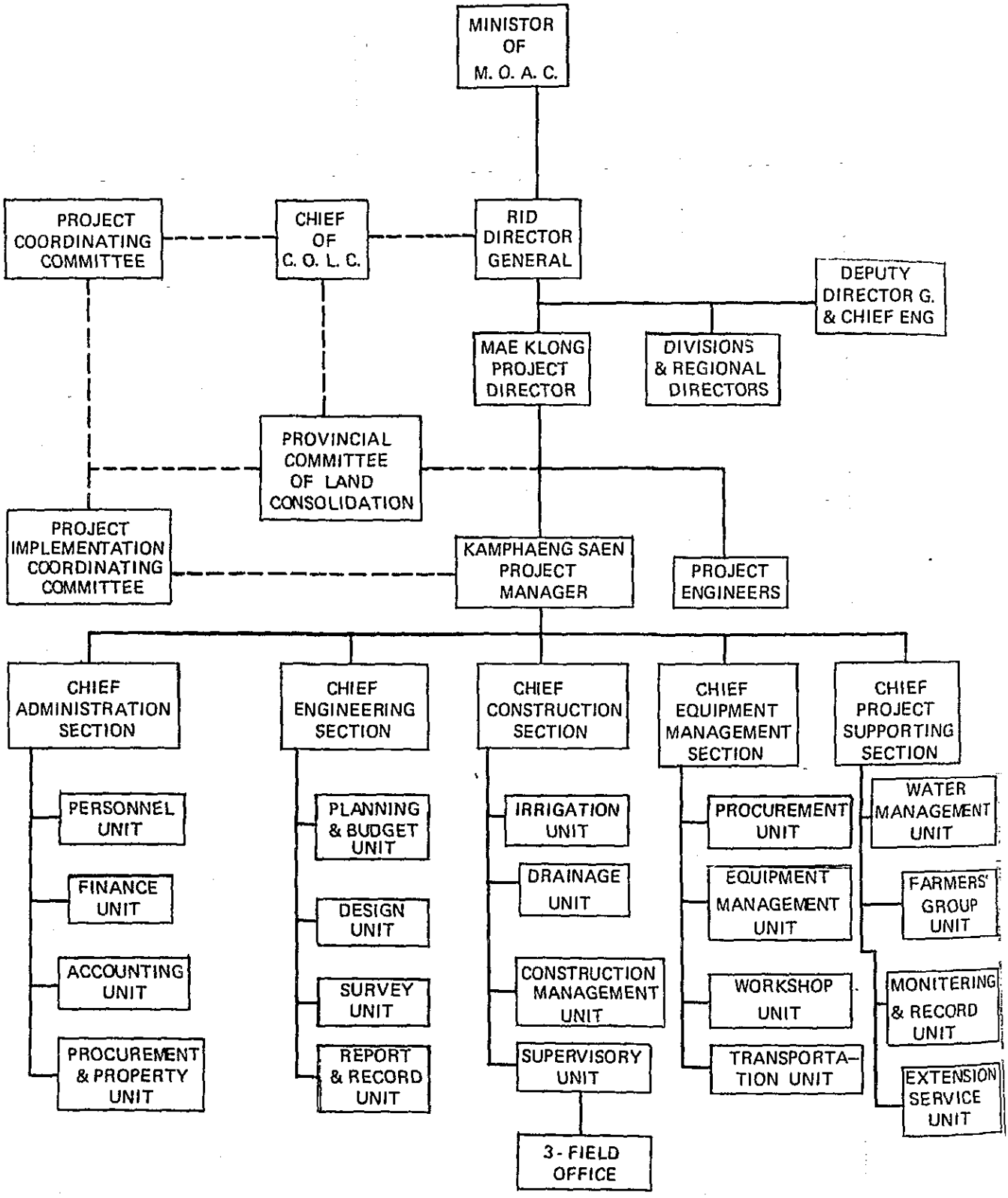
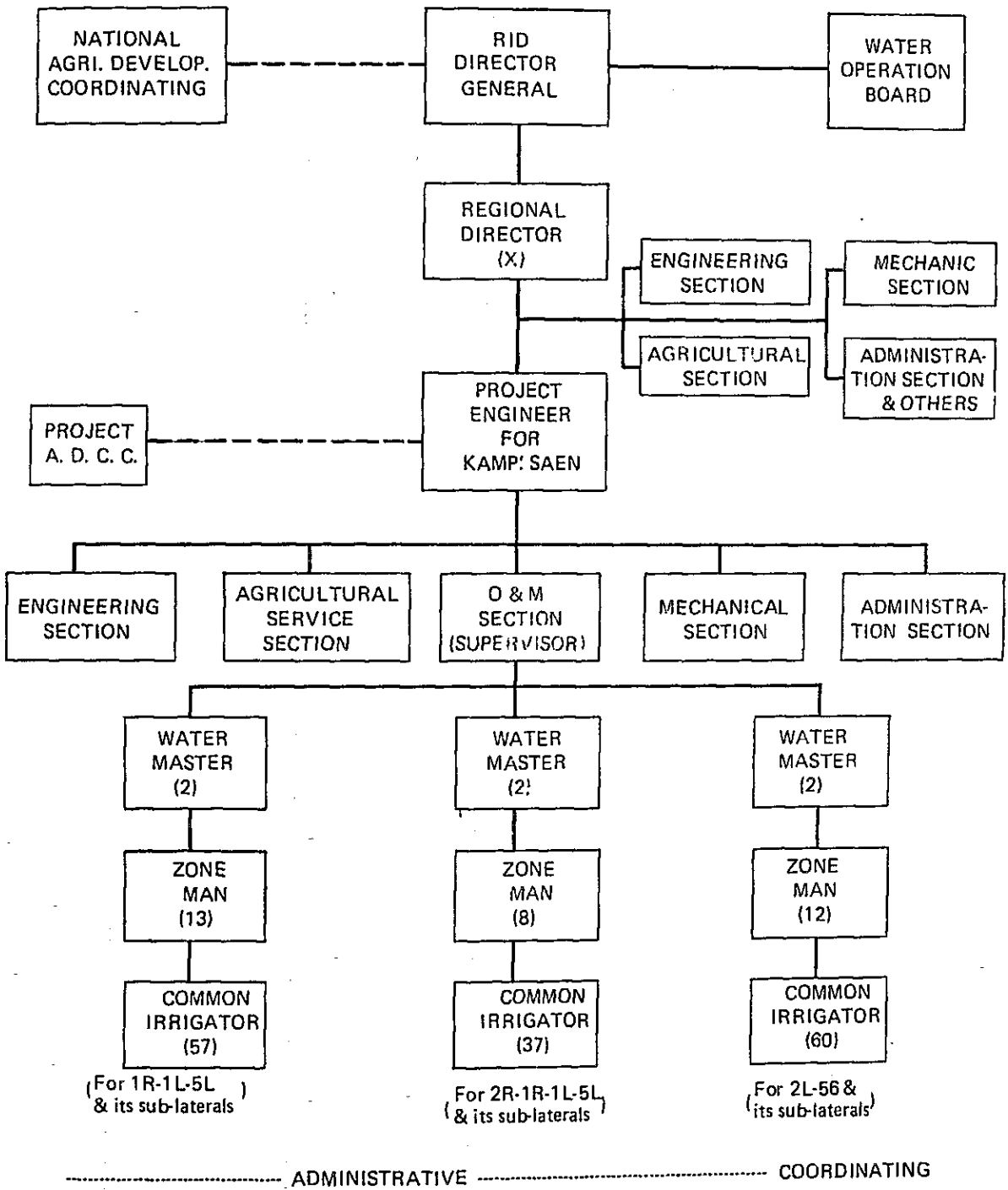


FIG. 5-2. PROPOSED ORGANIZATION CHART FOR OPERATION & MAINTENANCE



( ) PROPOSED NUMBERS

CHAPTER VI. PROJECT BENEFITS

CHAPTER VI. PROJECT BENEFITS

6.1. Market Prospect and Price

Rice

The principal export item in the country is agricultural products sharing about 60% of export earning, of which rice occupy about 32%. Thailand is considered as the main agricultural products exporting country in the world, sharing about 15% of the world rice exports. The government will pursue to increase rice production in order to increase export earnings from rice as well as to raise the living standard of peoples in the rural area through incremental agricultural production.

Export price of rice was assumed around US$295 per ton (5% broken, 20% milled rice) in 1979, as the prices have fluctuated in the latest 5 years, and estimated to US$360 per ton (f.o.b. Bangkok) in 1990, which is the target year at full development. Farm gate price of paddy is ฿2.4/kg at present and is assumed at ฿3.0/kg (1979, constant price) in future.

Sugarcane

Thailand exported a large amount of sugar since 1975. However, the sugar industry was placed in difficult circumstance when the world price declined since 1976. It is expected that sugar demand would increase in quantity in future.

The price of white sugar (f.o.b. Bangkok) is about US$212/ton in 1979 and would be raised up to about US$338/ton (1979 constant price) in 1990. Farm gate price of sugarcane also would increase from ฿280/ton at present to ฿320/ton (1979 constant price) in 1990.

Fertilizers

Prices of fertilizers were estimated based on the price of ammo-phos which is most common in the Project Area, as follows:

Prices of Fertilizers (฿/ton)

	PRESENT		FUTURE	
	Financial	Economic	Financial	Economic
Ammo-phos	3,130	2,810	5,140	4,620
Urea	2,950	2,650	4,840	4,350
Ammo-sulfate	2,360	2,120	3,870	3,480

6.2. Production Costs

Present costs, cultural practices and inputs usages are based on surveys conducted in the Project Area by RID during the field survey period. In the future without the project, inputs level would change gradually under the implementation of National Agricultural Extension Project and improved farmings. Future inputs levels for "with project" conditions are based on consultations with various governmental agencies and expected increases in mechanized cultivation and threshing, applied fertilizers and used chemicals.

6.3. Crop and Farm Budget

(1) Crop Budget

The net value of production per hectare of rice and sugarcane from crop budgets was prepared for the present and the future without and with project conditions.

In case of changing rainfed land to irrigated land with intensive facilities for wet season transplanting rice, the net value of production would increase from ฿2,445/ha at project to ฿9,840/ha in future with project or to 402% of present NVP in future with project. The NVP for sugarcane would be increased from ฿6,175/ha at present to ฿13,470/ha in future with project.

(2) Farm Budget

The net crop income was also determined using the rice farm budgets on the typical small and big farms. On small farms, the present average net crop income for rainfed rice farm (about 1.6 ha) is about ฿3,195 and about ฿6,935 for the same size on irrigated rice farms with extensive facilities. At full project development, the net crop income would average ฿23,455 or 7 times and 2 times the present rainfed and irrigated farms, respectively.

For the bigger farms, the net crop income was also assessed to compare with small farms. A typical 4.0 ha rice farm under present rainfed condition would average about ฿6,235 and the irrigated farm with extensive facilities (A), ฿13,305. With the project, the net crop income would amount to ฿49,160/farm in the future or about 8 times the rainfed farm and 4 times the irrigated farm (A) of the same size.

6.4. Economic Cost of Farm Labor

Labor demand for projected crop production was estimated at 1.54 million man-days under the present conditions and 2.56 million man-days or an increase of about 66 percent over the present demand in the future with project. Assuming the same present proportion of labor force in the future with project will prevail, farm labor supply is anticipated to increase to about 11 percent.

The total estimated farm labor force in the area was estimated to be about 6.67 million man-days at full project development. This figure would be sufficient to supply farm labor for the annual total demand of about 2.60 million man-days in future with project. In addition, although the higher monthly demand would occur in June and July, this figure would increase only about 14% to present labor demand in these months would enable to be supplied under the available labor force in the area. In usual practice, most farming works are done by unpaid family labor and traditional "exchange" labor. The

wage for hired labor in peak agricultural seasons at present is about ฿40 per man-day. These rates are assumed to reflect the opportunity cost of labor to economy of different regions at such times. As demand for labor increases, labor cost rises. For months of high rural unemployment, opportunity cost of labor would be much lower. Economic cost of farm labor in the Project Area was estimated by taking into account the prevailing rural unemployment and extreme seasonal fluctuation in labor demand. Economic cost of farm labor in the future with and without project were estimated at ฿19.03 million and ฿30.30 million, respectively.

6.5. Project Benefits

(1) Direct Benefits

Irrigation benefits are derived form the value of incremental agricultural production with and without the project less the cost of production and the imputed value of labor. The benefits were computed based on the expected increased yields for about 15,180 hectares of rice lands and 1,200 ha of sugarcane lands with the provision of water management, effective drainage, improved crop cultivation and closely coordinated agricultural supporting services. The total incremental net value of production for the whole project at full project development amounts to ฿260.12 million.

(2) Other Benefit Effects from the Project

The intangible benefits were not included in the computation of project benefits. But the main project development features would not only induce multiplier effects in productivity and farm incomes but would also encourage rural development. The provision of on-farm facilities, especially farm roads would facilitate the distribution of agricultural products and inputs and appreciate the value of land. During the construction period, farmers would have the opportunity to be employed by contractors and in force account works by the RID.

Table 6-1. Project Production Value (excluded hired labor costs)

Crops		Cropped Area (ha)	Yield (ton/ha)	Project Production ('000 ton)	Project Production			Project Net Value of Production (฿ million)
					Gross Value	Production Cost	Net Value	
					(฿/ha)			
Paddy								
Wet Season		a/						
Rainfed	P	2,110	1.6	3.38	3,840	1,395	2,445	5.16
	$\overline{W}$	2,110	2.0	4.22	6,000	1,450	4,550	9.60
Irrigated A	P	839	2.0	1.68	4,800	1,230	3,570	3.00
	$\overline{W}$	839	2.3	1.93	6,900	1,495	5,405	4.53
	W	2,250	3.3	7.43	9,900	2,400	7,500	16.88
Irrigated B	P	4,131	2.6	10.74	6,240	1,355	4,885	20.18
	$\overline{W}$	4,131	3.2	13.22	9,600	1,890	7,710	31.85
	W	12,620	4.2	53.00	12,600	2,900	9,700	122.41
Dry Season								
Irrigated A	P	4,761	2.4	11.43	5,760	1,490	4,270	20.33
	$\overline{W}$	4,761	2.8	13.33	8,400	1,975	6,425	30.59
	W	2,560	4.3	11.01	12,900	3,060	9,840	25.19
Irrigated B	P	7,139	2.8	19.99	6,720	1,655	5,065	36.16
	$\overline{W}$	7,139	3.4	24.27	10,200	2,180	8,020	57.25
	W	11,520	4.6	52.99	13,800	3,195	10,605	122.17
Sub-total	P	18,980		47.22				84.83
	$\overline{W}$	18,980		56.97				133.82
	W	28,950		124.43				286.65
Sugarcane	P	1,220	45	54.90	12,600	6,425	6,175	7.53
	$\overline{W}$	1,220	60	73.20	19,200	8,860	10,340	12.61
	W	1,200	80	96.00	25,600	12,130	13,470	16.16
Total	P	20,200						92.36
	$\overline{W}$	20,200						146.43
	W	30,150						302.81

Note. Financial prices and costs are used.

a/ P : present, $\overline{W}$: future without project, W : future with project.

Table 6-2. Net Value of Production for Economic Analysis

		Area (ha)	Net Value of Production (₱ millions)
Wet Season Paddy			
Irrigated A [a/]	$\overline{W}$ [b/]	839	7.26
	W	2,250	27.63
Irrigated B	$\overline{W}$	4,131	50.65
	W	12,620	199.33
Rainfed	$\overline{W}$	2,110	15.71
	W	-	-
Dry Season Paddy			
Irrigated A [b/]	$\overline{W}$	4,761	49.68
	W	2,560	41.19
Irrigated B [b/]	$\overline{W}$	7,139	91.99
	W	11,520	199.18
Sugar Cane			
	$\overline{W}$	1,220	26.77
	W	1,220	34.85
Total	$\overline{W}$	20,200	242.06
	W	30,150	502.18

(₱ millions)

	$\overline{W}$	W
Total net value of Production (before costing labor)	242.06	502.18
Less imputed labor cost	19.03	30.30
Total net value of Production	223.03	471.88
Net incremental value of production at full project development	248.85	

a/ $\overline{W}$: Future without project, W: Future with project

b/ A: with extensive facilities, B: with intensive facilities

CHAPTER VII. PROJECT EVALUATION AND JUSTIFICATION

CHAPTER VII. PROJECT EVALUATION AND JUSTIFICATION

7.1. Economic Evaluation

(1) Economic Cost

The total economic project cost is estimated at ฿488.10 million or US$24.41 million, including cost of project construction and O & M equipment cost. The cost is the real value of all good and services used for construction but excluded land expropriation costs, taxes, costoms, inflation cost, etc.

The annual O & M cost after completion of project construction would amount to ฿7.61 million for the whole project under the proposed organization, as compared to about ฿0.23 million at present.

(2) Economic Benefit

Economic benefit at full project development was estimated at ฿248.85 million or US$12.44 million.

The economic cost of farm labor was estimated at shadow wage rate, equal to its opportunity cost taking into account the general prevailing rural employment and seasonal fluctuation in labor demand.

(3) Economic Internal Rate of Return

The official foreign exchange rate may understate the value to the economy of foreign exchange used in carrying out the project, relative to the value of domestic resources, because of import taxes and quantitative restrictions. For this reason, specific conversion factors were used to express all values in terms of common unit of

account. These conversion factors range from 0.65 for government services to 1.01 for draft animals. The corresponding standard conversion factor for Thailand is commonly used as 0.79.

According to the project implementation schedule, some of the on-farm development would be finished by mid-1983 and all works would be completed by mid-1986, in time for the 1986 wet season crop. It is assumed that farmers in the area would lose one dry season crop while their farms are being developed. This results in negative net benefits during the construction period of on-farm facilities. On average, individual farmers would reach full development in year five; for the Project Area as a whole, full development is expected to be reached in year eleven, or 1990.

Taking into the above-mentioned factors and development periods, the internal rate of return was computed to measure the economic worth of the project assuming a 50-year economic life. For the whole project, the EIRR is about 27.0 percent.

7.2. Sensitivity Tests

To examine the impact of several assumptions made in the economic analysis on the rate of return, sensitivity test was made using several factors which are partly based on cost overrun and benefit delays. The assumptions of the economic internal rate of return are shown in the succeeding page.

Assumptions:	EIRR
Case A - 2-year delay in reaching full project benefit	24%
Case B - 10% increase in construction cost	25%
Case C - Combination of A and B	23%
Case D - 10% decrease in the price of rice	25%
Case E - Combination of A and D	22%

7.3. Rent and Cost Recovery

(1) Introduction

The government intend to collect the project outlays (capital plus O & M cost) from farmers who are project beneficiaries. Legal actions have been touched to collect the expenses in the land consolidation works and annual mentenance for the irrigation supply by The Land Consolidation Committee. In this section, ability to pay and proposed project charge are discussed.

In determining the extent of rent and cost recovery and the relation of project charges to benefits, two indices were used as follows:

(i) Rent Recovery Index: The ratio of incremental project charges to "project rent" before paying the charges. This index was defined both for standard farm models and for the project as a whole.

(ii) Cost Recovery Index: The ratio of revenues from incremental project charges paid by all project beneficiaries to project construction and incremental operation and mentenance costs. This index is defined for the entire project only.

(2) Ability to Pay

For this analysis, farm size of standard farm model took up the average farm size of 4 ha in the area. The imputed values include the cost items of return to capital, family labor, farm

management, depreciation on farm equipment and an allowance for risk and uncertainty. Incremental farm rent were estimated at ฿15,960 and ฿14,020 or 51% and 52% of incremental net cash income for the model farms equipped with extensive irrigation facilities and intensive facilities. As a whole project, incremental project rent was about ฿65.34 million or 49% of incremental project net cash income. These amounts would enable to appropriate for the project charges.

(3) Project Charge

The project charges were estimated as a refund of on-farm development costs and cost of current expenditures for irrigation water supply. As for the charge for project on-farm development costs, it was estimated based on 10% of input common facilities costs and all of land levelling costs with interest of 12%, payment term of 18 years including 3-year grace period after completion of the project. O & M costs are current expenditures including salaries and wages for staffs, depreciation cost of maintenance equipment and facilities, repair costs of canals and facilities, fuels and others necessary for O & M purposes. The project charges were estimated as follows:

Project charge for common on-farm costs (Averaged cost of each development type)		฿670/ha (฿123/rai)
	for land levelling costs	฿5,020/ha (฿838/rai)
	for O & M costs	฿375/ha (฿60/rai)

(4) Rent and Cost Recovery Indices

For the analysis of farm rent recovery index, two model farms, which have a farm size of 4.0 ha and land irrigated through extensive irrigation net works (CA) and intensive irrigation and drainage systems (CB), were sampled. The rent and cost recovery indices estimated are as follows.

	CA	CB	Total Project
		(%)	
Rent recovery index	23	31	38
Cost recovery index	-	-	19

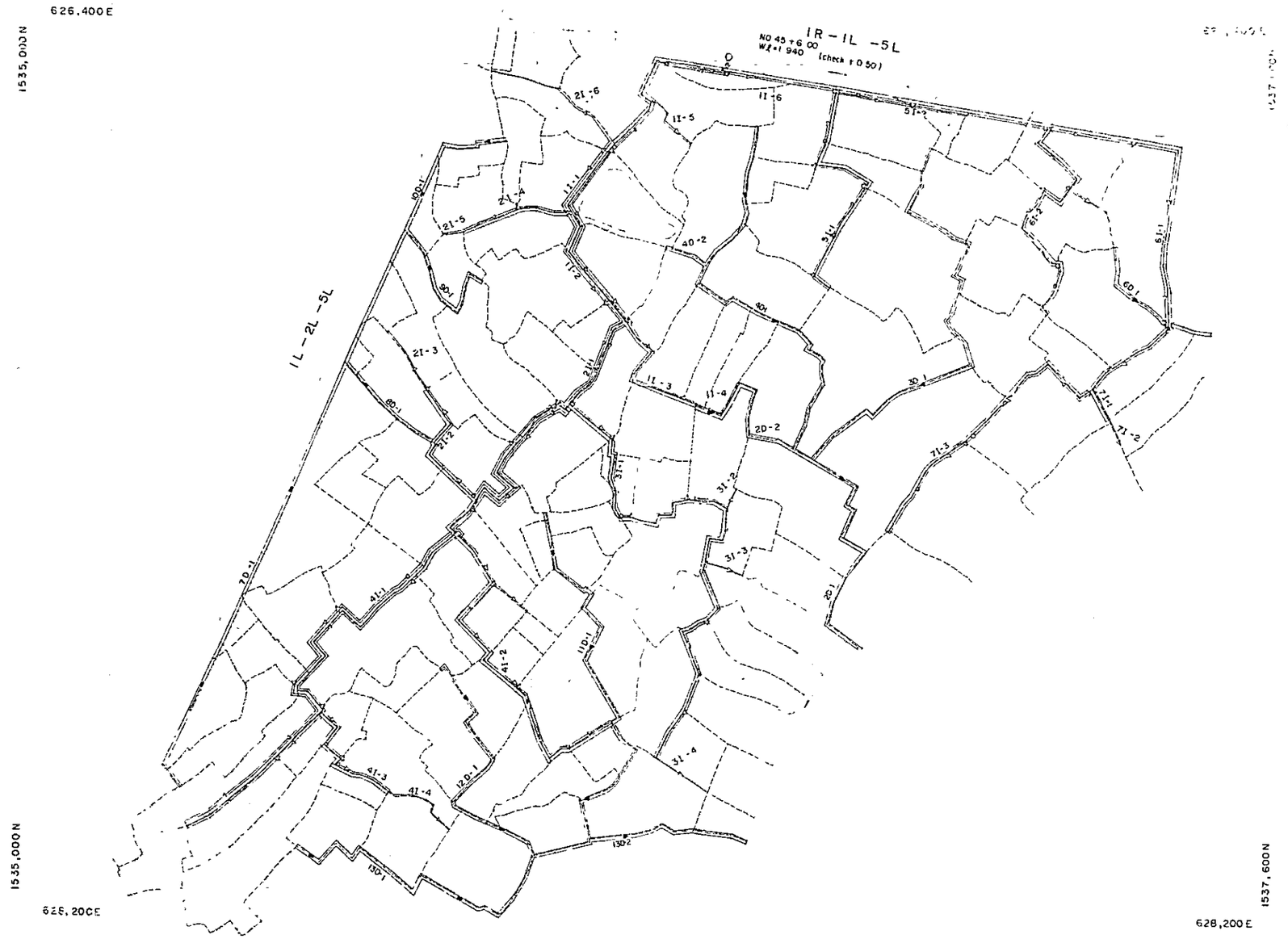
7.4. Project Feasibility and Justification

The economic rate of return of the project was estimated at 27 percent. Sensitivity of the rate of return to some of the uncertain factors adapted in the economic analysis was tested. In no case did the rate of return fall below 22 percent. The cost per beneficial area was estimated at about ฿30,620 ha (US$1,530/ha), excluded the anticipated price escalation.

These measures, as a result of the analysis, indicate that the projetct is economically feasible and financially justifiable.

EXHIBITS

EXHIBIT. I



LEGEND

	HOME STEAD
	ORCHARD & TREES
	RICE LAND
	SUGAR CANE
	WASTE LAND BUT CULTIVABLE
	ANNUAL DIVERSIFIED UP-LAND CRUPS
	INTAKE
	DIVERSION BOX
	FARM ROAD & FARM DITCH
	DRAINAGE DITCH
	CROSS CULVERT
	INLET
	FARM INLET

SCALE S=1:8,000

0 500m

KINGDOM OF THAILAND
MINISTRY OF AGRICULTURE AND COOPERATIVES
ROYAL IRRIGATION DEPARTMENT

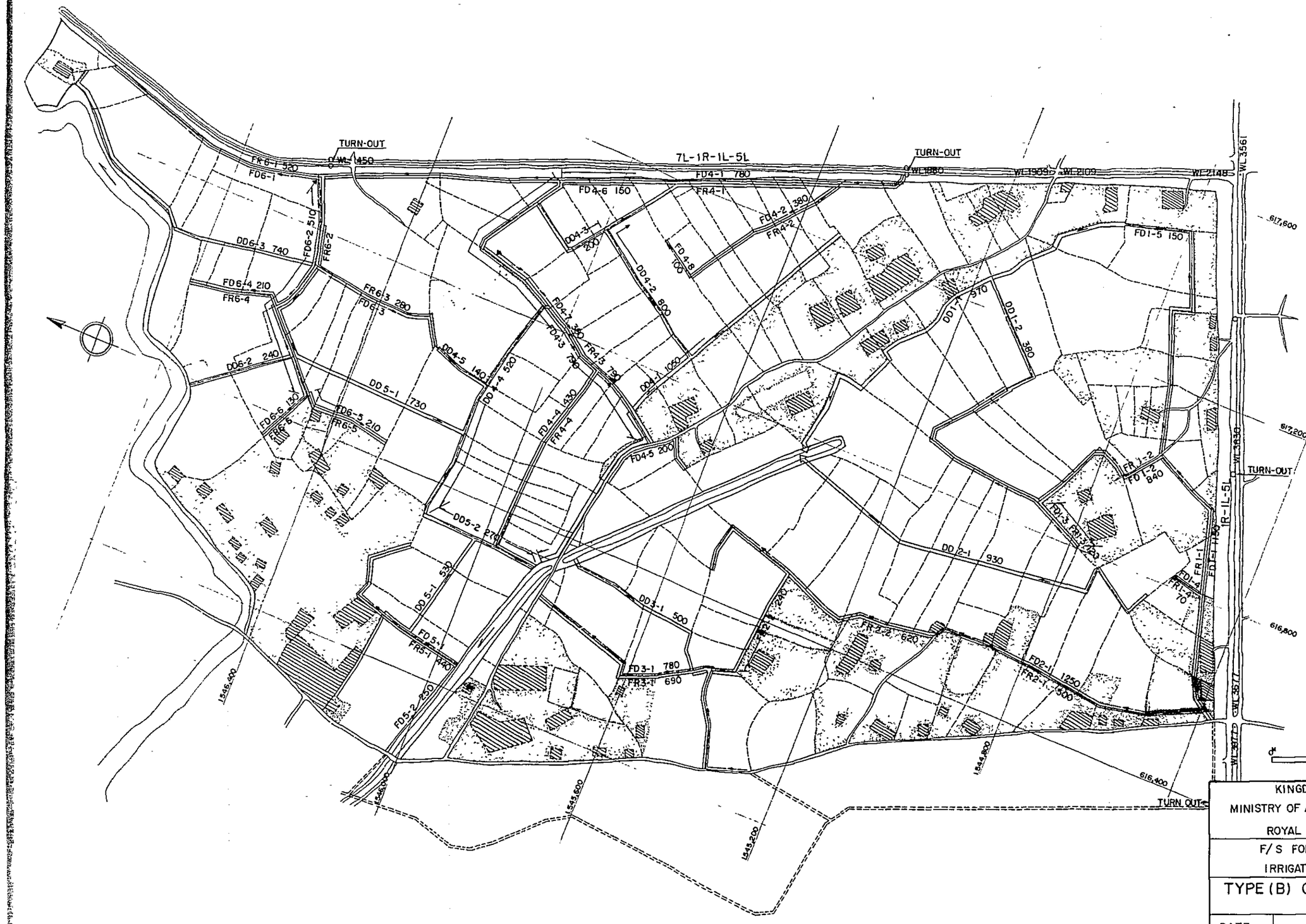
F/S FOR THE KAMPHAENG SAEN
IRRIGATED AGRICULTURE DEVELOPMENT

TYPE (A) ON-FARM DEVELOPMENT
L-3

DATE DWG

JAPAN INTERNATIONAL COOPERATION AGENCY

EXHIBIT. 2



LEGEND

	HOME STEAD
	ORCHARD & TREES
	SUGAR CANE
	RICE LAND
	WASTE LAND
	ANNUAL DIVERSIFIED UP-LAND CROPS
	BOUNDARY OF PLOT
FR-1	FARM ROAD & FARM DITCH
FD-2 DD-3	DRAINAGE DITCH
	EXISTING DRAINAGE CANAL
	EXISTING ROAD

SCALE 1:8,000

0M 500M

KINGDOM OF THAILAND

MINISTRY OF AGRIGULTURE AND COOPERATIVES

ROYAL IRRIGATION DEPARTMENT

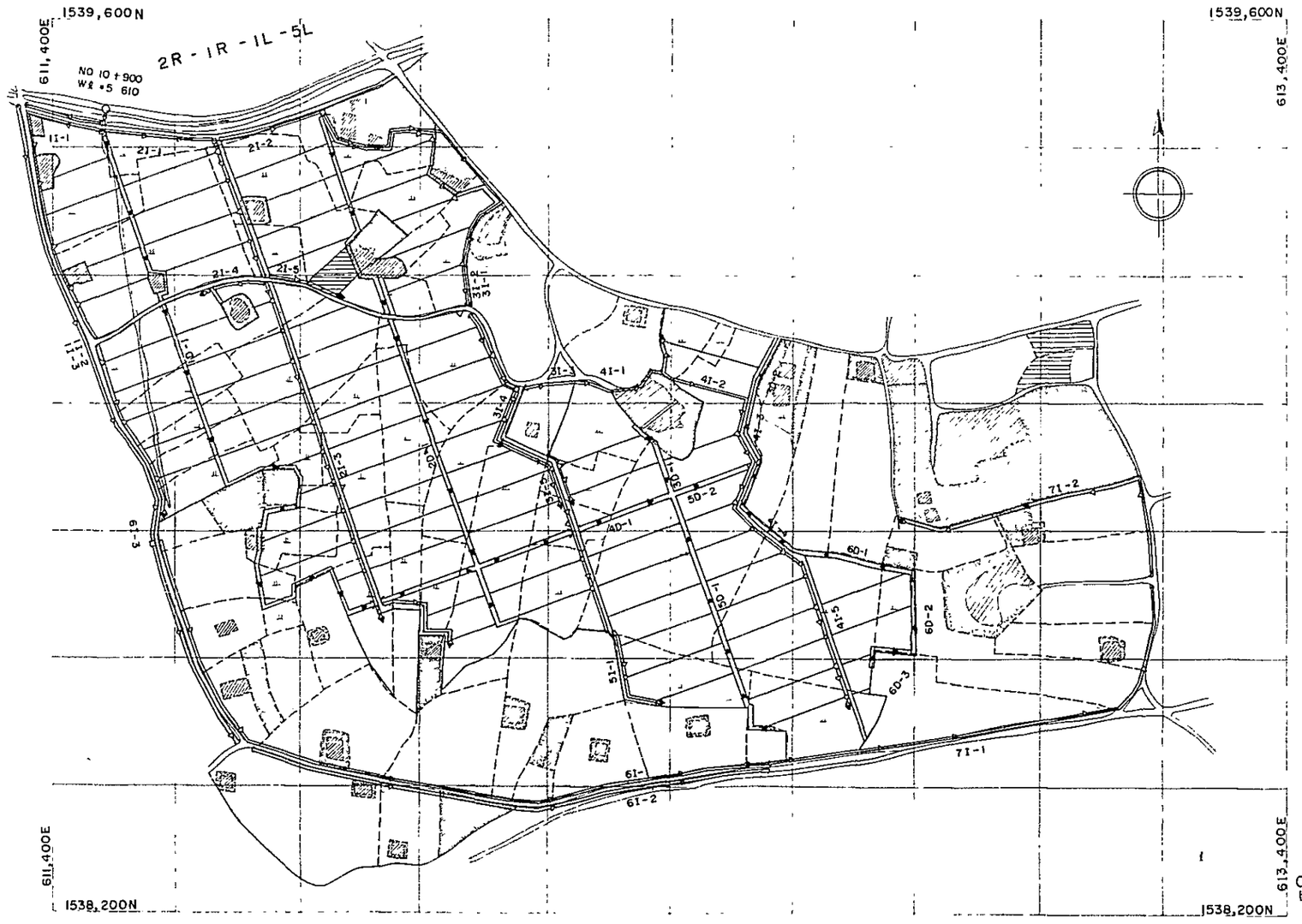
F/S FOR THE KAMPHAENG SAEN IRRIGATED AGRICVLTURE DEVELOPMENT

TYPE (B) ON-FARM DEVELOPMENT M-1

DATE	1979	D.W.G.	

JAPAN INTERNATIONAL COOPERATION AGENCY

EXHIBIT . 3



LEGEND

	HOME STEAD
	ORCHARD & TREES
	RICE LAND
	SUGAR CANE
	WASTE LND BUT CULTIVABLE
	ANNUAL DIVERSIFIED UP-LND CRUPS
	INTAKE
	DIVERSION BOX
	FARM ROAD & FARM DITCH
	DRAINAGE DITCH
	CROSS CULVERT
	INLET
	FARM INLET

SCALE S = 1: 8,000

0 500m

KINGDOM OF THAILAND
MINISTRY OF AGRICULTURE AND COOPERATIVES
ROYAL IRRIGATION DEPARTMENT

F/S FOR THE KAMPHAENG SAEN
IRRIGATED AGRICULTURE DEVELOPMENT

TYPE (C) ON-FARM DEVELOPMENT
H - 2

DATE	D.W.G	

JAPAN INTERNATIONAL COOPERATION AGENCY