

CHAPTER 6 POST-HARVEST AND MARKETING SYSTEM

In the jurisdictions of RID Regional Offices No. 1, 2, 3, 7, 8, 9 and 10, there exist about 3,500 rice mills of various sizes with total capacity of 95,000 tons of paddy/day and 540 paddy/rice warehouses with capacity of 76,000 tons (See Tables 6-1 and 6-2). In Changwat Ayutthya, there exist 55 large rice mills (daily capacity of over 20 tons) with total capacity of 42,720 tons, which occupy nearly a half of the aggregated capacity in the said jurisdictions. This is because the Changwat is located in the central part of the Chao Phraya Delta and Chao Phraya River flows therethrough to play an important role for inland water transportation.

The paddy/rice marketing in Thailand is basically carried out by private sector as shown in Figure 6-1. After reserving their harvested paddy for both home consumption and seeds for next cropping, farmers put the residual on the marketing channel. The local merchants are used to grade farmers' paddy through sample testing on moisture content, size and colour of paddy at procurement stage. After the said grading activity, the procured paddy is transported to rice mills through local merchants, Changwat traders and brokers, and then shipment to consumers and exporters is carried out in the shape of milled rice.

As one of the functions, the agricultural cooperatives are engaged in collecting and selling of the farm products. Since, however, the membership ratio of the agricultural cooperative is as low as 17 percent only throughout the Country, the number of the member farmers for one cooperative is about 800 farmers on an average, and consequently the cooperative can handle only a little amount of farm products for sales. As a matter of fact, the cooperatives can not stand against the merchants in handling volume and prices of the farm products due to less financial power than that of the merchants.

Under the circumstances, the Central Government has intervened into their marketing transaction through Marketing Organization for Farmers (MOF) and Public Warehouse Organization (PWO) (Refer to Table 6.8-1 of

Appendix 6.8). MOF was established to eliminate various disadvantages of farmers in marketing for agricultural inputs and products, and in particular, aims at smoothening the marketing transaction of the farm products in specific areas together with providing agricultural inputs with the farmers of the said areas as major activities. The procurement volume, however, is not so large due to financial capacity of MOF.

PWO is an organ under Ministry of Commerce, to make milled rice procurement, public warehouses operation, consumers' goods sales, etc. PWO, due to small financial capacity as well, is not in a position to function well enough in its business transactions.

Since 1984, the rice export from Thailand has tended to be decreased gradually under the adverse effects of the international rice market trend, although had an increasing or steady tendency up to that time.

	<u>Total Paddy Production (1)</u>	<u>Export (2)</u>	<u>2/(1) x 100 (%)</u>
1981	17,368	3,032	17
1982	17,774	3,784	21
1983	16,879	3,476	21
1984	19,549	4,615	23
1985	19,905	4,062	20

Furthermore, the international market conditions give the paddy price at the farm gate in Thailand and has caused the farm gate price to drop since 1986.

According to the information surveyed by Office of Agricultural Economics, Ministry of Agriculture and Cooperatives, about 80% of paddy marketing was handled by local rice millers and traders, while public agencies such as Public Warehouse Organization (PWO) and Marketing Organization for Farmer (MOF) occupied only 7% and 13%, respectively. Regarding marketing of milled rice, rice brokers in Bangkok handled nearly 90% of that, and the said public agencies did 7% and 4%, respectively. While 76% of marketed milled rice was for domestic markets and the rest for export, in 1983 (Refer to Figure 6-1).

In these days, the world market price of rice had stagnated, causing deterioration in Thai financial conditions, by which the said two public agencies could not fully function. And the tendency has been unchanged and continued until the present. During the period, Thai government had intervened in the paddy/rice marketing by introducing the supporting farm price policy for paddy and the premium policy for rice export, however the both policies were abolished and free marketing system is presently prevailing.

Since the sector of post harvest and marketing for an agricultural product is considered significant, which bridges agricultural production side with farmers' income, the market information system is considered an important mechanism for fully and systematically integrating production and marketing in line with the guidelines laid down in the "Programme Development of the Production System, Marketing and Employment" of the 6th NESDP.

Table 6-1

Inventory of Rice Mills

(Capacity: ton of paddy/day (24 hours))

Large: More than 20 t/d Medium: 5 - 20 t/d Small: Less than 5 t/d	Large Mills		Medium Mills		Small Mills		Total	
	No.	Capacity	No.	Capacity	No.	Capacity	No.	Capacity
C01 Chiang Mai	9	660	10	95	15	23.5	34	778.5
C02 Lamphun	1	40	44	249	110	260.8	155	549.8
C03 Mae Hong Son	-	-	11	72	49	96	60	168
C04 Chiang Rai	44	2,657.5	52	390	125	453.8	221	3,501.3
C05 Phayao	16	777	23	198	10	31	49	1,006
C06 Lamphang	4	109	19	137	38	113	61	359
C07 Phrae	-	-	1	8	84	171	85	179
C08 Nan	-	-	3	15	20	20	23	35
C09 Tak	2	70	21	184.5	100	184.5	123	439
C10 Sukhothai	12	525	11	130	6	16	29	671
C11 Uttaradit	13	434	13	176	24	70	50	680
C12 Phitsanulok	17	982	59	570	113	317.1	189	1,869.1
C13 Phetchabun	13	499	70	584	32	107	115	1,190
C14 Phichit	44	2,029	32	370	5	16	81	2,415
C15 Kamphaeng Phet	11	419	66	556	70	152.5	147	1,127.5
C16 Nakhon Sawan	39	1,632.4	106	1,255.5	26	75.5	171	2,963.4
C17 Uthai Thani	7	326	30	313	10	35	47	674
C18 Chainat	19	955	50	611	11	32.5	80	1,598.5
C19 Suphan Buri	63	3,855	67	954	8	25	138	4,834
C20 Sing Buri	25	1,049	29	402	5	13	59	1,464
C21 Ang Thong	16	574	20	289	3	11	39	874
C22 Ayutthaya	55	42,720	45	559	8	16	108	43,295
C23 Pathum Thani	27	2,022	34	462	4	6.5	65	2,490.5
C24 Nonthaburi	21	940	16	233	2	4	39	1,177
C25 Lop Buri	21	1,312	59	781	3	10	83	2,103
C26 Saraburi	46	2,833	38	540	5	14	89	3,387
C27 Bangkok Metropolis	13	519	18	276	2	3	33	798
C28 Samut Prakan	14	621	17	203	1	-	32	824
C29 Nakhon Nayok	11	594	17	188	5	19	33	801
C30 Phrachin Buri	18	763	97	1,015	48	160	163	1,938
C31 Chachoengsao	41	2,834	32	448	20	76	93	3,358
C32 Kanchanaburi	-	-	38	393	44	110	82	503
C33 Nakhon Pathom	36	1,685	48	637	7	26	91	2,348
C34 Samut Sakhon	7	240	15	181	3	9	25	430
C35 Samut Songkhram	-	-	4	40	-	-	4	40
C36 Ratchaburi	14	470	106	1,158	42	132	162	1,760
C37 Phetchaburi	13	520	46	483	17	49	76	1,052
C38 Prachuap Khiri Khan	1	25	6	50	91	99.8	98	174.8
C39 Chong Buri	8	409	46	486	49	131.5	103	1,026.5
C40 Rayong	1	40	14	102	36	71.15	51	213.15
C41 Chanthaburi	-	-	14	131	45	117	59	248
C42 Trat	-	-	7	67	35	77.5	42	144.5
Total	702	76,139.9	1,454	15,992	1,331	3,355.65	3,487	95,487.55

Source: Rice Control Div., Interior Trading Dept., Ministry of Commerce

Table 6-2

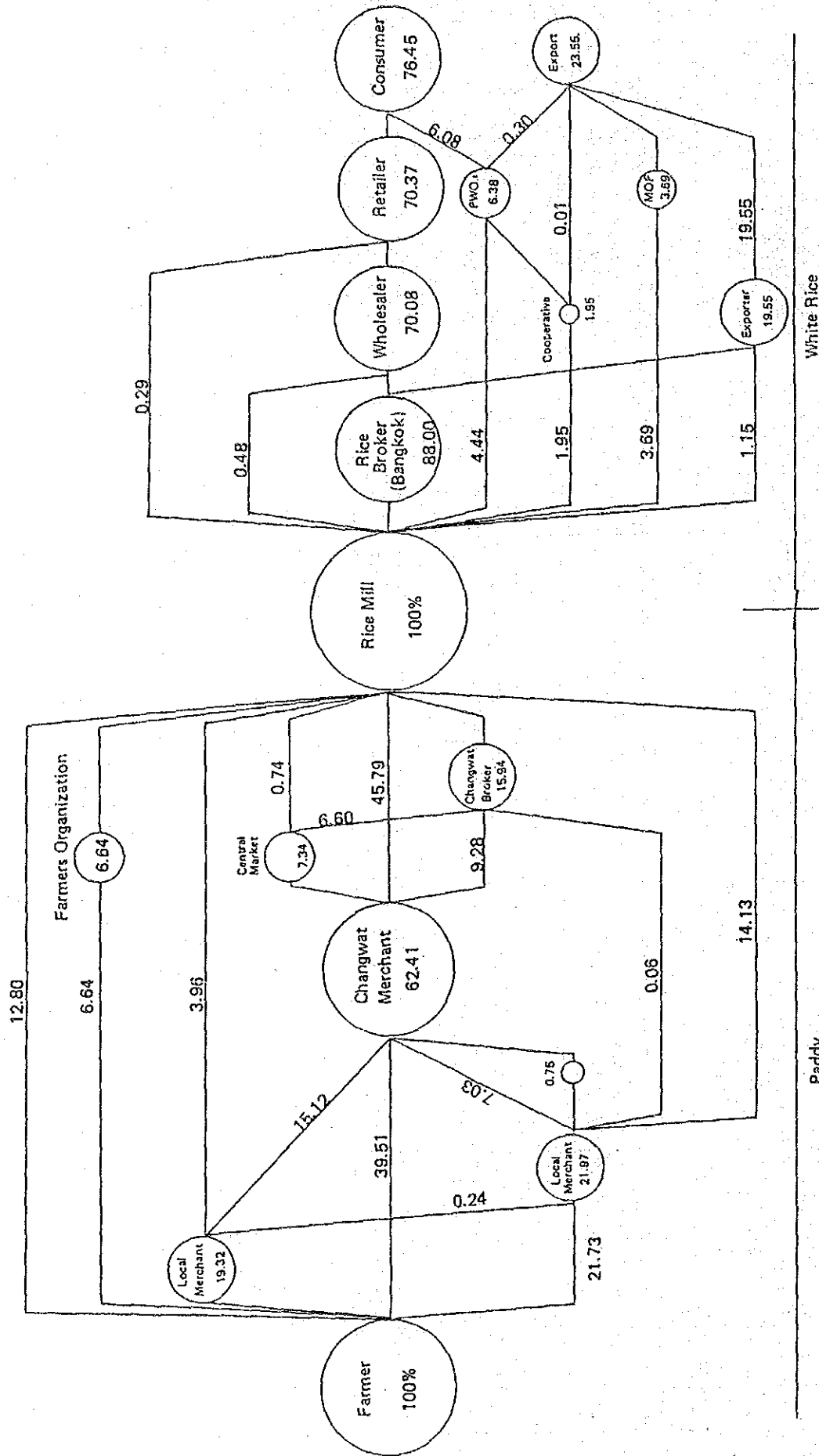
Inventory of Paddy/Rice Warehouse

(Capacity: ton of paddy)

	Paddy		Rice		Paddy + Rice	
	No.	Capacity	No.	Capacity	No.	Capacity
C01 Chiang Mai	N. A.	N. A.	N. A.	N. A.	-	-
C02 Lamphun	N. A.	N. A.	N. A.	N. A.	-	-
C03 Mae Hong Son	N. A.	N. A.	N. A.	N. A.	-	-
C04 Chiang Rai	N. A.	N. A.	N. A.	N. A.	4	420
C05 Phayao	N. A.	N. A.	N. A.	N. A.	15	4,800
C06 Lamphang	N. A.	N. A.	N. A.	N. A.	1	-
C07 Phrae	N. A.	N. A.	N. A.	N. A.	1	500
C08 Nan	N. A.	N. A.	N. A.	N. A.	-	-
C09 Tak	N. A.	N. A.	N. A.	N. A.	5	200
C10 Sukhothai	N. A.	N. A.	N. A.	N. A.	1	100
C11 Uttaradit	N. A.	N. A.	N. A.	N. A.	3	-
C12 Phitsanulok	N. A.	N. A.	N. A.	N. A.	37	5,845
C13 Phetchabun	N. A.	N. A.	N. A.	N. A.	9	30
C14 Phichit	N. A.	N. A.	N. A.	N. A.	137	22,043
C15 Kamphaeng Phet	N. A.	N. A.	N. A.	N. A.	3	2,100
C16 Nakhon Sawan	N. A.	N. A.	N. A.	N. A.	20	5,335
C17 Uthai Thani	N. A.	N. A.	N. A.	N. A.	19	7,070
C18 Chainat	N. A.	N. A.	N. A.	N. A.	15	1,600
C19 Suphan Buri	N. A.	N. A.	N. A.	N. A.	13	1,000
C20 Sing Buri	N. A.	N. A.	N. A.	N. A.	9	60
C21 Ang Thong	N. A.	N. A.	N. A.	N. A.	4	1,200
C22 Ayutthaya	N. A.	N. A.	N. A.	N. A.	49	860
C23 Pathum Thani	N. A.	N. A.	N. A.	N. A.	9	530
C24 Nonthaburi	N. A.	N. A.	N. A.	N. A.	2	-
C25 Lop Buri	N. A.	N. A.	N. A.	N. A.	23	1,000
C26 Saraburi	N. A.	N. A.	N. A.	N. A.	49	8,222
C27 Bangkok Metropolis	N. A.	N. A.	N. A.	N. A.	12	1,250
C28 Samut Prakan	N. A.	N. A.	N. A.	N. A.	1	-
C29 Nakhon Nayok	N. A.	N. A.	N. A.	N. A.	36	4,625
C30 Phrachin Buri	N. A.	N. A.	N. A.	N. A.	30	4,063
C31 Chachoengsao	N. A.	N. A.	N. A.	N. A.	17	1,800
C32 Kanchanaburi	N. A.	N. A.	N. A.	N. A.	1	-
C33 Nakhon Pathom	N. A.	N. A.	N. A.	N. A.	3	1,000
C34 Samut Sakhon	N. A.	N. A.	N. A.	N. A.	1	-
C35 Samut Songkhram	N. A.	N. A.	N. A.	N. A.	-	-
C36 Ratchaburi	N. A.	N. A.	N. A.	N. A.	6	-
C37 Phetchaburi	N. A.	N. A.	N. A.	N. A.	3	600
C38 Prachuap Khiri Khan	N. A.	N. A.	N. A.	N. A.	-	-
C39 Chong Buri	N. A.	N. A.	N. A.	N. A.	2	115
C40 Rayong	N. A.	N. A.	N. A.	N. A.	-	-
C41 Chanthaburi	N. A.	N. A.	N. A.	N. A.	-	-
C42 Trat	N. A.	N. A.	N. A.	N. A.	-	-
Total	-	-	-	-	540	76,368

Source: Rice Control Div., Interior Trading Dept., Ministry of Commerce

Figure 6-1 Marketing Structure of Paddy/Rice (1983)



Source: Office of Agricultural Economy, MOAC

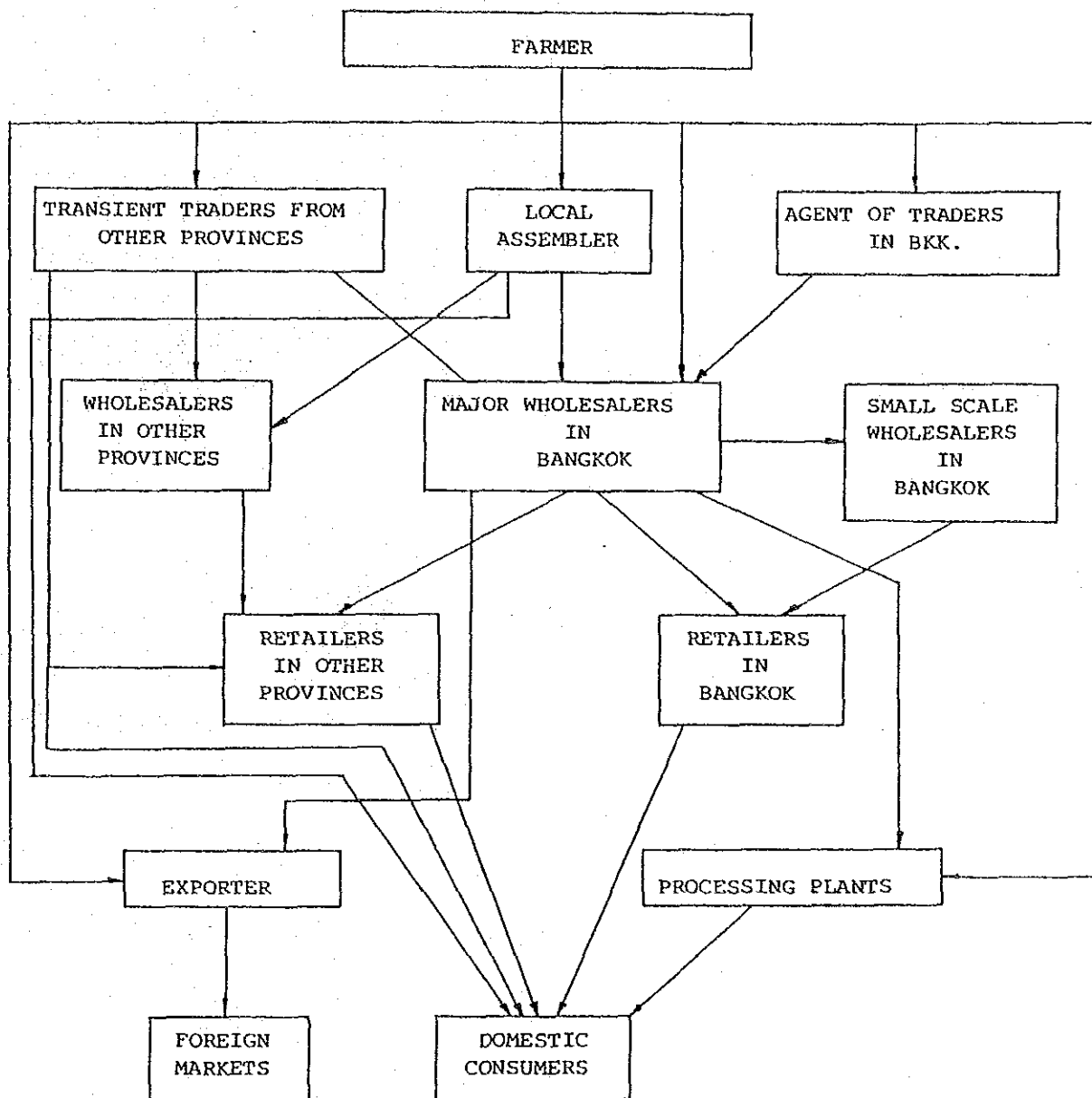


Figure 6-2 Marketing Channels for Fruits in Thailand

Source: Report on the Study for Improving the Agricultural Market System, September, 1984

CHAPTER 7 ON-FARM WATER MANAGEMENT AND FARMER ORGANIZATION

7.1 Relations with Farmers' Organization (See Figure 7-1)

There are two organizations for water management as Water Users' Group (WUG) and People's Irrigation (P.I.), both of which have been making even water distribution and proper operation and maintenance of irrigation facilities. P.I., which has long history in its services, has been well operated as reputed organization in the rural community, whereas WUG operation is not so favourable and active as P.I. with small numbers of its unit organization due to many resolutions several years after establishment of the unit organizations.

7.1.1 Water Users Group (WUG)

One unit of WUG, composed of about 20 - 30 farm households, can cover about 1,000 rai (about 160 ha), but their activities are not so active due to negligence of necessity for cooperative works and irrigation services for successful farming, in spite that WUGs are organized in the Chao Phraya River Basin where the irrigation systems are well developed.

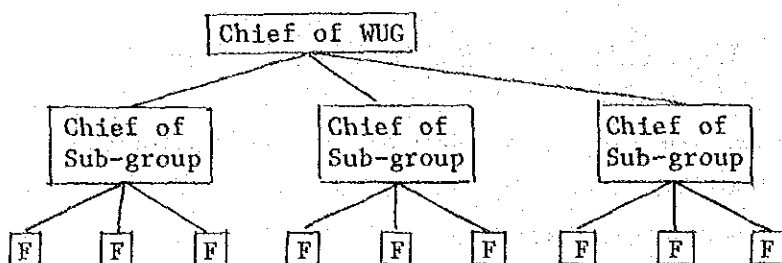
The present conditions of the organization is shown as follows.

	<u>No. of Units</u>	<u>No. of Members</u>
Region 1	65	1,961
2	77	-
3	713	26,444
7	904	18,661
8	388	909
10	1,242	53,981
<u>Total</u>	<u>3,447</u>	<u>102,353</u>

Figures 7-2 through 7-4 show a typical pattern of water distribution system at on-farm level.

Commonly, one unit of WUG consists of two or three sub-groups, and the one unit WUG has one chief of the Group and each sub-group has its

own chief and its members. This is the general formation of the Water Users Group.



As a rule, the diversion works on the lateral canals shall be operated by zoneman and those on the farm ditches by chief of each sub-group. The grass cutting works along the canals and ditches shall be made by group members twice per year. The dredging of the canals, if required by groups, will be conducted by RID by the charge on the groups for rental cost of the dredgers, etc., and such costs shall be borne by the members in proportion to the acreages of their owned land and collected by chief of the sub-group.

Repair works of the facilities like diversion works will be made by RID with RID's machines and procured materials.

7.1.2 People's Irrigation (P.I.) (See Figure 7-5)

The People's Irrigation (P.I.) in the Chiang Mai basin has been the traditionally prestigious water utilization organization with a long history of about 160 years in serving on the diversion weir basis.

P.I. has about 2,000 units and one unit covers about 3,000 to 5,000 rai of the irrigation areas. And the organization is further divided into sub-groups covering 500 to 1,000 rai by one group. One sub-group has its own chief to control diversion works. As a general rule, the members of the sub-groups shall present paddy to the chief by 7 to 20 kg per rai as remuneration for operation of facilities when they can enjoy the bumper of harvest of paddy.

The operation and maintenance of the water distribution facilities like weirs, canals, etc. are practised habitually by members themselves, and there are some rules imposed on the repair works for the facilities.

Actually, however, the water utilization organizations for the large-scale irrigation projects in the Chao Phraya River Basin have not been well operated, while the People's Irrigation organization have been successfully managed. And this is considered to come from the fact that the P.I. organization has been operated along with the habitual or traditional rule of the local community to keep the good social order.

7.2 Composition and Enhancement of the Organization

The water management/control organizations are primarily established to make the irrigation water distributed as evenly and fairly as possible and to render proper operation and maintenance (O & M) services of the irrigation facilities. According to the purposes as above, the water users' organizations have been established within the irrigated areas of the Chao Phraya River Basin. At present, however, the water users' organizations established in the middle - and lower reaches of the River have not been so well functioning as expected, although those named as people's Irrigation traditionally in the Chiang Mai Area have been well operated.

Unless the water control/management are made properly and effectively, farm production increase will not be expected and farmers will raise their complaints for the matter. Especially, in the dry season when the water available for irrigation is limited in its amount, the most adequate water intake control must be practised not only by those organizations themselves as each in the upper, middle and lower basins, but also individual members of each organization by stringently observing the rules imposed.

Such farmers' organizations have faced a variety of problems and troubles to solve, among which 1) to accelerate organizing non-member farmers as many as possible, ii) to strengthen the existing organizations are two major issues in summing-up. And followings are considered as necessary counter-measures to be taken for the above matters.

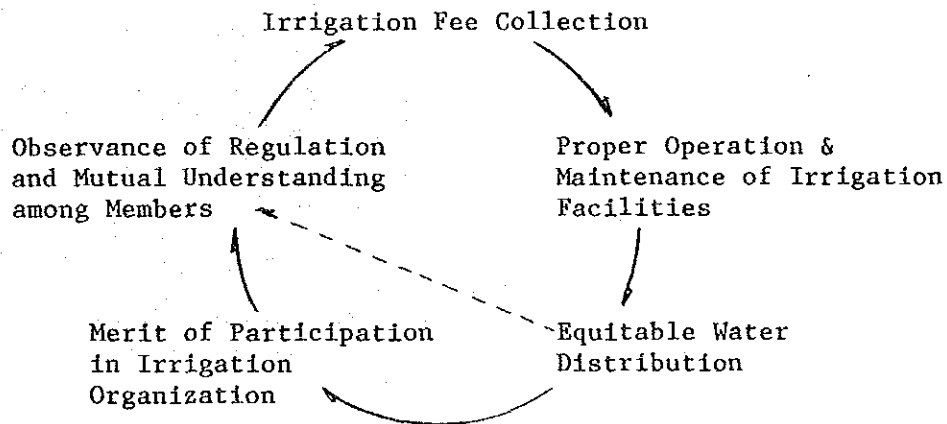
- To deploy the experts/specialist staffs to bring up the water users' organizations in the RID local offices, Project offices,
- To render development services by the above staffs in keeping close and daily contact with village chiefs, and farmers,
- To provide with the RID local offices the service cars with equipment and materials loaded to give education to the farmers on organization/operation of the farmers' organization in roving villages,
- To give repeating training to farmers to enhance the existing organizations through stringently observing the rules, mutual understanding, effective and efficient management of the organization, higher leadership, etc.
- To hold farmers' meetings regularly under the guidance of RID staffs in presence so as to grasp and solve the problems which the farmers will take up.
- To give thorough education to the zonemen on paddy cropping and the relations between crops husbandry and irrigation water management so as to make terminal water control successful in meeting the crops requirements of water at their respective growing stages.

The Chiang Mai District well-known the successfully operated traditional People's Irrigation as water users' organization, is not so blessed with physical conditions due to irrigation water shortage in the dry season. The People's Irrigations in Chiang Mai, although long exposed to the unfavourable conditions as above, have been most successfully operated with the background that the local farmers concerned have engaged themselves directly and positively in the operation and management in thinking traditionally both water and the facilities to be common properties of their own and have had a strong conscious for their organization as cooperative community with tight human bonds among members. It takes, however, a long spell of historical time to bring up the aforesaid well-functioning farmers' organizations.

Therefore, the water users' organizations in the vast plain areas of the middle/lower reaches of the Basin are considered essential to be brought up with a series of countermeasures to be taken as above.

7.3 Irrigation Fee Collection

For successful management of irrigation organization, the irrigation fee revenue which is used for management, has to be collected thoroughly. When irrigation facilities are operationed and managed properly by using collected irrigation fee as a running fund, equitable water distribution which is the fundamental purpose of establishing the irrigation organizations will be realized. They will understand merits of participation in the organized activities, and the organizations will be managed in good condition. The irrigation fee collection, however, is a mean for managing the organizations, and even if the irrigation fee is collected totally from members, equitable irrigation distribution would not be realized with negligence of regulation by members and mutual understanding. Therefore, a kind of circulation system for close communication should be composed as follows.



To realize the circulation system, education and training for members are indispensable in order to instill about necessity for irrigation fee collection and the members shall have thorough knowledge of it.

Figure 7-1 Comparison of Organization of National and People's Irrigation System

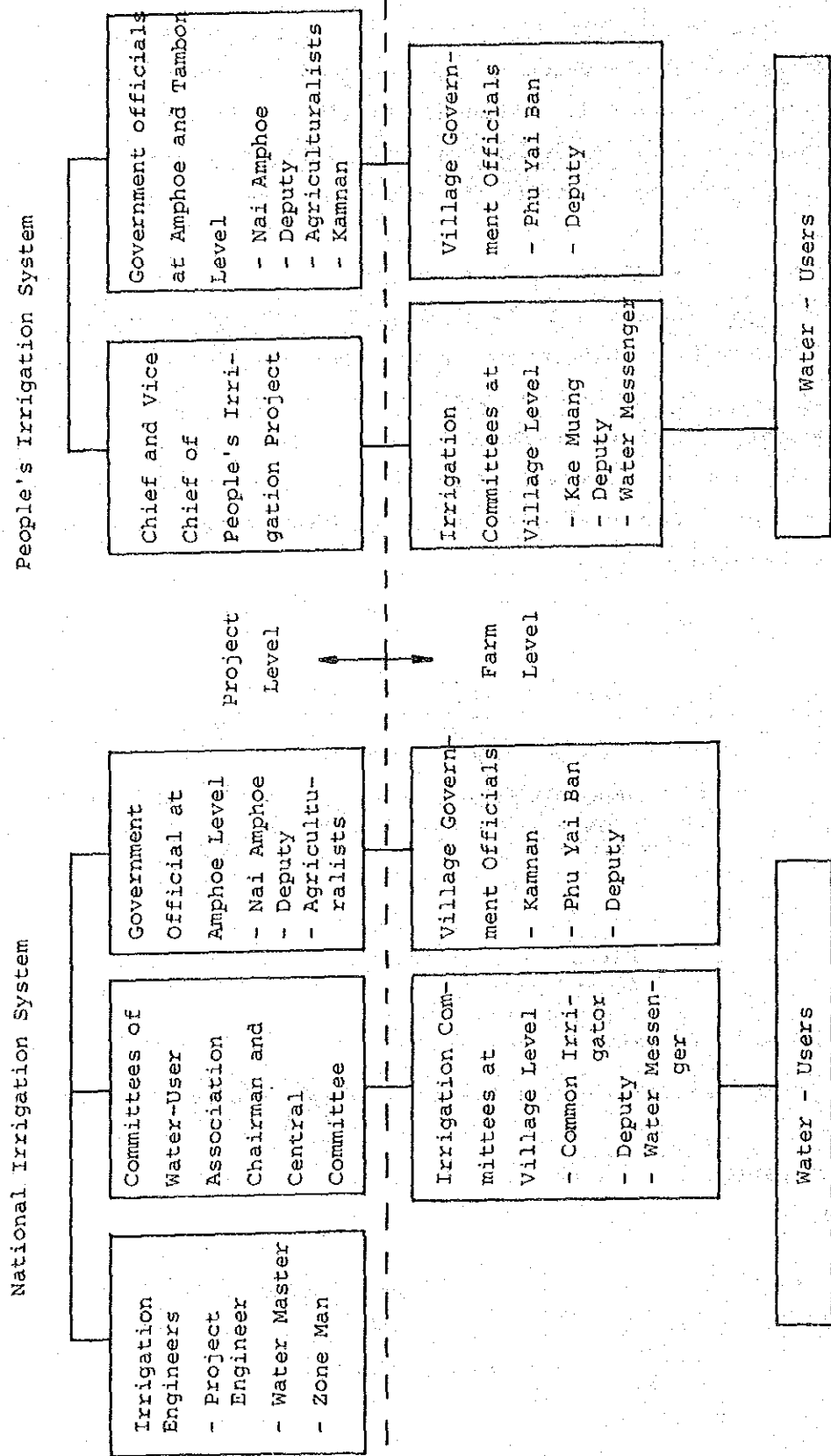


Figure 7-2

Irrigation Water Distribution at On-Farm Level

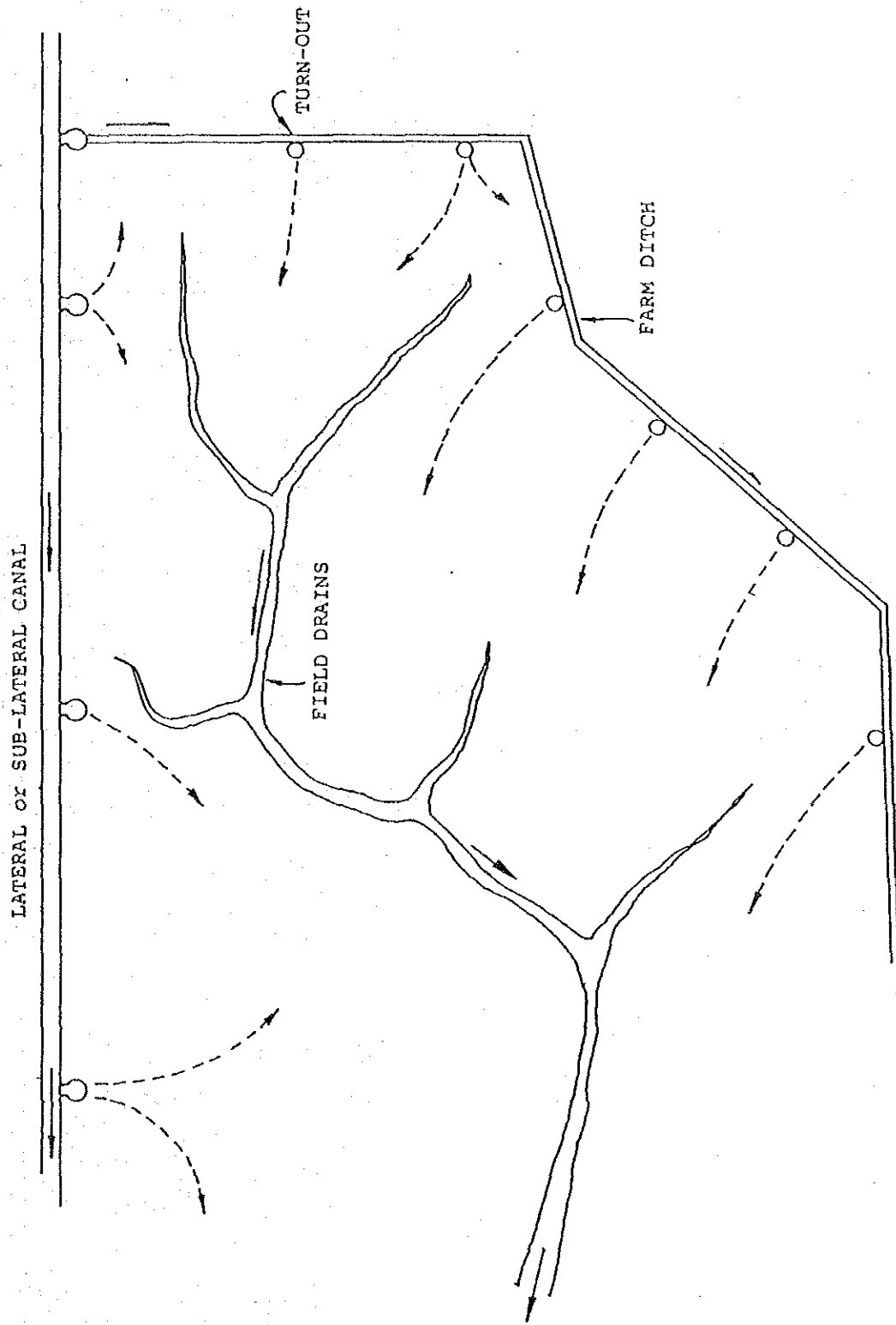
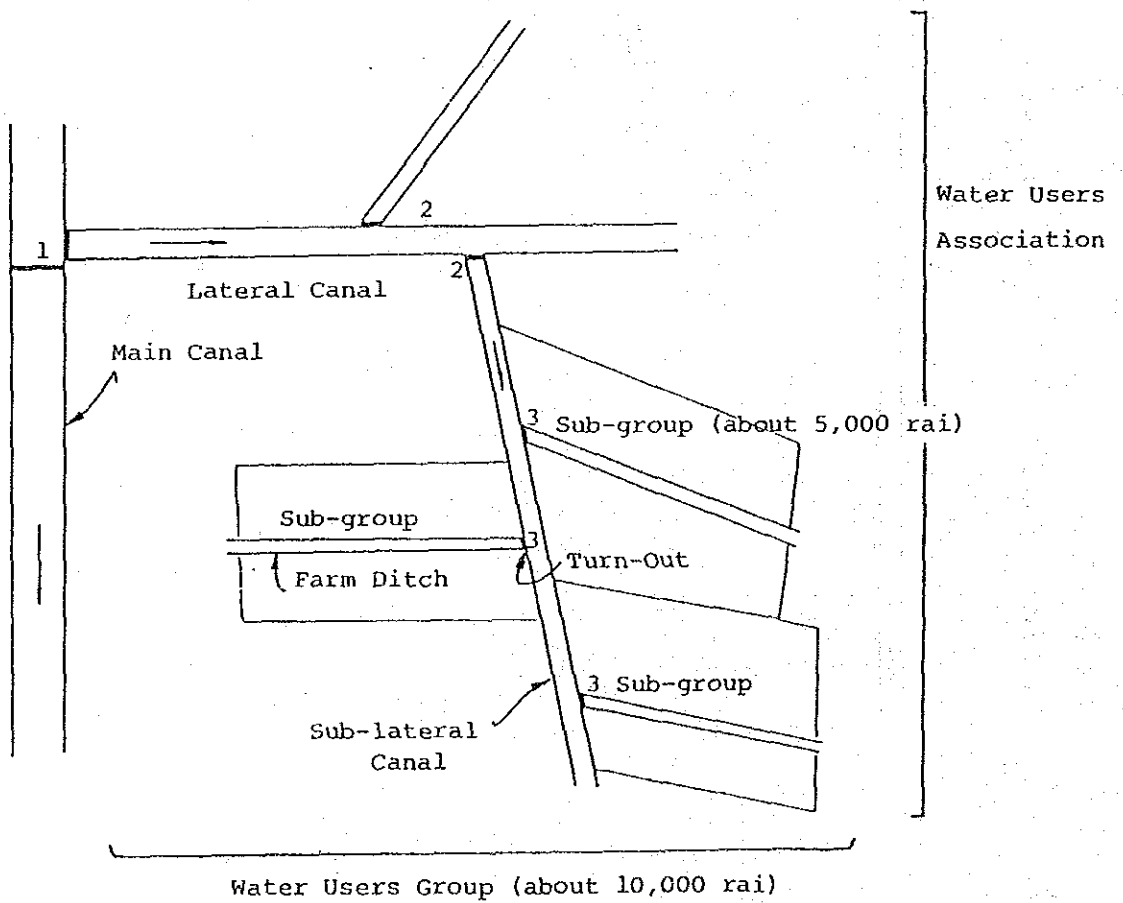
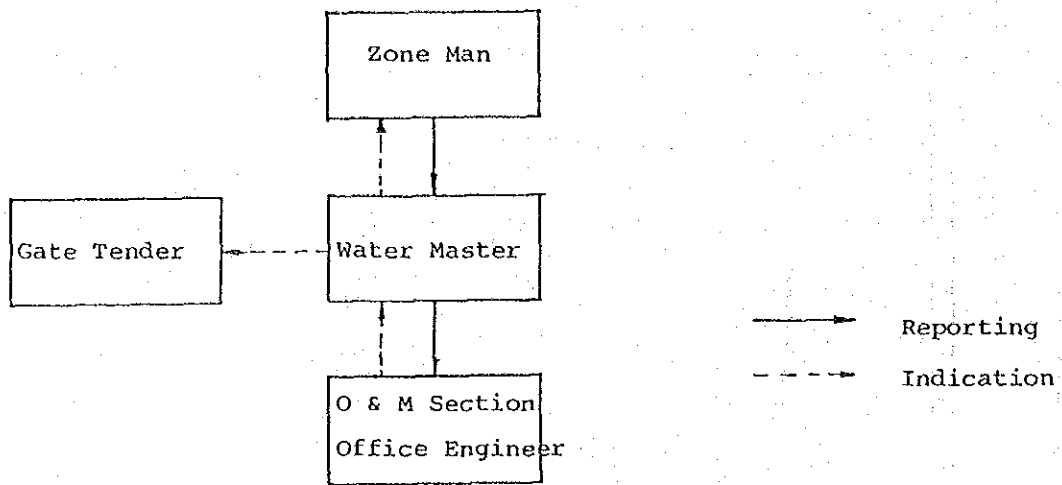


Figure 7-3 Flow of Water Distribution on-farm Level



Note : 1 = Operated by Gate Tender
 2 = Operated by Zone Man

3 = Operated by Chief of Sub-group

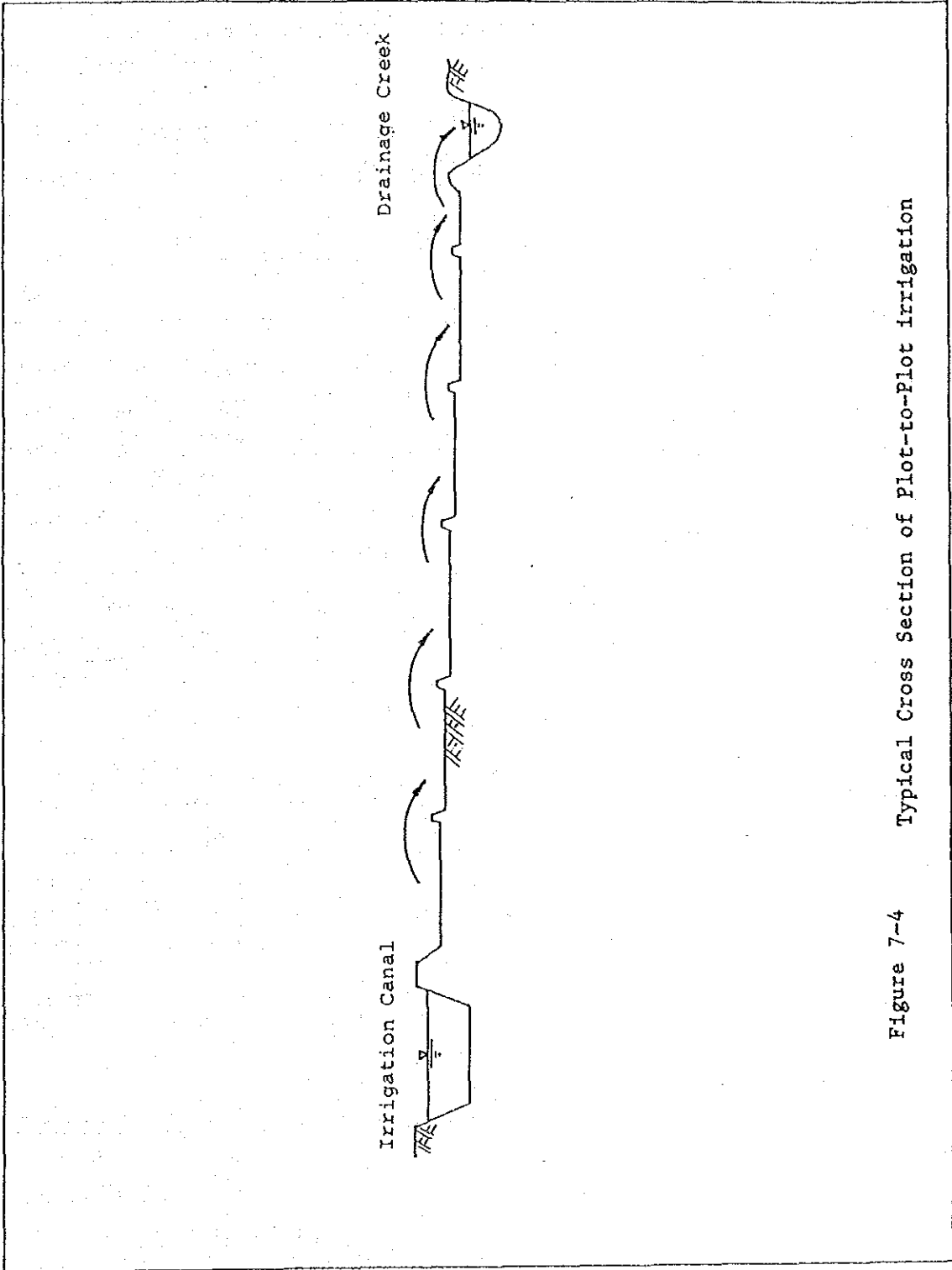
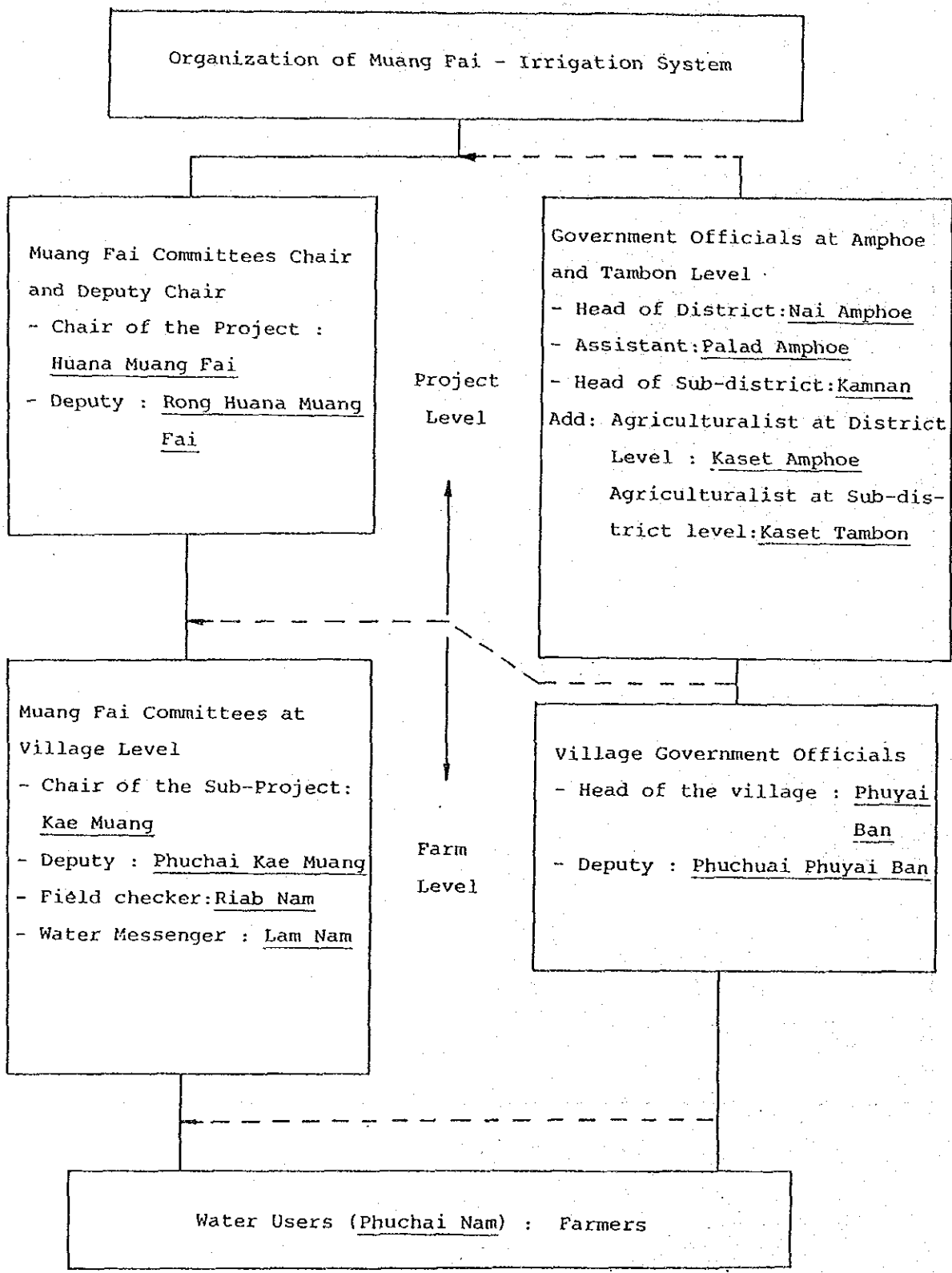


Figure 7-4 Typical Cross Section of Plot-to-Plot Irrigation

Figure 7-5 The Organization of People's Irrigation System



CHAPTER 8 INSTITUTIONAL SUPPORTING SERVICES

8.1 Agricultural Extension Office

Agricultural extension services in Thailand are mainly rendered by Department of Agricultural Extension which has 10 Divisions, six Regional Extension Offices, 73 Provincial Extension Offices, and 720 District Extension Offices as a terminal extension unit. (Refer to Figure 8-1).

In the Study Area, there are two Regional Extension Offices in Chiang Mai and Chainat, and Provincial Extension Offices are located at each Changwat. And 3,274 extension staffs are deployed in Northern and Central Plain Regions, covering 486 farm households per staff.

Other than the Department of Agricultural Extension, the Department of Livestock Development, Department of Fishery, Department of Land Development, and Department of Cooperative Promotion have also carried out extension activities for farmers in the respective fields.

8.2 Certified Seeds Production

The Department of Agricultural Extension is responsible to produce certified seeds and distribute them. There are 20 seed centers working throughout the Country as of May, 1986, which can produce 30,000 to 40,000 tons of seeds (1,500 - 2,000 tons/center) accounting for 20 to 30 percent of the total seed requirement. As shown in Figure 8-2, there are nine seed centers in the Study Area.

The seed production is made under the system that the farmers contracted with the seed centers shall plant paddy in using the original seeds and the seed centers purchase produced seeds from farmers. The seed centers are equipped with facilities for drying, sorting, storing, and inspection of the seeds.

8.3 Marketing Organization for Farmers (MOF)

MOF is in charge of purchasing paddy, maize, etc. from farmers in designated areas in which farm-gate price are lower, and supplying agricultural and daily materials for farmers' organizations and farmers. The following table shows the amount of fertilizers supplied through MOF and indicates that the amount is very small to the national total (Refer to Table 6.8-1 of Appendix 6.8).

Amount of Fertilizers Supplied through MOF

(Unit: tons)

	<u>North-eastern</u>	<u>North</u>	<u>Central</u>	<u>South</u>	<u>Total(1)</u>	<u>Fertilizers Used in Thailand(2)</u>	<u>(1)/(2)x100</u>
1981	40,295	11,849	126,144	10,060	188,348	894,542	21%
1982	19,535	9,822	96,148	8,144	133,649	1,042,503	13
1983	19,774	8,337	73,417	6,743	108,271	1,272,041	9
1984	60,484	14,781	54,207	12,032	141,504	1,246,688	11
1985	81,972	27,243	90,259	22,224	221,698	1,150,000	19

8.4 Agricultural Credit

Banking agencies for farmers are the Bank for Agriculture and Agricultural Cooperatives (BAAC) and commercial banks. BAAC finances farmers, agricultural cooperatives, and agricultural groups as main clients. There are three kinds of credits such as short-term, middle-term and long-term, and the actual financing amount is highest in short-term credit (Refer to Table 6.8-1 of Appendix 6.8).

Following four credits are prepared for the agricultural cooperatives.

- ° Finance for the members loan
- ° Finance for purchasing agricultural materials
- ° Finance for purchasing agricultural products from members
- ° Finance for the fund for long-termed investments

The Financing items for the Agricultural Groups are similar to those for the Agricultural Cooperative; however, financing for purchase of agricultural products is not provided.

8.5 Agricultural Research Institutes

Experiments and researches on agriculture are carried out by each department under the Ministry of Agriculture and Cooperatives; in details, experiments on crops by Department of Agriculture, livestock and forage crops by Department of Livestock, irrigation and drainage by RID, and land improvement by Department of Land Development, respectively.

The central experimental station belonging to the Department of Agriculture is located at Bang Kaen neighbouring to Bangkok, and branch stations are deployed throughout the Country in order to research paddy, field crops, horticulture, sericulture and rubber cultivation. As for paddy farming, there are 25 experimental stations as of 1986, out of which 13 stations are located in the Study Area to research paddy farming in various land and soil conditions (See Figure 8-3). The Training Division of the Rice Research Institute is in charge of transfer of technology available by experiments and trial farming of the technicians of the Department of Agriculture and Department of Agricultural Extension (See Figure 8-4).

In addition, there are four Regional Agricultural Development Centers in Thailand, two of which are located at Chiang Mai and Chainat in the Study Area, researching agricultural problems facing with farmers on technical and economic points.

Figure 8-1 Organization Chart of the Department of Agricultural Extension

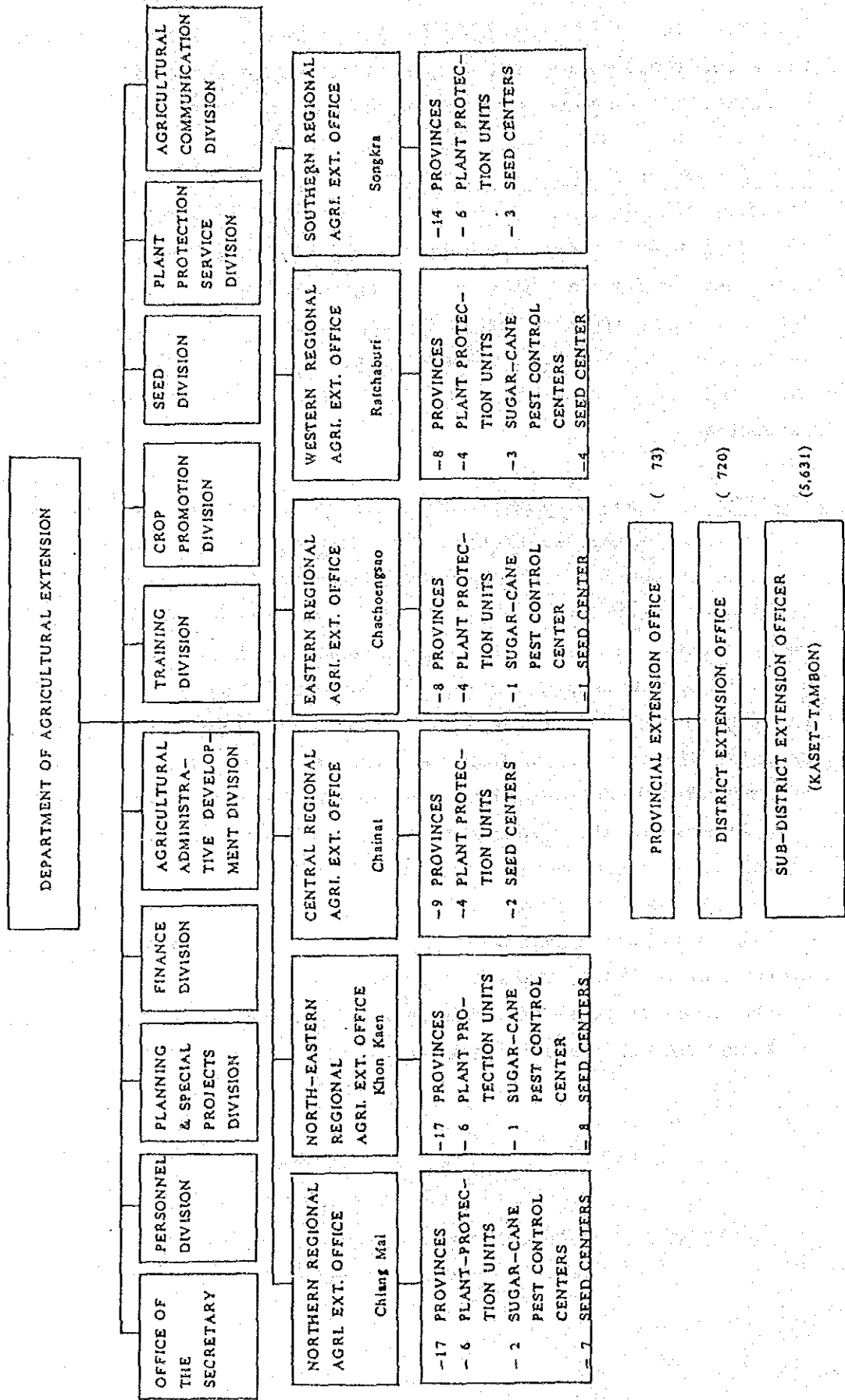
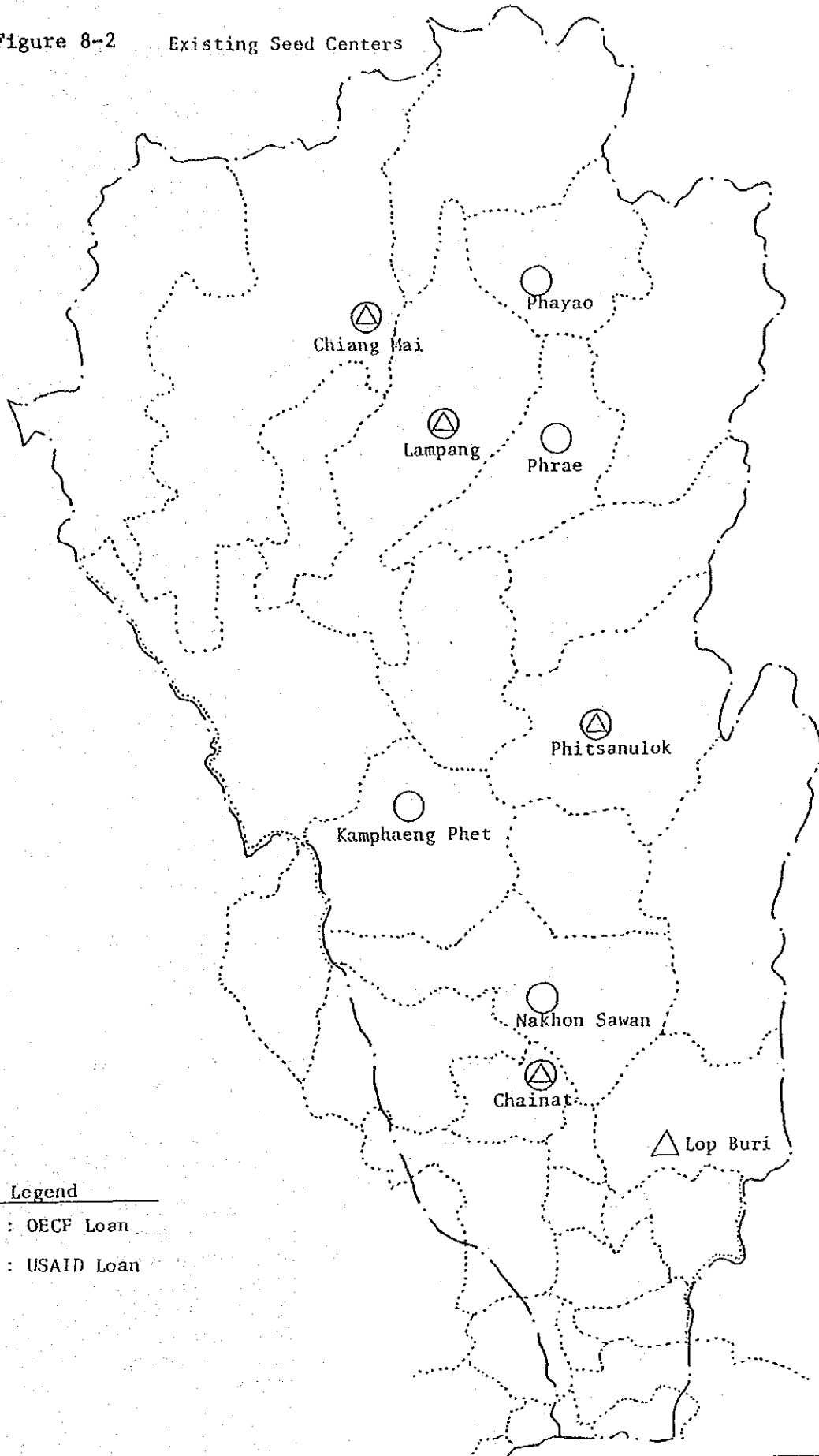


Figure 8-2 Existing Seed Centers



Legend
○ : OECF Loan
△ : USAID Loan

Figure 8-3 Location of Rice Experimental Stations

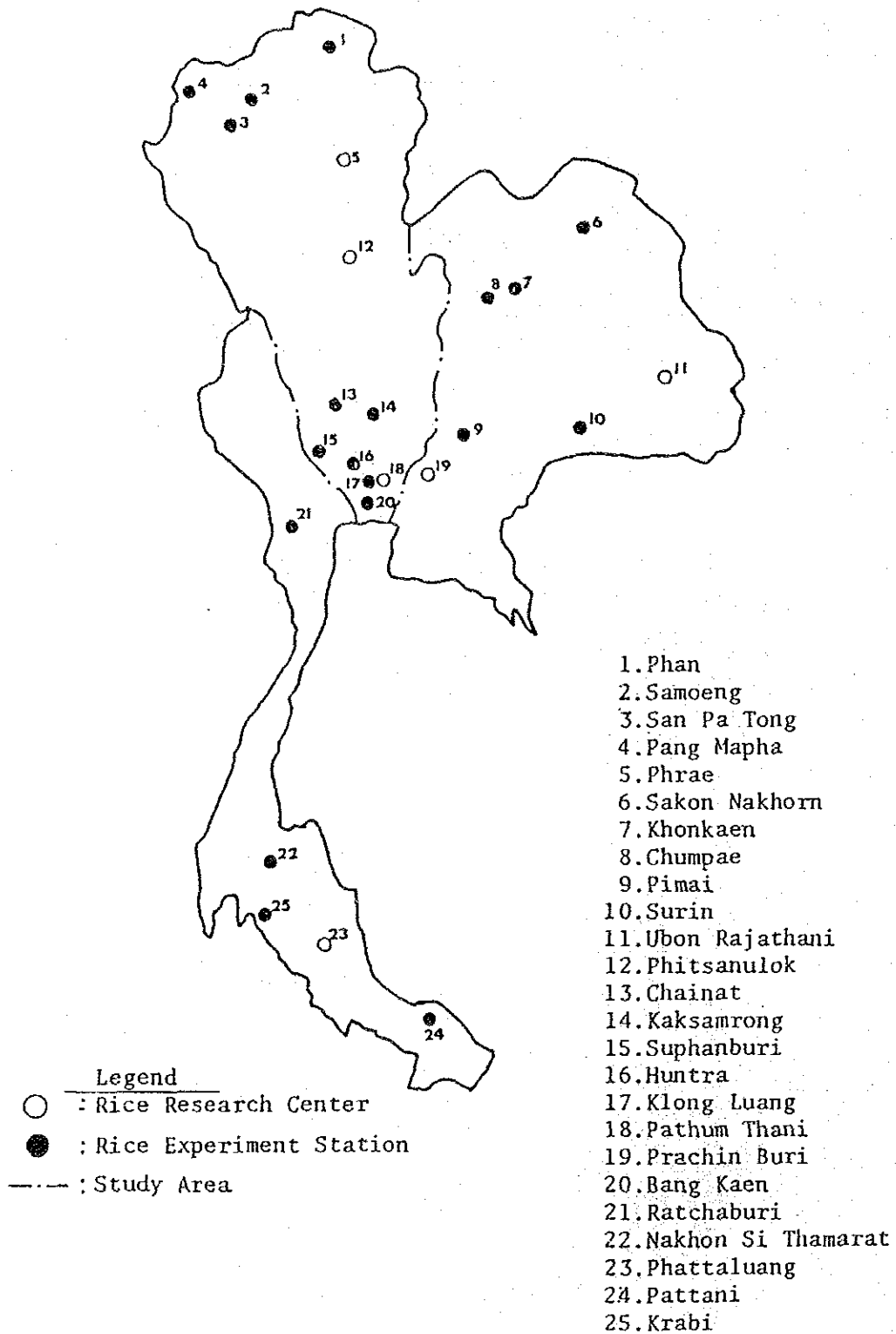
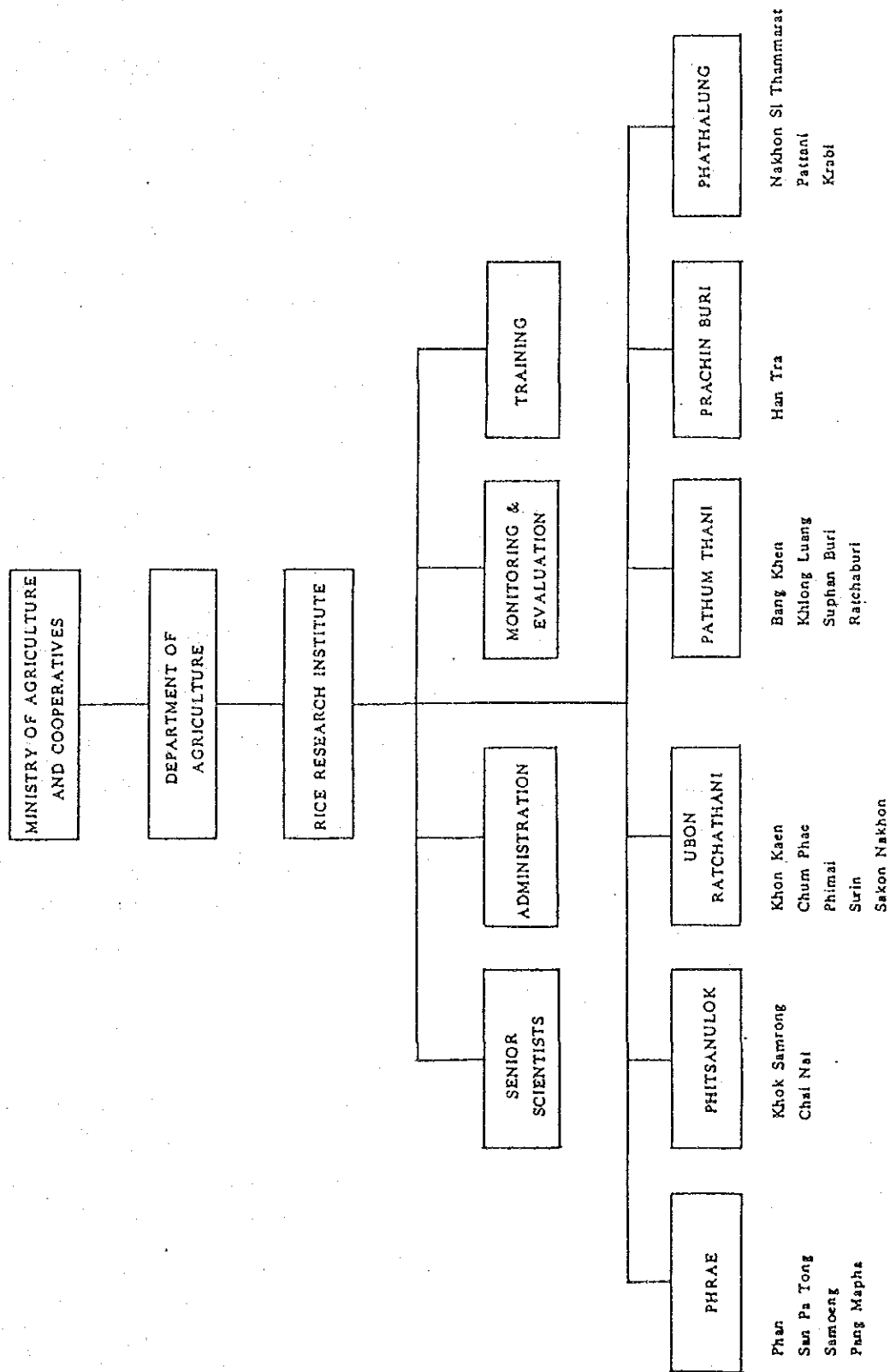


Figure 8-4 Organization Chart of the Rice Research Institute



CHAPTER 9 CROP DIVERSIFICATION PROMOTION CENTER

9.1 Background

Due to stagnation in world market price of primary agricultural commodities, especially rice, not only profitability of paddy cropping at farmers' level has been deteriorated, but also Thai export earnings by the primary agricultural commodities has been decreased, resulted in wider deficit in her foreign trade. Taking the prevailing conditions in the world market, especially rice, sugar and tapioca (cassava) into consideration, it can be said that Thai agriculture is now facing its turning point.

On the other hand, dry season paddy cropping acreage has been increasing in parallel with promotion of constructing irrigation facilities in the Chao Phraya river basin, by which available water resources in the basin has become quite tight and marginal under the existing condition. In this context, concept of "Annual Planned Cropping system" is examined and identified from viewpoint of the water management system to be improved. The proposed cropping system is to effectively allocate the limited water resources for both wet and dry season cropping through appropriate reservoir operation in the Bhumipol and the Sirikit dams. In addition to this, higher profitability could be expected by introducing various marketing information into the said reservoir operation.

Although the diversified crop cultivation requires more sophisticated farming practices including irrigation method and water management system, systematic approaches to these subjects has not been initiated yet by anybody else. Only on the individual basis, some advanced farmers or entrepreneur started to change their cropping pattern based on the traditional paddy cropping to diversified one, most of farmer, however, still rely on the traditional paddy cropping. Since the crop diversification is one of biggest subjects attached to the Thai agricultural policy, due consideration should be placed on promotion of the subject.

In order to promote the crop diversification, it is quite essential to secure both domestic and international market for respective diversified crops, however present market information system may, generally, not well function to integrate production and marketing. Primary information sources are limited, and the information is for the specific and diverse purposes of each agency. Consequently, there is no uniformity in the type, standard or data-collection period of the information. As a result, the existing information cannot be used as an effective mechanism for integrating production and marketing plans.

9.2 Basic Requirement

9.2.1 Flow/Stock Management of Crop and Water

For crop cultivation, water resources whether it is controlled or uncontrolled, is one of key elements. Since the wet season cropping is mostly depending on the rainfall pattern, resulted in wide fluctuation of crop production, adjustment could be made in dry season cropping in which an irrigation water is fully controlled. By using rainfall and/or irrigation water, a crop is cultivated and the harvested crop is either marketed or stored in accordance with the market condition.

Since market prices for crops are depending upon the relation between supply and demand, and crop production has seasonality, it is one of key factors to manage flow/stock of crop for the sake of getting higher return. Figure 9-1 shows an image of flow/stock of crop, and if it happens that an overproduction can not be stored in an existing storage facilities, it should be considered to newly construct additional storage facility or to market it out. Usually oversupply causes price decrease.

On the other hand, water is also storable as far as proper facilities are provided. In the Chao Phraya river basin, there are two big storage dams, Bhumipol and Sirikit, so that it should be fully analysed which is more economical to store in shape of either crop or water. In other words, when an oversupply or a weak demand for specific crop is forecasted, production control shall be carried out by

controlling irrigation water supply. In case of storing water in the two dams, only loss of evaporation should be counted, and it is not necessary to invest additional amount for water storage (Refer to Figure 9-2).

9.2.2 Upland Irrigation Technology

The upland irrigation is classified with many irrigation methods as shown in Table 9-1, and efficiency of irrigation water application differs according to physical conditions.. Most of all farmers are not familiar with the upland irrigation, it is, therefore, indispensable to research and experiment suitable method with proper crop selection, and then to extend the technology to farmers.

9.3 Objectives

By introducing diversified crops which demand less irrigation water as well as provide more cash income to farmers than paddy, it is planned to increase overall cropping intensity during dry season, resulted in promising more efficient utilization of seasonal under/unemployment, and more employment opportunity through expansion of agribusiness and agro-industry especially in rural areas.

By selecting promising crops both for import substitution such as oilseed crops, and export oriented such as fruits, flowers, fishery products, etc., it is expected to improve the prevailing trade deficit.

9.4 Function

To realize the said primary objective of the crop diversification, the proposed Crop Diversification Promotion Center (Refer to Figure 9-3) will have the following functions;

Diversified Crop Cultivation

- To select suitable crop/plant/fish
- To research and experiment proper irrigation method

- To provide appropriate education and training to farmers

Marketing Information

- To collect and monitor necessary information on marketing
- To arrange and compile the collected data and information
- To analyse and forecast demand for diversified crops
- To provide information services to various target groups

Planning

- To prepare proper zoning for targeted areas
- To coordinate the entire function of the center
- To prepare political directives/recommendations to targeted agencies

9.5 Preliminary Estimate of Cost and Benefit

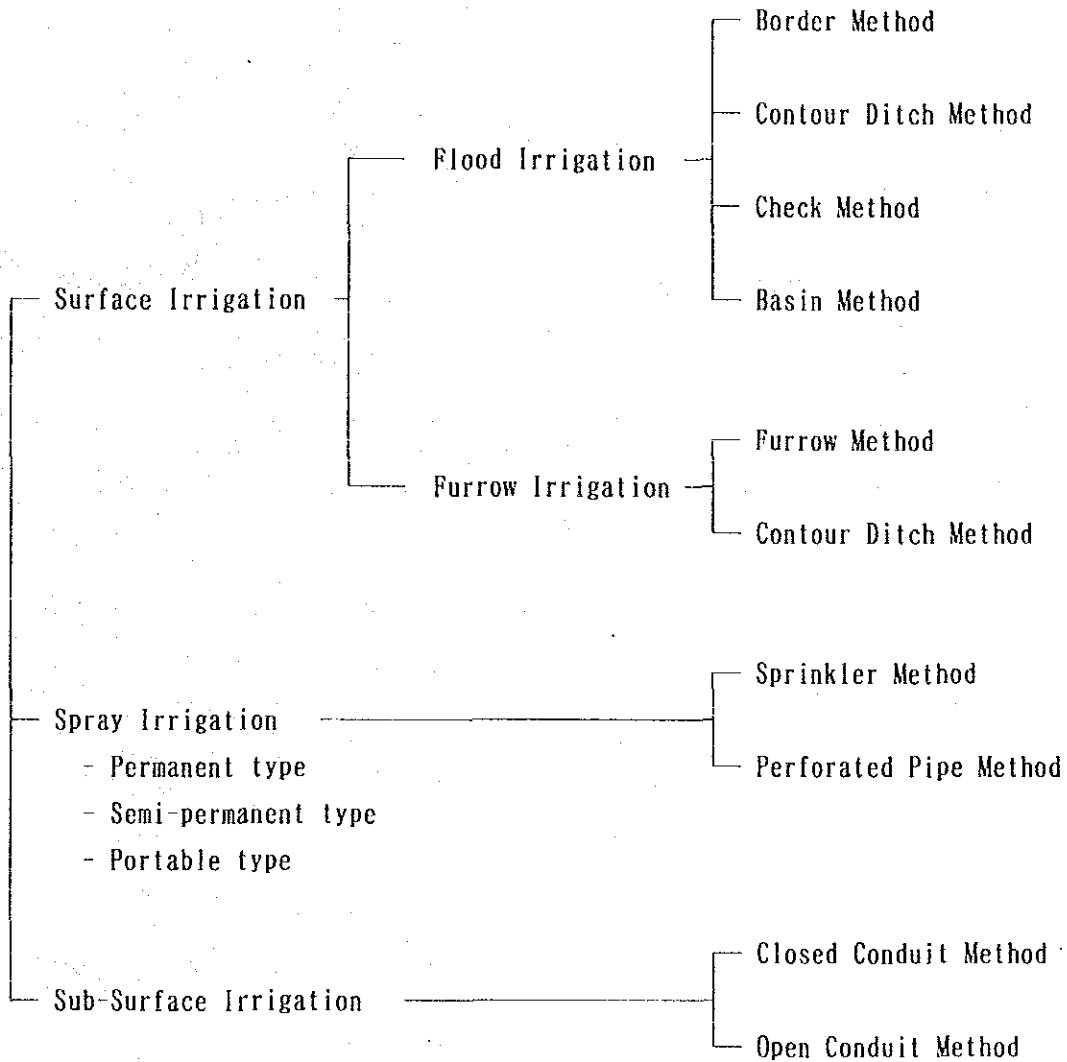
The required cost for establishment of the proposed crop diversification promotion center is composed of a study/design, facilities including building, equipments and supervision for construction. The total cost is roughly estimated at about 580 million bahts including 27 million bahts for the study/design component. Out of 580 million bahts, 520 million bahts is foreign currency portion (Details of the cost estimation is compiled in Appendix 6.9).

Through implementation and operation of the center, the following utility or benefit will be directly/indirectly expected;

- To create new job to moderately and highly educated people with incentives;
- To raise efficiency in land and water utilization;
- To contribute to improve the deficit in trade balance;
- To stabilize farmgate prices of agricultural products;
- To prevent overproduction; and
- To strengthen competitiveness in the world market.

Table 9-1 FIELD IRRIGATION/UPLAND IRRIGATION

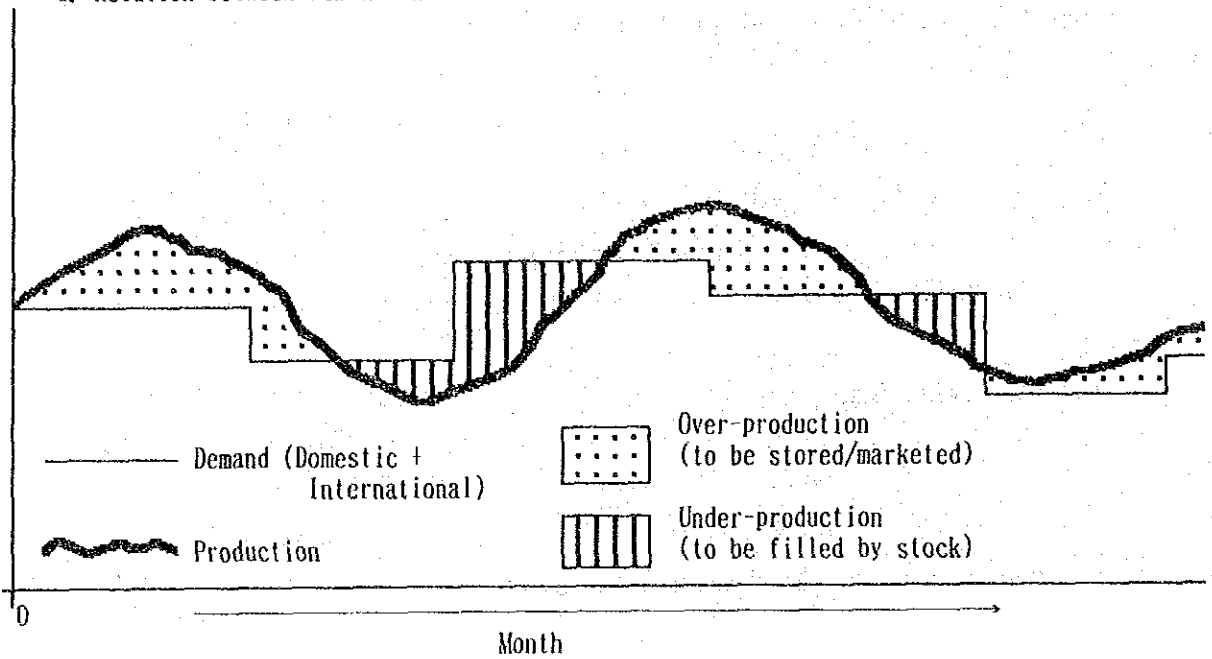
1. Classification of Field/Upland Irrigation



2. Applicable Irrigation Method by Slope

Irrigation Method	Slope	Applicable Crops
Border	less than 3°	mainly pasture
Contour Ditch	less than 27°	- ditto -
Furrow	less than 15°	row planting crops and fruits
Spray	no limitation	most of all crops

1. Relation between Demand and Production



2. Relation between Storage Capacity and Stock Requirement

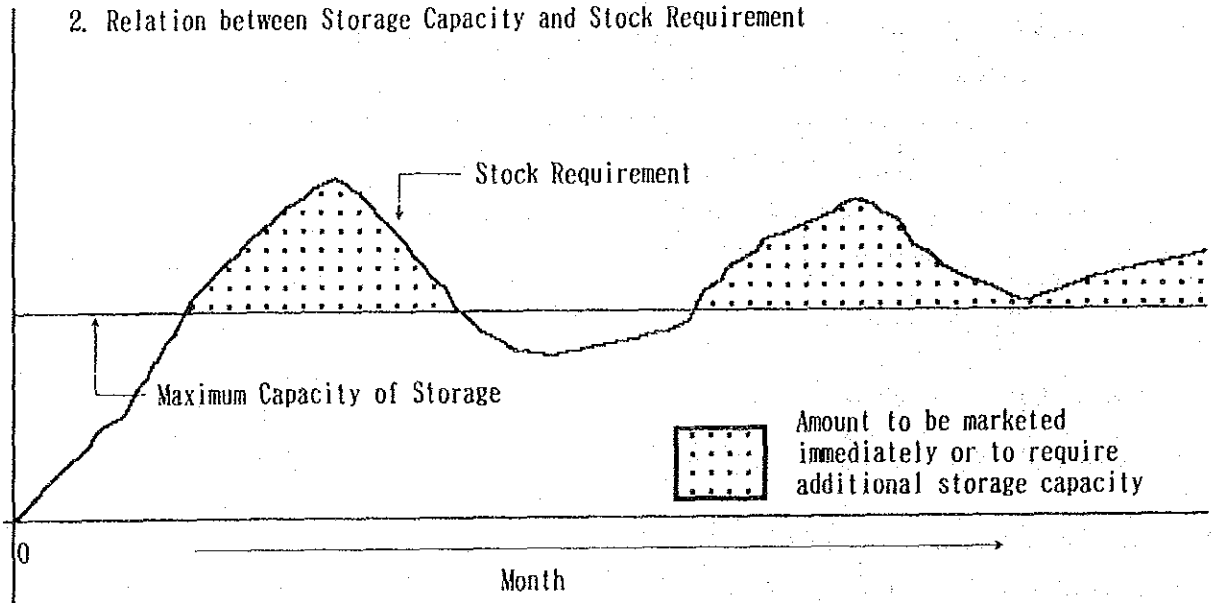
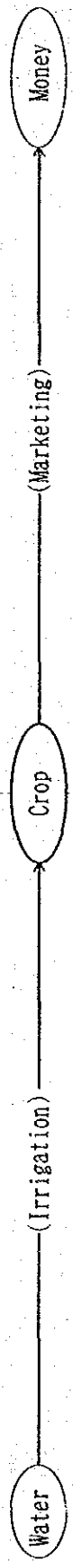


Figure 9-1 FLOW/STOCK MANAGEMENT OF AGRICULTURAL PRODUCTS (Image Only)

Flow/Stock Management of Water

- ① Forecasting System for Meteorology/Hydrology
- ② Reservoir Operation System (Bhumipol & Sirikit Dams)



Annual Planned Cropping System

Crop Diversification Promotion Center

(COORDINATION)

Monitoring:
- Rainfall

- Reservoirs' Storage Volume (Inflow/Outflow)
- Irrigation Demand and Release

Opening Information and Guidance:
- to Farmer Group/Association
- to Government Agencies concerned

Monitoring:

- Cropping Area by Season
- Damaged Area (Inundation/Drought)
- Forecast for Yield and Production
- Stock of Crops by Variety, Grade, Produced Year, etc.
- Trends in International Crop Markets

Opening Information and Guidance:

- to Farmer Group/Association
- to Traders of Crops
- to Government Agencies concerned

- Royal Irrigation Department (RID)
- Electricity Generating Authority of Thailand (EGAT)

- Ministry of Agriculture and Cooperatives (MOAC)
- Ministry of Commerce (MOC)
- National Statistical Office (NSO)
- Bank for Agriculture and Agricultural Cooperatives (BAAC)
- Private Federations for Agri-Business

Figure 9-2 FLOW/STOCK MANAGEMENT OF CROPS/IRRIGATION WATER

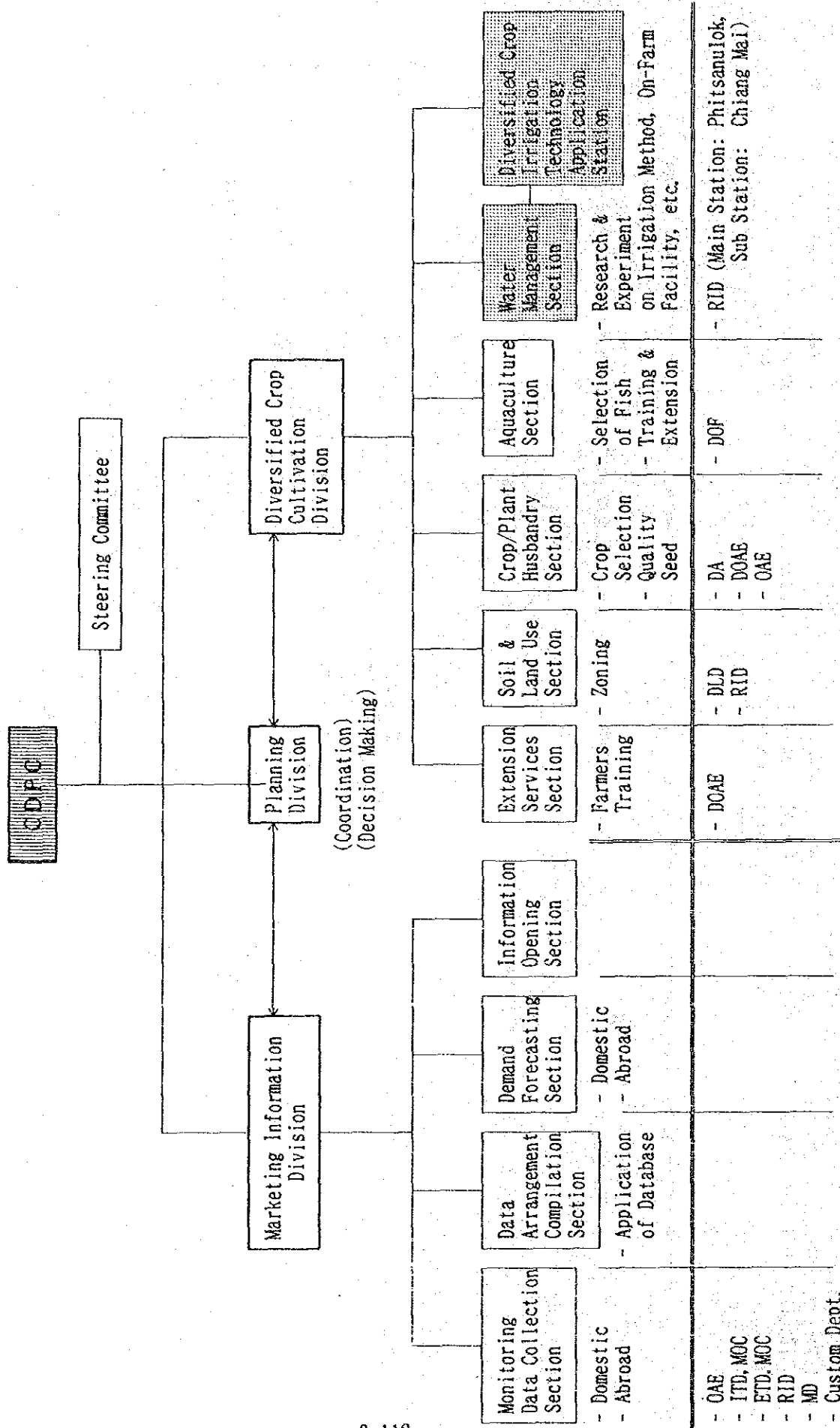


Figure 9-3 ORGANIZATION CHART OF CROP DIVERSIFICATION PROMOTION CENTER

A P P E N D I C E S

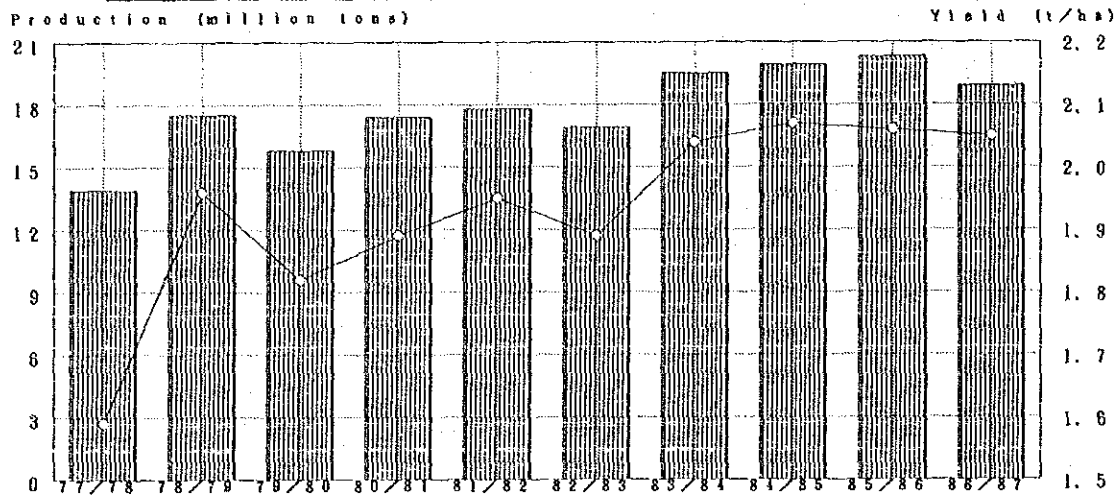
Table 6.1-1 CROPPING LAND USE INDEX, 1984/85

(Unit: %)

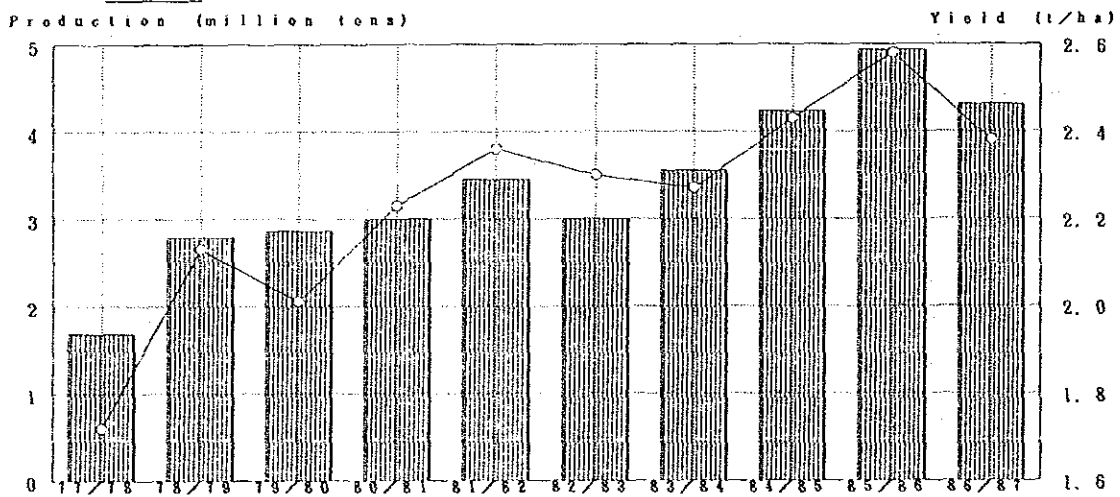
ZONE 1	Arable Land Area		Single Cropping Area		Double Cropping Area		Tripple and over Cropping Area		More than Once Cropping Area		Intensity of Cropping Area 7
	2	3	4	5	6	7					
Whole Kingdom	100	87.84	10.88	0.40	11.28	110.80					
1	100	88.99	1.93	0.24	2.17	93.57					
2	100	91.02	1.96	0.28	2.24	95.78					
3	100	86.65	1.77	0.14	1.91	90.61					
4	100	89.46	1.58	0.15	1.73	93.07					
5	100	85.27	5.01	0.27	5.28	96.10					
6	100	85.65	26.56	0.40	26.96	139.97					
7	100	95.57	33.23	0.10	33.33	162.33					
8	100	88.98	11.40	0.11	11.51	112.11					
9	100	79.92	15.94	0.24	16.18	112.52					
10	100	88.49	15.19	1.30	16.49	122.77					
11	100	84.02	34.80	0.90	35.70	156.32					
12	100	94.02	5.53	1.38	6.91	109.22					
13	100	92.53	12.32	0.14	12.46	117.59					
14	100	58.32	39.04	3.81	42.85	147.83					
15	100	91.50	0.76	0.19	0.95	93.59					
16	100	99.77	3.53	0.76	4.29	109.11					
17	100	84.88	6.58	0.72	7.30	100.20					
18	100	84.78	0.59	0.65	1.24	87.91					
19	100	83.83	5.41	0.11	5.52	94.98					

Source: Center of Agricultural Statistics, Office of Agricultural Economics
 Remark: Column No.6 = Col. No.4 + Col.5; Col.7 = Col.3 + (2 x Col.4) + (3 x Col.5)

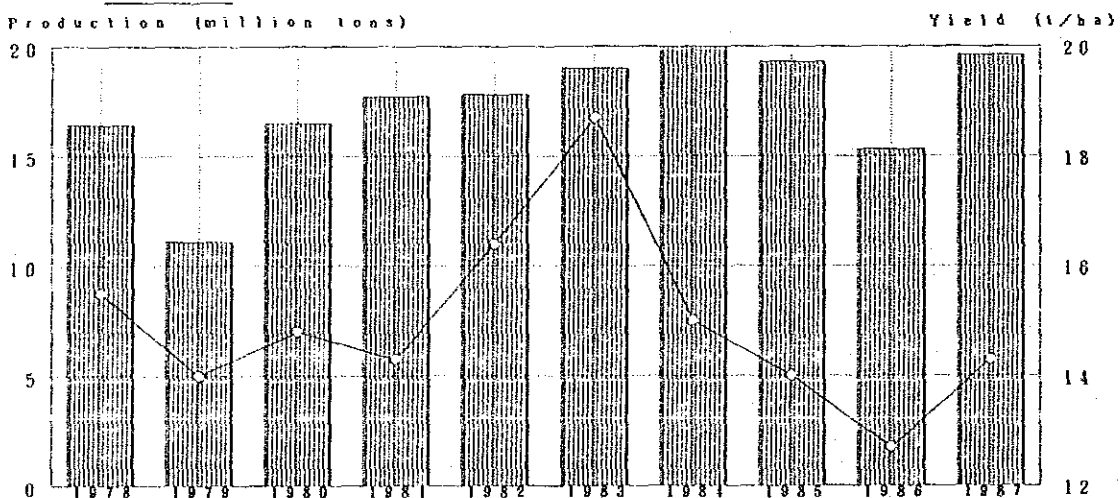
Rice (Second + Major)



Maize



Cassava



▨ Production ○ — — — — ○ Yield

Figure 6.1-1 AGRICULTURAL PRODUCTION IN THAILAND (1)

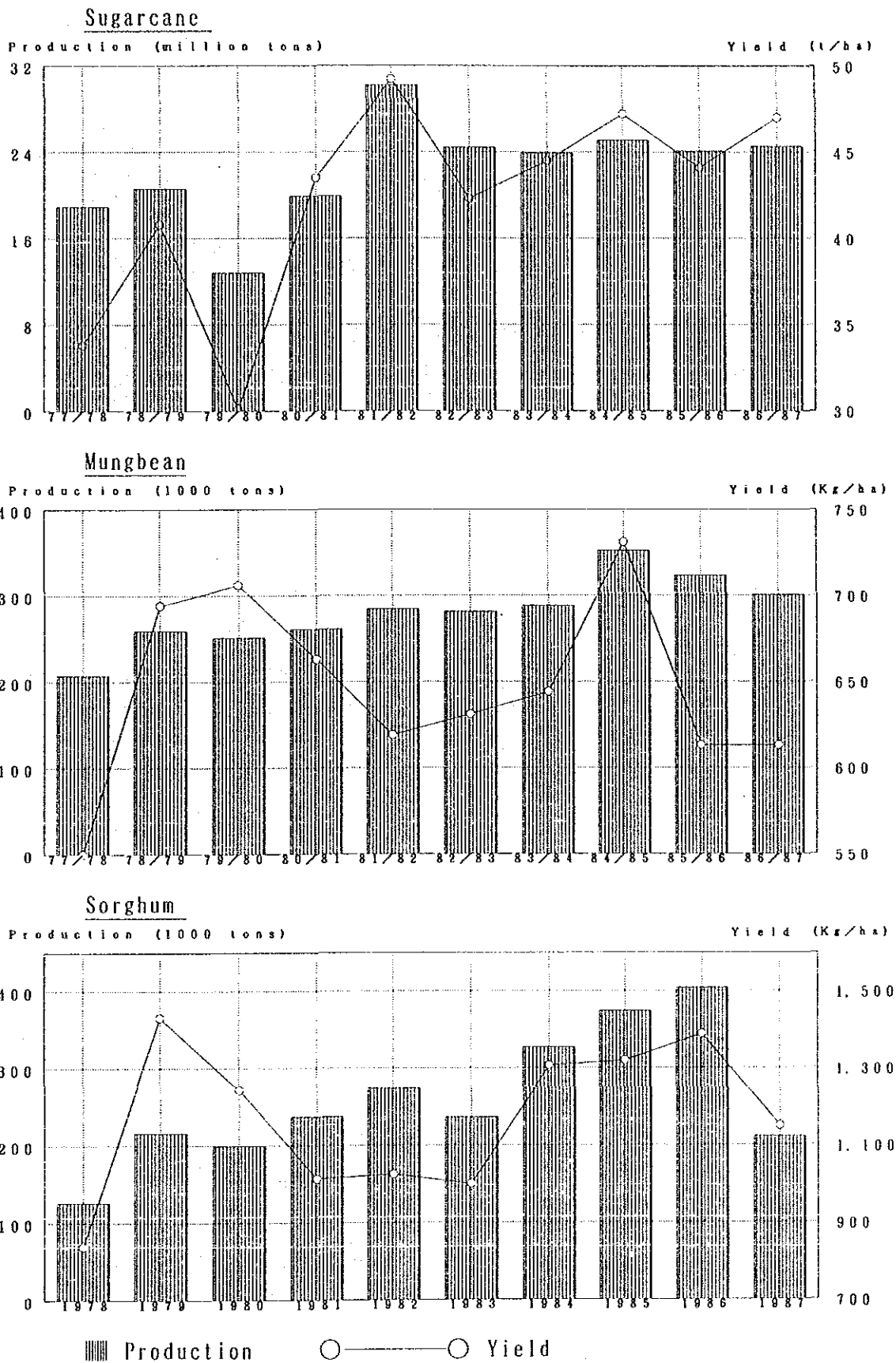


Figure 6.1-1 AGRICULTURAL PRODUCTION IN THAILAND (2)

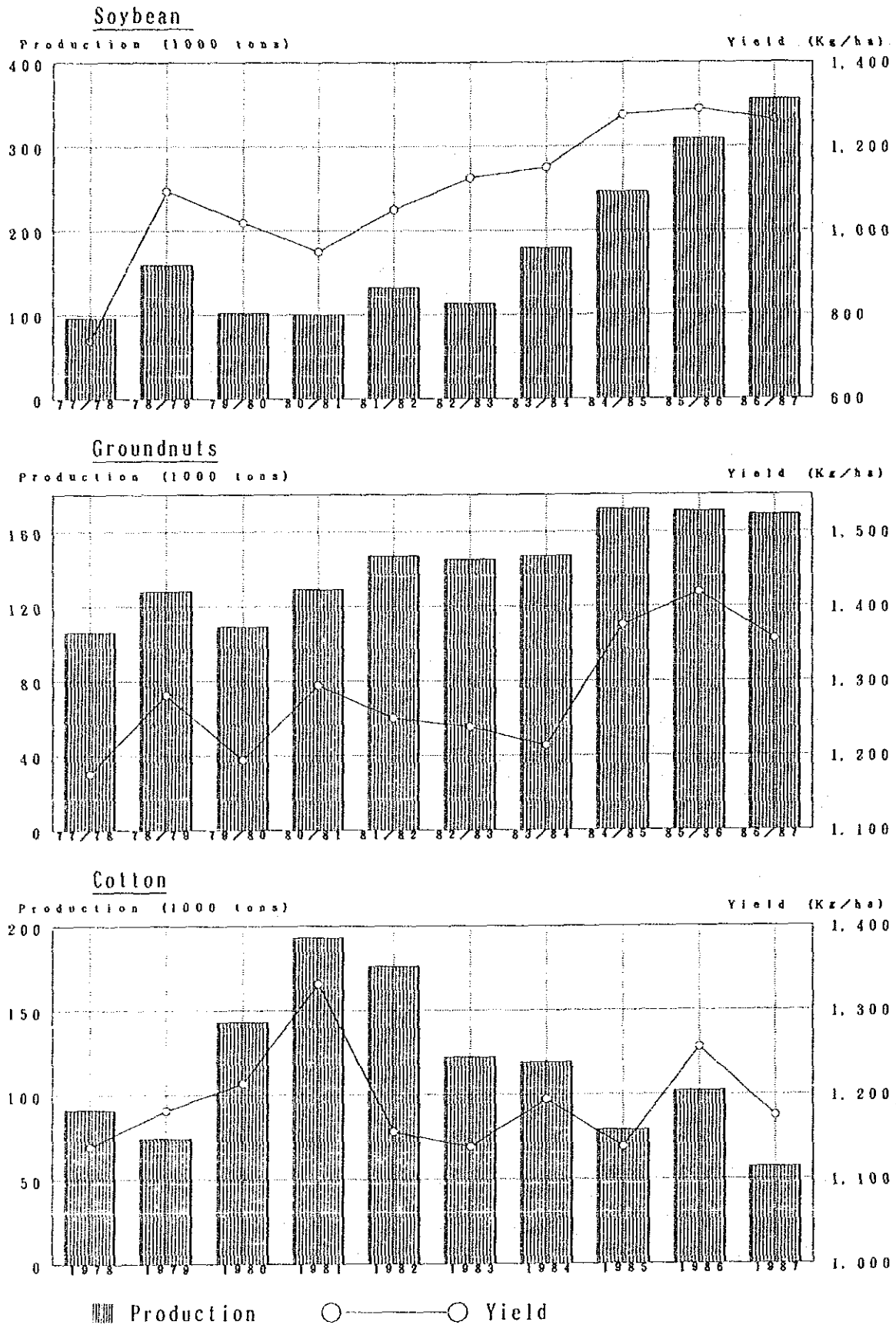


Figure 6.1-1 AGRICULTURAL PRODUCTION IN THAILAND (3)

Table 6.1-2 Ratio of Harvested Area to Planted Area of Paddy

(Unit : %)

	<u>Whole Thailand</u>		<u>North - Eastern</u>		<u>Northern</u>		<u>Central Plain</u>		<u>Southern</u>	
	<u>Paddy (Dry)</u>	<u>Paddy (Wet)</u>	<u>Dry</u>	<u>Wet</u>	<u>Dry</u>	<u>Wet</u>	<u>Dry</u>	<u>Wet</u>	<u>Dry</u>	<u>Wet</u>
1977	75.7	95.1								
78	96.6	96.9								
79	91.9	88.9								
80	93.3	91.7								
81	99.2	95.5	97.2	97.1	98.0	91.3	99.5	94.6	97.3	99.1
82	99.3	94.6	93.8	93.2	99.4	98.2	99.4	97.6	100.0	84.4
83	98.4	92.5	96.3	90.4	94.5	94.5	99.0	93.0	100.0	98.3
84	98.4	95.7	98.4	98.3	97.0	96.8	98.6	89.1	99.5	91.2
85	99.9	96.3	99.1	97.3	99.8	96.2	100.0	95.7	100.0	91.1
86	99.9	96.7	99.5	97.0	99.8	97.7	99.9	98.4	100.0	97.1
87	100.0	90.6	99.6	92.6	99.8	91.1	100.0	95.6	99.9	93.0

NA

Source : Agricultural Statistics of Thailand

Note : For the period from 1977 to 1980, harvested area is not shown in the statistics.

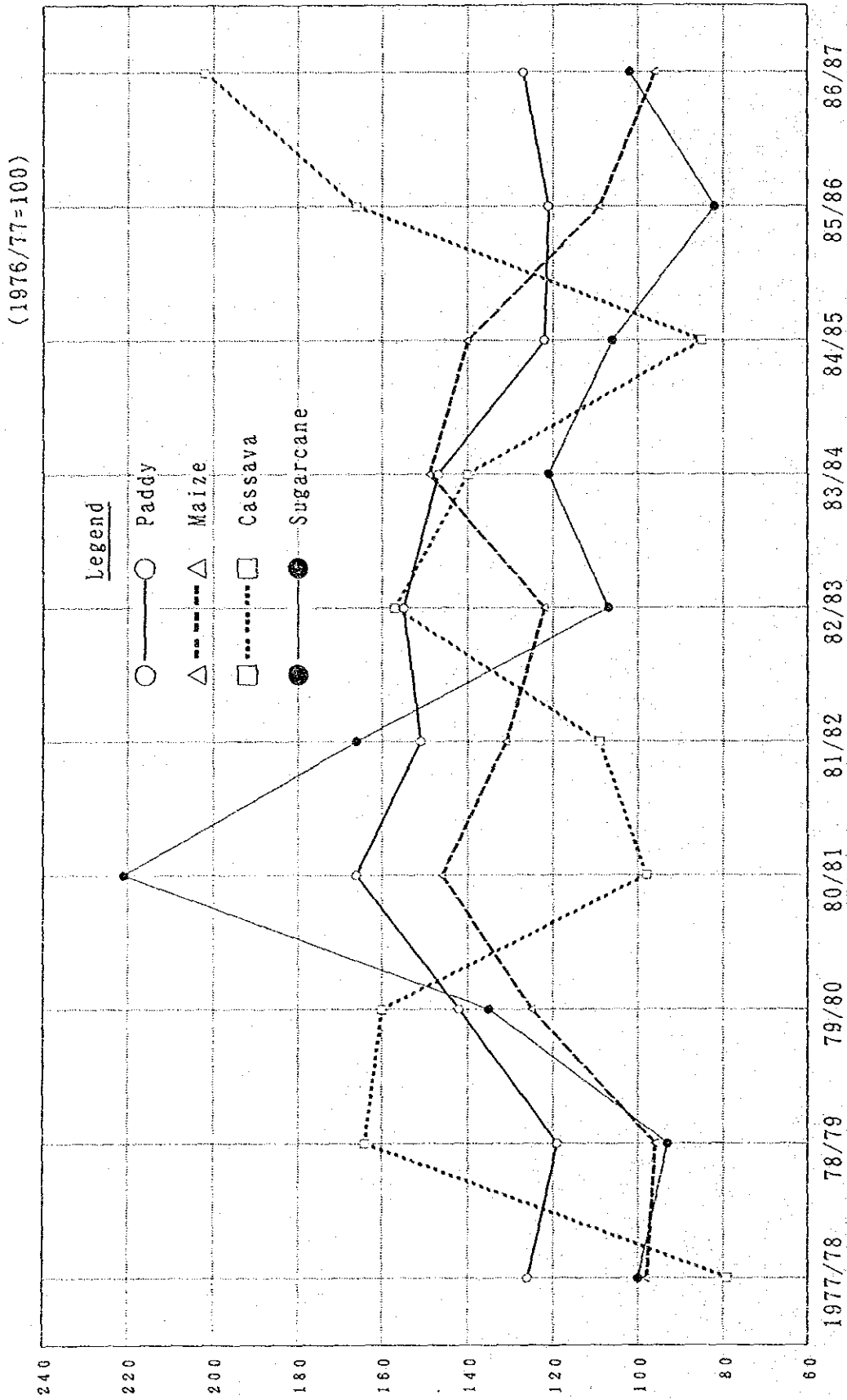


Figure 6.1-2 AVERAGE FARM PRICE OF PADDY, MAIZE, CASSAVA AND SUGARCANE

Table 6.1-3 LIST OF RECOMMENDED RICE VARIETIES IN THAILAND (1984)

No.	Variety Name	Type	Harvesting (day)	Reaction of diseases						Reaction to insects					Year of Release
				BL	BS	Sh.B	BB	YOLV	RSV	BPH	GLH	SB	GM		
<u>Non-Photosensitive Var.</u>															
1	RD1	NG	130	S	MS	S	S	S	S	S	S	S	S	1969	
2	RD2	NG	130	S	MS	S	S	MS	S	S	S	S	S	1969	
3	RD3	NG	128	S	MS	-	S	S	S	S	S	S	S	1969	
4	RD4	G	127	S	S	MS	S	S	S	R	R	S	R	1973	
5	RD5	NG	140	S	MS	-	MR	S	S	S	S	S	S	1973	
6	RD7	NG	120-130	MR	MR	-	R	S	MS	S	R	S	S	1973	
7	RD9	NG	115-125	S	S	MS	VS	MS	MS	R	R	MS	R	1975	
8	RD10	G	130	MR	-	-	S	S	S	S	S	S	S	1981	
9	RD11	NG	135	MR	MS	R	S	S	S	S	S	S	S	1977	
10	RD21	NG	120-130	S	S	S	MR	S	MR	R	MR	S	S	1981	
11	RD23	NG	120-130	S	MS	MS	R	S	MR	R	MR	S	S	1981	
12	RD25	NG	100	S	S	S	MR	S	MR	R	MR	S	S	1981	
<u>Northern Region</u>															
1	Muey Nawng 62M	G	Nov.20	S	MR	-	S	S	S	S	S	S	R	1959	
2	RD6	G	Nov.21	MR	MR	-	S	S	MS	S	R	S	S	1977	
3	Khao Dawk Mali 105	NG	Nov.25	S	MS	MR	MS	S	S	S	S	S	S	1959	
4	Leuang Yai 148	NG	Nov.25	S	MS	-	MS	S	S	S	S	S	S	1968	
5	Niaw San-pah-tawng	G	Nov.26	MS	MR	-	MS	S	MS	S	S	S	S	1962	
<u>North-Eastern Region</u>															
1	Hahng Yi 71	G	Nov.4	R	MS	-	S	S	MS	S	MS	S	S	1968	
2	Nam Sa-gui 19	NG	Nov.4	MS	MS	-	S	S	S	S	MS	S	S	1968	
3	RD15	NG	Nov.10	S	MR	MR	S	S	S	S	S	S	S	1978	
4	Khao Dawk Mali 105	NG	Nov.20	S	MS	MR	MS	S	S	S	S	-	S	1959	
5	RD6	G	Nov.21	MR	MR	-	S	S	MS	S	R	S	S	1977	
6	RD8	G	Nov.23	MS	MR	-	MS	S	-	S	MS	S	S	1978	
7	Niaw San-pah-tawng	G	Nov.26	MS	MR	-	MS	S	MS	S	S	S	S	1962	
8	Khao Pahk Maw 148	NG	Dec.3	MS	MS	-	MS	S	S	S	S	S	S	1965	
9	Khao fah Haeng 17	NG	Dec.20	-	-	MS	S	-	MS	-	-	-	-	1979	
10	Niaw Ubon 1	G	Nov.15	-	-	-	S	S	S	MS	S	VS	-	1984	

No.	Variety Name	Type	Harvest- ing (day)	Reaction to diseases				Reaction to insects				Year of Release	
				BL	BS	Sh.B	BB	YOLV	RSV	BPH	GLH		SB
<u>Central Region</u>													
1	Gow Ruang 86	NG	Nov.21	S	MS	-	MS	S	S	MR	S	S	1962
2	Nahng Mon S-4	NG	Nov.26	MS	MS	-	MS	S	S	S	S	S	1956
3	Khao Pakh Maw 148	NG	Dec.3	MS	MS	-	MS	S	S	S	S	S	1965
4	Leuang Pra-tew 123	NG	Dec.19	S	MS	-	S	MS	MR	S	S	S	1965
5	Khao Tah Haeng 17	NG	Dec.20	-	-	MS	S	S	MS	S	S	S	1956
6	RD27	NG	Dec.10	S	-	-	S	S	MR	MS	-	-	1981
<u>Southern Region</u>													
1	Puang Rai 2	NG	Feb.6	S	MS	-	S	S	S	MR	S	S	1968
2	Nahng Pa-yah 132	NG	Feb.16	S	MR	-	MS	S	S	MR	S	S	1962
3	Peuak Nam 43	NG	Feb.22	S	MR	-	MS	S	S	MS	S	S	1968
4	RD13	NG	Feb.26	R	MR	MR	S	S	S	MS	S	S	1978
5	Gaen Jan	NG	late Feb.	S	-	-	-	MR	R	MR	-	-	1983
<u>Floating Rice</u>													
1	Nahng Cha-lawng	G	Nov.30	MR	MS	-	S	S	S	S	S	S	1969
2	Ta-pow Gaew 161	NG	Dec.9	S	MS	-	S	S	S	S	S	S	1959
3	Leb Meu Nahng 111	NG	Dec.19	MS	MR	-	MS	S	S	S	S	S	1959
4	Pin Gaew 56	NG	Dec.29	S	MS	-	MS	S	S	MS	S	S	1959
5	RD19	NG	Dec.15	S	-	S	MS	S	S	S	S	S	1979
6	RD17	NG	140 days	MR	S	-	MS	S	MS	S	S	S	1979
<u>Upland Rice</u>													
1	Sew Mae Jan	G	Oct.15	MS	MS	-	S	-	-	S	S	S	1979
2	Dawk Pa-yawm	NG	150 days	-	-	-	S	-	-	S	S	S	1979
3	Goo Meuang Luang	NG	Dec.15	MR	-	VS	S	VS	S	S	S	S	1979

G = Glutinous
 NG = Non Glutinous
 BL = Blast
 BS = Brown Spot
 Sh.B = Sheath Blight
 BB = Bacterial Leaf Blight
 YOLV = Yellow Orange Leaf Virus
 RSV = Ragged Stunt Virus
 SB = Stem Borer
 BPH = Brown Plant Hopper

Table 6.1-4

AGRICULTURAL DOMESTIC CONSUMPTION, 1981 - 1985

	Unit	1981	1982	1983	1984	1985	Growth rate %
Paddy	1,000 tons	12,559	12,579	12,644	12,727	12,908	0.67
Maize	"	904	968	997	1,000	1,100	3.53
Sugar	"	525	464	631	655	676	8.87
Cassava ^{1/}	"	1,444	500	4,009	2,802	6,025	58.10
Rubber	"	29	29	31	32	33	3.63
Mung bean	"	112	89	132	177	84	1.13
Soy bean	"	310	375	412	615	501	15.66
Groundnut	"	136	120	153	180	169	8.76
Kenaf ^{2/}	"	223	214	229	148	229	-3.11
Cotton	"	130	95	140	210	192	17.04
Coconut	"	1,060	1,132	1,092	1,085	1,108	0.46
Cattle	1,000 Head	773	793	822	850	887	3.51
Buffalo	"	266	292	307	324	341	6.19
Swine	"	6,241	6,432	6,607	6,918	7,230	3.74
Chicken	"	194,160	217,800	236,040	258,600	275,703	9.12

Source : Division of Agricultural Economic Research, Office of
Agricultural Economics

Remarks : ^{1/} Domestic consumption and stock
^{2/} Conversion rate = 1 gunny bag = 1.134 kgs.

Table 6.1-5 Change in Forest Land in Thailand

<u>Year</u>	<u>National Land (1)</u> ha	<u>Forest Land (2)</u> ha	<u>(2)/(1) x 100 (%)</u>
1975	51,311,502	20,921,973	40.8
1976	"	19,841,700	38.7
1977	"	18,651,844	36.4
1978	"	17,522,400	34.1
1979	"	17,022,877	33.2
1980	"	16,546,998	32.2
1981	"	16,093,188	31.4
1982	"	15,660,000	30.5
1983	"	15,402,779	30.0
1984	"	15,151,274	29.5

Table 6.1-6 TIMBER PRODUCTION IN THAILAND

(Volume : m³)
(Value : 1,000 Bahts)

Year	Timber cut									
	Teak		Yang		Other timber		Total			
	Volume	Value	Volume	Value	Volume	Value	Volume	Value		
1976	263,700	1,085,389	870,142	870,142	2,076,587	3,469,568	3,210,429	5,425,099		
1977	137,972	593,280	989,897	1,385,856	2,212,479	3,887,596	3,340,348	5,866,734		
1978	112,270	505,215	476,988	906,277	2,019,449	3,571,008	2,608,707	4,962,500		
1979	179,577	1,086,441	627,441	1,223,510	2,157,518	5,608,125	2,964,536	7,918,076		
1980	97,323	700,726	551,077	1,157,262	1,895,816	5,208,359	2,544,216	7,066,347		
1981	73,245	728,788	289,431	694,634	1,435,900	4,549,511	1,796,576	5,972,933		
1982	58,076	577,856	341,303	819,127	1,305,633	3,883,712	1,705,012	5,280,695		
1983	57,513	572,254	396,810	952,344	1,362,254	3,968,232	1,816,577	5,492,830		
1984	48,172	479,311	589,905	1,415,772	1,393,646	4,143,336	2,031,723	6,038,419		
1985	39,166	389,702	534,747	1,283,393	1,251,353	3,702,952	1,825,266	5,376,047		

Table 6.1-7 CHANGE IN FOREST LAND IN THE STUDY AREA

	(Unit: ha)				
	1981	1982	1983	1984	1984/1981 (%)
1. Upstream					
1.1. Region - 1					
Chiang Mai	1,689,005	1,670,200	1,653,636	1,637,237	69.9
Lamphun	274,982	272,200	270,185	268,185	97.5
Mae Hong Son	974,689	963,800	956,342	948,943	97.4
Sub-total	2,938,676	2,906,200	2,880,163	2,854,365	97.1
1.2. Region - 2					
Lampang	954,175	944,500	932,139	919,940	96.4
Phayao	332,904	327,800	320,017	312,418	93.8
Phrae	279,753	274,600	269,714	264,914	94.7
Nan	596,283	561,500	548,641	536,077	89.9
Chiang Rai	500,411	483,900	475,039	466,340	93.2
Sub-total	2,663,526	2,592,300	2,545,550	2,499,689	93.8
<u>Total</u>	<u>5,602,202</u>	<u>5,498,500</u>	<u>5,425,713</u>	<u>5,354,054</u>	<u>95.6</u>
2. Midstream					
2.1. Region - 3					
Tak	931,581	913,315	908,630	903,970	97.0
Sukhothai	299,334	294,100	288,390	282,791	94.4
Uttaradit	356,287	349,700	341,998	334,466	93.9
Phitsanulok	326,470	315,100	309,501	304,002	93.1
Phetchabun	383,515	376,300	369,062	361,963	94.4
Phichit	-	-	-	-	-
Kamphaeng Phet	266,150	261,038	251,885	243,053	91.3
Nakhon Sawan	59,596	58,176	55,982	54,063	90.7
Lob Buri	179	175	172	170	95.0
<u>Total</u>	<u>2,623,112</u>	<u>2,567,904</u>	<u>2,525,620</u>	<u>2,484,478</u>	<u>94.7</u>
3. Downstream					
3.1. Region - 7					
Kamphaeng Phet	16,988	16,662	16,078	15,514	91.3
Nakhon Sawan	31,976	31,214	30,090	29,008	90.7

(cont'd)

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1984/1981</u>
Uthai Thani	185,766	182,915	180,260	177,645	95.6
Chainat	889	849	820	791	89.0
Suphan Buri	50,697	49,748	48,306	46,906	92.5
Sing Buri	-	-	-	-	-
Ang Thong	-	-	-	-	-
Ayutthaya	-	-	-	-	-
Pathum Thani	-	-	-	-	-
Nonthaburi	-	-	-	-	-
Bangkok Metro.	-	-	-	-	-
Samut Prakan	-	-	-	-	-
Kanchanaburi	42,973	42,218	41,226	40,257	93.7
Nakhon Pathom	-	-	-	-	-
Samut Sakhon	-	-	-	-	-
Sub-total	329,289	323,606	316,780	310,121	94.2
3.2. Region - 8					
Nakhon Sawan	14,660	14,311	13,795	13,299	90.7
Chainat	158	151	146	141	89.2
Sing Buri	-	-	-	-	-
Ayutthaya	-	-	-	-	-
Pathum Thani	-	-	-	-	-
Nonthaburi	-	-	-	-	-
Lob Buri	29,597	28,925	28,522	28,125	95.0
Saraburi	10,287	9,800	9,596	9,396	91.3
Bangkok Metro.	-	-	-	-	-
Samut Prakan	-	-	-	-	-
Nakhon Nayok	5,527	5,522	5,521	5,521	99.9
Sub-total	60,229	58,709	57,580	56,482	93.8
3.3. Region - 9					
Samut Prakan	-	-	-	-	-
Chachoengsao	26,479	24,643	24,630	24,618	93.0
Sub-total	26,479	24,643	24,630	24,618	93.0
<u>Total</u>	<u>415,997</u>	<u>406,958</u>	<u>398,990</u>	<u>391,221</u>	<u>94.0</u>
<u>Grand Total</u>	<u>8,641,311</u>	<u>8,473,362</u>	<u>8,350,323</u>	<u>8,229,753</u>	<u>95.2</u>

Table 6.1-8 Milk Production in Thailand

(Unit : tons)

Year	Dairy Farming Promotion Organization of Thailand						Nong-Pho Cooperative	Ayutthaya Cooperative	Nakhon Pathom Cooperative	Kasetsart Cooperative	Total	Average Ton/day
	Muaglek	Prachup Khiri Khan	Chiang Mai	Total (D.F.P.O.)								
1976	4,296.1	-	518.6	4,814.7	3,250.1	-	-	-	-	8,064.8	22.1	
1977	5,094.1	-	699.5	5,793.6	4,346.7	-	-	-	-	10,140.3	27.8	
1978	6,496.2	-	740.2	7,236.4	5,467.0	-	-	-	-	12,703.4	34.8	
1979	7,219.6	-	542.9	7,762.5	6,934.6	-	-	-	-	14,697.1	40.3	
1980	8,366.2	<u>1/</u> 81.1	613.4	9,060.7	8,445.0	-	-	-	-	17,505.7	48.0	
1981	10,769.6	855.7	752.0	12,377.3	8,933.2	-	-	-	-	21,310.5	58.4	
1982	13,903.5	1,859.1	934.7	16,697.3	9,374.2	<u>1/</u> 712.4	190.6	53.9	1/ 53.9	27,028.3	74.1	
1983	16,954.9	4,271.2	1,096.3	22,322.4	10,908.3	625.2	182.2	36.7	36.7	34,074.8	93.4	
1984	21,360.5	7,850.4	1,256.9	30,467.8	12,033.7	817.1	209.4	16.1	16.1	43,544.1	119.3	
1985	26,279.3	8,945.5	1,636.7	36,861.5	13,857.4	210.3	441.6	-	-	51,370.8	140.7	

1/ = the start

Table 6.1-9 No. of Livestock in the Study Area
(Unit : Head, Bird)

	1985			1983	
	Buffalo	Cattle	Swine	Chickens	Ducks
1. Upstream					
1.1 Region - 1					
Chiang Mai	132,604	112,252	165,855	2,323,275	338,146
Lamphun	27,336	45,302	34,606	515,113	37,853
Mae Hong Son	32,529	17,924	20,686	124,978	-
Sub-total	192,469	175,478	121,147	2,963,366	375,999
1.2 Region - 2					
Lampang	107,256	118,998	87,238	1,087,523	33,555
Phayao	60,783	85,796	59,729	777,280	128,267
Phrae	62,099	46,399	78,462	927,769	-
Nan	79,885	47,252	66,624	621,663	27,641
Chiang Rai	136,315	71,247	148,561	2,328,620	226,043
Sub-total	446,338	369,692	440,614	5,742,855	415,506
Total	638,807	545,170	561,761	8,706,221	791,505
2. Midstream					
2.1 Region - 3					
Tak	24,715	71,982	21,119	216,739	6,852
Sukhothai	31,741	44,294	48,202	882,666	92,115
Uttaradit	43,114	51,998	43,594	798,277	44,701
Phitsanulok	56,888	63,389	81,880	994,252	127,373
Phetchabun	68,609	127,254	82,501	1,254,045	144,701
Phichit	64,502	16,275	55,097	717,385	97,667
Kamphaeng Phet	28,879	14,265	57,675	738,074	130,756
Nakhon Sawan	31,817	88,309	21,411	1,013,436	369,255
Lob Buri	216	978	484	5,998	1,818
Total	350,481	478,744	411,963	6,620,872	1,015,238
3. Downstream					
3.1 Region - 7					
Kamphaeng Phet	1,846	911	3,681	47,111	8,346
Nakhon Sawan	17,071	47,381	11,488	543,752	41,870
Uthai Thani	35,368	7,560	30,922	439,514	73,754
Chainat	16,899	42,156	35,779	364,505	304,614
Suphan Buri	34,099	87,697	109,635	833,520	721,875

Sing Buri	5,515	13,582	31,777	151,233	52,403
Ang Thong	12,923	32,450	29,976	530,016	584,423
Ayutthaya	13,898	16,161	12,590	382,851	258,158
Pathum Thani	1,220	1,452	924	69,739	145,378
Nonthaburi	947	1,922	1,579	156,248	495,722
Bangkok Metro.	455	928	2,731	75,416	40,013
Samut Prakan	34	156	1,138	302,906	23,554
Kanchanaburi	1,087	6,078	1,473	20,069	1,645
Nakhon Pathom	1,929	9,442	56,989	694,325	278,383
Samut Sakhon	128	628	650	19,519	56,576
Sub-total	143,419	268,534	331,332	4,630,722	3,086,705
3.2 Region - 8					
Nakhon Sawan	7,827	21,723	5,267	249,295	9,833
Chainat	3,005	7,498	6,363	64,829	54,177
Sing Buri	1,336	3,290	7,698	36,634	12,694
Ayutthaya	14,465	16,821	13,104	398,477	268,696
Pathum Thani	2,889	3,438	2,188	165,069	344,110
Nonthaburi	2,879	449	2,126	17,168	54,469
Lob Buri	35,832	161,950	80,161	993,690	301,224
Saraburi	41,801	64,488	53,657	506,715	123,535
Bangkok Metro.	1,120	2,282	6,719	125,538	98,442
Samut Prakan	80	369	2,693	716,921	55,747
Nakhon Nayok	3,199	498	2,363	70,911	10,128
Sub-total	114,433	282,806	182,339	3,405,247	1,411,355
3.3 Region - 9					
Samut Prakan	34	156	1,138	302,906	23,554
Chachoengsao	4,528	4,905	25,707	579,708	108,885
Sub-total	4,562	5,061	26,845	882,614	132,439
Total	262,414	556,401	540,516	8,918,583	4,630,499
Grand Total	1,251,702	1,580,315	1,514,240	24,245,676	6,437,242

Source : Agricultural Statistics of Thailand, 1985/86
Intercensal Report, 1983

Table 6.1-10

Foreign Trade of Fishery Products

Appendix 6.1

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Volume and Value of Frozen Shrimp Exports

Volume : ton; Value : million baht

COUNTRIES	1982		1983		1984		1985		1986	
	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value
Japan	12,312	1,853.0	7,662	1,535.5	7,053	1,211.6	7,651	1,455.6	9,385	2,091.6
US	3,458	351.2	6,149	873.5	5,941	960.2	7,097	1,101.0	7,964	1,208.7
Singapore	376	38.8	459	42.5	1,010	90.2	3,362	339.9	3,357	336.7
	718	86.0	895	114.9	1,116	99.4	1,350	114.6	1,994	216.3
Hong Kong	3,431	187.6	2,503	139.3	1,862	109.0	1,907	116.3	1,882	109.4
Australia	418	53.1	1,002	216.4	1,062	187.5	852	161.0	1,202	66.4
France	384	35.6	378	44.3	301	26.3	323	24.6	566	69.1
Italy	740	50.3	157	11.7	58	1.6	116	12.4	555	90.5
W. Germany	394	74.0	479	110.0	267	53.5	272	62.2	366	101.0
Other countries	416	33.8	466	76.5	758	59.2	1,111	51.6	1,446	101.3
Total	22,647	2,763.5	20,150	3,164.5	19,428	798.6	24,041	3,439.1	28,717	4,391.0

Volume and Value of Frozen Fish Exports

Volume : ton; Value : million baht

COUNTRIES	1982		1983		1984		1985		1986	
	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value
Malaysia	39,753	202	36,356	198	55,048	384	75,667	598	85,054	624
Japan	8,605	368	7,997	313	10,371	398	11,316	481	19,103	986
US	964	54	1,347	84	1,531	124	2,652	160	3,944	335
Singapore	2,709	32	5,776	57	5,424	42	3,936	60	5,548	87
Australia	271	5	902	8	1,819	27	1,259	27	2,998	59
Other countries	915	28	1,031	26	1,461	42	1,591	51	3,260	83
Total	53,217	689	53,409	686	75,254	1,017	96,421	1,377	118,907	2,174

Imports and Exports of Marine

Volume : ton; Value : 1,000 baht

YEAR	EXPORTS		IMPORTS		BALANCE
	Volume	Value	Volume	Value	Value
1982	46,215	725,532	316,679	11,230,739	10,505,207
1983	58,942	1,093,081	344,899	12,677,173	11,584,092
1984	119,064	2,119,300	411,722	15,080,893	12,961,593
1985	152,707	3,857,457	466,792	18,527,660	14,670,203
1986	266,235	7,562,000	602,408	26,826,000	19,264,000

Table 6.1-11 Inland Fishery in the Study Area

(unit: ha)

	1980					1985					1985/1980				
	Pond	Paddy	Ditch	Cage	Total	Pond	Paddy	Ditch	Cage	Total	Pond	Paddy	Ditch	Cage	Total
	Culture	Culture	Culture	Culture		Culture	Culture	Culture	Culture		Culture	Culture	Culture	Culture	
1. Upstream															
1.1 Region - 1															
Chiang Mai	55	4	2	-	61	114	6	2	-	122	2.07	1.50	1.00	-	2.00
Lamphun	15	4	2	-	21	21	4	2	-	27	1.04	1.00	1.00	-	1.29
Hoe Hong Son	3	-	-	-	3	23	1	-	-	24	7.67	-	-	-	8.00
Sub-Total	73	8	4	-	85	158	11	4	-	173	2.16	1.38	1.00	-	2.04
1.2 Region - 2															
Lampang	18	1	-	-	19	30	-	-	-	30	1.67	-	-	-	1.58
Phayao	32	-	3	-	35	36	-	-	-	36	1.13	-	-	-	1.03
Phrae	20	-	-	-	20	39	-	-	-	39	1.95	-	-	-	1.95
Nan	12	-	-	-	12	16	-	-	-	16	1.33	-	-	-	1.33
Chiang Rai	179	6	-	-	185	315	41	1	-	357	1.76	6.83	-	-	1.93
Sub-Total	261	7	3	-	271	436	41	1	-	478	1.67	5.86	0.33	-	1.76
Total	334	15	7	-	356	594	52	5	-	651	1.78	3.47	0.71	-	1.83
2. Midstream															
2.1 Region - 3															
Tak	15	-	-	-	15	22	-	-	-	22	1.47	-	-	-	1.47
Sukhothai	8	-	-	-	8	60	14	-	-	74	7.50	-	-	-	9.25
Uttaradit	20	-	-	-	20	52	-	-	-	52	2.60	-	-	-	2.60
Phitsanulok	28	-	-	-	28	75	25	-	-	100	2.68	-	-	-	3.57
Phetchabun	25	-	-	-	25	81	12	-	-	93	3.24	-	-	-	3.72
Phichit	41	4	-	-	45	71	37	-	-	108	1.33	9.25	-	-	1.40
Kamphaeng Phet	11	-	-	-	11	275	-	-	-	275	25.00	-	-	-	25.00
Nakhon Sawan	15	-	-	3	18	115	1	-	2	118	7.67	-	-	0.67	6.56
Lob Buri	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	163	4	-	3	170	751	89	-	2	842	4.61	22.25	-	0.67	4.95
3. Downstream															
3.1 Region - 7															
Kamphaeng Phet	2	-	-	-	2	3	-	-	-	3	1.50	-	-	-	1.50
Nakhon Sawan	8	-	-	1	9	62	-	-	1	63	7.75	-	-	1.00	7.00
Uthai Thani	5	-	-	-	5	8	-	-	-	8	1.60	-	-	-	1.60
Chainat	14	-	-	-	14	57	-	-	-	57	4.07	-	-	-	4.07
Suphan Buri	64	-	-	-	64	879	19	12	-	910	13.73	-	-	-	14.22
Sing Buri	21	1	-	-	22	31	7	-	-	38	1.48	7.00	-	-	1.73
Ang Thong	16	1	-	-	17	175	2	-	-	177	10.94	2.00	-	-	10.41
Ayutthaya	45	5	2	-	52	262	38	2	-	302	5.82	7.60	1.00	-	5.80
Pachum Thani	37	-	1	-	38	129	-	2	-	131	3.49	-	2.00	-	3.45
Nonthaburi	24	8	-	-	32	110	5	4	-	119	4.58	0.63	-	-	3.72
Bangkok Metr.	296	12	3	-	311	461	13	3	-	477	1.56	1.08	1.00	-	1.53
Samut Prakan	7	3,136	-	-	3,143	330	3,260	-	-	3,590	47.14	1.04	-	-	1.14
Kanchanaburi	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Nakhon Pathom	58	34	1	-	93	419	43	2	-	464	7.22	1.26	2.00	-	4.99
Samut Sakhon	14	27	2	-	43	25	682	1	-	708	1.79	25.26	0.5	-	16.47
Sub-Total	612	3,224	9	1	3,846	2,951	4,069	16	1	7,037	4.82	1.26	1.78	1.00	1.83
3.2 Region - 8															
Nakhon Sawan	4	-	-	-	4	28	-	-	-	28	7.00	-	-	-	7.00
Chainat	2	-	-	-	2	10	-	-	-	10	5.00	-	-	-	5.00
Sing Buri	5	-	-	-	5	8	2	-	-	10	1.60	-	-	-	2.00
Ayutthaya	47	5	2	-	54	273	40	3	-	316	5.81	8.00	1.50	-	5.85
Pathum Thani	87	-	2	-	89	306	-	5	-	311	3.52	-	2.50	-	3.49
Nonthaburi	3	1	-	-	4	12	-	1	-	13	4.00	-	-	-	3.25
Lob Buri	32	4	3	-	39	50	7	3	-	60	1.56	1.75	1.00	-	1.54
Saraburi	9	1	-	-	10	26	-	-	-	26	2.89	-	-	-	2.60
Bangkok Metr.	727	30	6	-	763	1,143	32	7	-	1,182	1.57	1.07	1.17	-	1.55
Samut Prakan	18	7,422	22	-	7,462	780	7,714	22	-	8,516	43.33	1.04	1.00	-	1.14
Nakhon Nayok	5	1	-	-	6	8	-	-	-	8	1.60	-	-	-	1.33
Sub-Total	939	7,463	35	-	8,437	2,644	7,795	41	-	10,480	2.82	1.04	1.17	-	1.24
3.3 Region - 9															
Samut Prakan	7	3,136	-	-	3,143	330	3,260	-	-	3,590	47.14	1.04	-	-	1.14
Chachoengsao	19	908	14	-	941	46	1,005	11	-	1,062	2.42	1.11	0.79	-	1.13
Sub-Total	26	4,044	14	-	4,084	376	4,265	11	-	4,652	14.46	1.05	0.79	-	1.14
Total	1,577	14,731	58	1	16,367	5,971	16,129	68	1	22,169	3.79	1.09	1.17	1.00	1.35
Grand Total	2,074	14,750	65	4	16,893	7,316	16,270	73	3	23,662	3.53	1.10	1.12	0.75	1.40

Table 6.2-1 Legend and Recommendation - General Potential Land Use Map

No.1

Mapping Unit Number	General Description of Soils	Recommended Land Use	Major management required
AREAS WITH SOILS SUITED FOR UPLAND CROPS IN LOW RAINFALL ZONE			
1	Deep nearly level to gently sloping moderately well to well drained, medium to fine textured soils with moderate fertility.	Permanent agricultural land: very suitable for a variety of upland crops, vegetables and fruit trees: suggested crops are maize, sorghum, cotton, tobacco, beans, nuts, sugar cane and castor bean.	Need ordinary management practices to maintain soil fertility and structure: irrigation is required for continuous cultivation of various upland, crops.
2	Deep gently sloping, moderately well to well drained, fine textured soil with moderate to high fertility and consisting mainly of montmorillonite clay.	Permanent agricultural and generally suitable for upland crops and fruit trees but choice of crops may be limited due to unfavorable surface texture (very sticky clay); suggested crops are corn, cotton, sorghum and beans.	Need proper cultivation and suitable fertilizer application; application of trace element may be required for some crops such as beans.
3	Deep gently sloping to strongly sloping well to moderately well drained, fine textured soils with low or moderately low fertility.	Permanent agricultural land; suitable for large varieties of upland crops and fruit trees; suggested crops are corn, sorghum, cotton, castor bean, sugar cane and beans.	Require proper fertilizer application and conservation practices such as contour tillage planting and terracing; (drought may occur during period of little rainfall in the rainfed area).
4	Deep, gently sloping to strongly sloping, well to moderately well drained, medium to coarse textured soils with low fertility.	Permanent agricultural land; generally suitable for upland crops and fruit trees but choice of crops may be limited suggested crops are kenaf, beans, nuts, cassava, water melon, sugar cane and pine apple.	In addition to proper fertilization and good management measures to maintain soil fertility and structure, one or more special conservation practices such as contour tillage planting and terracing are required; (drought commonly occurs during periods of little rainfall in growing season of rainfed area).

No. 2

Mapping Unit Number	General Description of Soils	Recommended Land Use	Major management required
5	Shallow to moderately deep, gently sloping to moderately sloping, well to moderately well drained fine or medium textured soils with moderate fertility and high organic matter content in the surface.	Suitable for growing cultivated crops but choice of crops may be limited; suggested crops are maize, sorghum, cotton and beans.	Need ordinary management including fertilizer application to maintain soil fertility and structure; proper conservation practices are required on moderately sloping soils.
AREAS WITH SOILS SUITED FOR PADDY (WET LAND) RICE			
6	Deep, level, poorly drained, clayey soils with moderate to high fertility.	Best suited for wet land rice in the rainy season; with irrigation multiple crops of rice, vegetables or other upland crops can be grown.	Ordinary fertilizer application and irrigation to maintain productivity, irrigation suitable variety of rice.
7	Deep, level, poorly drained clayey low to moderately to low fertility.	Well suited for wet-land rice in the rainy season with irrigation multiple crops of rice vegetables or other upland crops can be grown.	Proper fertilizer application irrigation and improved variety of rice.
8	Shallow to moderately deep, level, poorly drained, gravelly soils that include areas with lateritic outcrops.	Can be used for growing wet-land rice in the rainy season under suitable management.	Require intensive work and high investment to cultivated land; proper fertilizer application is necessary.
9	Deep level poorly drained, extremely acid clayey soils.	Wet-land rice under proper management is suggested.	Proper fertilizer application especially N and P with lime, irrigation, improved variety of rice.

No.3

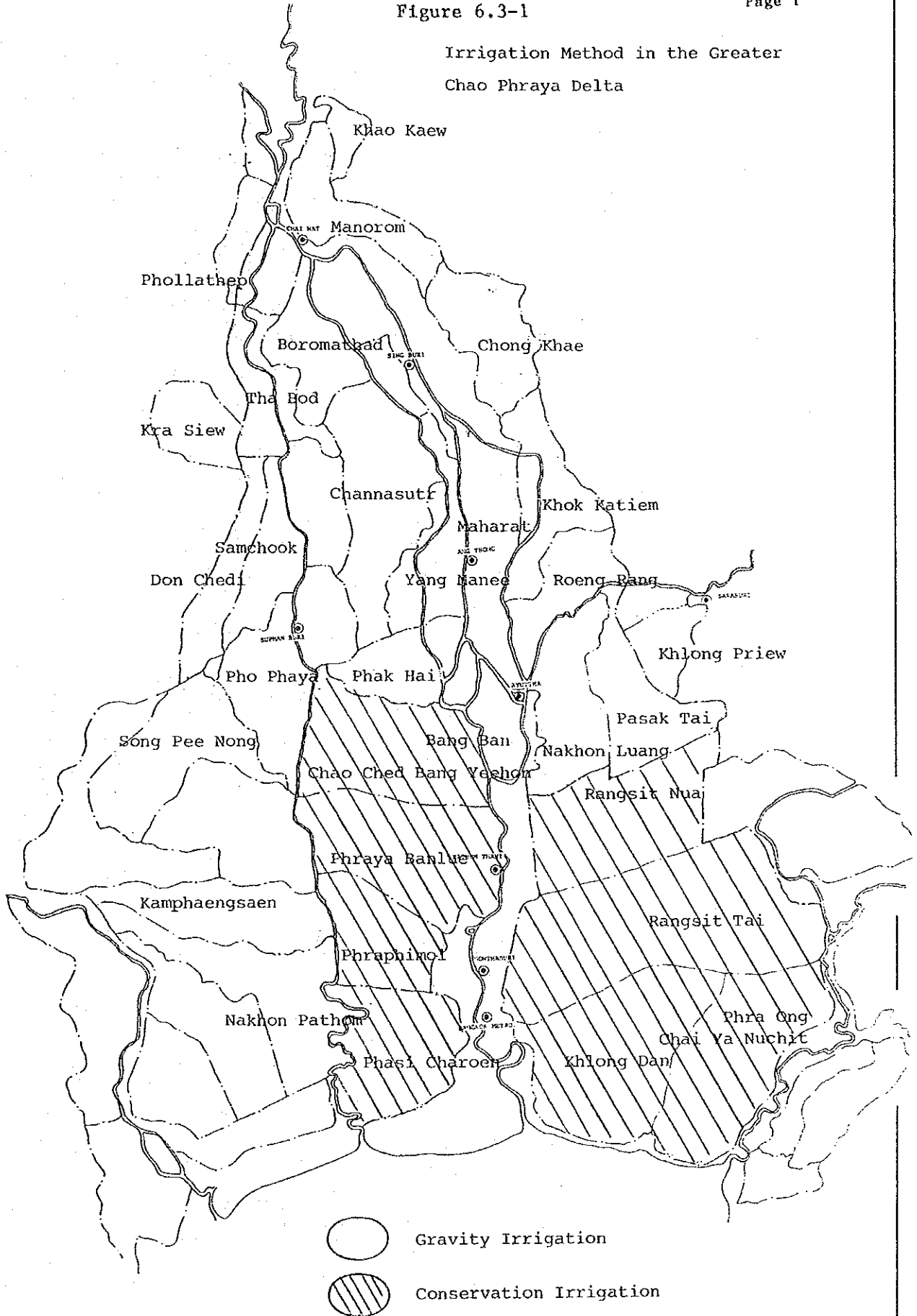
Mapping Unit Number	General Description of Soils	Recommended Land Use	Major management required
10	Deep, level to nearly level, poorly drained, medium textured or loamy soils with low to moderate fertility.	Well suited for wet land rice in the rainy season; with irrigation multiple crops of rice, vegetables or other upland crops can be grown.	Suitable fertilizer application; irrigation improved variety of rice (drought may occur during period of little rainfall in the rainfed area).
11	Deep, level to nearly level, poorly drained, medium textured or loamy soils of high salt content.	Generally suited for wet-land rice in the rainy season but may be risky due to high concentration of salt in soil during period of insufficient water supply.	Adequate irrigation system to supply enough water in the growing season; proper fertilizer application.
AREAS WITH SOILS SUITED FOR TREE CROPS IN HIGH RAINFALL ZONE			
13	Deep to moderately deep gently sloping to strongly sloping, moderately well to well drained soils with low fertility and of humid zone.	Well suited for many kinds of fruit trees, beverage crops, industrial oil crops and rubber.	Proper fertilizer application; use of erosion control practices such as cover crops, terracing contour cropping, etc.
AREAS WITH SOILS GENERALLY UNSUITED FOR CULTIVATED CROPS			
14	Shallow to very shallow, moderately sloping to steep, well to moderately well drained gravelly soils including areas with laterite or bedrock near the surface.	Generally not suited for cultivated crops with ordinary management practices; best suited for pasture and woodland.	Special conservation practices are required on sloping soils; fertilizer application and proper cultivation practices are required.

Mapping Unit Number	General Description of Soils	Recommended Land Use	Major management required
15	Shallow, gently sloping to steep, moderately well to well drained; gravelly soils of the humid zone including areas with bedrock, laterite or stone near the surface.	Generally suited for rubber and pasture best suited for woodland.	Proper fertilizer application, well prepared growing pit; use of erosion control practices such as cover crops, terracing, contour cropping etc.
16	Muddy soils on tidal flat prolonged deep flooding, regular flooding by sea water.	Not suited for any commercial crops, better maintained for woodland (mangrove) production or construction of shrimp and fish ponds in local areas.	Extensive improvement if being converted into cultivated land.
18	Deep, gently sloping, excessively drained sandy soils on beach or sandy terrace.	Not suited for cultivated crops except for pasture; but where water supply is adequate, water melon and other vegetables can be produced; on beach area coconut is well adapted.	Proper fertilizer application; irrigation or water conservation.
20	Shallow to deep, well to excessively drained, rolling to very steep soils of the hills and mountains.	Not suited for any commercial crops, suited for woodland or establishment of watershed protective vegetation.	Not recommended to convert into cultivated land because it required very high input which will impact the environment.

Source: General Potential Land Use Map (1982)
D L D, Bangkok

Figure 6.3-1

Irrigation Method in the Greater
Chao Phraya Delta



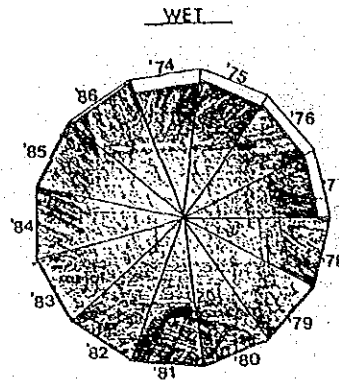
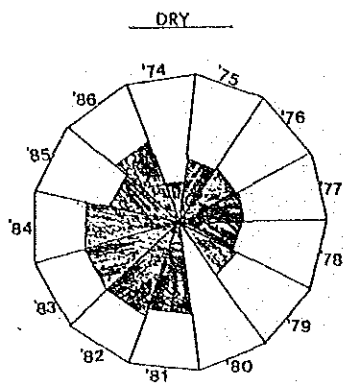
- Gravity Irrigation
- ▨ Conservation Irrigation

Table 6.3-1 Average Planted Area for Paddy by Project
(1974-1986)

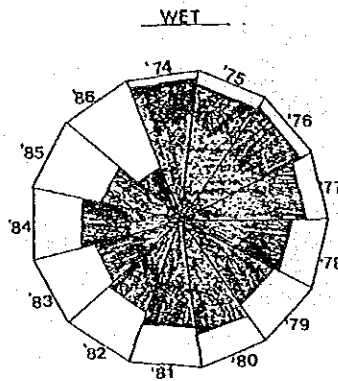
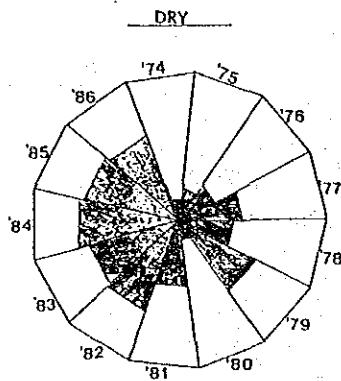
(Unit : ha.)

Project Name	Irrigable Area (ha)	Average Planted Area (1974-1986)	
		Dry	Wet
Phonlathep	15,411	5,826	15,416
Thabote	28,698	12,928	26,793
Samchook	48,800	23,224	42,929
Donchedi	23,112	10,816	22,523
Pho Phraya	59,200	26,348	42,839
Boromathat	58,400	16,124	58,201
Channasutr	75,888	28,249	74,226
Yang Manee	37,260	3,759	30,490
Phak Hai	32,960	361	31,318
Bangbal	23,072	2,563	18,283
Chao Ched Bang Yeehon	64,960	27,738	27,630
Phraya Banlue	70,000	60,295	18,350
Phra Phimol	41,825	34,466	16,194
Phasi Charoen	32,000	14,009	24,702
Region - 7 Total	611,586	266,706	449,894
Manorom/Khao Kaew	37,760	6,839	37,448
Chong Khae	46,786	2,871	36,887
Khok Kathiem	35,227	3,642	32,456
Roeng Rang	29,282	1,254	28,407
Maharat	76,208	7,464	73,782
Tha Luang	38,496	3,757	37,199
Rangsit Nua	72,640	16,419	58,310
Nakhon Luang	42,728	459	42,085
Rangsit Tai	92,468	36,056	67,915
Khlong Dan	84,468	14,246	52,236
Region - 8 Total	556,063	93,007	466,725
Phra Ong Chai Ya Nuchit	81,600	34,957	69,825
Grand Total	1,249,249	394,670	986,444

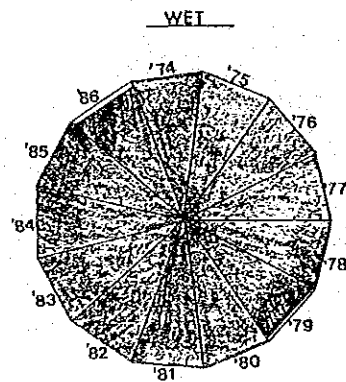
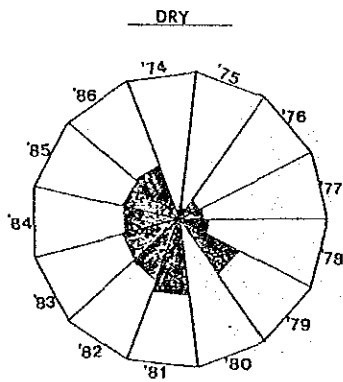
Paddy Planted Area in Chao Phraya Delta (2)



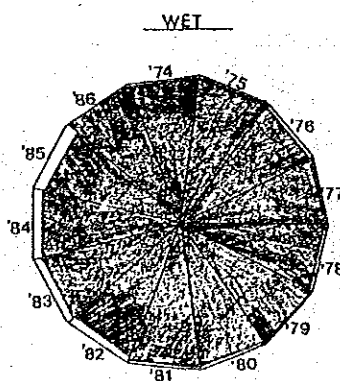
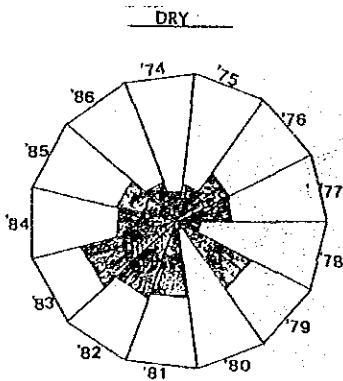
Donchedi



Pho Phraya

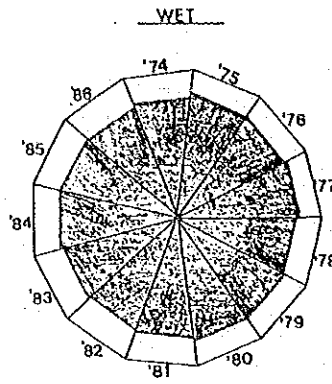
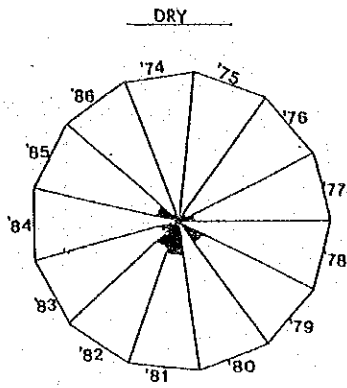


Boromathat

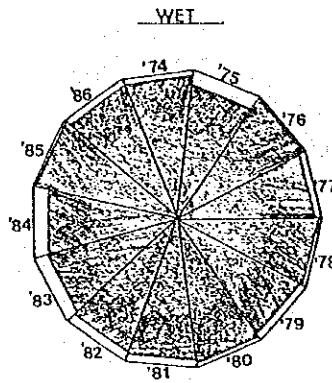
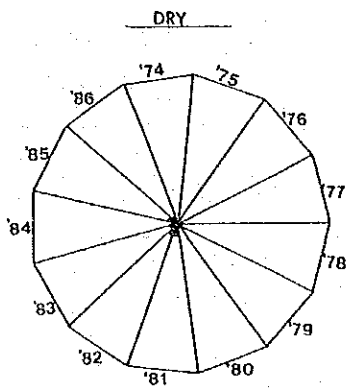


Chanasutr

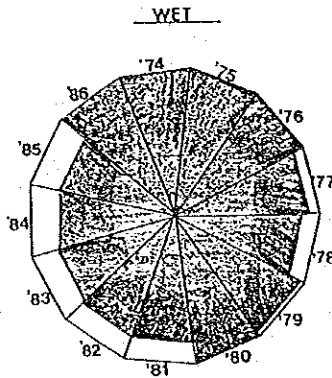
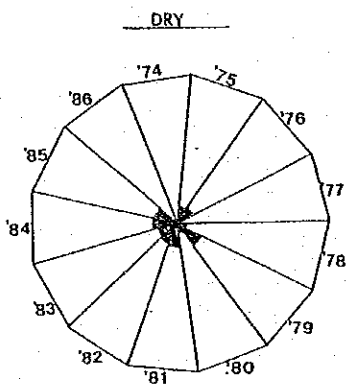
Paddy Planted Area in Chao Phraya Delta (3)



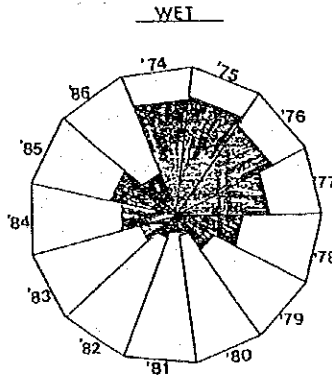
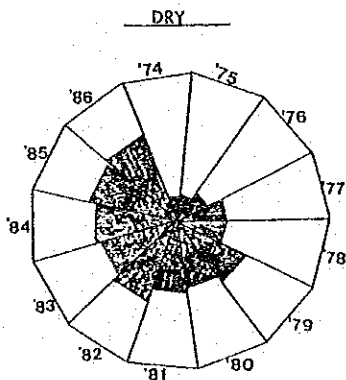
Yang Manee



Phak Hai

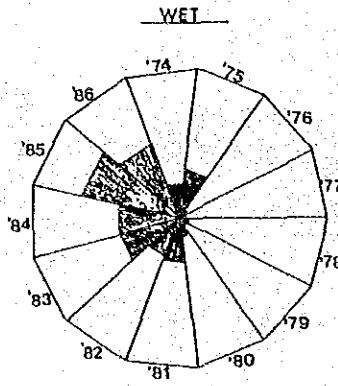
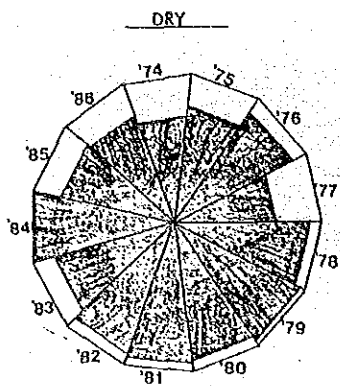


Bangbal

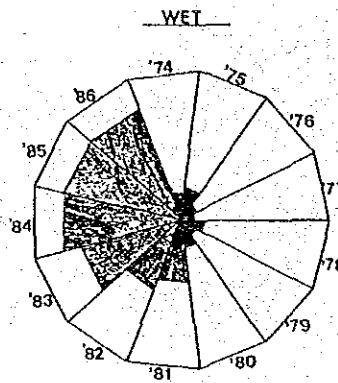
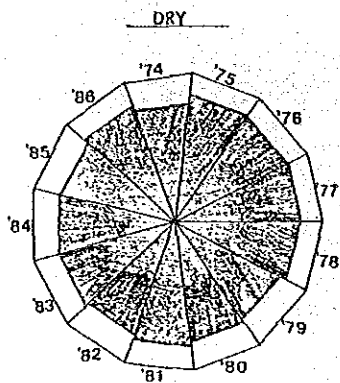


Chao Ched Bang
Yeehon

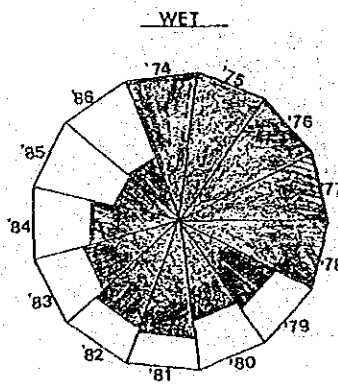
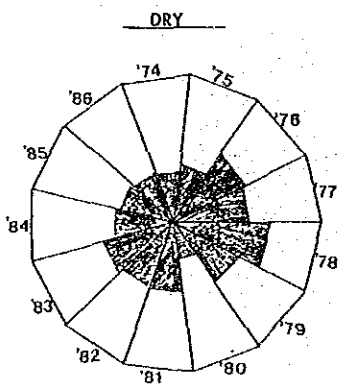
Paddy Planted Area in Chao Phraya Delta (4)



Phraya Banlue

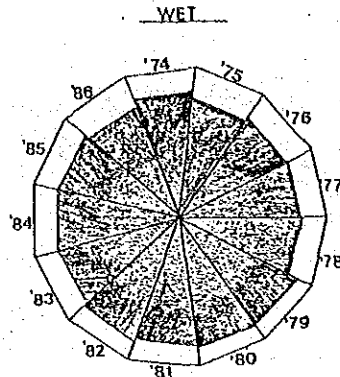
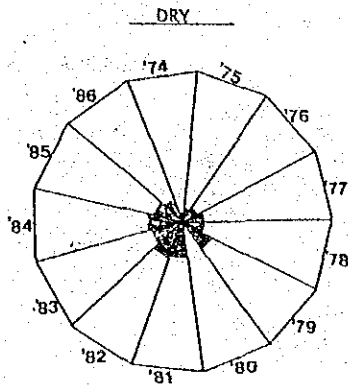


Phra Phimol

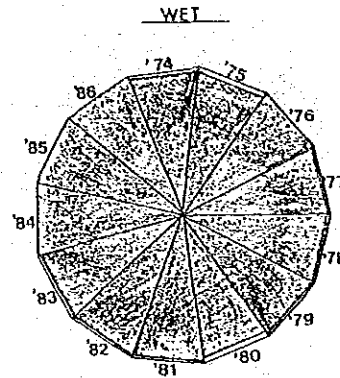
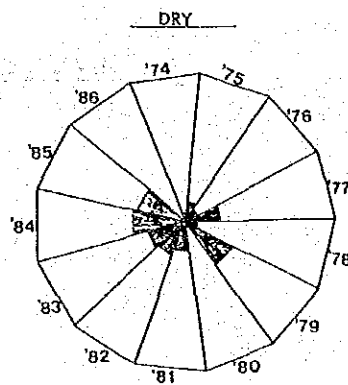


Phasi Charoen

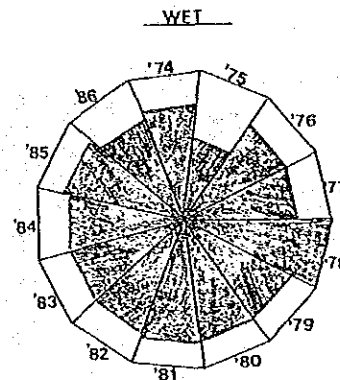
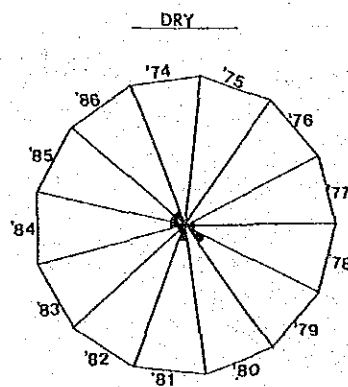
Paddy Planted Area in Chao Phraya Delta (5)



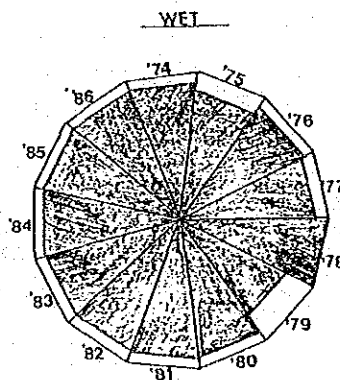
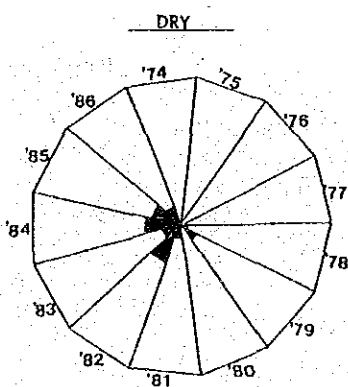
Region 8



Manorom/Khao
Kaew

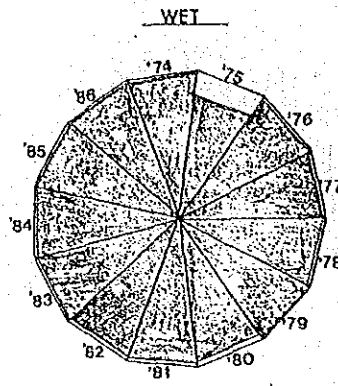
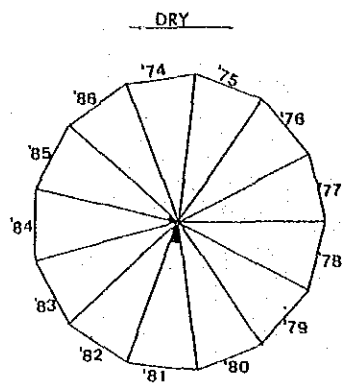


Chong Khae

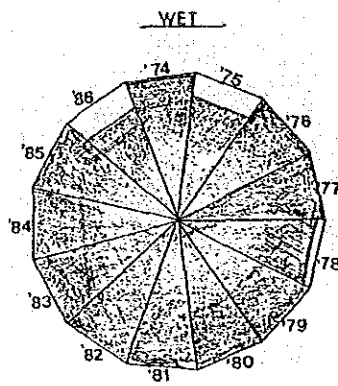
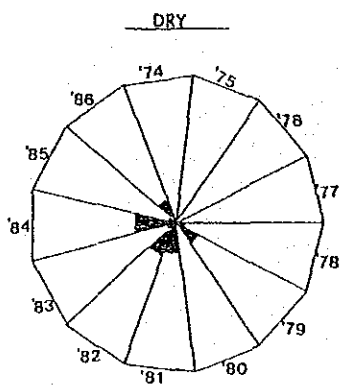


Khok Kathiem

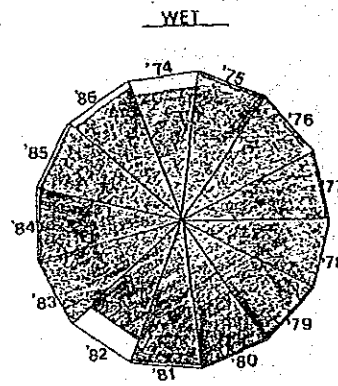
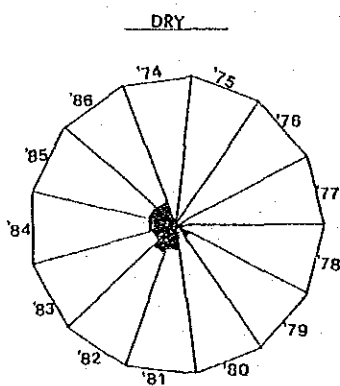
Paddy Planted Area in Chao Phraya Delta (6)



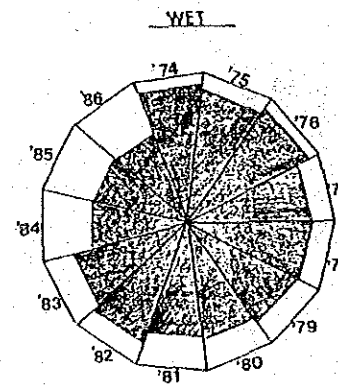
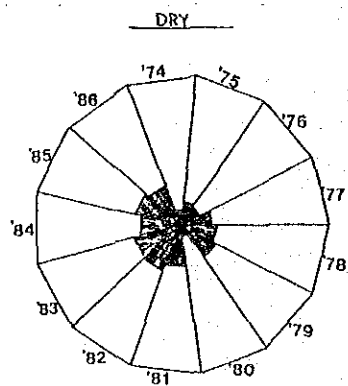
Roeng Rang



Maharat

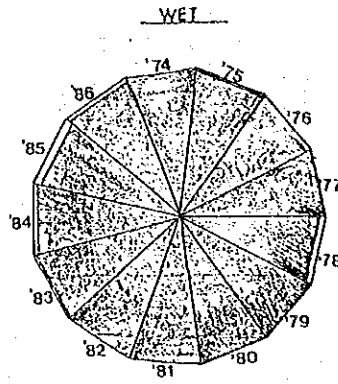
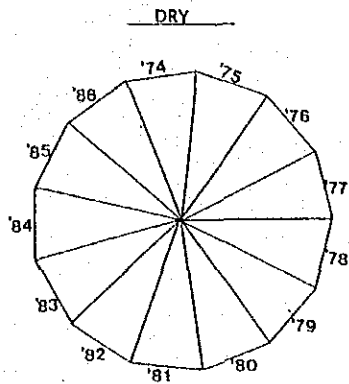


Tha Luang

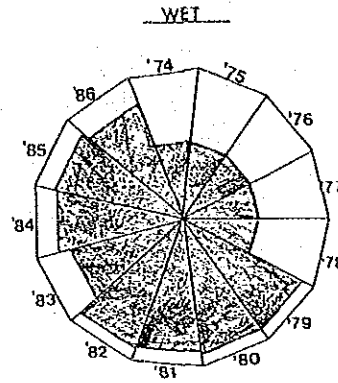
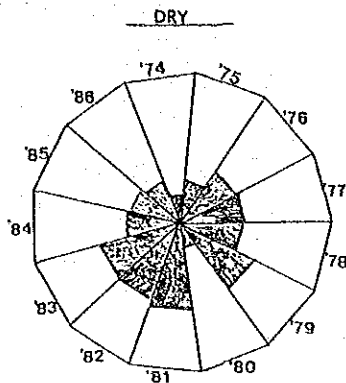


Rangsit Nua

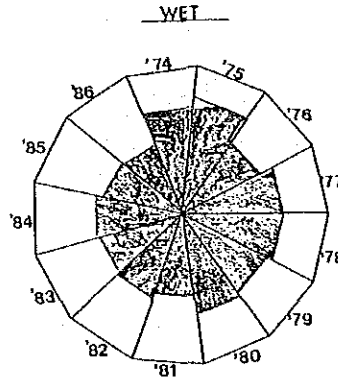
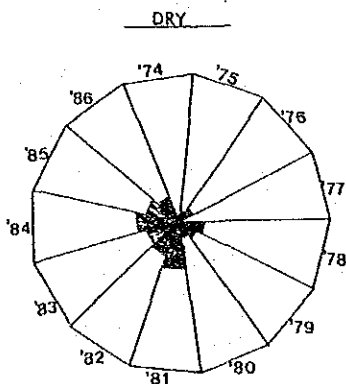
Paddy Planted Area in Chao Phraya Delta (7)



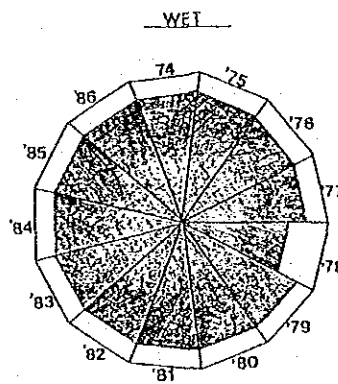
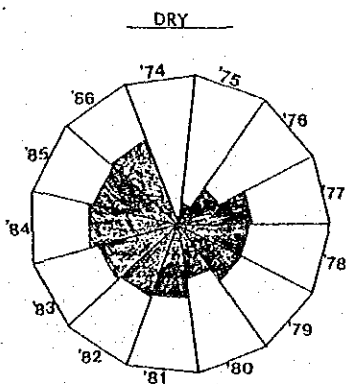
Nakhon Luang



Rangsit Tai



Khlong Dan



Phra Ong Chai
Ya Nuchit

Table 6.5-1

Average Number of Days to Harvest and Yield of Selected Crops

<u>Crops</u>	<u>Days to Harvest</u> <u>(days)</u>	<u>Average Yield</u> <u>(tons/ha)</u>	<u>Planting Time</u>
1. Chinese Kale	40 - 50	5.0	Year round (Oct.-Apr.)
2. Chinese Cabbage	35 - 45	4.4	"
3. Common Bean	50 - 60	9.4	" (Nov.-Mar.)
4. Yard Long Bean	50 - 70	4.1	" (Feb.-Nov.)
5. Angled Loofah	40 - 50	5.3	" (Oct.-Feb.)
6. Smooth Loofah	50 - 60	5.6	" (")
7. Tomato	60 - 70	4.1	" (")
8. Cucumber	30 - 40	5.3	" (")
9. Water Melon	80 - 120	12.5	"
10. Sweet Corn	75 - 80	31,250 ^{ear}	"
11. Baby Corn	45 - 50	0.6	"
12. Pumpkin	120 - 160	6.3	Nov. - Feb.
13. Bitter Gourd	45 - 50	4.1	Year round (Nov.-Feb.)
14. Chilli	60 - 90	1.6	" (")
15. Eggplant	60 - 85	6.3	" (")
16. Leek	45 - 50	3.1	"
17. Shallot Shoot	40 - 45	3.1	"
18. Mungbean	50 - 65	1.6	"
19. Soybean	75 - 100	2.2	"

Figure 6.5-1 Sequential Cropping of Selected Crops

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sweet Corn			Yard Long Bean			Baby Corn			Tomato		
		Eggplant			Sweet Corn			Chilli			Shallot
	Chinese Kale			Tomato		Chinese Cabbage			Chinese Kale		

Figure 6.5-2 Harvesting Time of Selected Fruits/Tree Crops

Fruits/Tree Crops	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Common Lime		█										
Mango				█	█							
Cashew Nut			█	█								
Tamarind		█										
Mangosteen						█	█					
Longon								█	█			
Lichee					█	█						
Langsat									█	█		
Longong									█	█		
Durian						█	█					
Rambutan							█	█				
Grape												
Sugarapple									█	█		
Tangerine												
Sweet Orange										█	█	
Acideless Sweet Orange												
Pomelo												
Banana												
Papaya												
Pineapple												

Source : DOAE, MOAC

Figure 6.5-3 Seasonality in Papaya Harvesting in the Selected Asian Countries

Country	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Thailand												
Philippines												
Sri Lanka												
Indonesia												

Source : APO, Fruit Production and Marketing in Asia and the Pacific

Figure 6.5-4 Seasonality in Mango Harvesting in the Selected Asian Countries

Country	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Rep. of China												
Pakistan												
Thailand												
Philippines												
Sri Lanka												
Indonesia												

Source : APO, Fruit Production and Marketing in Asia and the Pacific

Figure 6.5-5 Seasonality in Grape Harvesting in the selected Asian Countries

Country	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Japan												
Rep. of Korea												
Rep. of China												
Thailand												

Source : APO, Fruit Production and Marketing in Asia and the Pacific

Figure 6.5-6 Seasonality in Banana Harvesting in the Selected Asian Countries

Country	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Rep. of China												
Pakistan												
Thailand												
Philippines												
Sri Lanka												
Indonesia												

Source : Asian Productivity organization (APO), Fruit Production and Marketing in Asia and the Pacific

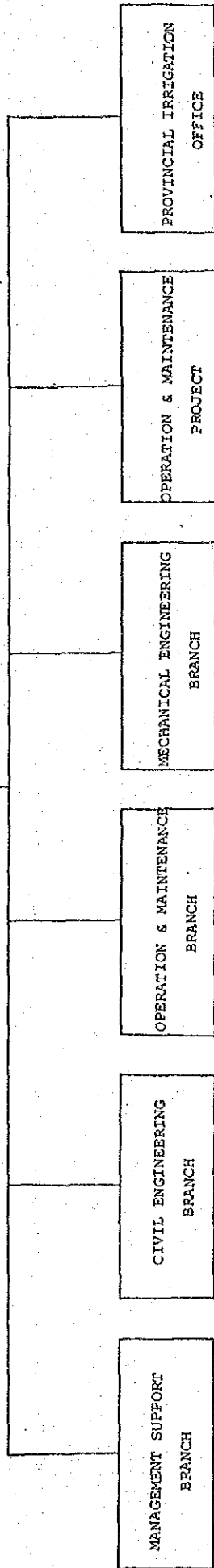
Figure 6.5-7
Region : I,2
Proposed Crop Rotation by Region (I)

Crop	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Wet Season Paddy (Transplanting)						HYV						
Wet Season Paddy (Transplanting)						LV						
Dry Season Paddy (Transplanting)												HYV
Paddy + Soybean						Paddy				Soybean		
Paddy + Groundnut						Paddy				Groundnut		
Paddy + Garlic						Paddy					Garlic	
Paddy + Tobacco						Paddy					Tobacco	

Table 6.6-1 PADDY PRODUCTION AND POST HARVEST FACILITIES

	Paddy Production (ton)			Rice Mill (ton of paddy/24 hrs)				Paddy/Rice Warehouse (ton)
	Wet	Dry	Total	Large	Medium	Small	Total	
1. PT	30,432	9,987	40,419	101	65	3	169	170
2. TB	41,758	22,037	63,795	292	98	3	393	172
3. SA	69,049	49,792	118,841	706	177	5	888	198
4. DC	29,481	21,170	50,651	308	76	2	386	80
5. PA	82,547	59,276	141,823	864	214	6	1,084	224
6. BO	123,878	47,809	171,687	521	262	13	796	504
7. CH	180,923	114,805	295,728	1,049	337	11	1,397	680
8. YM	72,334	51,529	123,863	850	128	5	983	408
9. PK	49,943	18,878	68,821	4,867	86	2	4,955	134
10. BB	38,346	11,329	49,765	4,529	60	2	4,591	93
11. CB	103,115	47,902	151,017	7,701	204	6	7,911	260
12. PB	98,810	155,850	254,660	3,000	365	10	3,375	389
13. PM	43,145	123,471	166,616	978	294	8	1,280	236
14. PC	48,334	39,697	88,031	324	171	6	501	405
<u>RID 07</u>	1,012,185	773,532	1,785,717	26,090	2,537	82	28,709	3,953
15. MA	69,388	16,819	86,207	206	137	7	350	422
16. CK	82,836	11,669	94,505	295	167	4	466	228
17. KT	64,456	7,938	72,394	1,621	129	2	1,752	600
18. RR	52,298	10,190	62,488	3,658	98	2	3,758	890
19. MH	156,035	59,451	215,486	3,630	295	8	3,933	370
20. TL	67,744	13,924	81,668	5,111	125	4	5,240	1,042
21. NR	120,394	148,543	268,937	2,561	263	4	2,828	309
22. NL	61,464	17,839	79,303	7,305	96	3	7,404	147
23. SR	151,224	107,621	258,845	1,095	269	16	1,380	1,544
24. KD	120,612	75,563	196,175	770	293	4	1,067	690
<u>RID 08</u>	946,451	469,557	1,416,008	26,252	1,872	54	28,178	6,242
25. PO	163,838	77,398	241,236	1,311	241	30	1,582	709
<u>RID 09</u>	163,838	77,398	241,236	1,311	241	30	1,582	709
Total	2,122,474	1,320,487	3,442,961	53,653	4,650	166	58,469	10,904

REGIONAL OFFICE - 3



- Administrative Section
- Finance and Accounting Section
- Supply Section
- Personnel and Legal Section
- Project Planning Section
- Survey Section
- Design Section
- Planning and Budget Section
- Research and Test Section
- Improvement Section
- Road Improvement and Maintenance Section
- Water Distribution Section
- Irrigated Agricultural Section
- Administrative Engineering Section
- Operation Section
- Repair Section
- Civil Engineering Section
- Water Management Section
- Mechanical Engineering Section
- Operation and Maintenance Section
- Navigation Lock Section
- Administrative Section
- Civil Engineering Section
- Operation and Maintenance Section
- Mechanical Engineering Section
- Consecutive and Special Activities Promotion Section
- Operation and Maintenance Section

Figure 6.7-1 Organization of RID Regional Office - 3

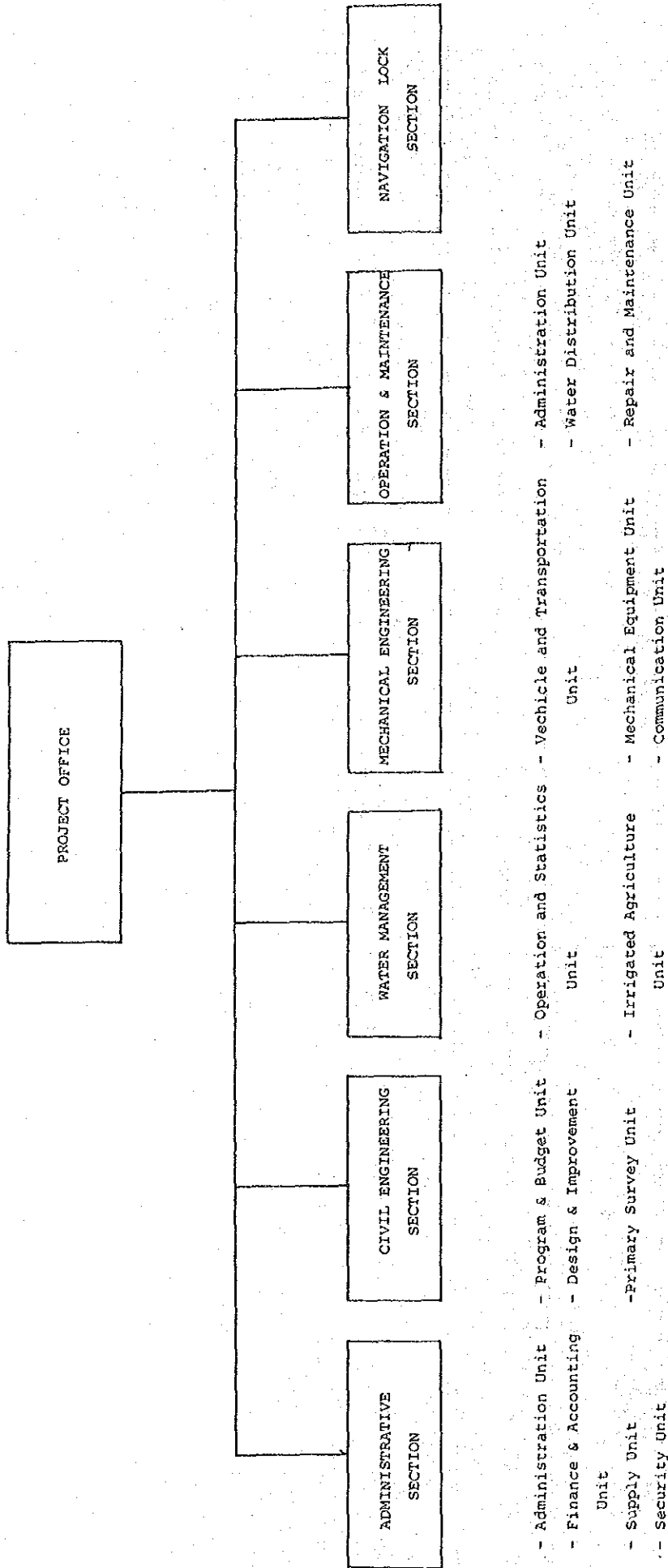


Figure 6.7-2 Organization of Project Office

Figure 6.7-3

The Organization of Muang Fai Mae Chaem

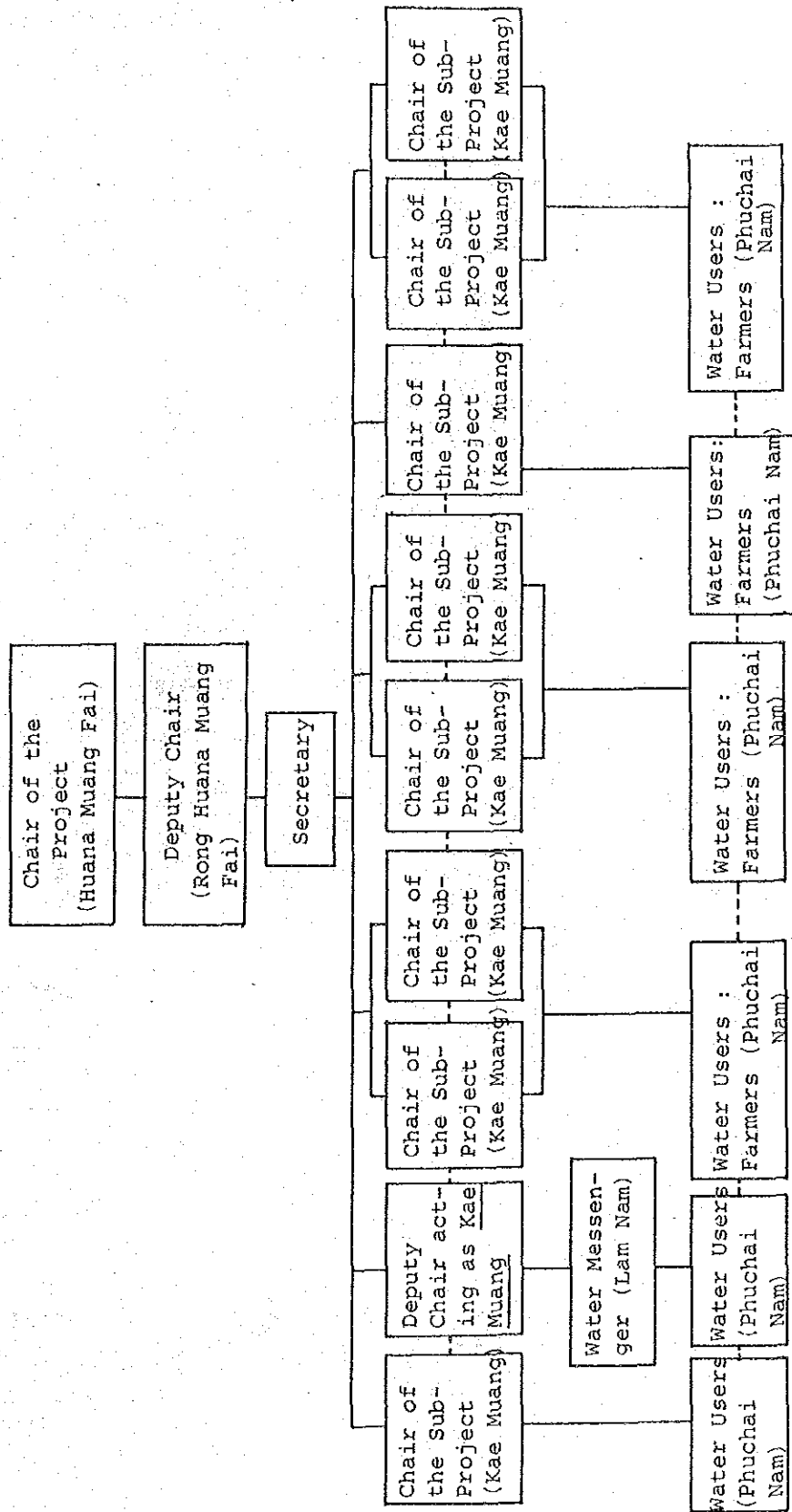


Figure 6.7-4

Existing Irrigation Projects in the Greater
Chao Phraya Delta

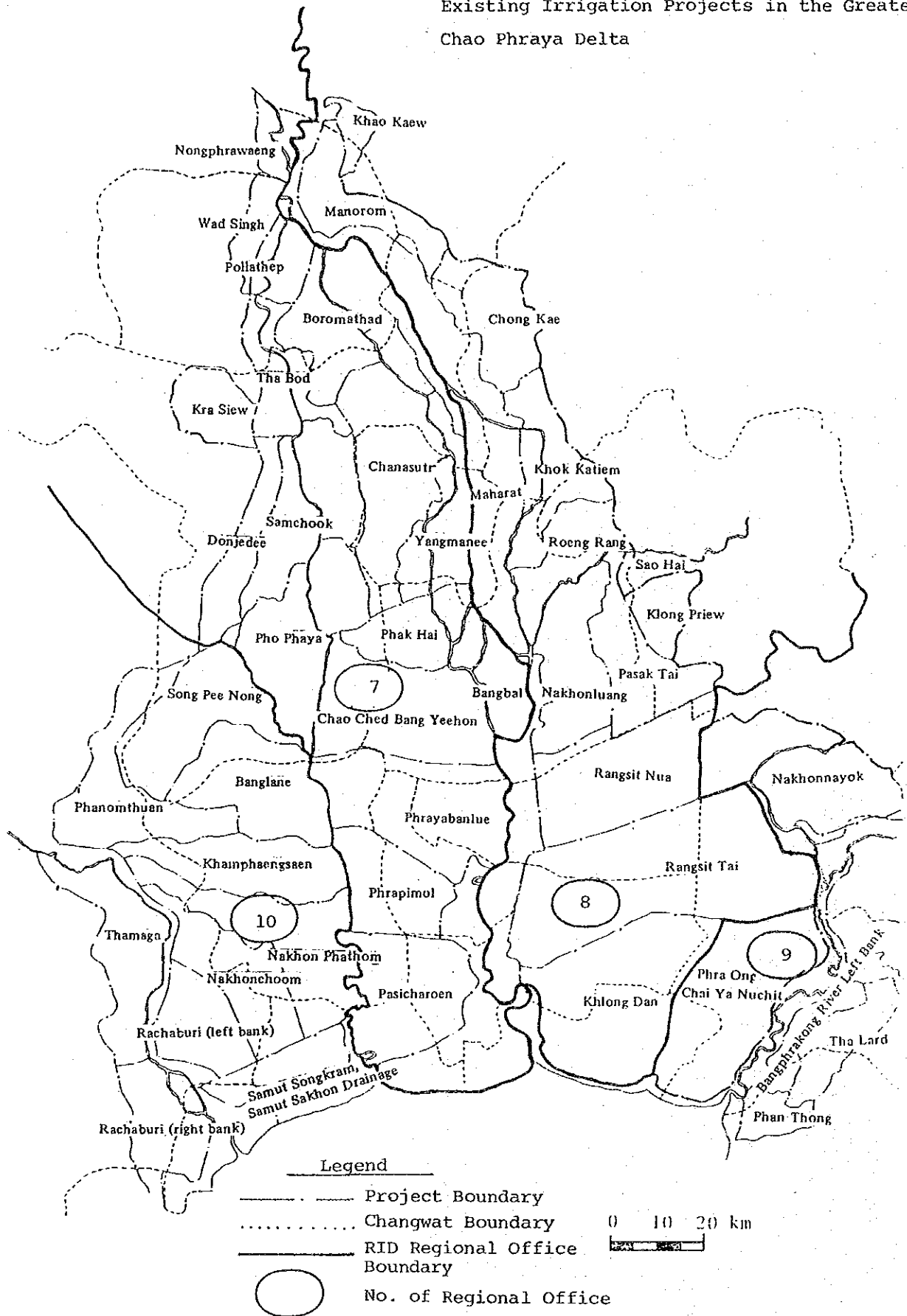
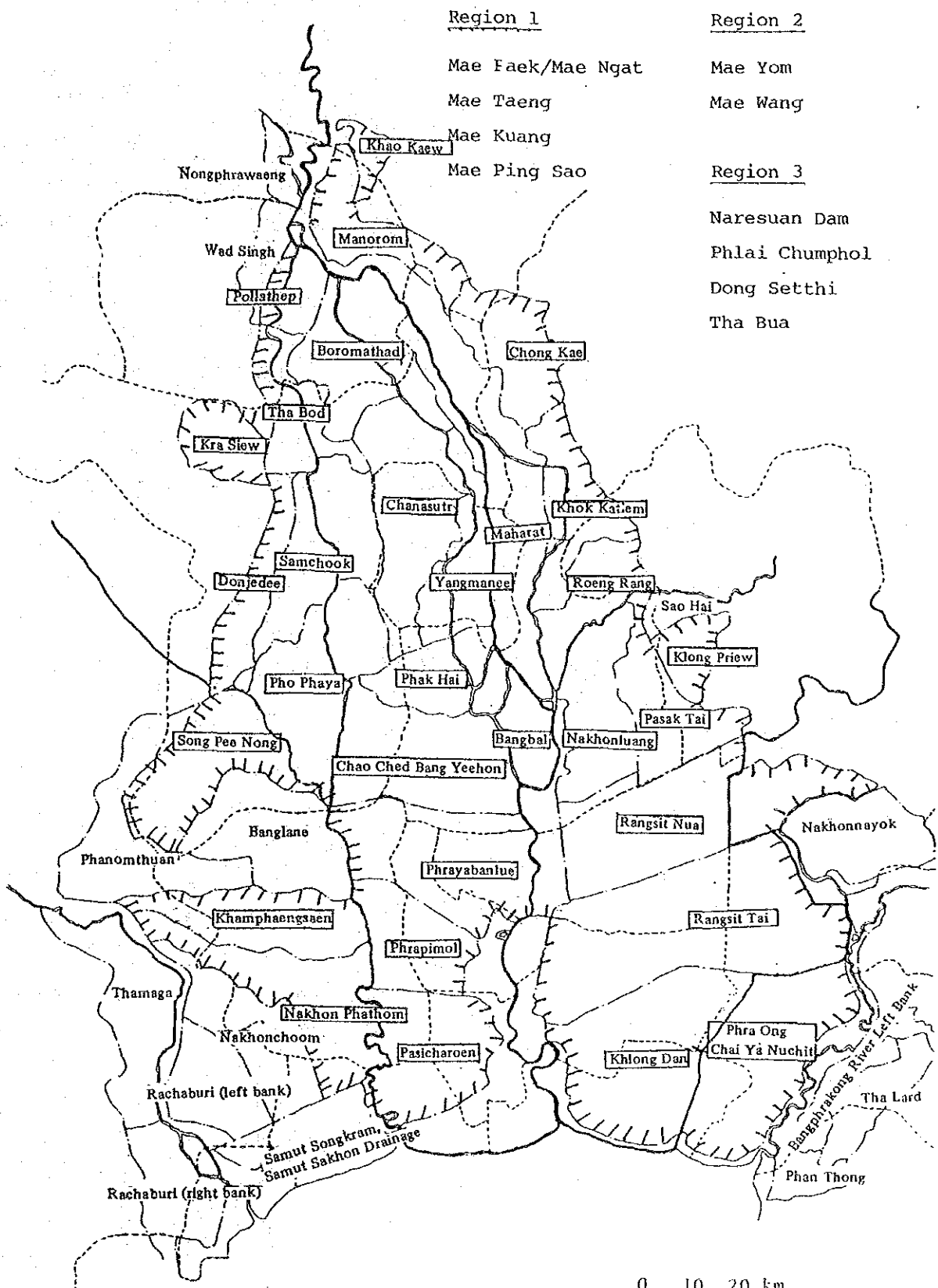


Figure 6.7-5

Existing Project Offices Surveyed on Cropping Pattern



0 10 20 km

Legend



-  Area Surveyed
-  Project Offices Surveyed

Table 6.7-1 GENERAL INFORMATION ON EXISTING IRRIGATION PROJECT

(1 of 5)

Name of Project	Section	Project Area	Irrigable Area	Zoneman	
				Number	Coverage
<u>Region 7</u>		(rai)	(rai)		(rai/ZM)
1. Phonlathep	1	-	51,000	5	10,200
	2	-	45,300	3	15,100
	Total	103,000	96,300	8	12,038
2. Borommathat	1	91,270	81,880	6	13,647
	2	101,043	89,699	10	8,970
	3	121,090	110,965	9	12,329
	4	91,597	82,486	5	16,497
	Total	405,000	365,030	30	12,168
3. Thabote	1	61,888	55,699	6	9,283
	2	156,468	140,821	10	14,082
	Total	218,356	196,520	16	12,283
4. Kra-sieo	-	-	-	-	-
	2	33,310	29,919	4	7,480
	3	90,841	81,757	4	20,439
	Total	(124,151)	(111,666)	(8)	(13,958)
5. Don Chedi	1	93,984	84,400	7	12,057
	2	68,666	61,600	5	12,320
	Total	162,500	146,000	12	12,167
6. Chanasutr	1	56,175	47,722	4	11,931
	2	84,000	64,596	7	9,228
	3	60,403	53,199	5	10,640
	4	85,952	76,170	6	12,695
	5	62,593	53,604	5	10,721
	6	81,474	69,600	7	9,943
	7	95,863	83,359	7	11,908
	Total	527,000	448,250	41	10,933

GENERAL INFORMATION ON EXISTING IRRIGATION PROJECT

(2 of 5)

Name of Project	Section	Project Area	Irrigable Area	Zoneman	
				Number	Coverage
		(rai)	(rai)		(rai/ZM)
7. Sam Chuk	1	110,190	89,731	7	12,819
	2	83,300	70,362	4	17,658
	3	94,450	77,917	5	15,583
	4	83,660	66,720	3	22,240
	Total	372,100	305,000	19	16,053
8. Pho Phraya	1	118,021	107,800	11	9,800
	2	120,892	107,600	11	9,782
	3	113,890	104,300	10	10,430
	4	63,135	50,300	4	12,575
	Total	415,938	370,000	36	10,278
9. Yangmanee	1	81,122	67,209	5	13,442
	2	71,165	69,850	7	9,973
	3	81,402	73,262	6	12,210
	Total	233,689	210,321	18	11,685
10. Bang Ban	1	78,950	70,900	5	14,180
	2	81,050	66,100	3	22,033
	Total	160,000	137,000	8	17,125
11. Phak Hai	1	-	-	-	-
	2	156,000	140,348	8	17,544
	3	50,000	50,000	5	10,000
	Total	(206,000)	(190,348)	(13)	(14,642)
12. Chao Chet-Bang Yihon	1	151,230	140,230	3	46,473
	2	136,930	126,970	3	42,323
	3	149,690	138,800	3	46,267
	Total	437,850	406,000	9	45,111

GENERAL INFORMATION ON EXISTING IRRIGATION PROJECT

(3 of 5)

Name of Project	Section	Project Area	Irrigable Area	Zoneman	
				Number	Coverage
		(rai)	(rai)		(rai/ZM)
13. Phraya Ban Lu	1	-	-	-	-
	2	112,160	91,950	4	22,988
	3	82,850	67,920	1	67,920
	4	123,035	100,860	2	50,430
	5	119,455	97,920	2	48,960
	Total	(437,500)	(358,650)	(9)	(39,850)
14. Phra Phimon	1	127,550	116,760	1	116,760
	2	158,013	144,650	1	144,650
	Total	285,563	261,410	2	130,705
15. Phasi Charoen	1	153,590	87,770	2	43,885
	2	196,410	112,230	4	28,058
	Total	350,000	200,000	6	33,333
Region 8					
1. Manorom/Khao Kaeo	1	88,653	78,679	8	9,835
	2	97,917	91,904	11	8,355
	3	77,450	71,540	8	8,943
	Total	264,110	242,123	27	8,963
2. Chong Kae	1	141,934	120,321	8	15,040
	2	139,690	118,418	10	11,842
	Total	281,624	238,739	18	13,263
3. Maharaj	1	106,500	95,850	8	11,981
	2	80,900	72,810	8	9,101
	3	78,000	70,200	8	8,775
	4	78,580	70,722	8	8,840
	5	77,570	69,813	8	8,727
	6	81,250	73,125	8	9,140
	Total	502,800	452,520	48	9,428

GENERAL INFORMATION ON EXISTING IRRIGATION PROJECT

(4 of 5)

Name of Project	Section	Project Area	Irrigable Area	Zoneman	
				Number	Coverage
4. Koke Kathiem		(rai)	(rai)		(rai/ZM)
	1	104,358	N. A.	8	(13,045)
	2	103,762	N. A.	8	(12,970)
	Total	208,120	N. A.	16	(13,008)
5. Roeng Rang	1	87,086	N. A.	5	(17,417)
	2	91,940	N. A.	6	(15,323)
	Total	179,000	N. A.	11	(16,273)
6. Khlong Prieu	1	122,436	91,892	6	15,315
	2	54,293	43,434	7	6,205
	Total	176,789	135,326	13	10,410
7. Pasak Tai	1	113,300	103,250	7	14,750
	2	158,700	137,350	10	13,735
	Total	272,000	240,600	17	14,153
8. Nakhon Luang	1	102,263	90,474	9	10,053
	2	111,526	98,669	10	9,967
	3	88,057	76,905	19	10,986
	Total	301,846	267,048	26	10,271
9. Rangsit Nua	1	N. A.	N. A.	12	-
	2	N. A.	N. A.	15	-
	3	N. A.	N. A.	14	-
	Total	N. A.	454,000	41	11,073
10. Rangsit Tai	1	100,000	N. A.	3	(33,333)
	2	105,000	N. A.	1	105,000)
	3	110,000	N. A.	2	(55,000)
	4	96,000	N. A.	1	(96,000)
	5	155,000	N. A.	2	(77,500)
	Total	566,000	577,923	9	64,214

GENERAL INFORMATION ON EXISTING IRRIGATION PROJECT

(5 of 5)

Name of Project	Section	Project Area	Irrigable Area	Zoneman	
				Number	Coverage
		(rai)	(rai)		(rai/ZM)
11. Khlong Dan	1	246,832	232,486	4	58,112
	2	124,710	107,468	1	107,468
	3	197,498	185,046	-	-
	Total	569,000	525,000	5	N. A.
	Total*	371,502*	339,954*	5*	67,991*
<u>Region 9</u>					
1. Phra Ong Chaiyanuchit	1	108,900	N. A.	5	(21,780)
	2	169,000	N. A.	3	(56,333)
	3	87,200	N. A.	3	(29,067)
	4	144,900	N. A.	5	(28,980)
	Total	510,000	510,000	16	31,875

* Excluding Section No. 3

Table 6.8-1 GENERAL CONDITION OF INSTITUTIONAL SUPPORTING SERVICES

I. Bank for Agriculture and Agricultural Cooperatives (BAAC)

1. Establishment: November 1st, 1966

2. Jurisdiction: Ministry of Finance

3. Fund (as of 31st March, 1986)

1) Deposit from Commercial Banks	฿10,685 million
2) General Deposit	5,548
3) Loan	6,369
4) Own Capital	2,624
5) Bill (BOT)	3,500
6) Others	689
<u>Total</u>	<u>฿29,415 million</u>

4. Lending (Contracted Amount in 1986)

1) Individual Farmer	฿15,499 million
2) Agricultural Cooperatives	3,480
3) Farmers' Group	25
<u>Total</u>	<u>฿19,004 million</u>

5. No. of Staff: 6,373

II. Public Warehouse Organization (PWO)

1. Establishment: 1955

2. Jurisdiction: Ministry of Commerce

3. Main Job:

- 1) Purchasing milled rice from millers, and selling it to domestic market as well as exporter
- 2) Selling consumer commodities at low price
- 3) Warehousing to private dealers

4. Total Capacity of Warehouse: 170,000 tons

5. No. of Staff: 452

6. Fund: Government (100%)

7. Others: Receiving JICA Technical Assistance of "Feasibility Study on The Comprehensive Storage Facilities Development Project"

III. Marketing Organization for Farmer (MOF)

1. Establishment: October 5th, 1974

2. Jurisdiction: Ministry of Agriculture and Cooperatives

3. Main Job:

- 1) Purchasing agricultural products such as paddy, maize, etc
- 2) Selling input materials such as fertilizers, etc
- 3) Selling foods to perishable market or supermarket

4. Organization: Branch office in changwat level, Farmers group (150 farmers/group) of which member is 600,000

5. Fund: Government (100%)

Table 6.9-1 Preliminary Cost Estimate for CDPC¹

Item	Unit	Q'ty	U. Price	(Unit: ¥1,000)		
				L/C	F/C	Total
1 CIS²						
1-1 Main Office	L. S.	1	-	150,000	791,000	941,000
1-2 Data Collec'n Base	L. S.	1	-	-	224,000	224,000
1-3 Design & Superv.	L. S.	1	-	-	300,000	300,000
<u>Total (1-1~1-3)</u>	-	-	-	<u>150,000</u>	<u>1,315,000</u>	<u>1,465,000</u>
2 DiCITAS³						
2-1 Main Station	L. S.	1	-	48,000	566,000	614,000
2-2 Sub Station	L. S.	1	-	24,000	268,000	292,000
2-3 Design & Superv.	L. S.	1	-	-	262,500	262,500
<u>Total (2-1~2-3)</u>	-	-	-	<u>72,000</u>	<u>1,096,500</u>	<u>1,168,500</u>
3 CDPC Additional						
3-1 Land Acquisition	m ²	600	150	90,000	-	90,000
3-2 Building	m ²	800	210	-	168,000	168,000
3-3 Office Equipment	L. S.	1	-	-	5,000	5,000
3-4 Extension Base						
- Micro Bus	unit	12	3,000	-	36,000	36,000
- Audio Visual	set	12	1,000	-	12,000	12,000
<u>Sub-total</u>	-	-	-	-	<u>48,000</u>	<u>48,000</u>
<u>Total (3-1~3-4)</u>				<u>90,000</u>	<u>221,000</u>	<u>311,000</u>
4 Grand Total				<u>312,000</u>	<u>2,632,500</u>	<u>2,944,500</u>
				(B52,000)	(B438,750)	(B490,750)

¹ CDPC: Crop Diversification Promotion Center

² CIS: Crop Information Station

³ DiCITAS: Diversified Crop Irrigation Technology Application Station

Table 6.9-2 Preliminary Cost Estimate for DiCITAS*

							(Unit: ¥1,000)	
Item	Unit	Q'ty	U. Price	L/C	F/C	Total	Remarks	
<u>1 Main Station</u>							Phitsanulok	
1-1 Land Acquisition	rai	200	240	48,000	-	48,000		
1-2 Building								
- Rank B	m ²	1,400	170	-	238,000	238,000	Office, Laboratory	
- Rank C	m ²	800	105	-	84,000	84,000	Trainees' Dormitory	
- Rank D	m ²	300	40	-	12,000	12,000	Store, Workshop	
Sub-total (1-2)	-	-	-	-	334,000	334,000		
1-3 On-farm, Land Consol.	ha	480	400	-	192,000	192,000		
1-4 Irrigation Equipment	L. S.	-	-	-	20,000	20,000	Pump, Sprinkler, Pipe	
1-5 Laboratory Facility	L. S.	-	-	-	10,000	10,000		
1-6 Audio Visual	L. S.	-	-	-	5,000	5,000		
1-7 Office Equipment	L. S.	-	-	-	5,000	5,000	Perso. Comp., Copy M.	
Total (1-1~1-7)	-	-	-	48,000	566,000	614,000		
<u>2 Sub Station</u>							Chiang Mai	
2-1 Land Acquisition	rai	100	240	24,000	-	24,000		
2-2 Building								
- Rank B	m ²	600	170	-	102,000	102,000	Office, Laboratory	
- Rank C	m ²	400	105	-	42,000	42,000	Trainees' Dormitory	
- Rank D	m ²	200	40	-	8,000	8,000	Store, Workshop	
Sub-total (2-2)	-	-	-	-	152,000	152,000		
2-3 On-farm, Land Consol.	ha	240	400	-	96,000	96,000		
2-4 Irrigation Equipment	L. S.	-	-	-	10,000	10,000	Pump, Sprinkler, Pipe	
2-5 Laboratory Facility	L. S.	-	-	-	5,000	5,000		
2-6 Audio Visual	L. S.	-	-	-	2,500	2,500		
2-7 Office Equipment	L. S.	-	-	-	2,500	2,500	Perso. Comp., Copy M.	
Total (2-1~2-7)	-	-	-	24,000	268,000	292,000		
<u>3 Design & Supervision</u>								
3-1 Basic Design	M/M	24	2,500	-	60,000	60,000	6 months x 4 pers.	
3-2 Construction Superv.	M/M	81	2,500	-	202,500	202,500	18 months x 4.5 per.	
Total (3-1~3-2)	-	-	-	-	262,500	262,500		
<u>Grand Total</u>				72,000	1,096,500	1,168,500		

*DiCITAS: Diversified Crop Irrigation Technology Application Station

Table 6.9-3 Preliminary Cost Estimate for CIS*

Item	Unit	Q'ty	U. Price	L/C	F/C	(Unit: ¥1,000)	
						Total	Remarks
<u>1 Main Office</u>						Bangkok	
1-1 Land Acquisition	m ²	1,000	150,000	150,000	-	150,000	
1-2 Building	m ²	1,200	210,000	-	252,000	252,000	Rank A
1-3 Host Computer	L. S.	-	-	-	500,000	500,000	W/ software
1-4 Display Panel	Unit	1	30,000	-	30,000	30,000	
1-5 Fax	Unit	4	1,000	-	4,000	4,000	
1-6 Office Equipment	L. S.	-	-	-	5,000	5,000	Copy Machine, etc.
<u>Total (1-1~1-6)</u>		-	-	-	150,000	791,000	941,000
<u>2 Data Collection Cell</u>							
2-1 OAE ¹ , MOAC ⁶	unit	73	2,000	-	146,000	146,000	Changwat level
2-2 RID ² , MOAC	unit	12	2,000	-	24,000	24,000	Region level
2-3 ITD ³ , MOC ⁷	unit	24	2,000	-	48,000	48,000	3rd Gen. Level
2-4 Other agencies	unit	3	2,000	-	6,000	6,000	ETD ⁴ , MD ⁵ , Custom Dept
<u>Total (2-1~2-4)</u>		-	-	-	224,000	224,000	
<u>3 Design & Supervision</u>							
3-1 Basic Design	M/M	30	2,500	-	75,000	75,000	6 months x 5
perso. 3-2 Construction Superv.	M/M	90	2,500	-	-	225,000	225,000 18 months x 5
perso.							
<u>Total (3-1~3-2)</u>		-	-	-	150,000	300,000	300,000
<u>Grand Total</u>				150,000	1,315,000	1,465,000	

* CIS: Crop Information Station

- Note: ¹ OAE: Office of Agricultural Economics
² RID: Royal Irrigation Department
³ ITD: Internal Trade Department
⁴ ETD: External Trade Department
⁵ MD: Meteorological Department
⁶ MOAC: Ministry of Agriculture and Cooperatives
⁷ MOC: Ministry of Commerce

